

1. Foreword

A: FOREWORD

These manuals are used when performing maintenance, repair or diagnosis of Subaru Forester.

Application model: 2007 MY SG*****

The manuals contain the latest information at the time of publication. Changes in the specifications, methods, etc. may be made without notice.

How To Use This Manuals

HOW TO USE THIS MANUALS

1. How To Use This Manuals

A: HOW TO USE THIS MANUALS

1. STRUCTURE

Each section consists of SCT that are broken down into SC that are divided into sections for each component. The specification, maintenance and other information for the components are included, and the diagnostic information has also been added where necessary.

2. INDEX

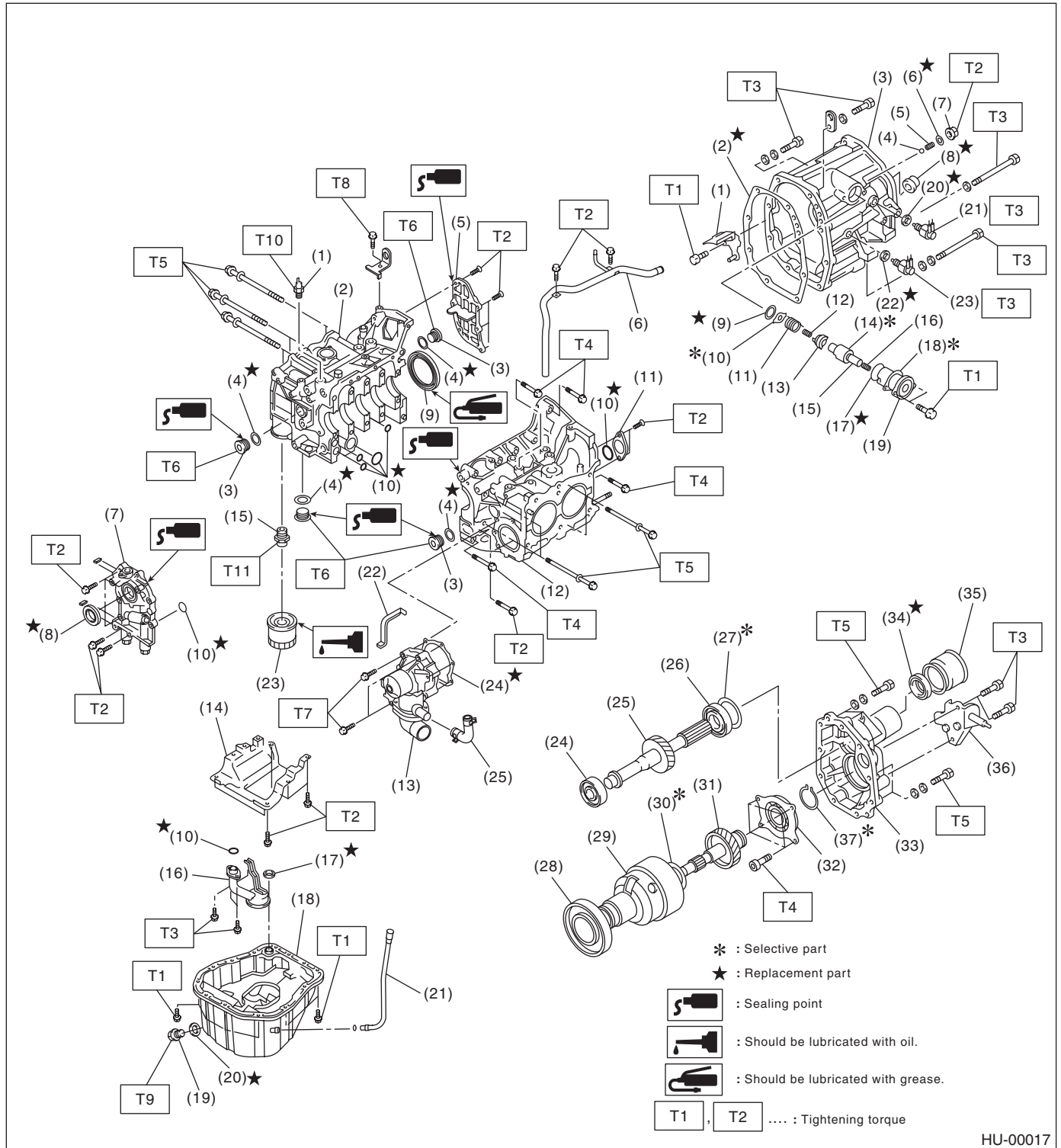
The first page has an index with tabs.

3. COMPONENT

Illustrations are provided for each component. The information necessary for repair work (tightening torque, grease up points, etc.) is described on these illustrations. Information is described using symbol.

To order parts, refer to parts catalogue.

Example:



HU-00017

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4. SPECIFICATION

If necessary, specifications are also included.

5. INSPECTION

Inspections to be carried out before and after maintenance are included.

6. MAINTENANCE

- Maintenance instructions for serviceable parts describe work area and detailed step with illustration. It also describes the use of special tool, tightening torque, caution for each procedure.
- If many serviceable parts are included in one service procedure, appropriate reference is provided for each parts.

Example:

15. Main Shaft Assembly for Single-Range ← (A)

A: REMOVAL ← (B)

1) Remove the manual transmission assembly from vehicle. <Ref. to MT-33, REMOVAL, Manual Transmission Assembly.> ← (C)

11) Tighten the lock nuts to the specified torque using ST1 and ST2.

NOTE: ← (D)

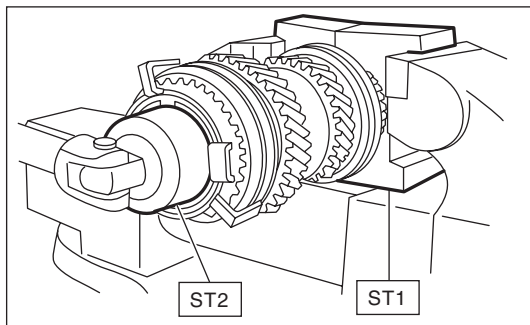
Secure the lock nuts in two Places after tightening.

ST1 498937000 TRANSMISSION HOLDER

ST2 499987003 (E) SOCKET WRENCH (35) (F)

Tightening torque:

118 N·m (12.0 kgf-m, 86.8 ft-lb) ← (G)



HU-00020

(A) Component

(B) Process

(C) Reference

(D) Cautions

(E) Tool number of special tool

(F) Name of special tool

(G) Tightening torque

(H) Illustration

7. DIAGNOSIS

Tables showing a step-by-step process make it easy to conduct diagnosis.

8. SI UNITS

Measurements in these manuals are according to the SI units. Metric and yard/pound measurements are also included.

Example:

Tightening torque:

44 N·m (4.5 kgf-m, 33 ft-lb)

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Forester

SPECIFICATIONS

1. Forester

A: DIMENSION

Model			2.5 L	
			AWD	
			Non-turbo	Turbo
Overall length	mm (in)		4,485 (176.6)	
Overall width	mm (in)		1,735 (68.3)	
Total height (at C.W.)	mm (in)		1,590 (62.6)	1,585 (62.4)
Compartment	Head-room	Front	mm (in)	1,012 (39.8) 992 (39.0)*1
		Rear	mm (in)	998 (39.3) 938 (36.9)*1
	Leg room	Front	mm (in)	1,108 (43.6)
		Rear	mm (in)	856 (33.7)
	Shoulder room	Front	mm (in)	1,356 (53.4)
		Rear	mm (in)	1,361 (53.6)
Wheelbase	mm (in)		2,525 (99.4)	
Tread	Front	mm (in)	1,495 (58.9)	
	Rear	mm (in)	1,485 (58.5)	
Minimum road clearance	mm (in)		205 (8.07)	200 (7.87)

*1: Model with sunroof

B: ENGINE

Model		2.5 L Non-turbo	2.5 L Turbo
Engine type		Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine	
Valve system mechanism	Method	SOHC	DOHC
	Number of valves	Intake 2/Exhaust 2	
Bore × stroke	mm (in)	99.5 × 79 (3.92 × 3.11)	
Displacement	cm ³ (cu in)	2,457 (149.94)	
Compression ratio		10.0±0.2	8.4±0.2
Ignition order		1 — 3 — 2 — 4	
Idling speed [at neutral position on MT, or "P" or "N" position on AT]	rpm	MT: 650±100 AT: 700±100	700±100
Maximum output	kW (HP)/rpm	129 (173)/6,000	172 (230)/5,600
Maximum torque	N·m (kgf·m, ft·lb)/rpm	226 (23.0, 166)/4,400	319 (32.5, 235)/3,600

C: ELECTRICAL

Model		2.5 L Non-turbo	2.5 L Turbo
Ignition timing/Idle speed	BTDC/rpm	MT: 10°±8°/650 AT: 15°±8°/700	17°±10°/700
Spark plug		NGK: FR5AP-11	NGK: ILFR6B
Generator		12 V — 90 A	12 V — 110 A
Battery		MT: 12 V — 48 AH (55D23L) AT: 12 V — 52 AH (75D23L)	

D: TRANSMISSION

Model		2.5 L Non-turbo		2.5 L Turbo		
Transmission		5MT	4AT	5MT	4AT	
Clutch type		DSPD	TCC	DSPD	TCC	
Gear ratio	1st	3.454	2.785	3.454	2.785	
	2nd	2.062	1.545	1.947	1.545	
	3rd	1.448	1.000	1.366	1.000	
	4th	1.088	0.694	0.972	0.694	
	5th	0.780	—	0.738	—	
	Rev.	3.333	2.272	3.333	2.272	
Reduction gear (Front)	First deceleration	Type	—	Helical	—	Helical
		Gear ratio	—	1.000	—	1.000
	Final deceleration	Type	Hypoid			
		Gear ratio	4.111	4.444		4.111
Reduction gear (Rear)	Transfer reduction	Type	Helical	—	Helical	—
		Gear ratio	1.000	—	1.000	—
	Final deceleration	Type	Hypoid			
		Gear ratio	4.111	4.444		4.111

5MT: 5-forward speeds with synchromesh and 1-reverse

4AT: Electronically controlled fully-automatic, 4-forward speeds and 1-reverse

DSPD: Dry Single Plate Diaphragm

TCC: Torque Converter Clutch

E: STEERING

Model		2.5 L Non-turbo		2.5 L Turbo		
Type		Rack and Pinion, Integral				
Turns, lock to lock		3.1		3.0		
Minimum turning diameter	m (ft)	Curb to curb	10.6 (34.8)		10.8 (35.4)	
		Wall to wall	11.4 (37.4)		11.6 (38.1)	

F: SUSPENSION

Front	Macpherson strut type independent suspension
Rear	Dual link strut type independent suspension

G: BRAKE

Model	2.5 X	2.5 XS, 2.5 XT, CROSS SPORTS 2.5 XT, L.L.Bean
Service brake system	Dual circuit hydraulic with vacuum suspension and power unit	
Front	Ventilated disc brake	
Rear	Drum brake	Disc brake
Parking brake	Mechanical on rear brakes	

H: TIRE

Wheel size	16 × 6 ¹ / ₂ JJ, 16 × 6 ¹ / ₂ J	17 × 7JJ
Tire size	P215/60R16 94H	P215/55R17 93H
Type	Steel belted radial, tubeless	

Forester

SPECIFICATIONS

I: CAPACITY

Model			2.5 L Non-turbo		2.5 L Turbo	
Transmission			5MT	4AT	5MT	4AT
Fuel tank			ℓ (US gal, Imp gal)			
			60 (15.9, 13.2)			
Engine oil	Total capacity (Overhaul)		5.0 (5.3, 4.4)			
	Filling amount of engine oil	When replacing engine oil and oil filter	4.2 (4.4, 3.7)		4.3 (4.5, 3.8)	
		When replacing only engine oil	4.0 (4.2, 3.5)			
Transmission oil			ℓ (US qt, Imp qt)			
			3.5 (3.7, 3.1)	—	3.5 (3.7, 3.1)	—
ATF			ℓ (US qt, Imp qt)			
			—	9.3 (9.8, 8.2)	—	9.3 (9.8, 8.2)
Front differential gear oil			ℓ (US qt, Imp qt)			
			—	1.2 (1.3, 1.1)	—	1.2 (1.3, 1.1)
Rear differential gear oil			ℓ (US qt, Imp qt)			
			0.8 (0.8, 0.7)			
Power steering fluid			ℓ (US qt, Imp qt)			
			0.7 (0.7, 0.6)			
Engine coolant			ℓ (US qt, Imp qt)			
			Approx. 6.9 (Approx. 7.3, 6.1)	Approx. 6.8 (Approx. 7.2, 6.0)	Approx. 7.4 (Approx. 7.8, 6.5)	Approx. 7.3 (Approx. 7.7, 6.4)

J: WEIGHT**1. FOR U.S. MODEL**

Option code★ 1			U5ZK		U5FK		U6ZK		U6FK	
Engine type			2.5 L Non-turbo							
Grade			2.5 X							
Transmission			5MT	4AT	5MT	4AT	5MT	4AT	5MT	4AT
Vehicle weight (C.W.)	Front axle	kg (lb)	796 (1,755)	814 (1,795)	789 (1,740)	807 (1,779)	796 (1,755)	814 (1,795)	789 (1,740)	807 (1,779)
	Rear axle	kg (lb)	639 (1,410)	639 (1,410)	632 (1,394)	632 (1,394)	639 (1,410)	639 (1,410)	632 (1,394)	632 (1,394)
	Total	kg (lb)	1,435 (3,165)	1,453 (3,205)	1,421 (3,133)	1,439 (3,173)	1,435 (3,165)	1,453 (3,205)	1,421 (3,133)	1,439 (3,173)
Total axle weight (G.A.W.)	Front axle	kg (lb)	930 (2,050)	930 (2,050)	930 (2,050)	930 (2,050)	930 (2,050)	930 (2,050)	930 (2,050)	930 (2,050)
	Rear axle	kg (lb)	998 (2,200)	998 (2,200)	998 (2,200)	998 (2,200)	998 (2,200)	998 (2,200)	998 (2,200)	998 (2,200)
Total vehicle weight (G.V.W.)		kg (lb)	1,882 (4,150)	1,882 (4,150)	1,882 (4,150)	1,882 (4,150)	1,882 (4,150)	1,882 (4,150)	1,882 (4,150)	1,882 (4,150)
Option	Aluminum wheel		—		○		—		○	
	Leather seats and leather door trim center decoration		—		—		—		—	
	Front fog light		○		○		○		○	
	Cruise control		○		○		○		○	
	Leather package base		—		—		—		—	
	Sunroof		—		—		—		—	
	VDC+VTD		—		—		—		—	
	Seat heater		—		—		—		—	
	Fully automatic air conditioner		—		—		—		—	
	Manual air conditioner		○		○		○		○	
	Cold zone package		—		—		—		—	
	Side airbag		○		○		○		○	
	De-icer		—		—		—		—	

★ 1: For option codes, refer to the ID section. <Ref. to ID-4, MODEL NUMBER PLATE, IDENTIFICATION, Identification.>

Forester

SPECIFICATIONS

Option code★1			U5SW		U5SL		U5SM		U6SW	
Engine type			2.5 L Non-turbo							
Grade			2.5 XS							
Transmission			5MT	4AT	5MT	4AT	5MT	4AT	5MT	4AT
Vehicle weight (C.W.)	Front axle	kg (lb)	796 (1,755)	814 (1,795)	795 (1,753)	815 (1,797)	789 (1,740)	810 (1,785)	789 (1,740)	810 (1,785)
	Rear axle	kg (lb)	644 (1,420)	644 (1,420)	645 (1,422)	645 (1,422)	635 (1,400)	635 (1,400)	635 (1,400)	635 (1,400)
	Total	kg (lb)	1,440 (3,175)	1,458 (3,215)	1,440 (3,175)	1,460 (3,219)	1,424 (3,140)	1,444 (3,185)	1,424 (3,140)	1,444 (3,185)
Total axle weight (G.A.W.)	Front axle	kg (lb)	930 (2,050)	930 (2,050)	930 (2,051)	930 (2,051)	930 (2,050)	930 (2,050)	930 (2,050)	930 (2,050)
	Rear axle	kg (lb)	998 (2,200)	998 (2,200)	1,000 (2,205)	1,000 (2,205)	998 (2,200)	998 (2,200)	998 (2,200)	998 (2,200)
Total vehicle weight (G.V.W.)		kg (lb)	1,882 (4,150)	1,882 (4,150)	1,880 (4,145)	1,880 (4,145)	1,882 (4,150)	1,882 (4,150)	1,882 (4,150)	1,882 (4,150)
Option	Aluminum wheel		○		○		○		○	
	Leather seats and leather door trim center decoration		—		—		—		—	
	Front fog light		○		○		○		○	
	Cruise control		○		○		○		○	
	Leather package base		○		○		○		○	
	Sunroof		○		○		—		○	
	VDC+VTD		—		—		—		—	
	Seat heater		—		○		○		—	
	Fully automatic air conditioner		○		○		○		○	
	Manual air conditioner		—		—		—		—	
	Cold zone package		—		○		○		—	
	Side airbag		○		○		○		○	
	De-icer		—		○		○		—	

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Forester

SPECIFICATIONS

Option code★ 1		U6SL		U6SM		U5TL	U6TL	U4TL		U483	U484	
Engine type		2.5 L Non-turbo						2.5 L Turbo		2.5 L Turbo		
Grade		2.5 XS				L.L.Bean		2.5 XT		CROSS SPORTS 2.5XT		
Transmission		5MT	4AT	5MT	4AT	4AT		5MT	4AT	5MT	4AT	
Vehicle weight (C.W.)	Front axle	kg (lb)	795 (1,753)	815 (1,797)	789 (1,740)	810 (1,785)	814 (1,795)	814 (1,795)	830 (1,830)	880 (1,940)	830 (1,830)	880 (1,940)
	Rear axle	kg (lb)	645 (1,422)	645 (1,422)	635 (1,400)	635 (1,400)	651 (1,435)	651 (1,435)	650 (1,433)	649 (1,432)	650 (1,433)	649 (1,432)
	Total	kg (lb)	1,440 (3,175)	1,460 (3,219)	1,424 (3,140)	1,444 (3,185)	1,465 (3,230)	1,465 (3,230)	1,480 (3,263)	1,529 (3,372)	1,480 (3,263)	1,529 (3,372)
Total axle weight (G.A.W.)	Front axle	kg (lb)	930 (2,051)	930 (2,051)	930 (2,050)	930 (2,050)	930 (2,050)	930 (2,050)	990 (2,183)	993 (2,190)	990 (2,183)	993 (2,190)
	Rear axle	kg (lb)	1,000 (2,205)	1,000 (2,205)	998 (2,200)	998 (2,200)	998 (2,200)	998 (2,200)	1,020 (2,249)	1,020 (2,250)	1,020 (2,249)	1,020 (2,250)
Total vehicle weight (G.V.W.)		kg (lb)	1,880 (4,145)	1,880 (4,145)	1,882 (4,150)	1,882 (4,150)	1,882 (4,150)	1,882 (4,150)	1,960 (4,322)	1,959 (4,320)	1,960 (4,322)	1,959 (4,320)
Option	Aluminum wheel		○		○		○		○		○	
	Leather seats and leather door trim center decoration		—		—		○		○		○	
	Front fog light		○		○		○		○		○	
	Cruise control		○		○		○		○		○	
	Leather package base		○		○		○		○		○	
	Sunroof		○		—		○		○		○	
	VDC+VTD		—		—		—		—		—	
	Seat heater		○		○		○		○		○	
	Fully automatic air conditioner		○		○		○		○		○	
	Manual air conditioner		—		—		—		—		—	
	Cold zone package		○		○		○		○		○	
	Side airbag		○		○		○		○		○	
	De-icer		○		○		○		○		○	

★ 1: For option codes, refer to the ID section. <Ref. to ID-4, MODEL NUMBER PLATE, IDENTIFICATION, Identification.>

Forester

SPECIFICATIONS

2. FOR CANADA MODEL

Option code★ 1			COZK		COTL		COSL		COSM	
Engine type			2.5 L Non-turbo							
Grade			2.5 X		2.5 XS					
Transmission			5MT	4AT	5MT	4AT	5MT	4AT	5MT	4AT
Vehicle weight (C.W.)	Front axle	kg (lb)	795 (1,753)	815 (1,797)	795 (1,753)	815 (1,797)	795 (1,753)	815 (1,797)	790 (1,742)	810 (1,786)
	Rear axle	kg (lb)	640 (1,411)	640 (1,411)	650 (1,433)	650 (1,433)	645 (1,422)	645 (1,422)	635 (1,400)	635 (1,400)
	Total	kg (lb)	1,435 (3,164)	1,455 (3,208)	1,445 (3,186)	1,465 (3,230)	1,440 (3,175)	1,460 (3,219)	1,425 (3,142)	1,445 (3,186)
Total axle weight (G.A.W.)	Front axle	kg (lb)	930 (2,051)	930 (2,051)	930 (2,051)	930 (2,051)	930 (2,051)	930 (2,051)	930 (2,051)	930 (2,051)
	Rear axle	kg (lb)	1,000 (2,205)	1,000 (2,205)	1,000 (2,205)	1,000 (2,205)	1,000 (2,205)	1,000 (2,205)	1,000 (2,205)	1,000 (2,205)
Total vehicle weight (G.V.W.)		kg (lb)	1,880 (4,145)	1,880 (4,145)	1,880 (4,145)	1,880 (4,145)	1,880 (4,145)	1,880 (4,145)	1,880 (4,145)	1,880 (4,145)
Option	Aluminum wheel		—		○		○		○	
	Leather seats and leather door trim center decoration		—		○		—		—	
	Front fog light		○		○		○		○	
	Cruise control		○		○		○		○	
	Leather package base		—		○		○		○	
	Sunroof		—		○		○		—	
	VDC+VTD		—		—		—		—	
	Seat heater		—		○		○		○	
	Fully automatic air conditioner		—		○		○		○	
	Manual air conditioner		○		—		—		—	
	Cold zone package		—		○		○		○	
	Side airbag		○		○		○		○	
	De-icer		—		○		○		○	

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SPECIFICATIONS

Option code★1			CO66		COSL		COTL		COSM	
Engine type			2.5 L Non-turbo				2.5 L Turbo			
Grade			2.5 XS				2.5 XT			
Transmission			5MT	4AT	5MT	4AT	5MT	4AT	5MT	4AT
Vehicle weight (C.W.)	Front axle	kg (lb)	790 (1,742)	810 (1,786)	845 (1,863)	865 (1,907)	830 (1,830)	850 (1,874)	825 (1,819)	845 (1,863)
	Rear axle	kg (lb)	635 (1,400)	635 (1,400)	655 (1,444)	655 (1,444)	650 (1,433)	650 (1,433)	635 (1,400)	635 (1,400)
	Total	kg (lb)	1,425 (3,142)	1,445 (3,186)	1,500 (3,308)	1,520 (3,352)	1,480 (3,263)	1,500 (3,308)	1,460 (3,219)	1,480 (3,263)
Total axle weight (G.A.W.)	Front axle	kg (lb)	930 (2,051)	930 (2,051)	990 (2,183)	990 (2,183)	990 (2,183)	990 (2,183)	990 (2,183)	990 (2,183)
	Rear axle	kg (lb)	1,000 (2,205)	1,000 (2,205)	1,020 (2,249)	1,020 (2,249)	1,020 (2,249)	1,020 (2,249)	1,020 (2,249)	1,020 (2,249)
Total vehicle weight (G.V.W.)		kg (lb)	1,880 (4,145)	1,880 (4,145)	1,960 (4,322)	1,960 (4,322)	1,960 (4,322)	1,960 (4,322)	1,960 (4,322)	1,960 (4,322)
Option	Aluminum wheel		○		○		○		○	
	Leather seats and leather door trim center decoration		—		—		○		—	
	Front fog light		○		○		○		○	
	Cruise control		○		○		○		○	
	Leather package base		○		○		○		○	
	Sunroof		—		○		○		—	
	VDC+VTD		—		—		—		—	
	Seat heater		○		○		○		○	
	Fully automatic air conditioner		—		○		○		○	
	Manual air conditioner		○		—		—		—	
	Cold zone package		○		○		○		○	
	Side airbag		○		○		○		○	
	De-icer		○		○		○		○	

★1: For option codes, refer to the ID section. <Ref. to ID-4, MODEL NUMBER PLATE, IDENTIFICATION, Identification.>

Forester

SPECIFICATIONS

3. OPTION

Option	Front kg (lb)	Rear kg (lb)	Total kg (lb)
Aluminum wheel	-6.6 (-14.6)	-6.6 (-14.6)	-13.2 (-29.1)
Leather seats and leather door trim center decoration	1.2 (2.6)	3.0 (6.6)	4.2 (9.3)
Front fog light	0.7 (1.5)	-0.1 (-0.2)	0.6 (1.3)
Cruise control	1.5 (3.3)	0.2 (0.4)	1.7 (3.7)
Leather package base	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Sunroof	3.5 (7.7)	13.2 (29.1)	16.7 (36.8)
VDC+VTD	3.0 (6.6)	1.0 (2.2)	4.0 (8.8)
Seat heater	0.2 (0.4)	0.3 (0.7)	0.5 (1.1)
Fully automatic air conditioner	16.9 (37.3)	-1.4 (-3.1)	15.5 (34.2)
Manual air conditioner	16.9 (37.3)	-1.4 (-3.1)	15.5 (34.2)
Cold zone package	0.1 (0.2)	0.2 (0.4)	0.3 (0.7)
Side airbag	2.0 (4.4)	2.4 (5.3)	4.4 (9.7)
De-icer	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

1. Precaution

A: CAUTION

Please clearly understand and adhere to the following. They must be strictly followed to avoid minor or serious injury to the person doing the work or people in the area.

1. ABS

Handle the ABS as a total system. Do not disassemble or attempt to repair individual parts. Follow the directions in this manual when performing maintenance on the ABSCM&H/U. When parts other than those specified are disassembled, the ABS system may not operate when needed, or may operate incorrectly and result in injury.

2. VEHICLE DYNAMICS CONTROL (VDC)

Handle the VDC as a total system. Do not disassemble or attempt to repair individual parts. Doing so could prevent the VDC system from operating when needed, or the system may operate incorrectly and result in injury.

3. BRAKE FLUID

If brake fluid gets in your eyes or on your skin, do the following:

- Wash out your eyes and seek immediate medical attention.
- Wash your skin with soap and then rinse thoroughly with water.

4. RADIATOR FAN

The radiator fan may rotate without warning, even when the engine is not ON. Do not place your hand, cloth, tools or other items near the fan at any time.

5. ROAD TEST

Always conduct road tests in accordance with traffic rules and regulations to avoid bodily injury and traffic interruption.

6. AIRBAG

To prevent bodily injury from unexpected deployment of airbags and unnecessary maintenance, follow the instructions in this manual when performing maintenance on the airbag components or nearby, around front of the vehicle (radiator panel, front wheel apron, front side frame, front bumper, front hood panel, front fender panel), around side of the vehicle (front door panel, center pillar, side sill), and the airbag wiring harnesses or nearby.

To prevent unexpected deployment, turn the ignition switch to OFF and disconnect the ground cable from battery, then wait at least 20 seconds to discharge electricity before starting work.

7. AIRBAG MODULE AND SEAT BELT PRETENSIONER DISPOSAL

To prevent bodily injury from unexpected airbag deployment, do not dispose the airbag modules and seat belt pretensioner in the same way as other waste. Follow all government regulations concerning disposal of refuse.

8. AIRBAG MODULE

Adhere to the following when handling and storing the airbag module to prevent bodily injury from unexpected deployment:

- Do not hold the harnesses or connectors to carry the module.
- Do not face the bag in the direction that it opens towards yourself or other people.
- Do not face the bag in the direction that it opens towards the floor or walls.

9. AIRBAG SPECIAL TOOLS

To prevent unexpected deployment, only use special tools.

10. WINDOW

Always wear safety glasses when working around any glass to prevent glass fragments from damaging your eyes.

11. WINDOW ADHESIVE

Always use the recommended or equivalent adhesive when attaching glass to prevent it from coming loose and falling, resulting in accidents and injury.

12. OIL

When handling oil, adhere to the following to prevent from unexpected accident.

- Prepare a container and cloth when performing work which oil possibly spills. If oil spills, wipe it off immediately to prevent from penetrating into floor or flowing out for environmental protection.
- Follow all government and local regulations concerning disposal of refuse when disposing.

13. FUEL

When handling and storing fuel, adhere to the following to prevent from unexpected accident.

- Be careful with fire.
- Prepare a container and cloth to prevent scattering of fuels when performing work where fuels can be spilled. If the fuel spills, wipe it off immediately to prevent from penetrating into floor or flowing out for environmental protection.
- Follow all government and local regulations concerning disposal of refuse when disposing.

14.ENGINE COOLANT

When handling engine coolant, adhere to the following to prevent from unexpected accident.

- Never remove the radiator cap since engine coolant may blow out when it is hot.
- Prepare a container and cloth to prevent scattering of engine coolant when performing work where engine coolant can be spilled. If the fuel spills, wipe it off immediately to prevent from penetrating into floor or flowing out for environmental protection.
- Follow all government and local regulations concerning disposal of refuse when disposing.

15.AIR CONDITIONER REFRIGERANT

In order to prevent from global warming, avoid releasing air conditioner refrigerant into the atmosphere. Using a refrigerant recovery system, discharge and reuse it.

Precaution

PRECAUTION

1. Note

A: NOTE

This is the information that can improve the efficiency of maintenance and assure the sound work.

1. FASTENER NOTICE

Replace the nonreusable parts with new parts. Check the tightening torque and tighten to the specified torque.

Do not apply paint, lubricant, rust retardant or other substance to the surface around bolts, nuts, etc. Doing so will make it difficult to obtain the correct torque and result in looseness and other problem.

2. STATIC ELECTRICITY DAMAGE

Do not touch the control modules, connectors, logic boards and other such parts when there is a risk of static electricity. Always use a static electricity prevention cord or touch grounded metal for the elimination of static electricity before conducting work.

3. BATTERY

When removing the battery cables, always be sure to turn the ignition switch to OFF to prevent electrical damage to the control module from overcurrent.

4. SERVICE PARTS

Use genuine parts for maximum performance and maintenance when conducting repairs. Subaru/FHI will not be responsible for poor performance resulting from the use of parts except for genuine parts.

5. PROTECTING VEHICLE UNDER MAINTENANCE

Make sure to attach the fender cover, seat covers, etc. before work.

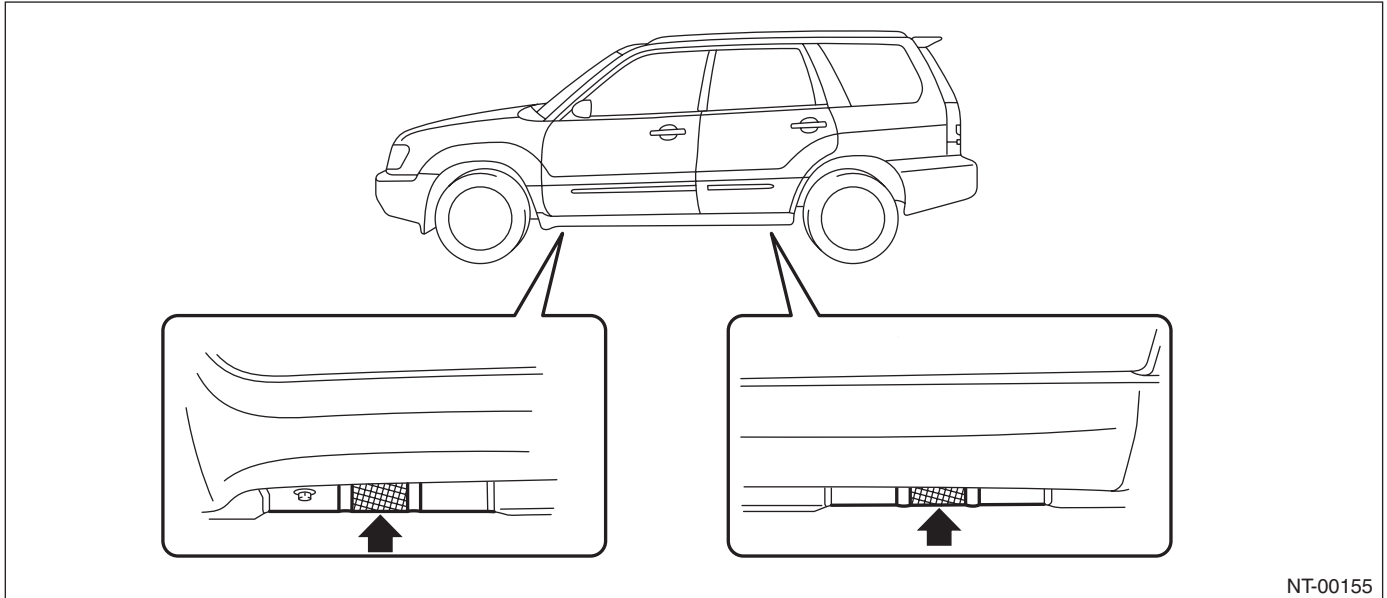
6. ENSURING SAFETY DURING WORK

When working in a group of two or more, perform the work with calling each other to ensure mutual safety.

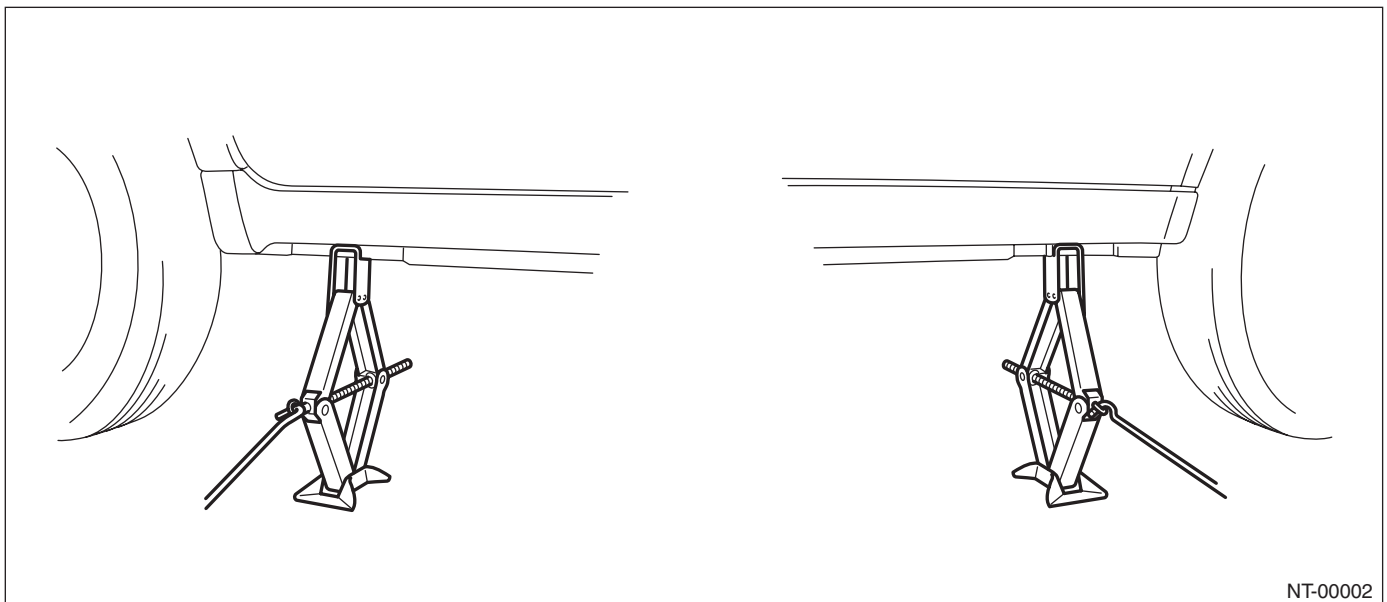
7. LIFTS AND JACKS

When using a lift or shop jack to raise a vehicle or using rigid racks to support a vehicle, always follow instructions concerning jack-up points and weight limits to prevent the vehicle from falling, which could result in injury. Be especially careful that the vehicle is balanced before raising it. Be sure to set the wheel stoppers when jacking-up only the front or rear side of the vehicle.

SUPPORT LOCATIONS



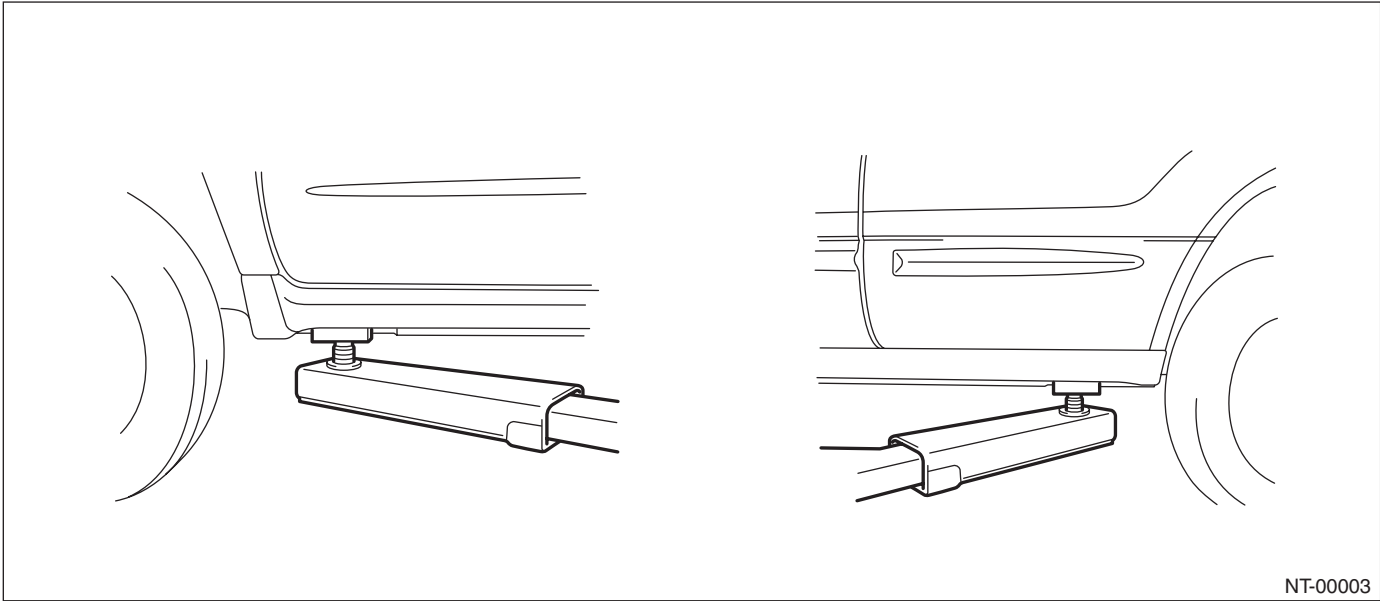
PANTOGRAPH JACK



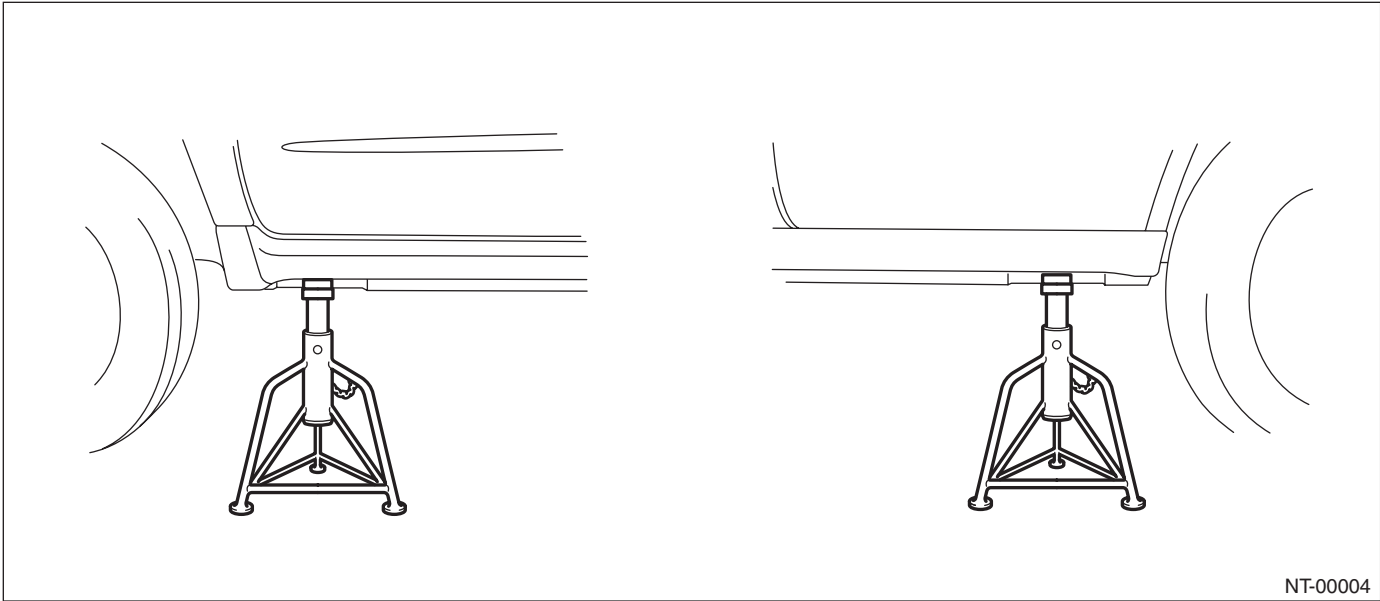
Note

NOTE

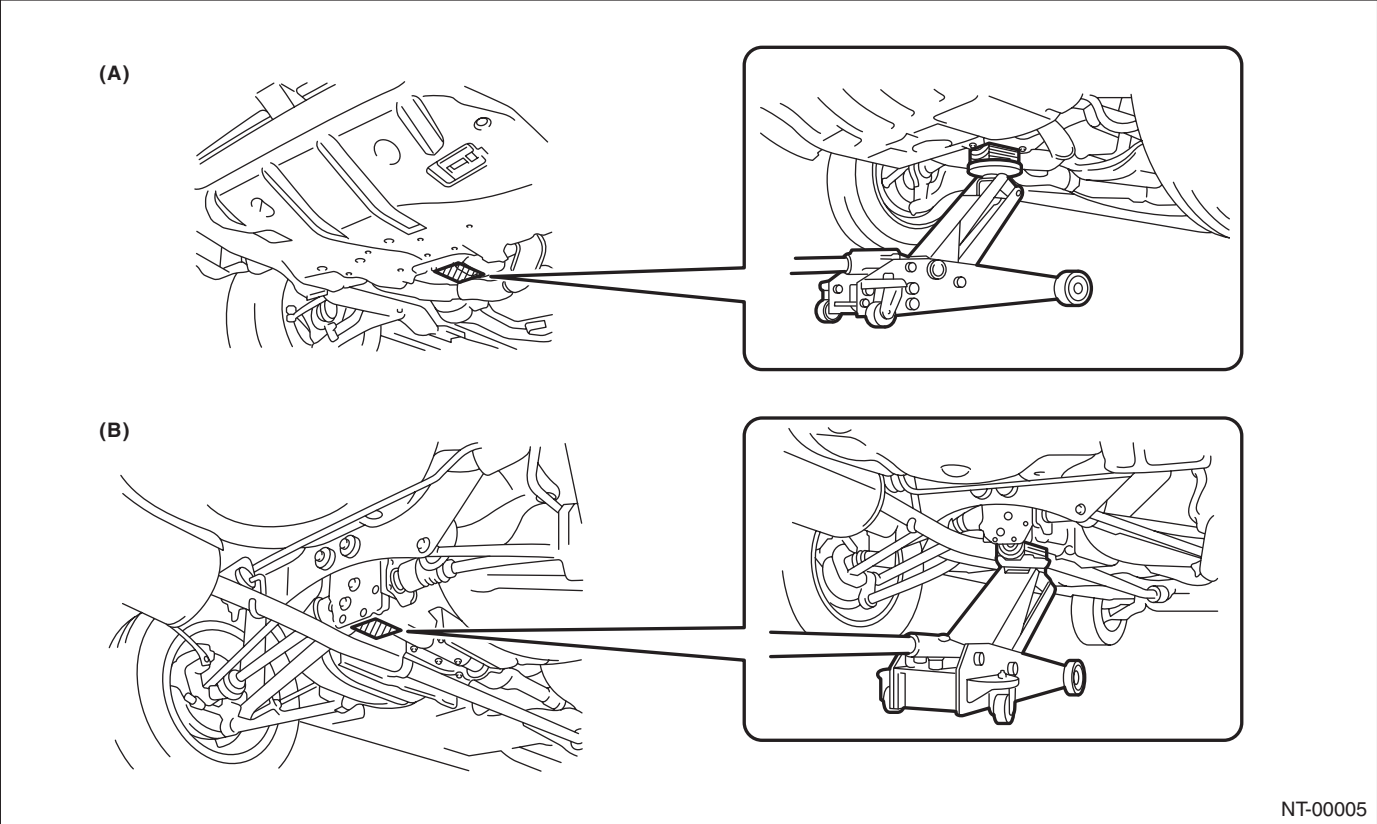
LIFT



RIGID RACK



JACK-UP POINT



(A) Front

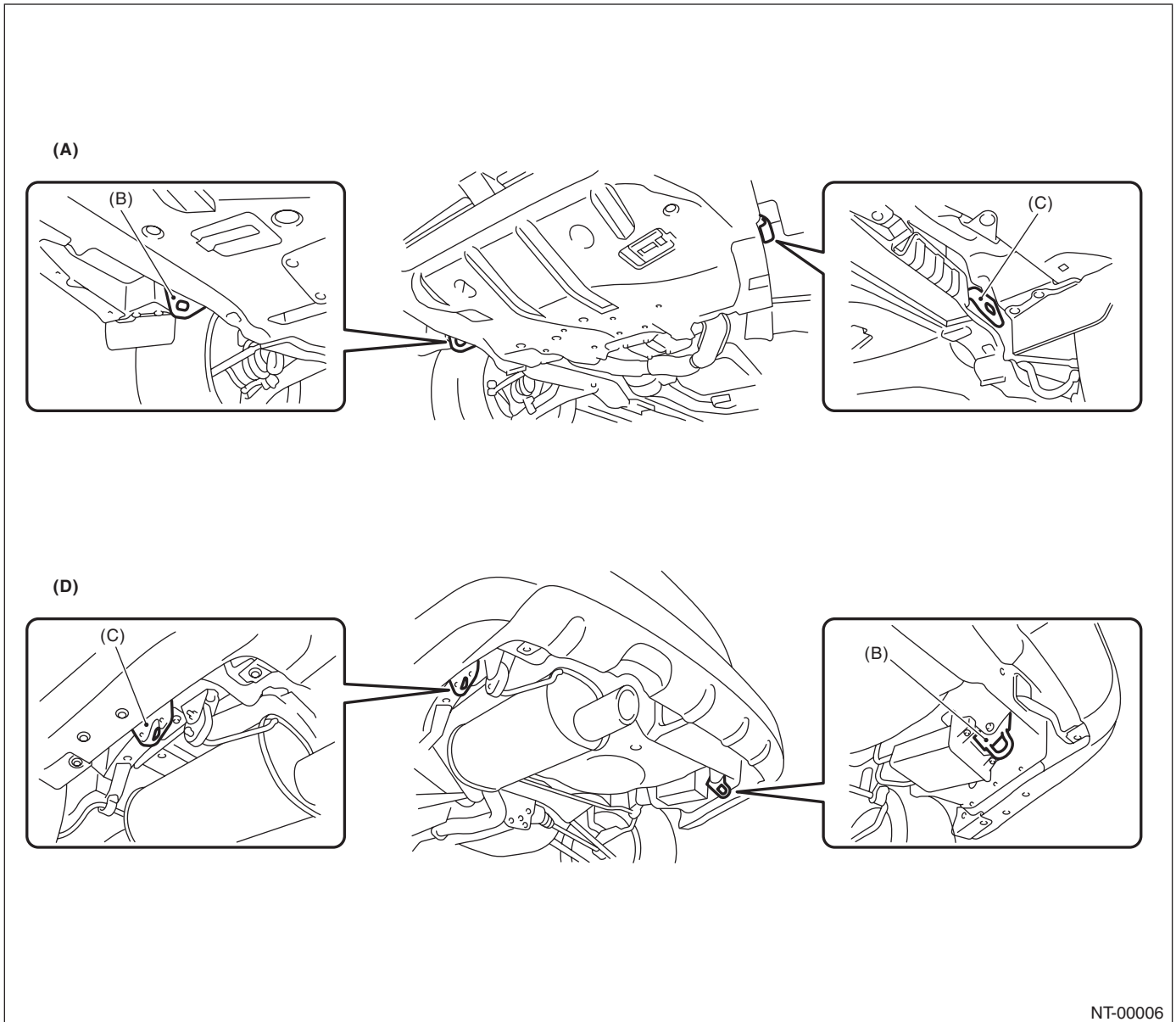
(B) Rear

Note

NOTE

8. TIE-DOWNS

Tie-downs are used when transporting vehicles and when using the chassis dynamo. Attach tie-down only to the specified place on the vehicle.



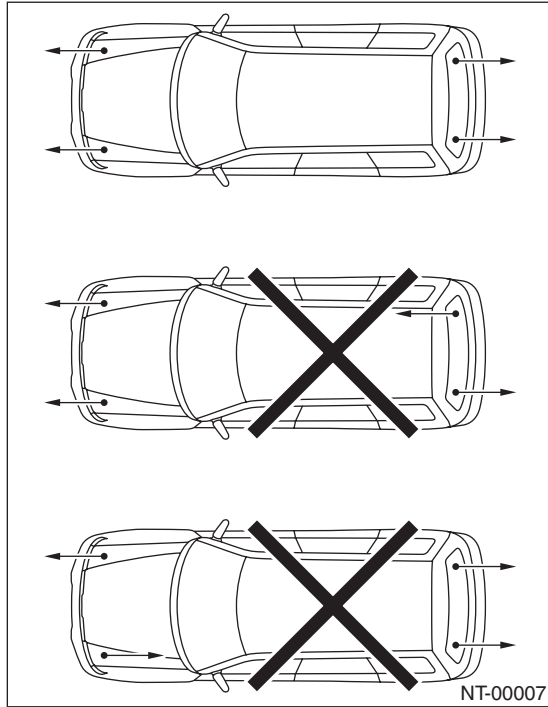
NT-00006

- (A) Front
- (B) Hook for tie-down and towing

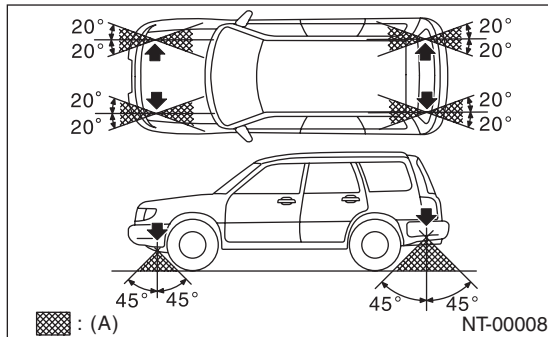
- (C) Hook for tie-down

- (D) Rear

CHAIN DIRECTION AT TIE-DOWN CONDITION



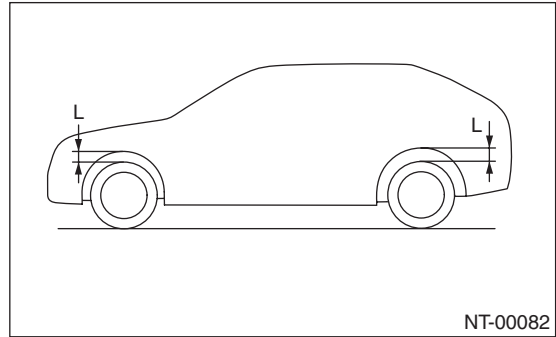
CHAIN PULLING RANGE AT TIE-DOWN CONDITION



(A) Chain pulling range at tie-down condition

VEHICLE SINKING VOLUME AT TIE-DOWN CONDITION

Measure the distance between the highest tire point and highest arch point before and after tie-down. Difference of measured values (sinking volume) should be within 50 mm (1.97 in) and make sure to fix the vehicle securely.



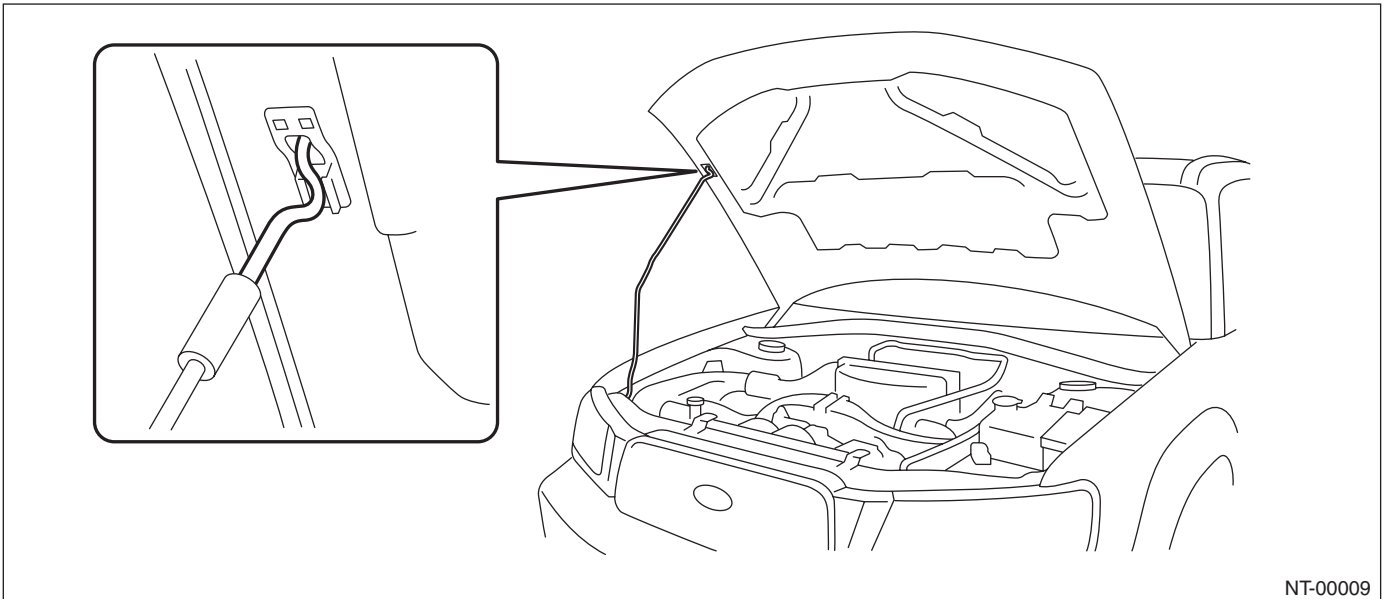
9. TOWING

Avoid towing vehicles except when the vehicle cannot be driven. For models with AWD or AT, use a loader instead of towing. When towing other vehicles, pay attention to the following to prevent hook or vehicle damage resulting from excessive weight.

- Do not tow other vehicles with a front tie-down hook.
- Make sure the vehicle towing is heavier than the vehicle being towed.

NOTE

10.FRONT HOOD STAY INSTALLATION AT THE CHECK AND GENERAL MAINTENANCE



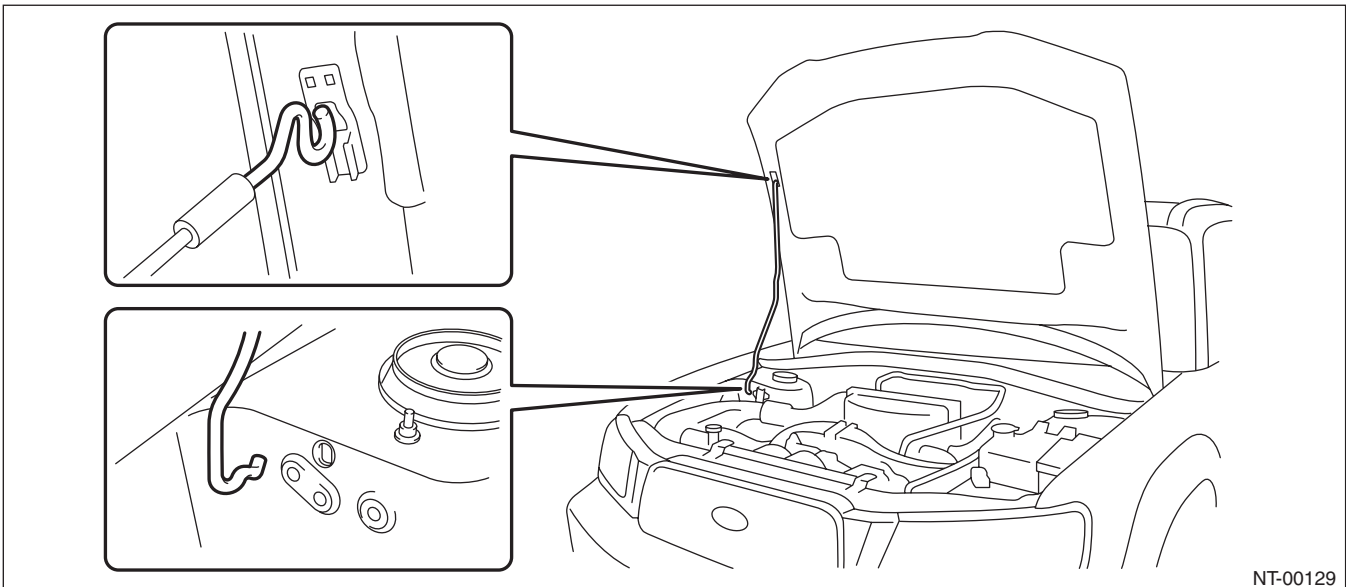
NT-00009

WHEN WIDER HOOD OPENING IS NECESSARY

Set stay into the hole of hood inner as shown in the figure below.

NOTE:

Before setting the front hood in this position, remove the windshield washer hose attaching clip from the front hood.



NT-00129

11.TRAINING

For an information about training, contact a dealer or agent.

12.GENERAL SCAN TOOL

Using general scan tools will greatly improve the efficiency of repairing engine electronic controls. Subaru Select Monitor can be used to diagnose the engine, ABS, air conditioner and other parts.

Identification

IDENTIFICATION

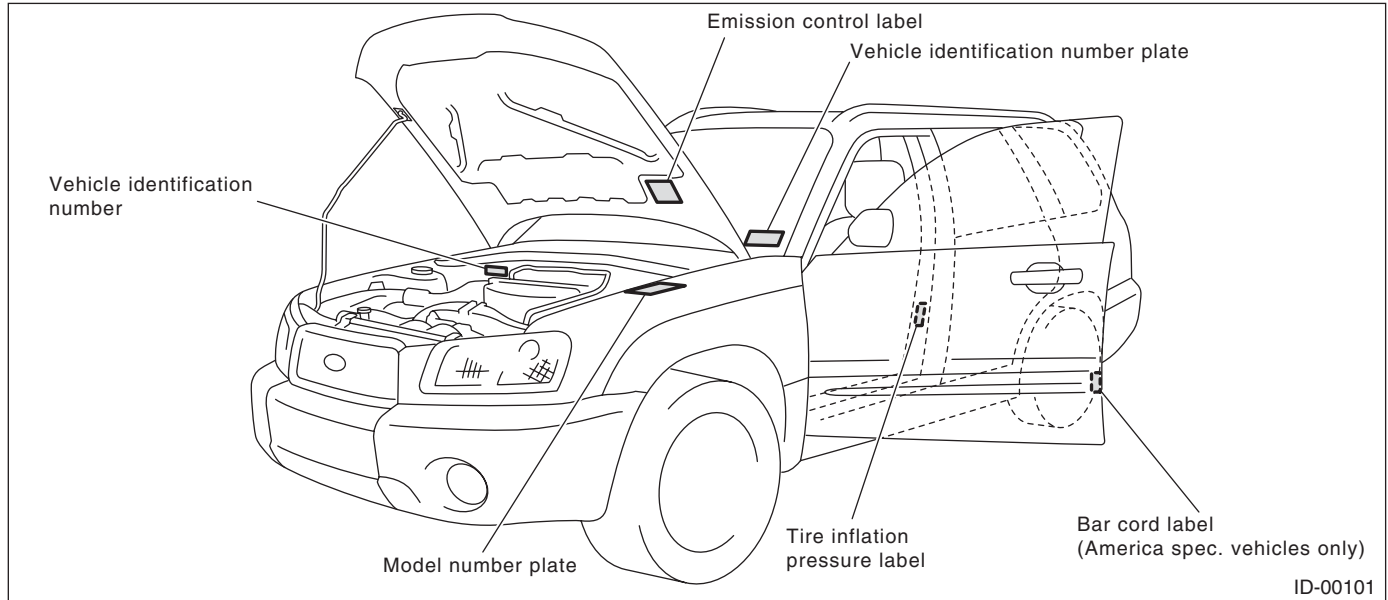
1. Identification

A: IDENTIFICATION

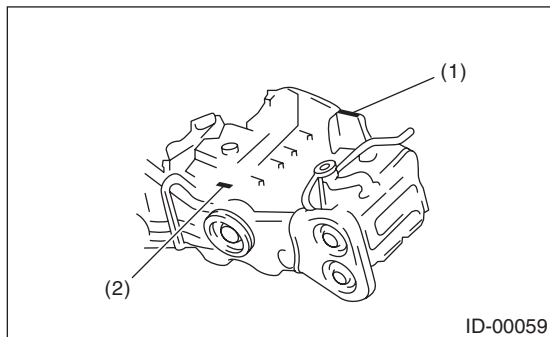
1. IDENTIFICATION NUMBER AND LABEL LOCATIONS

The Vehicle Identification Numbers (V.I.N.) is used to classify the vehicle.

• POSITIONING OF THE PLATE LABEL FOR IDENTIFICATION

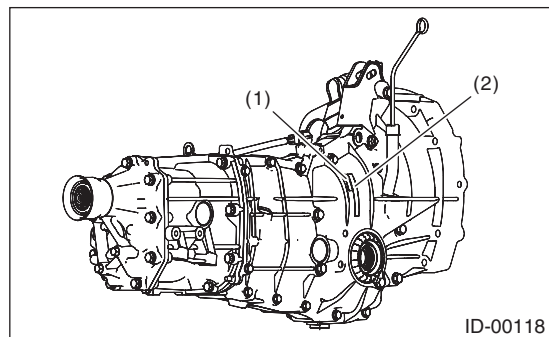


• ENGINE



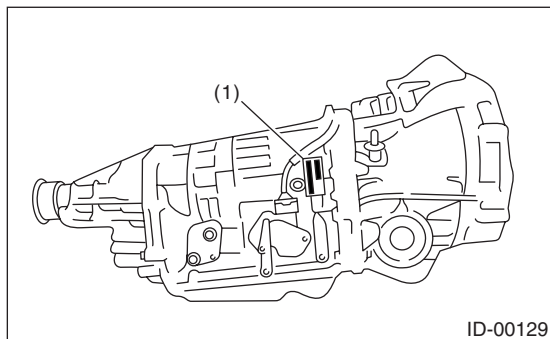
- (1) Engine serial number (Punch mark)
- (2) Engine type (Crankcase upper side)

• MANUAL TRANSMISSION



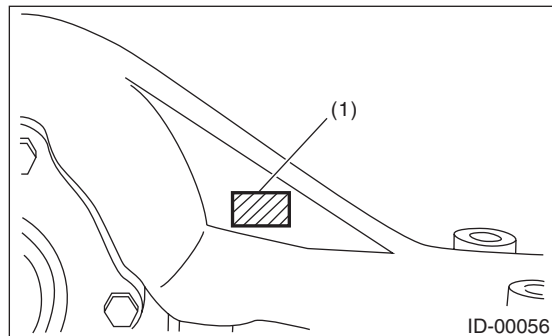
- (1) Transmission serial number
- (2) MT type label

• AUTOMATIC TRANSMISSION



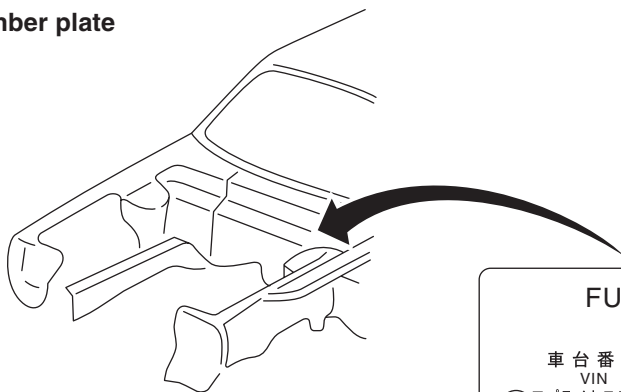
- (1) AT type and transmission serial number label

• REAR DIFFERENTIAL



(1) Type (white paint)

Model number plate



FUJI HEAVY INDUSTRIES LTD.													
型 式 <input type="text"/>													
車台番号		J F 1 S G 6 3 6 X 7 G 7 0 0 0 0 1											
VIN													
アプライトモデル		S G 9 D Y 4 J				オプションコード						U 5 Z K	
applied model						option code							
トリムコード		4 1 0		エンジン型式		E J 2 5 3 B S R H B							
trim code				engine type									
外装飾コード		2 3 0		ミッション型式		T Y 7 5 5 V C 7 A A							
Color code				transmission type									

ID-00152

Identification

IDENTIFICATION

2. MEANING OF V.I.N.

The meaning of the V.I.N. is as follows:

JF1SG636X7G700001

The large parentheses ([]) located in front and back are stop marks.

Digits	Code	Meaning	Details
1 — 3	JF1	Origin of manufacture of body	JF1: FHI manufactured passenger car
4	S	Car line	S: Forester
5	G	Body type	G: Wagon
6	6	Displacement class	6: 2.5 L AWD
7	3	Grade	3: 2.5 X 5: 2.5 XS 7: L.L. Bean 9: 2.5 XT
8	6	Restraint	6: Manual belt, dual airbags, side airbags
9	X	Check numbers	X or 0 — 9
10	7	Model year	7: 2007MY
11	G	Transmission type	G: Full-time AWD 5 speed MT H: Full-time AWD 4 speed AT
12 — 17	700001	Serial number	—

3. MODEL NUMBER PLATE

The model number plate indicates: the applied model, the option code, the trim code, the engine type, the transmission type, and the exterior color code. This information is helpful when placing orders for parts.

SG9EY4J

Digits	Code	Meaning	Details
1	S	Series	S: Forester
2	G	Body type	G: Wagon
3	9	Total engine displacement Drive system	9: 2.5 L AWD
4	E	Model year	E: 2007MY
5	Y	Destination	Y: U.S.A., Canada
6	4	Grade	4: 2.5 X 6: 2.5 XS 9: 2.5 XT C: L.L. Bean
7	J	Transmission, fuel feed system	D: DOHC turbo MFI 5 speed MT J: SOHC MFI 5 speed MT P: DOHC turbo MFI 4 speed AT R: SOHC MFI 4 speed AT

Identification

IDENTIFICATION

The engine and transmission type are as follows.

Engine

EJ253ASQFB

Digits	Code	Meaning	Details
1 and 2	EJ	Engine type symbol	EJ: 4 cylinder
3 and 4	25	Displacement class	25: 2.5 L
5	3	Fuel feed system	3: MFI non-turbo (SOHC) 5: MFI DOHC turbo
6	A	Exhaust regulations	A: For states not using California emission standards B: For all states C: For states using California emission standards
7	S	Mounted transmission	P: AT S: MT
8 — 10	QFB	Detailed specifications	Used for ordering parts. Refer to parts catalog for details.

Transmission

TY755VC7AA

Digits	Code	Meaning	Details
1	T	Transmission	T: Transmission
2	Y	Transmission system	V: Full-time AWD AT center differential (VTD) Y: Full-time AWD MT center differential Z: Full-time AWD AT MPT
3 and 4	75	Classification	1B: AT 75: MT
5	5	Series	5: MT, AT
6	V	Transmission basic specifications	L: MP-T full-time AWD direct 4 speed AT M: VTD center differential full-time AWD direct 4 speed AT V: Full-time AWD 5 speed MT single range with viscous coupling center differential
7	C	Installed body	C: 2.5 L SOHC B: 2.5 L DOHC turbo 5 speed MT W: 2.5 L DOTC turbo 4 speed AT
8 — 10	7AA	Detailed specifications	Used for ordering parts. Refer to parts catalog for details.

Rear differential

T2

Code	Reduction gear ratio	LSD
T2	4.111	None
JP	4.111	Viscous
TP	4.444	None
CF	4.444	Viscous

Option code

U5ZK

Digits	Code	Meaning	Details
1 — 2	U5	Destination	U5: U.S. (for states using California emission standards) U6: U.S. (for states not using California emission standards) U4: U.S. (for all states) CO: Canada
3 — 4	ZK	Vehicle main options	—

Identification

IDENTIFICATION

Recommended Materials

RECOMMENDED MATERIALS

1. Recommended Materials

A: RECOMMENDED MATERIALS

1. GENERAL

To insure the best performance, always use the specified oil, gasoline, adhesive, sealant, etc. or a substitute of equivalent quality.

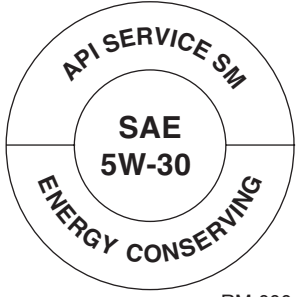

2. FUEL

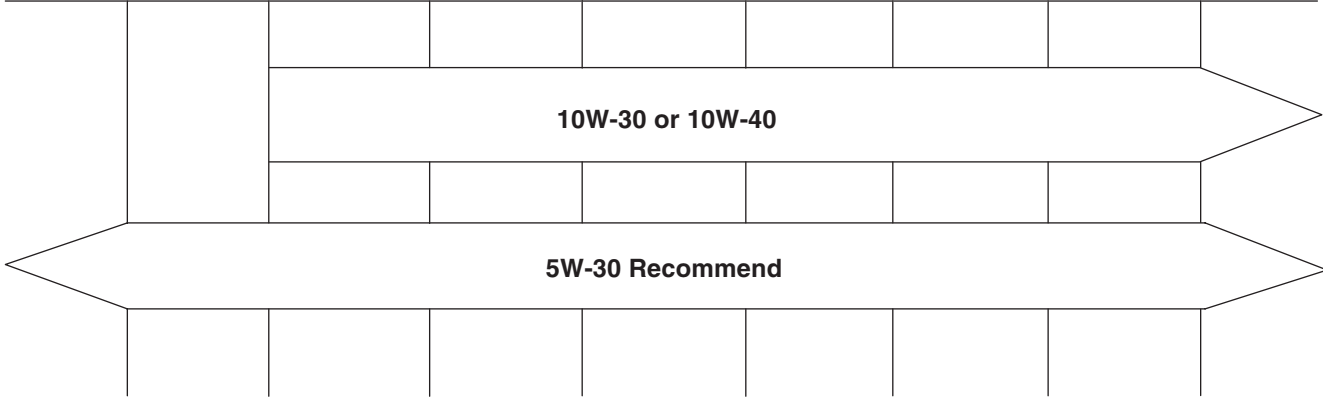
- Use unleaded gasoline to reduce air pollution, because using leaded gasoline will damage the catalytic converter.
- Do not use the low quality gasoline, or improper fuel such as diesel fuel, fuel alcohol, or gasoline additive because they will adversely affect on engine components.
- Always use gasoline that is equivalent to that prescribed in the instruction manual or that of high octane value. There is the possibility of damaging or improper operation of the engine and fuel injection system if the specifications are not observed. Use the prescribed gasoline type to maintain proper vehicle performance.

Recommended Materials

3. LUBRICANTS

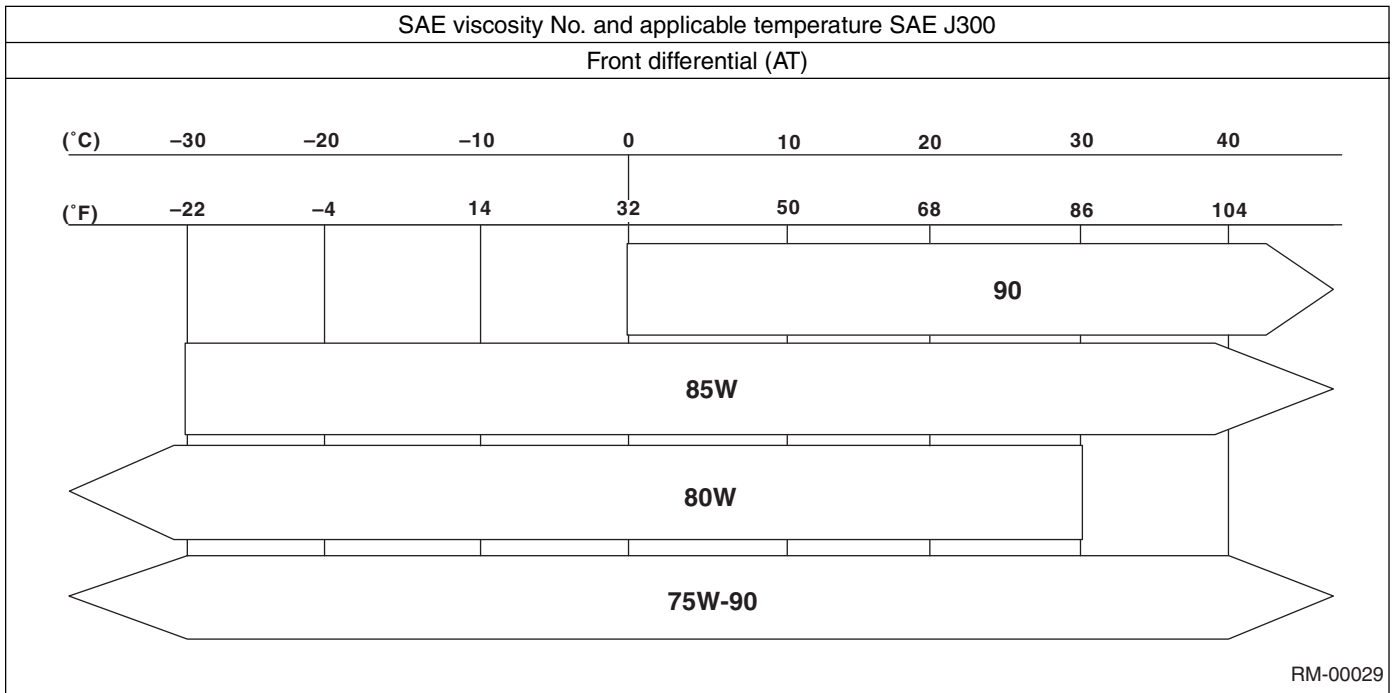
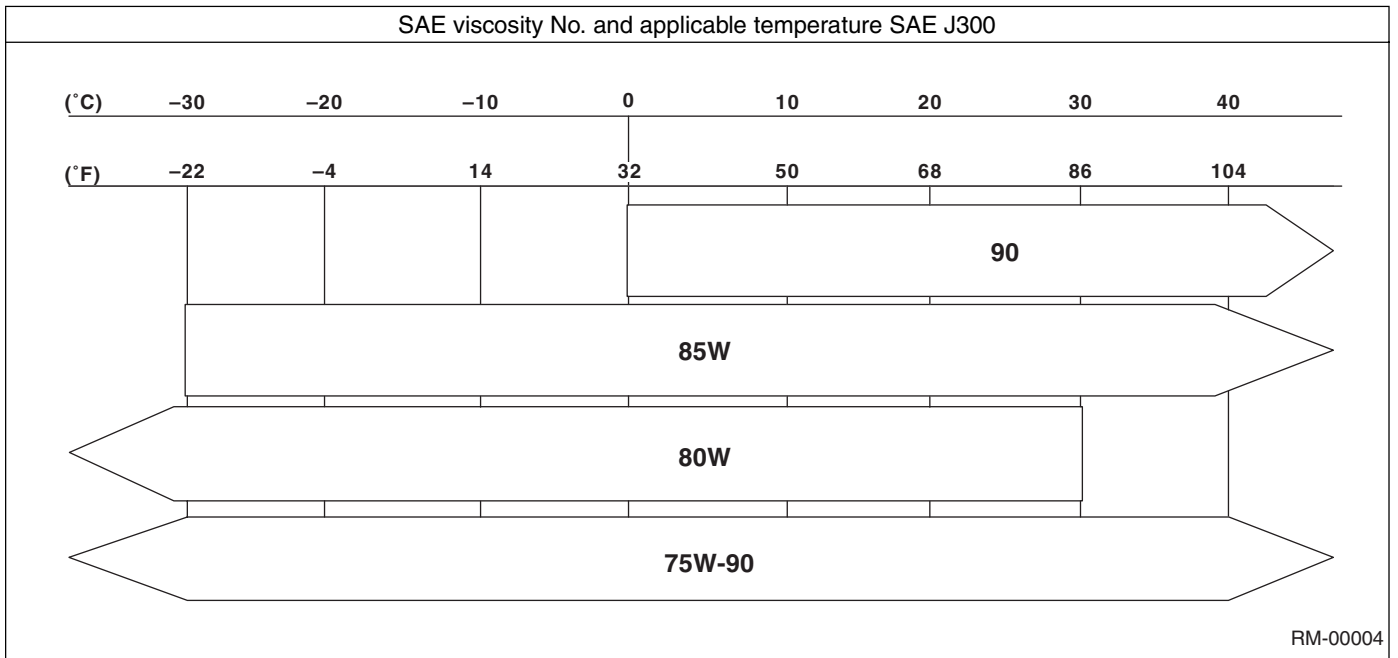
Use the lubricants shown in the table below, or equivalent. See the table below to choose the correct SAE viscosity.

Lubricants	Recommended materials	
	API spec.	ILSAC spec.
Engine oil	SM grade "Energy conservation"  RM-00049	GF-4  RM-00002
Manual transmission oil	GL-5	—
Front differential oil	GL-5	—
Rear differential oil	GL-5	—

SAE viscosity No. and applicable temperature SAE J300								
Engine oil								
(°C)	-30	-20	-10	0	10	20	30	40
(°F)	-22	-4	14	32	50	68	86	104
								
RM-00059								
Manual transmission oil and rear differential oil								

Recommended Materials

RECOMMENDED MATERIALS



4. FLUID

Use the fluids specified in the table below. Do not mix two different kinds or makes of fluid.

Fluid	Recommended materials	Item number	Alternative
Automatic transmission fluid	SUBARU ATF HP	—	Idemitsu: ATF HP Castrol: Transmax J Pennzoil Quakerstate: Pennzoil ATF-J
Power steering fluid	DEXRON III	—	—
Brake fluid	FMVSS No. 116 DOT3	—	FMVSS No. 116 DOT4
Clutch fluid	FMVSS No. 116 DOT3	—	FMVSS No. 116 DOT4

Recommended Materials

RECOMMENDED MATERIALS

5. ENGINE COOLANT

Use genuine engine coolant to protect the engine.

Engine coolant	Recommended materials	Item number	Alternative
Coolant	SUBARU coolant	000016218	Phosphoric acid (non-amine) type
Water for dilution	Distilled water	—	Soft water or tap water
Cooling system protecting agent	Cooling system conditioner	SOA345001	None

6. REFRIGERANT

Standard air conditioners on Subaru vehicles use HFC134a refrigerant. Do not mix it with other refrigerants. Also, do not use any air compressor oil other than ZXL200PG.

Air conditioner	Recommended materials	Item number	Alternative
Refrigerant	HFC134a	—	None
Compressor oil	ZXL200PG	—	None

7. GREASE

Use the grease and supplementary lubricants shown in the table below.

Grease	Application point	Recommended materials	Item number	Alternative
Supplementary lubricants	<ul style="list-style-type: none"> • Oxygen sensor • Bolts etc. 	Spray type lubricant	—	—
Grease	MT main shaft	NICHIMOLY N-130	—	—
	Clutch master cylinder push rod	Silicone grease G-40M	004404003	—
	<ul style="list-style-type: none"> • Gear shift lever • Select lever • Clutch activating cylinder • Accelerator pedal • Clutch pedal • Brake pedal • Hill holder • Clutch bearing • Clutch release lever • Steering shaft bearing 	KOPR-KOTE	003603001	—
	Selector lever lock plate unit	Suncall GLO-244	0029408040	—
	Steering gearbox	Variant grease M-2	003608001	One luber MO or One luber SG
	<ul style="list-style-type: none"> • Disc brake • Drum brake wheel cylinder 	Niglube RX-2	K0779GA102	—
	<ul style="list-style-type: none"> • Drum brake • Brake shoe 	Molykote No. 7439	003602001	—
	Brake pad	Molykote AS-880N	K0777YA010	—
	Front axle AARi	One luber C	28395SA000	—
	Front axle AC	Olistamoloy	28395SA020	—
	Rear axle BJ, EBJ	NTG2218-M	28395AG010	—
	Rear axle DOJ	NGK205	28495AG000	—
<ul style="list-style-type: none"> • Water pump • Door latch • Door striker 	Silicone grease G-30M	004404002	—	

Recommended Materials

RECOMMENDED MATERIALS

8. ADHESIVES

Use the adhesives shown in the table below, or equivalent.

Adhesive	Application point	Recommended materials	Item number	Alternative
Adhesive	Windshield, rear window glass, rear quarter glass, rear gate and body	Dow Automotive's Adhesive: ESSEX U-400 HV or equivalent Glass primer: U-401 and No. U-402 Paint surface primer: U-413	—	—
	Rearview mirror base	REPAIR KIT IN MR	65029FC000	—
	Soft vinyl	Cemedine 540	—	3M's EC-776, EC-847 or EC-1022 (Spray type)
	Momentary sealant	Cemedine 3000	—	Armstrong's Eastman 910

9. SEAL MATERIAL

Use the seal material shown in the table below, or equivalent.

Seal material	Application point	Recommended materials	Item number	Alternative
Seal material	MT transmission case	THREE BOND 1215B	—	Dow corning's No. 7038
	<ul style="list-style-type: none"> • Cylinder block • DOHC cam cap (Turbo model) • Torque converter clutch case • Oil pump 	THREE BOND 1215	004403007	
	Engine oil pan	THREE BOND 1207C	004403012	—
	ATF oil pan	THREE BOND 1217B	K0877YA020	—
	<ul style="list-style-type: none"> • Rear differential • Engine oil pressure switch • Cylinder head (Nipple) 	THREE BOND 1324	004403042	—
	<ul style="list-style-type: none"> • Rear differential • Service hole plug 	THREE BOND 1105	004403010	Dow corning's No. 7038
	Weather strip	Star caulking B-33A	000018901	Butyl rubber sealant
	<ul style="list-style-type: none"> • Steering adjusting screw • PCV Valve 	THREE BOND 1141	004403006	—
	<ul style="list-style-type: none"> • SOHC cam cap • DOHC rocker cover • Separator cover • DOHC semicircular plug 	THREE BOND 1280B	K0877YA018	THREE BOND 1217G
	<ul style="list-style-type: none"> • Front sealing cover • Rear sealing cover 	3M Butyl Rubber 8626	—	—

1. Pre-delivery Inspection

A: GENERAL DESCRIPTION

The purposes of the pre-delivery inspection (PDI) are as follows.

- Remove the additional parts used for ensuring the vehicle quality during transportation and restore the vehicle to its normal condition.
- Check that the vehicle before shipment is in normal condition.
- Check that there are no scratches on the vehicle and that none of the vehicle protective parts are missing when shipping or in storage.
- Make sure to deliver a complete vehicle to customer.

For above reasons, all SOA service centers must carry out the PDIs before delivery of vehicle.

Furthermore, all SOA service centers and PDI centers must inspect the status of all vehicles and clarify the responsible party.

B: PRE-DELIVERY INSPECTION (PDI) PROCEDURE

Follow the procedures shown in the table below.

Static Checks Just After Vehicle Receipt

Step	Check point
1. Appearance check	<ol style="list-style-type: none"> 1. If the vehicle is covered with protective coating, visually check the vehicle body for damage and dents. If the protective coating has been removed, visually inspect the body paints for small areas of damage or rust. 2. Visually check the glass and light lenses for any damage, cracks or excessive gaps between body sheet metal. 3. Visually check the plated parts for any damage.
2. Tire check	<ol style="list-style-type: none"> 1. Check the tires for damage, defective, and dents on wheels. 2. Check the tire air pressure.
3. Fuse installation	If the vehicle is about to be shipped to the customer, attach a room light fuse.
4. Air conditioner harness connection	If the vehicle is about to be shipped to the customer, connect the air conditioner harness.
5. Lock/unlock and open/close operation checks of doors.	<ol style="list-style-type: none"> 1. Using the key, check the trunk lid can be locked or unlocked normally. 2. Open and close all doors to check that there are no defective.
6. Operation check of child safety lock system	Check the child safety lock system operates normally.
7. Lock/unlock and open/close operation checks of the rear doors.	<ol style="list-style-type: none"> 1. Open and close the rear gate to see that there are no abnormal conditions. 2. Check if the rear gate can be unlocked normally through the emergency hole. 3. Operate the power door lock switch to check that the rear gate is locked and unlocked normally.
8. Operation check of fuel lid opener lock release lever	Operate the fuel lid opener to check that the fuel lid is unlocked normally.
9. Accessory check	<p>Check that the following accessories are provided.</p> <ul style="list-style-type: none"> • Owner's manual • Warranty booklet • Maintenance note • Spare key • Key number plate • Jack • Tool set • Spare tire
10. Operation check of front hood lock release system	Operate the front hood lock release lever to check that the front hood opens normally.
11. Battery	Check the battery for any abnormal conditions such as rust and trace of battery fluid leaks.
12. Brake fluid	Check the fluid amount.
13. Engine oil	Check the oil amount.
14. Transmission fluid	Check the fluid amount.
15. AT front differential oil	Check the AT front differential oil amount.
16. Engine coolant	Check the engine coolant amount.
17. Clutch fluid	Check the clutch fluid amount.
18. Window washer fluid	Check the window washer fluid amount.
19. Front hood latch check	Check that the hood is closed and latched completely.
20. Keyless entry system	Check that the keyless entry system operates normally.
21. Alarm system	Check that the alarm system operates normally.
22. Seat	<ol style="list-style-type: none"> 1. Check the seat surfaces for stains or dirt. 2. Check the seat installation conditions and functionality. 3. Check that the passenger's seat occupant detection system operates normally.
23. Seat belt	<ol style="list-style-type: none"> 1. Check the seat belt installation conditions and functionality. 2. Check the seat belt warning functionality for normal operations.

Pre-delivery Inspection

PRE-DELIVERY INSPECTION

Checks with the Engine Running

Step	Check point
24. Test mode connector	Test mode connector
25. Starting condition	Start the engine and check that the engine starts smoothly.
26. Exhaust system	Check that the exhaust noise is normal and no leaks are found.
27. Indicator and warning lights	Check that all indicator lights and warning lights operate normally.
28. Clock	Check that the clock operates normally.
29. Radio	Check that the radio system operates normally.
30. Accessory power socket	Check that the accessory power socket operates normally.
31. Lighting system	Check that the lighting system operates normally.
32. Window washer	Check that the window washer system operates normally.
33. Wiper	Check that the wiper system operates normally.
34. Power window operation check	Check the power window for normal operations.

Dynamic Test with the Vehicle Running

Step	Check point
35. Brake test	Check the foot brake for normal operations.
36. Parking brake	Check the parking brake for normal operations.
37. AT shift control	Check that the AT shifts normally.
38. Heater & ventilation	Check that the heater & ventilation system operates normally.
39. Air conditioner	Check that the air conditioner operates normally.
40. Cruise control	Check that the cruise control system operates normally.

Checks after Dynamic Test

Step	Check point
41. ATF level	Check that the ATF level is correct.
42. Power steering fluid level	Check that the power steering fluid level is normal.
43. Fluid leak check	Check for fluid/oil leaks.
44. Water leak check	Spray the vehicle with water and check for water leaks.
45. Appearance check 2	<ol style="list-style-type: none">1. Remove the protective coating (if any).2. Check the body paints for damage and stain.3. Check the plated parts for damage and rust.

1. APPEARANCE CHECK

- 1) If the vehicle is covered with protective coating, visually check the vehicle body for damage and dents.
- 2) When there is no protective coating, check the body paints for damage or stains in detail and repair as necessary.
- 3) Check the window glass, door glass, and lights for any cracks or damage and replace the parts as necessary.
- 4) Check the plated parts, such as the grilles and door knobs, for damage or loss of gloss and replace the parts as necessary.

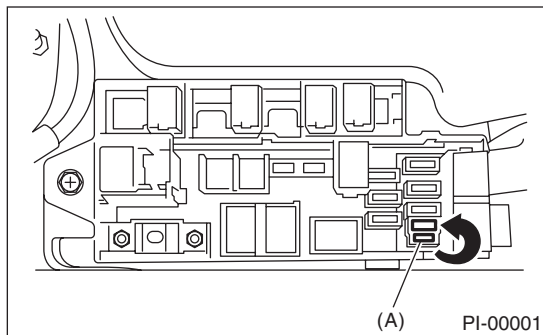
2. TIRE CHECK

- Check the outer side surface of the tire damage.
- Check the tire air pressure by referring to the following table.

Tire size	Tire inflation pressure kPa (kg/cm ² , psi)	
	Front	Rear
P215/60R16	200 (2.0, 29)	190 (1.9, 28)
P215/55R17	220 (2.2, 32)	210 (2.1, 30)

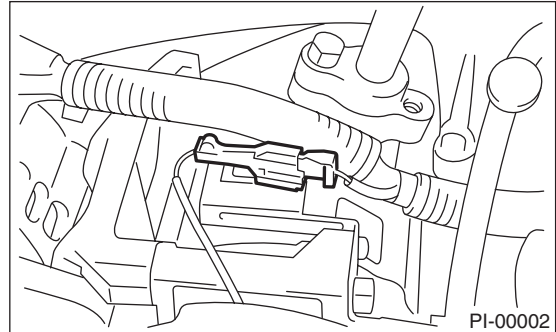
3. FUSE INSTALLATION

A vehicle just delivered has no fuse for the room light circuit to prevent battery discharge. Attach a 15 A fuse (A) as shown in the figure.



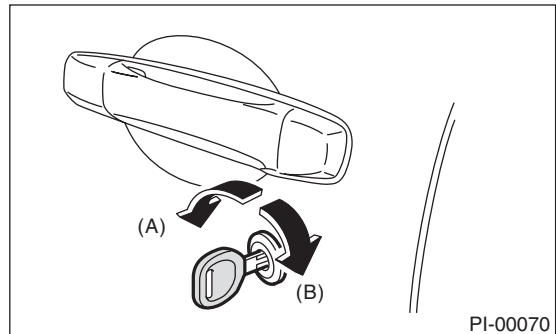
4. CONNECTION OF AIR CONDITIONER HARNESS

A vehicle just delivered has its air conditioner harness disconnected to protect the air conditioner compressor. Connect the harness as shown in the figure.



5. CHECK THE DOORS FOR LOCK/UNLOCK AND OPEN/CLOSE OPERATIONS

1) Using the key, lock and unlock the door several times to check for normal operation. Open and close the door several times for smooth movement.



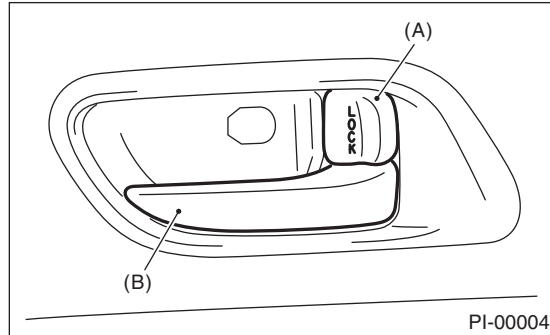
- (A) Unlock
- (B) Lock

Pre-delivery Inspection

PRE-DELIVERY INSPECTION

2) Close the door of driver seat completely, and place the door lock knob (A) to the lock position. Then pull the inner remote (B) to ensure that doors will not open.

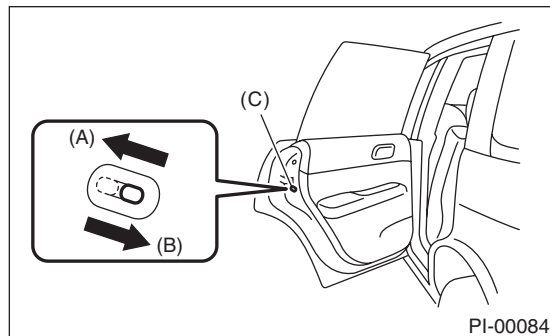
For other doors, place the door lock knob (A) to lock position and then pull the inner remote (B) to ensure that doors will not open.



- (A) Door lock knob
- (B) Inner remote

6. CHECK THE OPERATION OF CHILD SAFETY LOCKS

- 1) Set the child safety lock on both rear doors to the lock position.
- 2) Close the rear doors completely.
- 3) Check that the lock levers of the rear doors are in the unlock position. Then, pull inner remote of rear doors to ensure that doors will not open.
- 4) Pull the outer handles of the rear doors to ensure that doors will open.



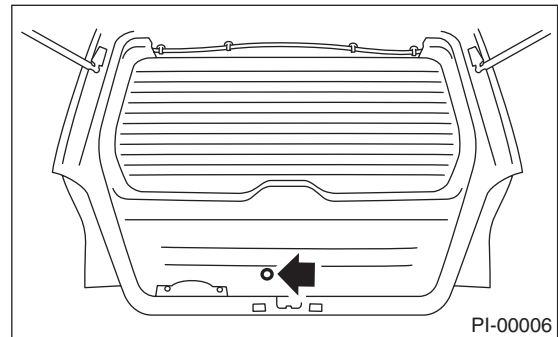
- (A) Unlock
- (B) Lock
- (C) Child safety lock

7. CHECK THE REAR GATE FOR LOCK/ UNLOCK AND OPEN/CLOSE OPERATIONS

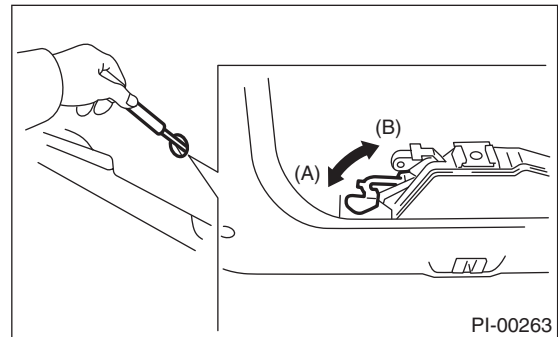
1) Open and close the rear gate several times for smooth movement.

2) Operate the rear gate emergency lever to check that the rear gate is locked and unlocked normally.

(1) Remove the cover inside the rear gate.



(2) Operate the driver to check that the rear gate is locked and unlocked normally.



- (A) Lock
- (B) Unlock

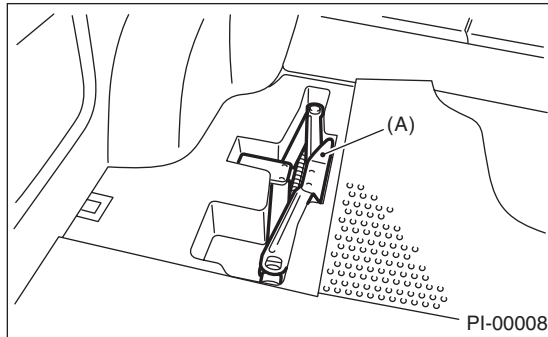
8. OPERATION CHECK OF FUEL LID OPENER LOCK RELEASE LEVER

Operate the fuel lid opener to check that the fuel lid opens normally. Check that the filler cap is securely closed.

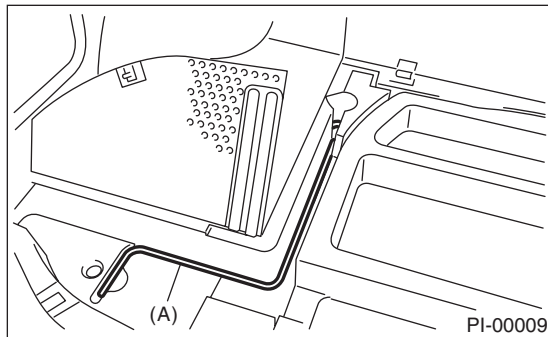
9. ACCESSORY CHECK

Check that the following accessories are provided.

- Owner's manual
- Warranty booklet
- Maintenance note
- Spare key
- Key number plate
- Jack
- Tool set
- Spare tire



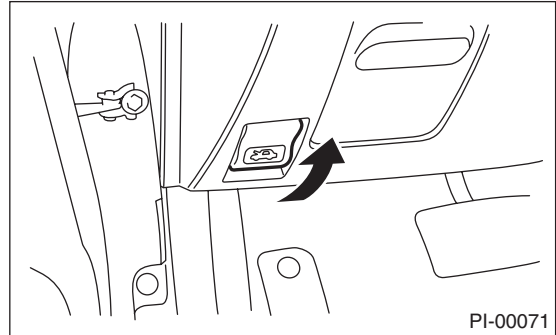
(A) Jack



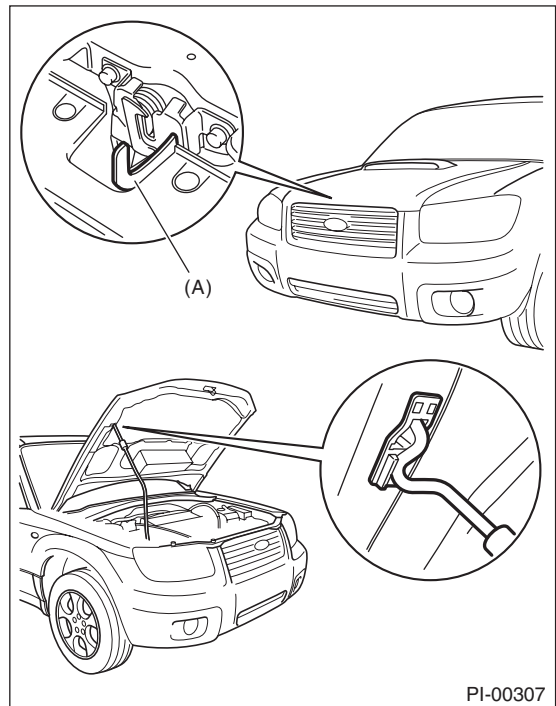
(A) Jack handle

10. OPERATION CHECK OF FRONT HOOD LOCK RELEASE SYSTEM

Operate the front hood release knob to check that the front hood is locked normally.



Operate the lever (A) and check that the front hood is opened normally. Support the front hood with hood stay.

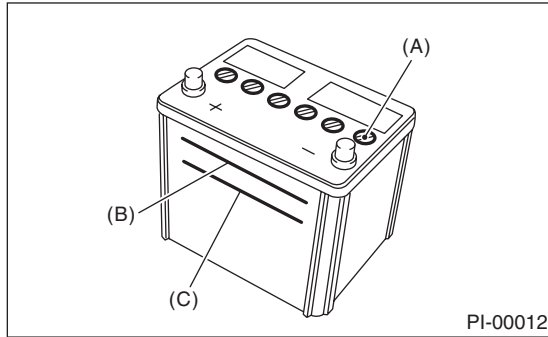


Pre-delivery Inspection

PRE-DELIVERY INSPECTION

11. BATTERY

Check the battery terminals to make sure that no rust or corruptions due to fluid leaks are found. Check that the battery caps are securely tightened.



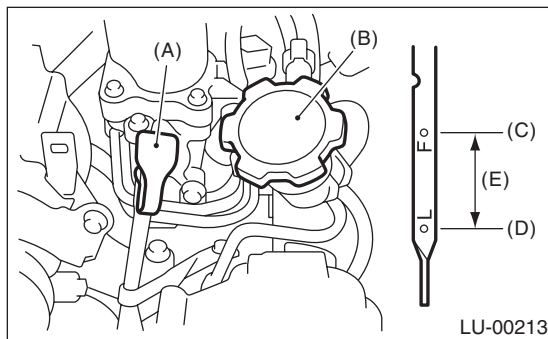
- (A) Cap
- (B) Upper level
- (C) Lower level

12. BRAKE FLUID

Check the brake fluid amount. If the amount is insufficient, carry out a brake line test to identify brake fluid leaks and check the brake operation. After that, refill the brake fluid tank with the specified type of fluid.

13. ENGINE OIL

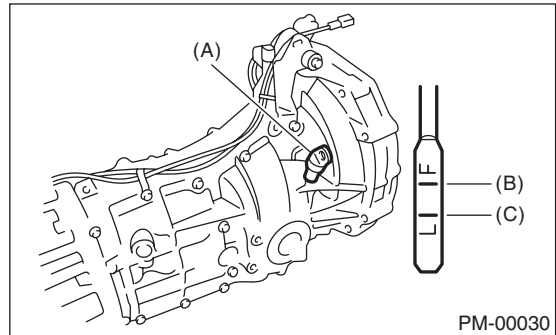
Check the engine oil amount. If the amount of oil is insufficient, check that no leaks are found. Then, add the necessary amount of the specified engine oil.



- (A) Engine oil level gauge
- (B) Engine oil filler cap
- (C) Upper level
- (D) Lower level
- (E) Approx. 1 ℓ (1.1 US qt, 0.9 Imp qt)

14. TRANSMISSION FLUID

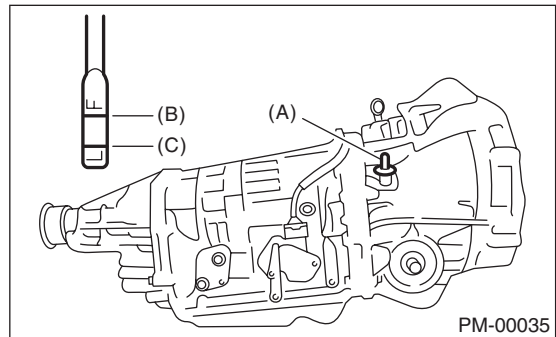
Check the transmission fluid amount. If the amount of fluid is inappropriate, check that no leaks are found. Then, add the necessary amount of specified fluid.



- (A) Oil level gauge
- (B) Upper level
- (C) Lower level

15. AT FRONT DIFFERENTIAL OIL

Check the AT front differential oil amount. If the amount of oil is inappropriate, check that no leaks are found. Then, add the necessary amount of the specified AT front differential oil.



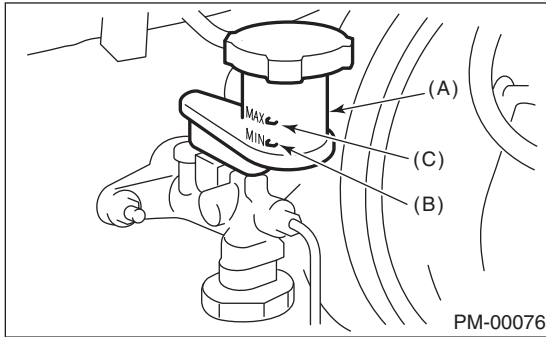
- (A) Oil level gauge
- (B) Upper level
- (C) Lower level

16. ENGINE COOLANT

Check the coolant amount on the reservoir. If the amount of engine coolant is insufficient, check that no leaks are found. Then, add the necessary amount of coolant with the specified concentration.

17. CLUTCH FLUID

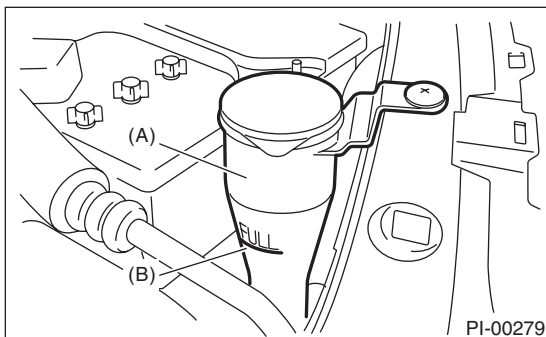
Check the clutch fluid amount. If the amount of fluid is insufficient, check that no leaks are found. Then, add the necessary amount of specified fluid.



- (A) Reservoir tank
- (B) MIN. level
- (C) MAX. level

18. WINDOW WASHER FLUID

Check the window washer fluid amount. If the amount is insufficient, check that no leaks are found. Then, add the necessary amount of washer fluid commercially available.



- (A) Window washer tank
- (B) FULL level

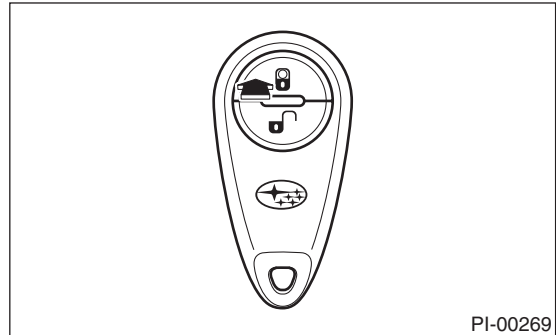
19. FRONT HOOD LATCH CHECK

Retract the front hood stay and close the front hood. Check that the front hood is completely latched.

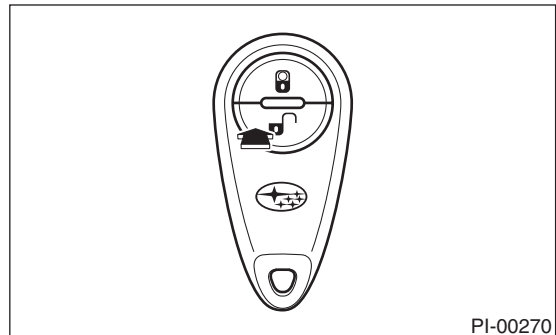
20. KEYLESS ENTRY SYSTEM

Check the keyless entry system operations as follows:

- 1) Fully open all the door windows.
- 2) Remove the key from the ignition switch and close all the doors including rear gate.
- 3) Press the "LOCK/ARM" button once on the keyless transmitter. Check if all the doors are locked, the buzzer rings once and hazard light blinks once.



- 4) Press the "UNLOCK/DISARM" button once on the keyless transmitter. Check if the driver's side door is unlocked, the buzzer rings twice and hazard light blinks twice.



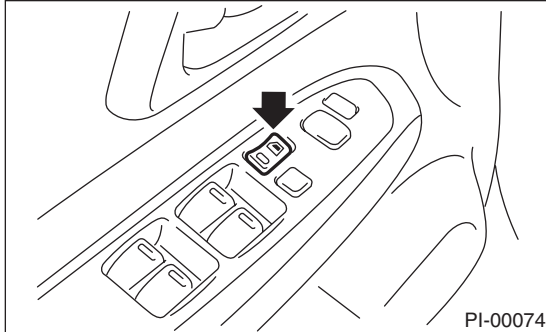
- 5) Press the "UNLOCK/DISARM" button once on the keyless transmitter within 5 seconds. Check that all doors (including rear gate) are unlocked.
- 6) Press the "LOCK/ARM" button on the keyless transmitter for approximately 2 seconds. Check whether a panic state (horn continuously honks) occurs. Also, check whether that state continues for 30 seconds or until the keyless transmitter button is pressed.
- 7) Press the "LOCK/ARM" button once on the keyless transmitter with one door (including the rear gate) open. Check that the buzzer rings five times and the door open warning is issued. Next, close all the doors including rear gate. Check if all the doors are locked, the buzzer rings once and hazard light blinks once.

Pre-delivery Inspection

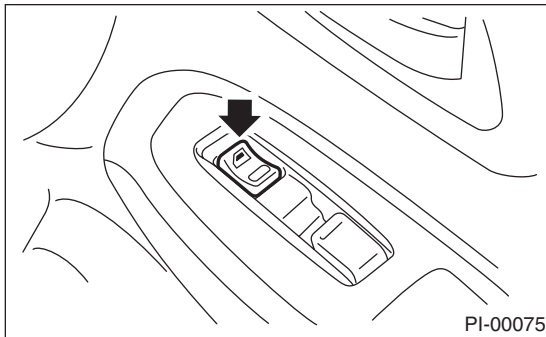
PRE-DELIVERY INSPECTION

8) Press the “LOCK” side of the power door switch with one door (including the rear gate) open. Next, close all the doors including rear gate. Check if all the doors are locked, the buzzer rings once and hazard light blinks once.

- Driver’s side



- Passenger’s side



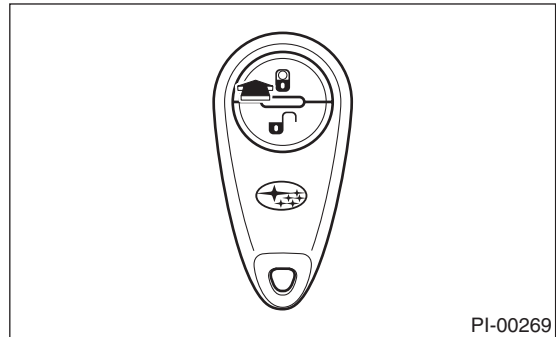
CHECK ALARM OPERATION

The system uses a buzzer to ring an alarm when the doors are locked or unlocked. The alarm can be turned off if desired. To turn off the alarm, execute the unlocking procedures of the keyless entry system. Press the “LOCK/ARM” button and the “UNLOCK/DISARM” button simultaneously for more than 2 seconds. The buzzer will ring twice, the hazard light will blink twice, and the alarm will show that it is OFF. To turn ON the alarm, execute the unlocking procedures of the keyless entry system. Press the “LOCK/ARM” button and the “UNLOCK/DISARM” button simultaneously for more than 2 seconds. The buzzer will ring once, the hazard light will blink once, and the alarm will show that it is on.

21.ALARM SYSTEM

Check that the alarm system is operating as shown below.

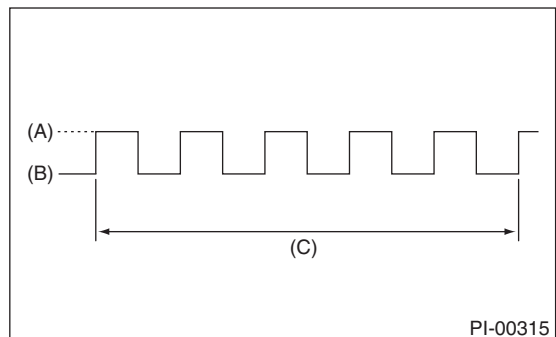
- 1) Fully open all the door windows.
- 2) Remove the key from the ignition switch and close all the doors including rear gate.
- 3) Press the “LOCK/ARM” button once on the keyless transmitter.



- 4) If all the doors are locked, the buzzer rings once, the hazard light blinks once and security indicator light blinks as shown in the figure, the alarm system is in the arming preparatory state.



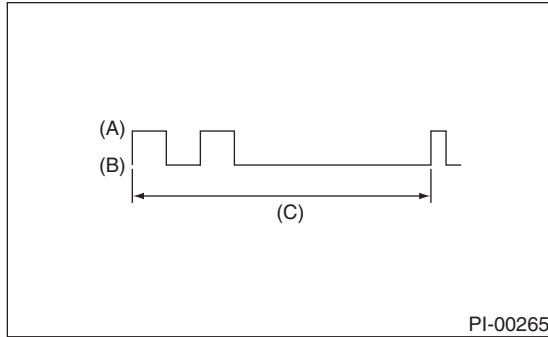
- Alarm system arming state



- (A) Light ON
- (B) Light OFF
- (C) 2 seconds

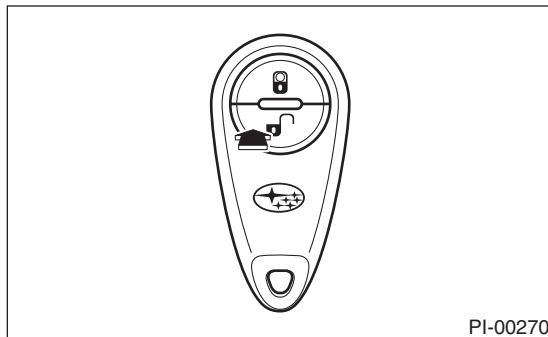
5) Check that the condition described in 4) lasts for 30 seconds and then the system is brought into the arming state.

- Alarm system arming state (all models)



- (A) Light ON
- (B) Light OFF
- (C) 2 seconds

6) Press the “UNLOCK/DISARM” button once on the keyless transmitter.



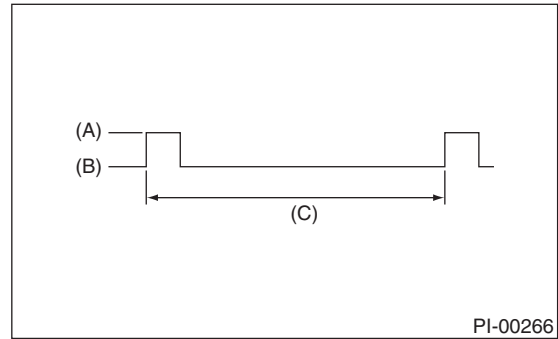
7) The driver’s side door is unlocked, the buzzer rings twice and hazard light blinks twice, the room light is lit and if the security indicator light is extinguished, the alarm system has been disarmed.

NOTE:

After pressing the “UNLOCK/DISARM” button on the keyless transmitter, the security indicator light does not blink on models without an immobilizer.

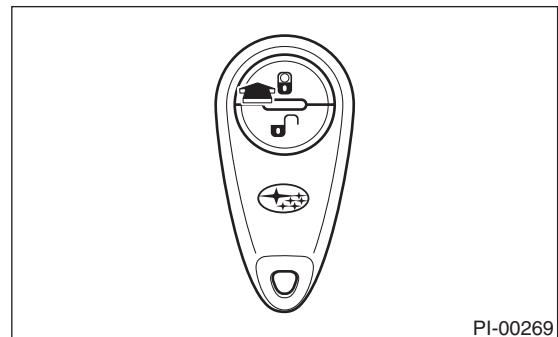


- Alarm system unarming preparatory state (model with immobilizer)



- (A) Light ON
- (B) Light OFF
- (C) 3 seconds

8) Press the “LOCK/ARM” button once on the keyless transmitter with one door (including the rear gate) open.

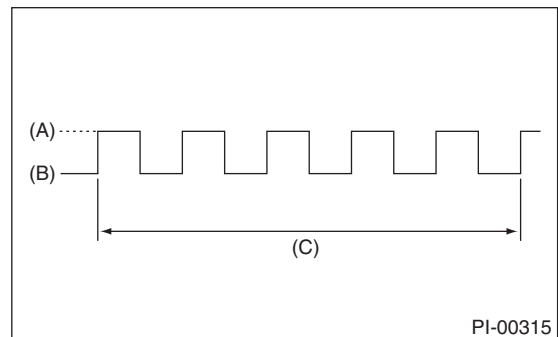


9) Check that the buzzer rings five times and the door open warning is issued.

10) Close all the doors including rear gate.

11) Check that it is in the arming state (all the doors are locked, the buzzer rings once and hazard light blinks once).

- Alarm system arming preparatory state

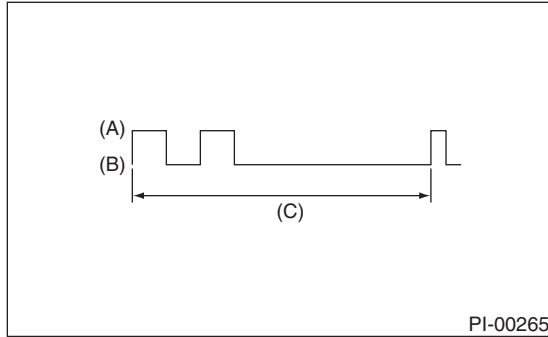


- (A) Light ON
- (B) Light OFF
- (C) 2 seconds

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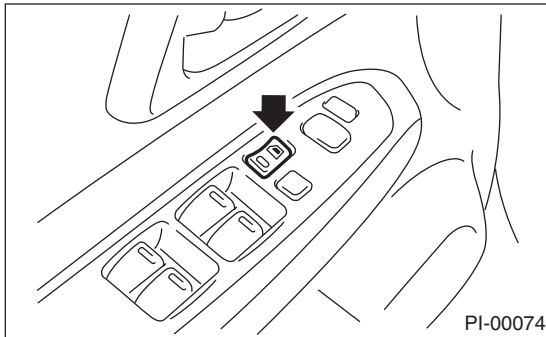
12) Check that the condition described in 11) lasts for 30 seconds and then the system is brought into the arming state.



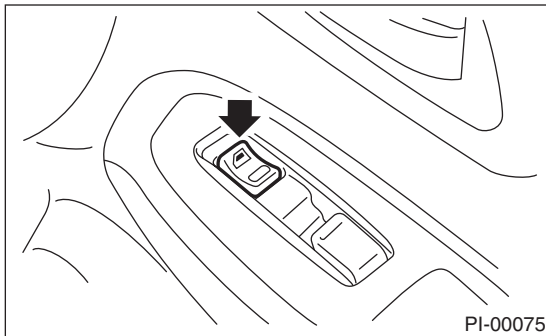
- (A) Light ON
- (B) Light OFF
- (C) 30 seconds

13) Press the “LOCK” side of the power door switch with all doors (including the rear gate) open.

- Driver’s side



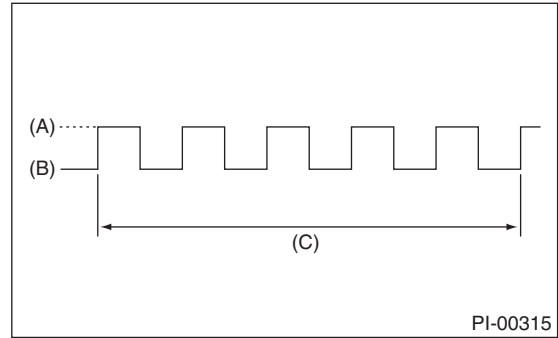
- Passenger’s side



14) Close all the doors including rear gate.

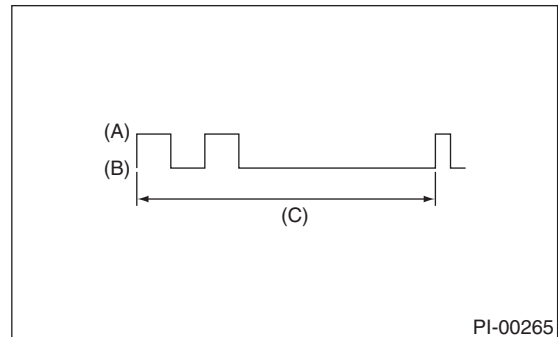
15) If all the doors are locked, the buzzer rings once and hazard light blinks once, the alarm system is in the arming preparatory state.

- Alarm system arming preparatory state



- (A) Light ON
- (B) Light OFF
- (C) 30 seconds

16) Check that the condition described in 15) lasts for 30 seconds and then the system is brought into the arming state.



- (A) Light ON
- (B) Light OFF
- (C) 30 seconds

17) Use the inner lock knob or key to unlock the door, and open the door while the alarm system is in the arming state.

18) Check whether the alarm state (horn continuously honks, hazard light blinks, and security indicator light illuminates) has occurred.

19) Check that the state described in 18) lasts for 30 seconds or more, or until the keyless transmitter button “UNLOCK/DISARM” is pressed.

20) Also, check that the starter motor does not operate and the engine does not start even if the ignition key is turned to the “START” position while in the arming state.

21) For model with impact sensor, manually tap on the windshield glass to cause an alarm to occur while the alarm system is in the arming state.

22) Perform troubleshooting on the security system if the above does not apply. <Ref. to SL-22, INSPECTION, Security System.>

22. SEAT

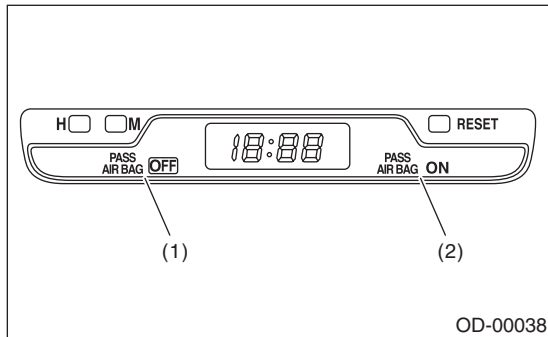
1) Check that each seat provides full functionality in sliding and reclining. Check all of the functions of the rear seat.

2) Check that the passenger's seat occupant detection system.

(1) Empty the passenger's seat and turn the ignition switch to ON.

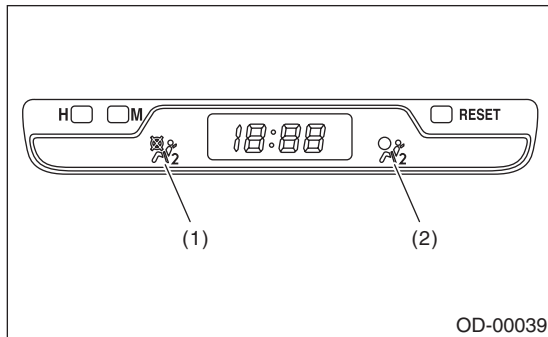
(2) Check the ON and OFF of passenger's airbag indicator light come on simultaneously for about 6 seconds and go off for 2 seconds, and then only OFF comes on again.

- U.S. model



- (1) Passenger's airbag OFF indicator light
- (2) Passenger's airbag ON indicator light

- Canada model



- (1) Passenger's airbag OFF indicator light
- (2) Passenger's airbag ON indicator light

(3) Have an adult sit down in the passenger's seat, and check if the passenger's airbag indicator lamp lights in about 4 seconds.

(4) Empty the passenger's seat and check if the OFF of passenger's airbag indicator light comes on in about 2 seconds.

23. SEAT BELT

1) Pull out the seat belt and then release it. Check that the belt retracts smoothly.

2) Check seat belt warning system

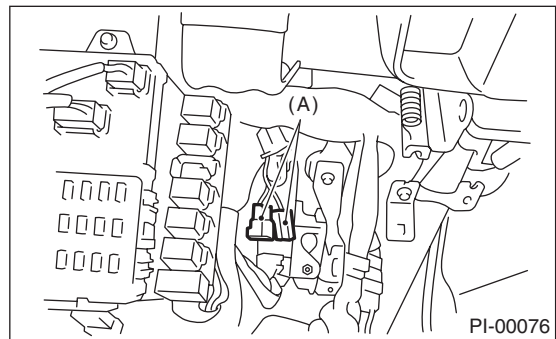
(1) Turn the ignition switch to ON without fastening driver's and passenger's seat belts.

(2) Check if the seat belt warning lights of driver's and passenger's side blink for about 6 seconds and the buzzer beeps intermittently.

(3) Then, check that the seat belt warning light comes on and blinks, and buzzer beeps in 15 second cycles. (If the passenger's seat is empty, seat belt warning light for passenger's side does not operate.)

24. TEST MODE CONNECTOR

Turn the ignition switch to ON and check that the engine malfunction indicator light starts blinking. If the light blinks, return the ignition key to LOCK and disconnect the test mode connector. Then, turn the ignition key to ON again. If the engine malfunction indicator light blinks at that time in spite of the disconnected test mode connector, carry out an engine diagnosis.



(A) Test mode connector (Green)

25. STARTING CONDITION

Start the engine and check that the engine starts smoothly. If the battery voltage is low, recharge or replace the battery. If any noises are observed, immediately stop the engine and check and repair the abnormal components.

26. EXHAUST SYSTEM

Listen to the exhaust noise to see if no noises are observed.

27. INDICATOR AND WARNING LIGHTS

Check that all the indicator and warning lights are gone out.

28. CLOCK

Check the clock for normal operations and enough accuracy.

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29.RADIO

Check the radio for full functionality and normal noise level. Also check the CD unit operations.

30.ACCESSORY POWER SOCKET

- 1) Check the lighting system operations.
- 2) Check operation of the accessory power socket in console box.
- 3) Check operation of the accessory power socket in luggage room.

31.LIGHTING SYSTEM

- 1) Check the headlight operations.
- 2) Check the stop light operation.
- 3) For model with manual headlight beam levelizer, check the operation of headlight beam levelizer.
- 4) Check other lights for normal operations.

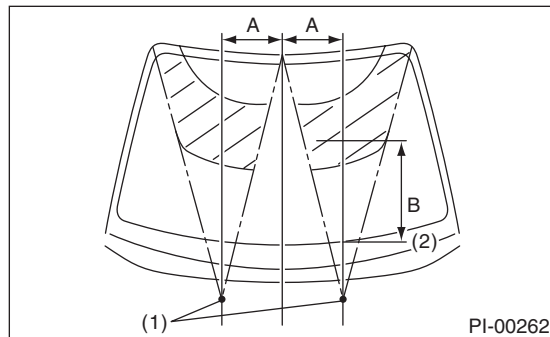
32.WINDOW WASHER

Check that the window washer system injects washer fluid to the specified area of the windshield and rear window glass shown in the figure.

Front injection position:

A: 250 mm (9.84 in)

B: 345 mm (13.58 in)

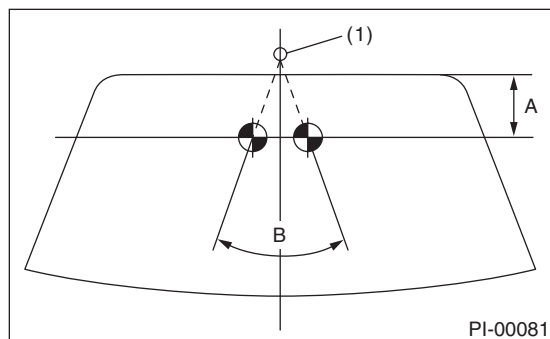


- (1) Nozzle
- (2) Ceramic line

Rear injection position:

A: 35 mm (1.38 in)

B: 72°



- (1) Nozzle

33.WIPER

Check the front and rear wipers for normal operations.

34.POWER WINDOW OPERATION CHECK

Operate the power window switches one by one to check that each of the power windows goes up and down without noises.

35.BRAKE TEST

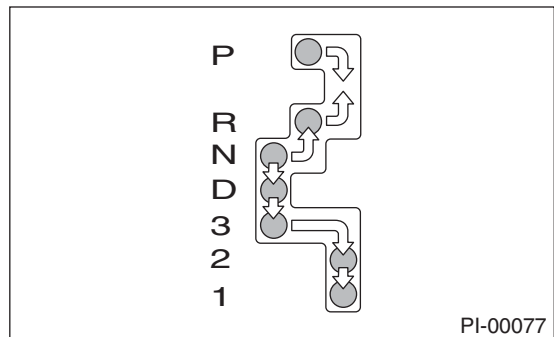
Check the foot brake for normal operations.

36.PARKING BRAKE

Check the parking brake for normal operations.

37.AT SHIFT CONTROL

- 1) Turn the ignition switch to ON.
- 2) While brake pedal is not depressed, check if the select lever does not move from "P" range.
- 3) While brake pedal is depressed, check if the select lever moves from "P" range.
- 4) Set the select lever to other than "P" range.
- 5) When the ignition switch is turned OFF, check if the ignition key switch cannot be removed.
- 6) Set the AT selector lever to each gear position while checking that the demanded gear position is correctly attained.



Selector position	Gear position			
	1st	2nd	3rd	4th
D	OK	OK	OK	OK
3	OK	OK	OK	—
2	—	OK	—	—
1	OK	—	—	—

38.HEATER & VENTILATION

Operate the heater & ventilation system to check for normal airflow outlet control, air inlet control, airflow capacity and heating performance.

39.AIR CONDITIONER

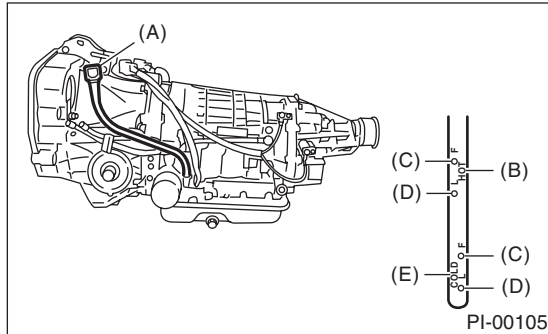
Operate the air conditioner. Check that the A/C compressor operates normally and enough cooling is provided.

40. CRUISE CONTROL

Operate the cruise control system. Check whether operating and canceling of other systems can be executed correctly.

41. ATF LEVEL

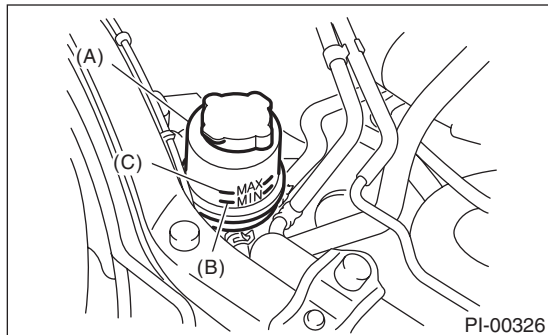
After selecting all positions (P, R, N, D, 3, 2, 1), set the select lever in P range. Measure the ATF level with engine idling for one or two minutes. If the amount of ATF is insufficient, check that no leaks are found. Then, add the necessary amount of the specified ATF.



- (A) Level gauge
- (B) Inspection position when "HOT" (70 — 80°C (158 — 176°F))
- (C) Upper level
- (D) Lower level
- (E) Inspection position when "COLD" (20 — 30°C (68 — 86°F))

42. POWER STEERING FLUID LEVEL

Check that the power steering fluid level is normal. If insufficient, check for leaks. Then add the necessary amount of the specified power steering fluid.



- (A) Reservoir tank
- (B) MIN. level
- (C) MAX. level

43. FLUID LEAK CHECK

Check entire areas of the vehicle for any trace of coolant/oil/fluid leaks.

44. WATER LEAK TEST

Spray the vehicle with water using a hose and check that no water enters the passenger compartment.

- Before performing the water leakage test, remove anything that may obstruct the operation or which must be kept dry.
- Close all the windows and doors securely. Close the hood before starting the test.
- Connect a hose to a tap, and spray water on the vehicle. The rate of water spray must be approx. 20 to 25 ℓ (5.3 — 6.6 US gal, 4.4 — 5.5 Imp gal) per minute.

When spraying water on areas adjacent to the floor and wheel house, increase the pressure. When spraying water on areas other than the floor and wheel house, decrease the pressure. But the force of water must be made strong occasionally by pressing the end of the hose.

NOTE:

Be sure to keep the hose at least 10 cm (3.9 in) from vehicle.

Check the following areas.

- Front window and body framework mating portion
- Door mating portions
- Glass mating portions
- Rear quarter window mating portions
- Rear window and body framework mating portion
- Around roof drips

If any dampness in the compartments is discovered after the water has been applied, carefully check all the areas that may have possibly contributed to the leak.

45. APPEARANCE CHECK 2

1) When vehicle body is covered with protective film (wrap guard), peel it off.

NOTE:

- It is easier to remove the wrap guard using steam.
- For the vehicle left for a long time or at low temperature, sprinkle some water heated 50 — 60°C (122 — 140°F) over the vehicle to raise its surface temperature before peeling off the wrap guard. Do not use the water heated to over 60°C (140°F).
- If the adhesive remains exists on the coated surface, soak a flannel rag, etc. with a small amount of coating wax or solvent such as oil benzene and IPA, put the soaked cloth on the remains lightly, and then wipe them off with a flannel rag etc.
- Keep solvent from touching the resin or rubber parts. Do not use coating wax or solvent while the component surface temperature is high due to hot weather etc.
- If the coated surface is swollen out due to seams or moisture, expose the vehicle to the sunlight for a few hours or heat the seam and swollen portions using a dryer etc.
- Dispose of the peeled wrap guard as burnable industrial garbage.
- If a yellow label is attached to the fog light lens, remove it.

2) Check the whole vehicle body for flaking paint, damage by transportation, corrosion, dirt, cracks or blisters.

NOTE:

- It is better to determine an inspection pattern in order to avoid missing an area, since the total inspection area is wide.
- Do not repair the body paint unless absolutely necessary. Also, if the vehicle is in need of repair to remove scratches or corroded paint, the repair area must be limited to the minimum. Re-painting and spray painting must be avoided as possible.

3) Check each window glass for scratches carefully. Slight damage may be removed by polishing with cerium oxide. (Fill a cup half with cerium oxide, and add warm water to it. Then agitate the content until it turns to wax. Apply this wax to a soft cloth, and polish the glass with it.)

4) Check each portion of the vehicle body and underside components for the formation of rust. If rust is discovered, remove it with sandpaper of #80 to #180 and treat the surface with rust preventive. After this treatment is completed, flush the portion thoroughly, and prepare the surface for repair painting.

5) Check each portion of body and all of the exterior parts for deformation or distortion. Also, check each light lens for cracks.

General Description

PERIODIC MAINTENANCE SERVICES

1. General Description

A: GENERAL DESCRIPTION

Be sure to perform periodic maintenance in order to maintain vehicle performance and find problems before they occur.

Schedule

PERIODIC MAINTENANCE SERVICES

2. Schedule

A: MAINTENANCE SCHEDULE 1

1. FOR U.S. MODEL

		MAINTENANCE INTERVAL																	Remarks
		[Number of months or km (miles), whichever occurs first]																	
Months		3	7.5	15	22.5	30	37.5	45	52.5	60	67.5	75	82.5	90	97.5	105	112.5	120	
× 1,000 km		4.8	12	24	36	48	60	72	81.4	96	108	120	132	144	156	168	180	192	
× 1,000 miles		3	7.5	15	22.5	30	37.5	45	52.5	60	67.5	75	82.5	90	97.5	105	112.5	120	
1	Engine oil		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
2	Engine oil filter		R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
3	Spark plug					R				R				R				R	
										R								R	
4	Drive belt					I				I				I		R			
5	Timing belt					I				I				I		R			
6	Fuel line					(I)				(I)				(I)				I	
7	Fuel filter									R								R	
8	Air cleaner element					R				R				R				R	
9	Cooling system					I				I				I				I	
10	Engine coolant					R				R				R				R	
11	Clutch system			I		I		I		I		I		I		I		I	
12	Transmission oil					I				I				I				I	
13	ATF					I				I				I				I	
14	Front & rear differential gear oil					I				I				I				I	
15	Brake line			I		I		I		I		I		I		I		I	
16	Brake fluid					R				R				R				R	
17	Disc brake pads and discs					I				I				I				I	
18	Brake linings and drums					I				I				I				I	
19	Parking brake			I		I		I		I		I		I		I		I	
20	Suspension			I		I		I		I		I		I		I		I	
21	Wheel bearing									(I)								(I)	
22	Axle boots and joints			I		I		I		I		I		I		I		I	
23	Tire rotation		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
24	Steering system (Power steering)			I		I		I		I		I		I		I		I	
25	Airbag system	10th-year inspection																	
26	ATF filter assembly	Annual inspection																	
27	Air conditioner filter	Every 12 months or 12,000 km (7,500 miles) inspection																	

Symbol

R: Replace

I: Inspect

(R) or (I): Inspections recommended for vehicle safety

NOTE:

1. This inspection is not necessary to observe exhaust gas regulations or is the responsibility of the manufacturer under the current basic EPA regulations that must be observed by law.

2. Replace the air cleaner element more frequently than the periodic replacement if the vehicle is being used in an excessively dusty environment.

3. The ATF filter needs replacement when it is physically damaged, rusty or ATF leaked.

4. Replace the tires if the tread-wear indicator has caused a bar-shaped cut across the tread. The indicator will appear when the remaining amount of tread is less than 1.6 (0.063 in).

Schedule

PERIODIC MAINTENANCE SERVICES

2. FOR CANADA MODEL

		MAINTENANCE INTERVAL																	Remarks
		[Number of months or km (miles), whichever occurs first]																	
		3	7.5	15	22.5	30	37.5	45	52.5	60	67.5	75	82.5	90	97.5	105	112.5	120	
Months	× 1,000 km	× 1,000 miles																	
1	Engine oil	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
2	Engine oil filter	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	
3	Spark plug					R				R				R				R	Non-turbo Model
										R								R	Turbo Model
4	Drive belt					I				I				I			R		
5	Timing belt					I				I				I			R		
6	Fuel line					(I)				(I)				(I)				I	Note (1)
7	Fuel filter									R								R	Note (1)
8	Air cleaner element					R				R				R				R	Note (2)
9	Cooling system					I				I				I				I	
10	Engine coolant					R				R				R				R	
11	Clutch system			I		I		I		I		I		I		I		I	
12	Transmission oil					I				I				I				I	
13	ATF					I				I				I				I	
14	Front & rear differential gear oil					I				I				I				I	
15	Brake line			I		I		I		I		I		I		I		I	
16	Brake fluid					R				R				R				R	
17	Disc brake pads and discs					I				I				I				I	
18	Brake linings and drums					I				I				I				I	
19	Parking brake			I		I		I		I		I		I		I		I	
20	Suspension			I		I		I		I		I		I		I		I	
21	Wheel bearing									(I)								(I)	
22	Axle boots and joints			I		I		I		I		I		I		I		I	
23	Tire rotation		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	Note (4)
24	Steering system (Power steering)			I		I		I		I		I		I		I		I	
25	Airbag system	10th-year inspection																	
26	ATF filter assembly	Annual inspection																	Note (3)
27	Air conditioner filter	Every 12 months or 12,000 km (7,500 miles) inspection																	

Symbol

R: Replace

I: Inspect

(R) or (I): Inspections recommended for vehicle safety

NOTE:

1. This inspection is not necessary to observe exhaust gas regulations or is the responsibility of the manufacturer under the current basic EPA regulations that must be observed by law.
2. Replace the air cleaner element more frequently than the periodic replacement if the vehicle is being used in an excessively dusty environment.
3. The ATF filter needs replacement when it is physically damaged, rusty or ATF leaked.
4. Replace the tires if the tread-wear indicator has caused a bar-shaped cut across the tread. The indicator will appear when the remaining amount of tread is less than 1.6 (0.063 in).

Schedule

PERIODIC MAINTENANCE SERVICES

B: MAINTENANCE SCHEDULE 2

Item	Every	Repeat short distance drive	Repeat rough muddy road drives	Extremely cold weather area	Salt or other corrosive used or coastal area	High humidity or mountain area	Repeat towing trailer
Engine oil	3.75 months	R		R			R
	6,000 km						
	3,750 miles						
Engine oil filter	3.75 months	R		R			R
	6,000 km						
	3,750 miles						
Fuel filter	15 months				I		
	24,000 km						
	15,000 miles						
Fuel line	15 months				I		
	24,000 km						
	15,000 miles						
Transmission oil	15 months						R
	24,000 km						
	15,000 miles						
ATF	15 months						R
	24,000 km						
	15,000 miles						
Front & rear differential gear oil	15 months						R
	24,000 km						
	15,000 miles						
Brake line	15 months	I	I		I		I
	24,000 km						
	15,000 miles						
Brake fluid	15 months					R	
	24,000 km						
	15,000 miles						
Disc brake pads and discs	15 months	I	I		I		I
	24,000 km						
	15,000 miles						
Brake linings and drums	15 months	I	I		I		I
	24,000 km						
	15,000 miles						
Parking brake	15 months	I	I		I		I
	24,000 km						
	15,000 miles						
Suspension	7.5 months		I	I	I		I
	12,000 km						
	7,500 miles						
Axle boots and joints	7.5 months	I	I	I	I		I
	12,000 km						
	7,500 miles						
Steering system (Power steering)	7.5 months	I	I	I	I		I
	12,000 km						
	7,500 miles						

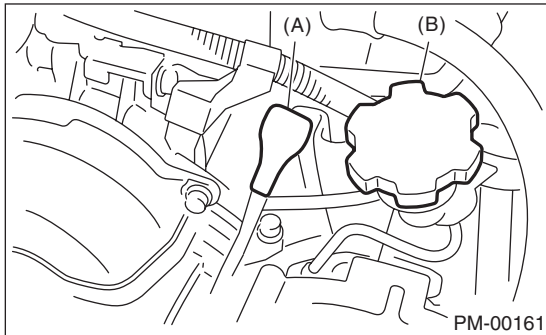
Engine Oil

PERIODIC MAINTENANCE SERVICES

3. Engine Oil

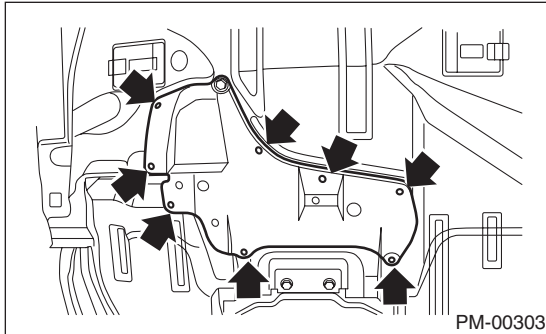
A: REPLACEMENT

1) Open the engine oil filter cap for quick draining of engine oil.

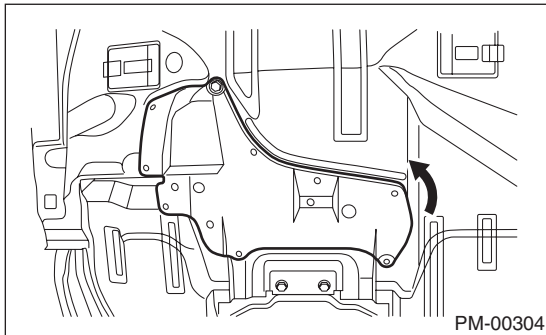


- (A) Oil level gauge
- (B) Engine oil filler cap

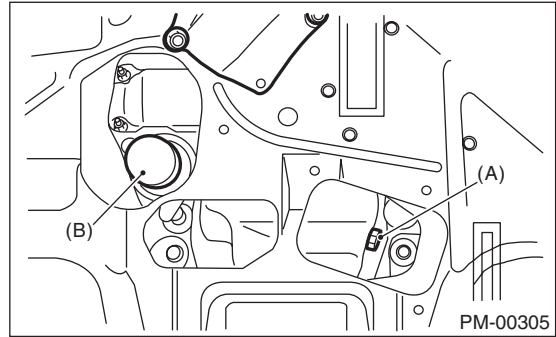
2) Remove the service hole cover clip.



3) Turn the service hole cover in the counterclockwise direction (looking from the bottom side of the vehicle).



4) Drain engine oil by loosening the engine oil drain plug.



- (A) Engine oil drain plug
- (B) Oil filter

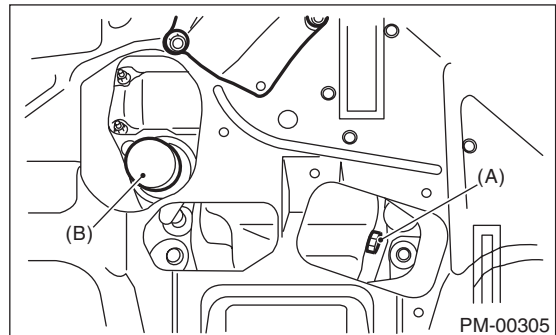
CAUTION:

Be careful not to spill engine oil on the exhaust pipe to prevent it from emitting smoke or causing a fire. If engine oil spilled, wipe it off completely.

5) Replace the drain plug gasket with a new part.
6) Tighten the engine oil drain plug after draining engine oil.

Tightening torque:

44 N·m (4.5 kgf·m, 33 ft·lb)



- (A) Engine oil drain plug
- (B) Oil filter

7) Fill engine oil through the level gauge up to center between the upper level and lower level. Place the vehicle on a level surface when checking oil level. Use engine oil of proper quality and viscosity, selected in accordance with the table in figure.

Recommended oil:

API standard

SM specifications marked with “Energy saver or Energy saver II” (If an SM grade product is difficult to obtain, use an SL grade product.)

ILSAC standard

GF-4 specifications with the mark of “Starburst”

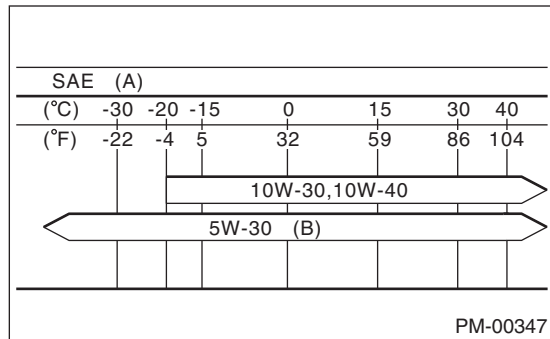
Engine oil capacity:

Upper level:

Approx. 4.0 ℓ (4.2 US qt, 3.5 Imp qt)

Lower level:

Approx. 3.0 ℓ (3.2 US qt, 2.6 Imp qt)



- (A) Viscosity No. and applicable temperature
- (B) Recommended

The vehicle will start well even when temperatures are low or high by increasing the cranking speed by reducing viscous friction for the appropriate viscosity.

NOTE:

- Do not use any oil from a different manufacturer than that is in the engine when replacing oil. Use oil that matches the API standards and SAE viscosity number set by Subaru.
- It is acceptable to use oil having the viscosities described below if the vehicle is being used in desert locations or in excessive environments where temperatures are extremely high.

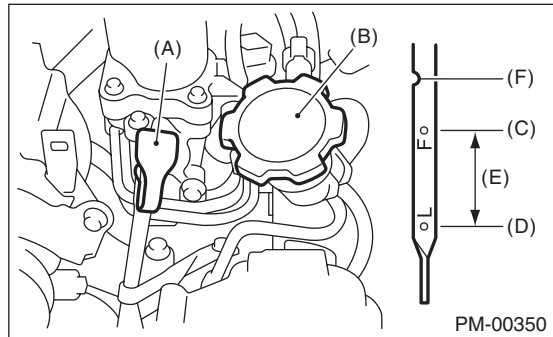
API standard: SM or SL

SAE viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50

- 8) Close the engine oil filler cap.
 - 9) Start the engine and warm it up for a time.
 - 10) Stop the engine to inspect the oil level again.
- <Ref. to PM-7, INSPECTION, Engine Oil.>

B: INSPECTION

- 1) Park the vehicle on a level surface.
- 2) Remove the oil level gauge and wipe away all of the oil.
- 3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the correct position.
- 4) Remove the level gauge again and record the oil level. If the oil level is below the “L” line, add oil to bring the level up to the “F” line.



- (A) Engine oil level gauge
- (B) Engine oil filler cap
- (C) Upper level
- (D) Lower level
- (E) Approx. 1 ℓ (1.1 US qt, 0.9 Imp qt)
- (F) Notch mark

- 5) Wait for several minutes until the oil has returned to the oil pan after stopping the engine.
- 6) Immediately after driving or while the engine is warm, the engine oil level may be shown between the “F” line and the notch mark. This is caused by thermal expansion of engine oil.
- 7) To prevent overfilling of engine oil, do not add oil above “F” line when the engine is cold.

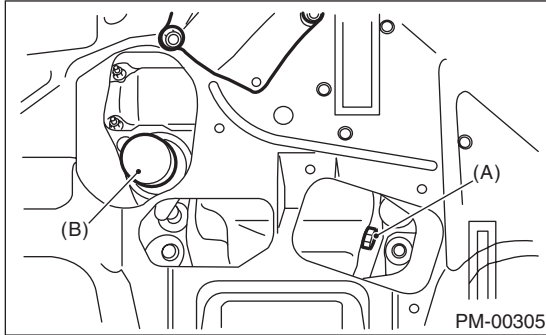
Engine Oil Filter

PERIODIC MAINTENANCE SERVICES

4. Engine Oil Filter

A: REPLACEMENT

1) Remove the engine oil filter.



- (A) Engine oil drain plug
(B) Oil filter

- ST 18332AA000 OIL FILTER WRENCH (OUTER DIAMETER: 68 mm (2.68 in) FOR OIL FILTER)
ST 18332AA010 OIL FILTER WRENCH (OUTER DIAMETER: 65 mm (2.56 in) FOR OIL FILTER)

CAUTION:

Be careful not to spill engine oil on the exhaust pipe to prevent it from emitting smoke or causing a fire. If engine oil spilled, wipe it off completely.

- 2) Clean the oil filter installation surface on cylinder block or oil cooler.
3) Obtain a new engine oil filter and apply a thin coat of engine oil to the seal rubber.

CAUTION:

Be careful because the oil filters having an outer diameter of 80 mm (3.15 in) cannot be used.

4) Install the oil filter by turning it by hand, being careful not to damage seal rubber.

- Tighten the oil filter 68 mm (2.68 in) in diameter (approx. 1 rotation) after the seal rubber of the oil filter comes in contact with cylinder block or oil cooler. When using a torque wrench, tighten to the following torque values.

Tightening torque:

14 N·m (1.4 kgf-m, 10.3 ft-lb)

- Tighten the oil filter 65 mm (2.56 in) in diameter (approx. 2/3 — 3/4 rotation) after the seal rubber of the oil filter comes in contact with cylinder block or oil cooler. When using a torque wrench, tighten to the following torque values.

Tightening torque:

12 N·m (1.2 kgf-m, 8.8 ft-lb)

CAUTION:

Do not tighten excessively, or oil may leak.

5) After mounting the oil filter, fill the prescribed amount of engine oil. <Ref. to PM-6, REPLACEMENT, Engine Oil.>

NOTE:

The filter element and filter case are permanently jointed, therefore, interior cleaning is not necessary.

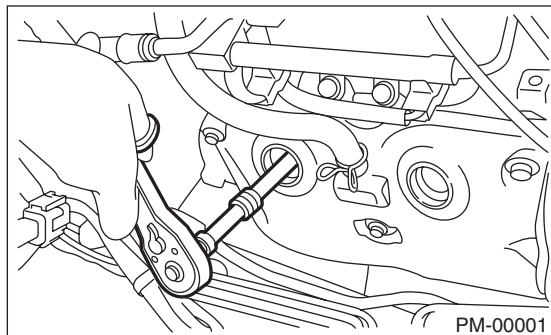
6) After installing the oil filter, run the engine and make sure that no oil is leaking around seal rubber.

7) Check the engine oil level. <Ref. to LU (H4SO)-10, REPLACEMENT, Engine Oil.>

5. Spark Plug

A: REPLACEMENT

- 1) Remove the intake duct and intake chamber.
- 2) Remove the washer tank and set to the side.
- 3) Disconnect the spark plug cord.
- 4) Remove the spark plug with a plug-wrench.



- 5) Install a new spark plug.

Spark plug:

Non-turbo model

NGK: FR5AP-11

Turbo model:

NGK: ILFR6B

Spark plug gap:

Non-turbo model

1.0 — 1.1 mm (0.039 — 0.043 in)

Turbo model

0.7 — 0.8 mm (0.028 — 0.031 in)

- 6) Tighten the spark plug lightly with hand, and then secure with a plug-wrench to the specified torque.

Tightening torque:

21 N·m (2.14 kgf·m, 15.49 ft·lb)

NOTE:

- Be sure to place the gasket between the cylinder head and spark plug.
- If the torque wrench is not available, tighten the spark plug until gasket contacts cylinder head, then tighten further 1/4 to 1/2 turns.

6. V-belt

A: INSPECTION

- 1) Replace the belts, if crack, fraying or wear is found.
- 2) Check the V-belt tension and adjust it if necessary by changing the generator installing position or idler pulley installing position. <Ref. to PM-10, REPLACEMENT, V-belt.>

Belt tension (A):

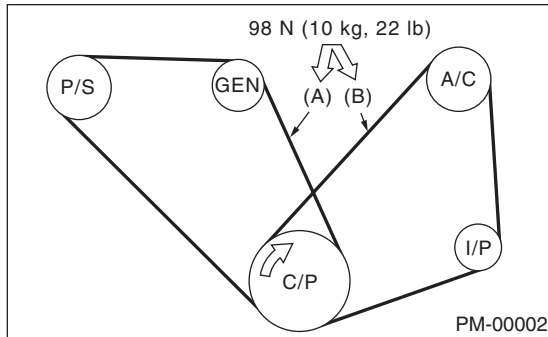
When replaced: 7.0 — 9.0 mm (0.276 — 0.354 in)

When reused: 9.0 — 11.0 mm (0.354 — 0.433 in)

Belt tension (B):

When replaced: 7.5 — 8.5 mm (0.295 — 0.335 in)

When reused: 9.0 — 10.0 mm (0.354 — 0.394 in)



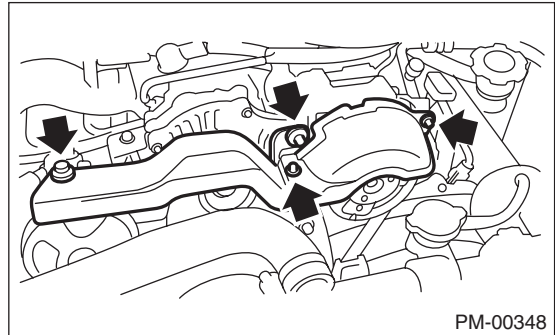
- (A) Front side belt
- (B) Rear side belt
- C/P Crank pulley
- GEN Generator
- P/S Power steering oil pump pulley
- A/C A/C compressor pulley
- I/P Idler pulley

B: REPLACEMENT

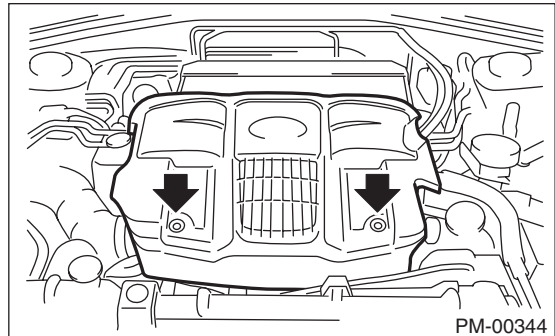
1. V-BELT COVER

Remove the V-belt covers.

- Non-turbo model



- Turbo model



2. FRONT SIDE BELT (FOR POWER STEERING OIL PUMP AND GENERATOR)

NOTE:

Wipe off any oil or water on the belt and pulley.

- 1) Loosen the lock bolt (A).
- 2) Loosen the slider bolt (B).
- 3) Remove the front side bolt (C).
- 4) Install a new belt, and tighten the slider bolt so as to obtain the specified belt tension.
- 5) Tighten the lock bolt (A).
- 6) Tighten the slider bolt (B).

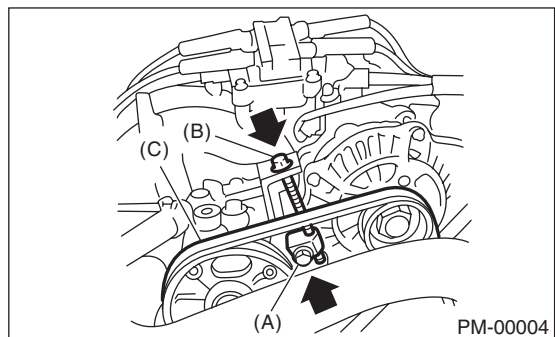
Tightening torque:

Lock bolt

25 N·m (2.5 kgf-m, 18 ft-lb)

Slider bolt

8 N·m (0.8 kgf-m, 5.8 ft-lb)



3. REAR SIDE BELT (FOR AIR CONDITIONER)

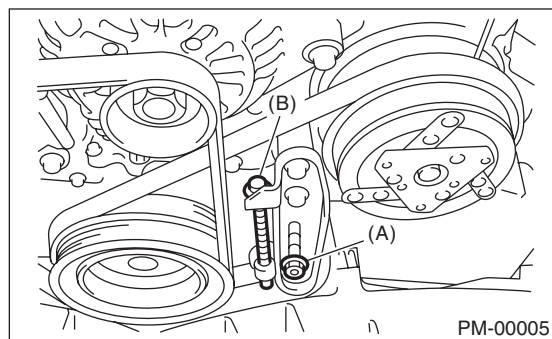
NOTE:

Wipe off any oil or water on the belt and pulley.

- 1) Remove the front side belts.
- 2) Loosen the lock nut (A).
- 3) Loosen the slider bolt (B).
- 4) Remove the rear side belt.
- 5) Install a new belt, and tighten the slider bolt so as to obtain the specified belt tension.
- 6) Tighten the lock nut (A).
- 7) Install the front side belt. <Ref. to ME(H4SO)-40, FRONT SIDE BELT, INSTALLATION, V-belt.>

Tightening torque:

23 N·m (2.3 kgf·m, 17.0 ft·lb)



Timing Belt

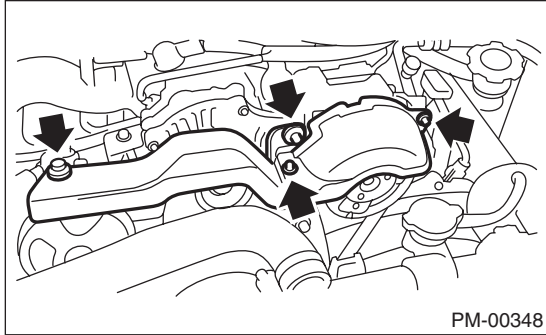
PERIODIC MAINTENANCE SERVICES

7. Timing Belt

A: REPLACEMENT

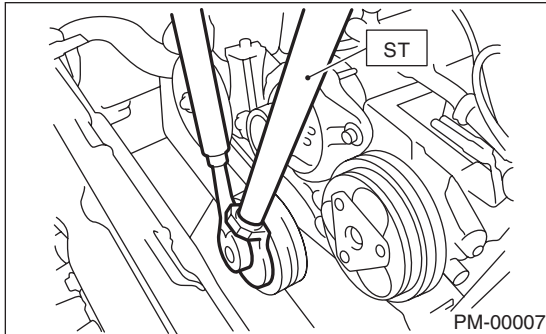
1. NON-TURBO MODEL

- 1) Remove the radiator fan and air conditioner fan. <Ref. to CO(H4SO)-34, Radiator Main Fan and Fan Motor.> <Ref. to CO(H4SO)-41, Radiator Sub Fan and Fan Motor.>
- 2) Protect the radiator with cardboard and blanket.
- 3) Remove the V-belt covers.

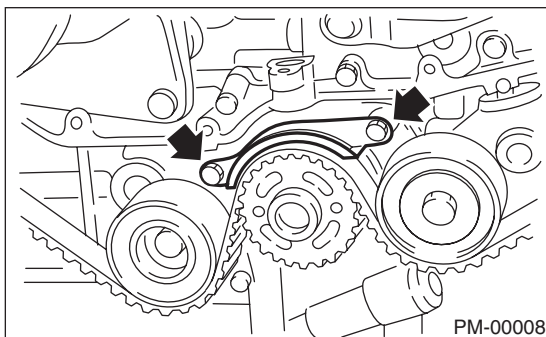


- 4) Remove the V-belts. <Ref. to ME(H4SO)-40, V-belt.>
- 5) Remove the A/C compressor V-belt tensioner.
- 6) Using the ST, lock the crankshaft and remove pulley bolt.

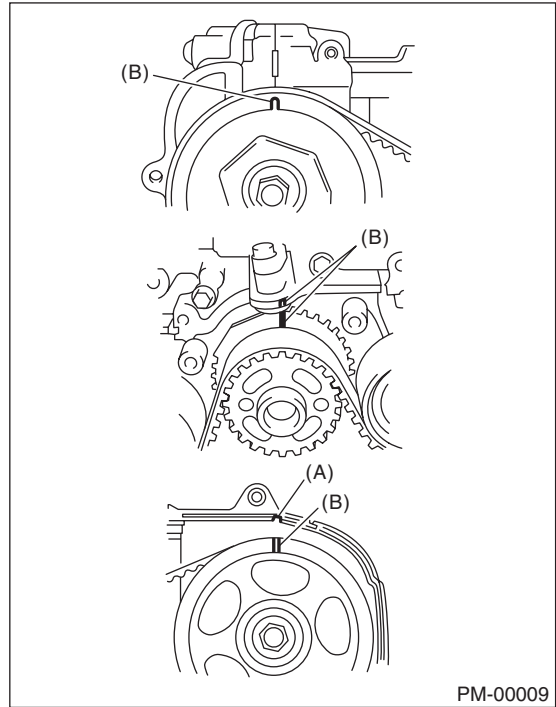
ST 499977100 CRANK PULLEY WRENCH



- 7) Remove the crank pulley.
- 8) Remove the belt cover LH.
- 9) Remove the front timing belt cover.
- 10) Remove the timing belt guide. (MT model)

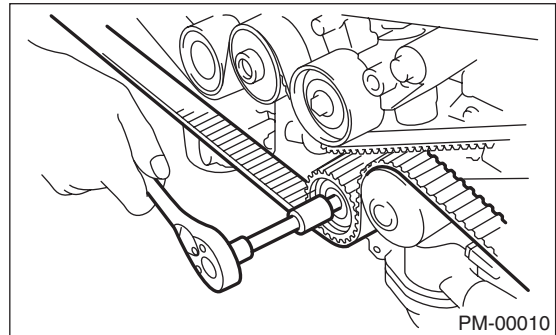


- 11) Turn the crankshaft and align the alignment marks on crankshaft, and left and right cam sprockets with notches of belt cover and cylinder block. ST 499987500 CRANKSHAFT SOCKET

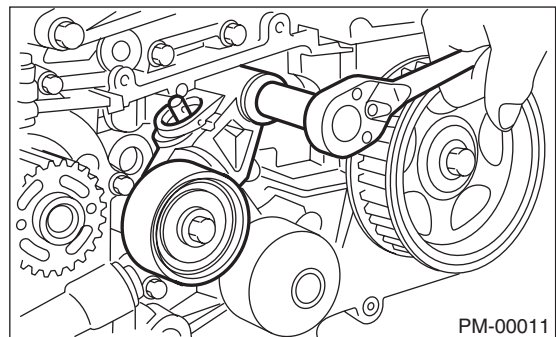


- (A) Notch
(B) Alignment mark

- 12) Remove the belt idler.
- 13) Remove the belt idler (No. 2).



- 14) Remove the timing belt.
- 15) Remove the automatic belt tension adjuster assembly.

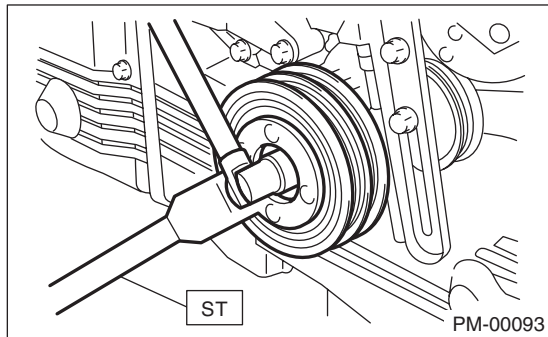


16) Install in the reverse order of removal. <Ref. to ME(H4SO)-45, INSTALLATION, Timing Belt.>

2. TURBO MODEL

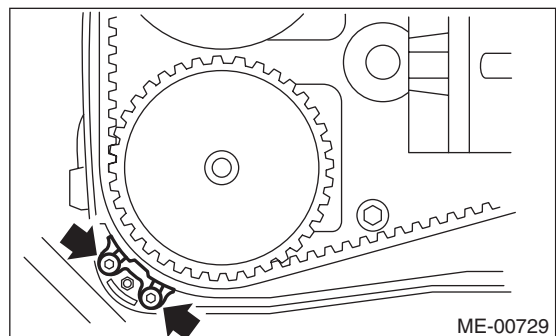
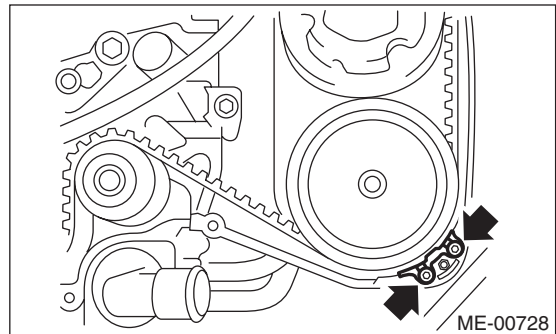
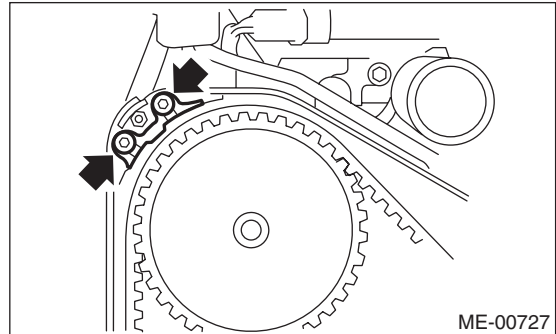
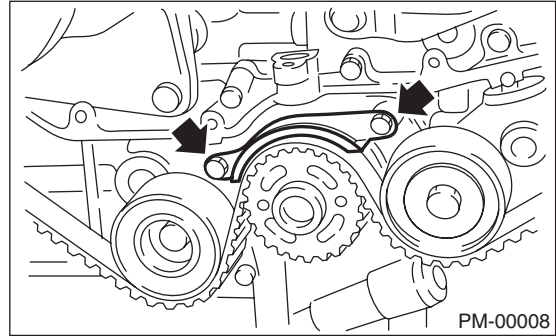
- 1) Remove the radiator fan and air conditioner fan. <Ref. to CO(H4SO)-35, TURBO MODEL, REMOVAL, Radiator Main Fan and Fan Motor.> <Ref. to CO(H4SO)-41, Radiator Sub Fan and Fan Motor.>
- 2) Protect the radiator with cardboard and blanket.
- 3) Remove the V-belts. <Ref. to ME(H4SO)-40, V-belt.>
- 4) Remove the A/C compressor V-belt tensioner.
- 5) Using the ST, lock the crankshaft and remove pulley bolt.

ST 499977100 CRANK PULLEY WRENCH



- 6) Remove the crank pulley.
- 7) Remove the belt cover (LH).
- 8) Remove the belt cover (RH).
- 9) Remove the front belt cover.

10) Remove the timing belt guide. (MT model)

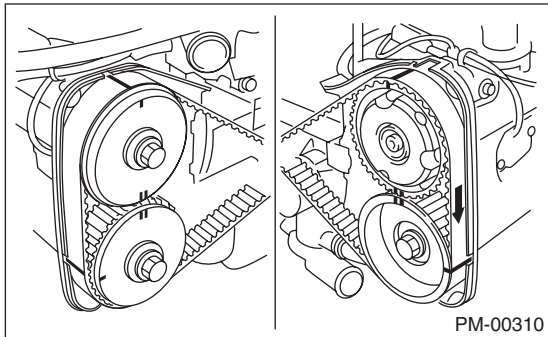
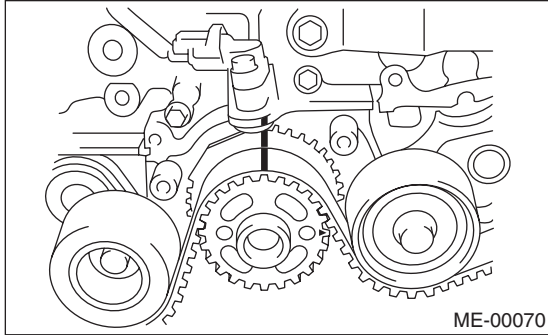


Timing Belt

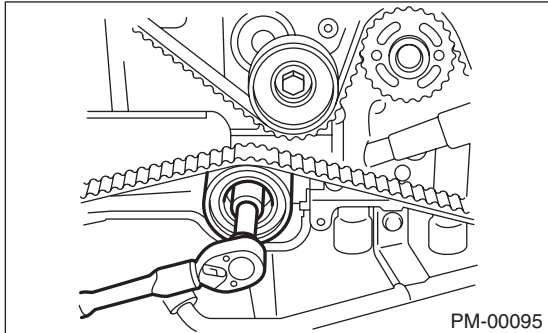
PERIODIC MAINTENANCE SERVICES

11) Turn the crankshaft and align the alignment marks on crankshaft, and left and right cam sprockets with notches of belt cover and cylinder block. Use the ST to turn crankshaft.

ST 499987500 CRANKSHAFT SOCKET

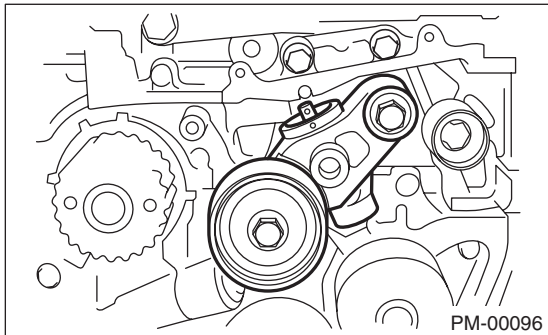


12) Remove the belt idler.



13) Remove the timing belt.

14) Remove the automatic belt tension adjuster assembly.



15) Install in the reverse order of removal. <Ref. to ME(H4DOTC)-46, INSTALLATION, Timing Belt.>

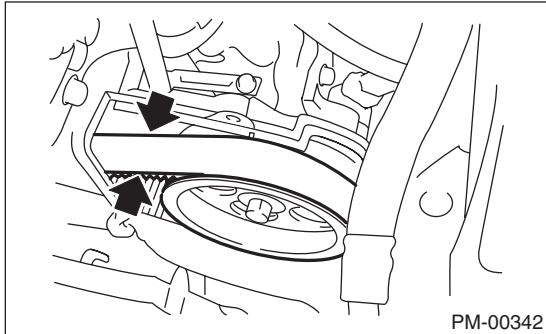
CAUTION:

When installing the timing belt, be sure to align all alignment marks on the belt with corresponding marks on the sprockets. If incorrectly installed, interference between pistons and valves may occur.

B: INSPECTION

1. SOHC MODEL

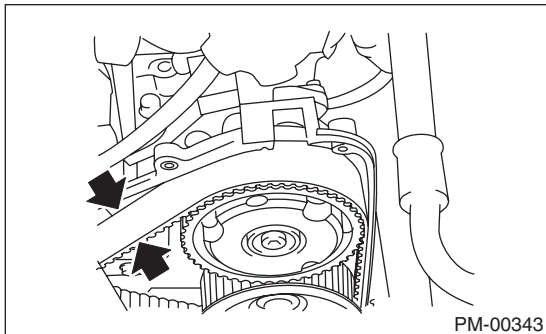
- 1) Remove the front timing belt cover and timing belt cover (LH).
- 2) While cranking engine at least four rotations, check the timing belt back surface for cracks or damage. Replace the faulty timing belt as needed.
- 3) If the surface of timing belt (surface indicated by the arrow in the figure) is worn abnormally (scuffing and coming out of core) or damaged, inspect the idlers, tensioner, water pump pulley and cam sprocket and check the idler alignment for squareness. Replace the worn or damaged timing belt.



- 4) Install the front timing belt cover and timing belt cover (LH).

2. DOHC MODEL

- 1) Remove the timing belt cover (LH).
- 2) While cranking engine at least four rotations, check the timing belt back surface for cracks or damage. Replace the faulty timing belt as needed.
- 3) If the surface of timing belt (surface indicated by the arrow in the figure) is worn abnormally (scuffing and coming out of core) or damaged, inspect the idlers, tensioner, water pump pulley and cam sprocket and check the idler alignment for squareness. Replace the worn or damaged timing belt.



- 4) Install the timing belt cover (LH).

8. Fuel Line

A: INSPECTION

Check the pipes and for rust around the pipe, damage to the hose, and for looseness of the band. If faulty parts are found, repair or replace them. <Ref. to FU(H4SO)-59, Fuel Delivery, Return and Evaporation Lines.>

9. Fuel Filter

A: REPLACEMENT

For fuel filter replacement procedure, refer to FU section.

<Ref. to FU(H4SO)-56, Fuel Filter.>

B: INSPECTION

1) If the filter is clogged, or if the replacement interval has been reached, replace it.

Air Cleaner Element

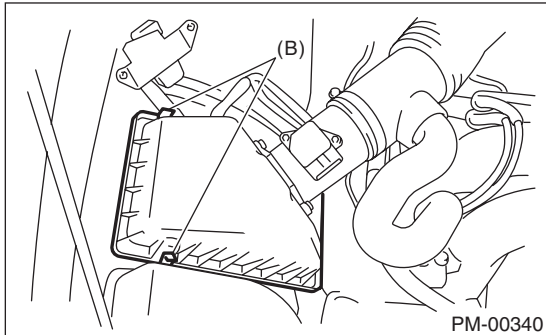
PERIODIC MAINTENANCE SERVICES

10. Air Cleaner Element

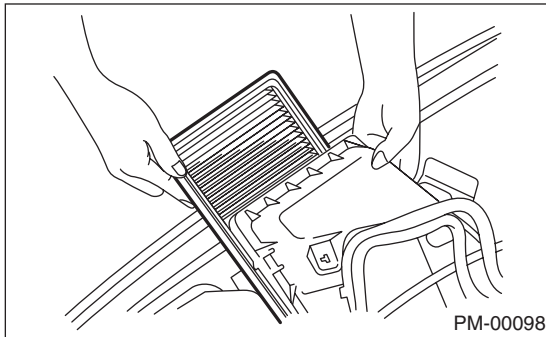
A: REMOVAL

1. NON-TURBO MODEL

1) Remove the clips (B) on air cleaner case.

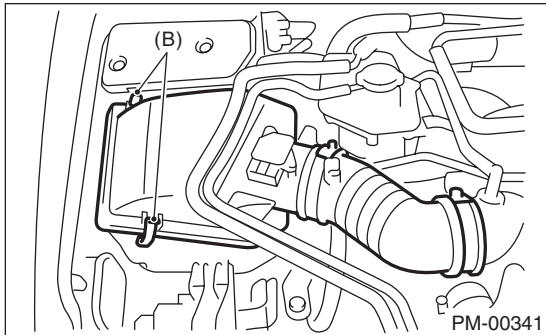


2) Remove the air cleaner element.

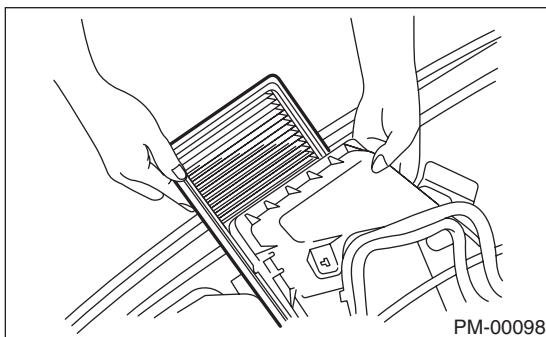


2. TURBO MODEL

1) Remove the clips (B) on air cleaner case.



2) Remove the air cleaner element.



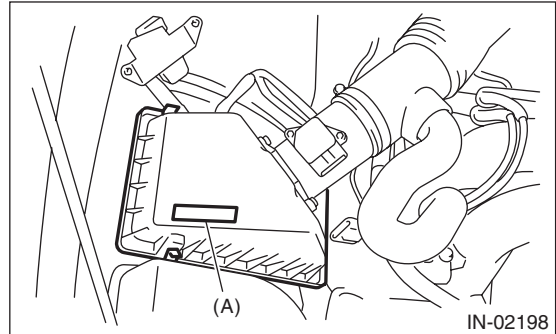
B: INSTALLATION

1. NON-TURBO MODEL

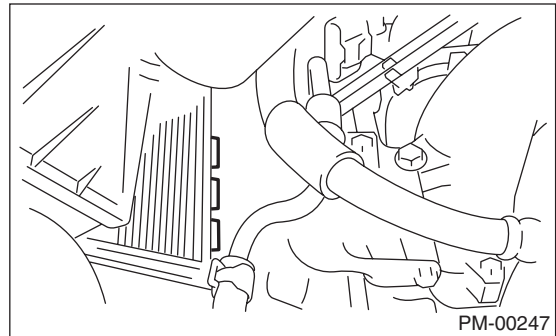
Install in the reverse order of removal.

NOTE:

•The air cleaner element differs depending on the destination market. For the specification of U5 model, refer to the NOTE (A) on the upper side of air cleaner upper cover.



•Fasten with a clip after inserting the lower tab of case.

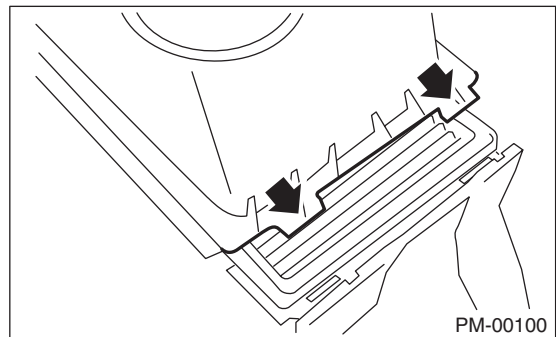


2. TURBO MODEL

Install in the reverse order of removal.

CAUTION:

Position the protrusion on the air cleaner upper cover with the hole in the air cleaner lower case to mount the upper cover on the case.



C: INSPECTION

- Replace with a new part if the air cleaner element is extremely damaged or dirty.
- Replace the air cleaner upper cover when the HC adsorption filter is damaged. (U5 model)

11. Cooling System

A: INSPECTION

1) To check the radiator for leakage, fill it with engine coolant, and attach the radiator cap tester (A) to the filler neck, and apply pressure.

Pressure:

Non-turbo model

157 kPa (1.6 kg/cm², 23 psi)

Turbo model

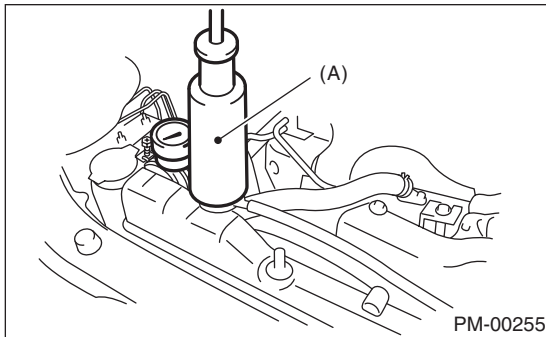
122 kPa (1.2 kg/cm², 18 psi)

Check the following points:

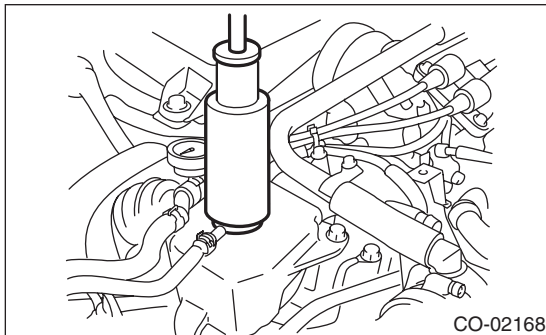
- Leak from radiator
- Hose joints and other connections for leakage

CAUTION:

- For Turbo model, inspection must be carried out at the side of coolant filler tank, not at the side of radiator.
- Be particularly careful not to deform the filler neck of radiator when installing and removing the tester and after testing.
- When performing this check, be sure to keep the engine stationary and fill radiator with coolant.
- Wipe off check points before applying pressure.
- Use care not to spill coolant when detaching tester from radiator.
- Non-turbo model



- Turbo model



2) Check the radiator cap valve open pressure using radiator cap tester.

Raise the pressure until the needle of gauge stops and see if the pressure can be retained for five to six seconds. The radiator cap is normal if a pressure above the service limit value has been maintained for this period.

CAUTION:

Rust or dirt on the cap may prevent valve from functioning normally: be sure to clean the cap before testing.

Non-turbo model radiator side and turbo model coolant filler tank side

Specification:

93 — 123 kPa (0.95 — 1.25 kg/cm², 14 — 18 psi)

Service limit pressure:

83 kPa (0.85 kg/cm², 12 psi)

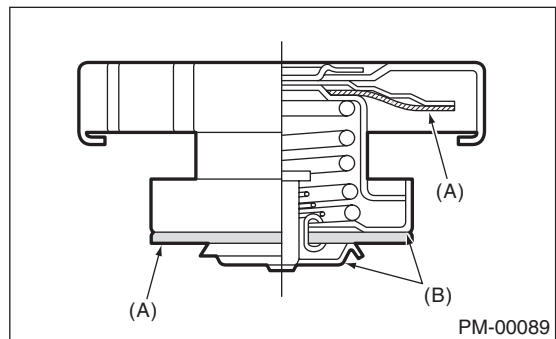
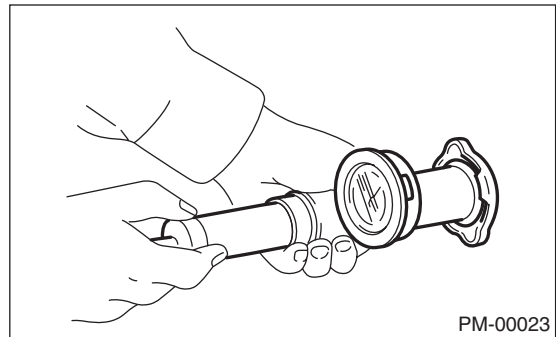
Radiator side on turbo models

Specification:

122 — 152 kPa (1.24 — 1.55 kg/cm², 18 — 22 psi)

Service limit pressure:

112 kPa (1.14 kg/cm², 16 psi)



- (A) Check points for deformation
- (B) Check points for deformation, damage, rust

Cooling System

PERIODIC MAINTENANCE SERVICES

3) Start the engine, and then inspect that it does not overheat or it is cooled excessively. If it overheats or it is cooled excessively, check the cooling system. <Ref. to CO(H4SO)-24, INSPECTION, Water Pump.> <Ref. to CO(H4SO)-26, INSPECTION, Thermostat.> <Ref. to CO(H4SO)-27, Radiator.> <Ref. to CO(H4SO)-33, Radiator Cap.>

4) Check the radiator fan operates using Subaru Select Monitor, when the coolant temperature exceeds 95°C (203°F). If it does not operate, check the radiator fan system. <Ref. to CO(H4SO)-12, Radiator Fan System.>

12.Engine Coolant

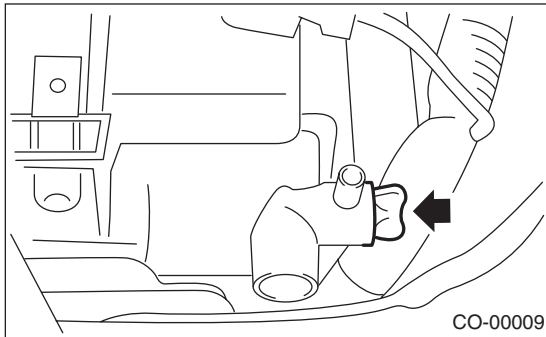
A: REPLACEMENT

1. REPLACEMENT OF ENGINE COOLANT

WARNING:

The radiator is of the pressurized type. Do not attempt to remove the radiator cap immediately after the engine has been stopped.

- 1) Lift-up the vehicle.
- 2) Remove the under cover.
- 3) Place a container under drain pipe.
- 4) Loosen and remove the drain cock to drain engine coolant into container.



- 5) For quick draining, remove the radiator cap.

CAUTION:

Be careful not to spill coolant on the floor.

- 6) Drain the coolant from reservoir tank.
- 7) Tighten the drain cock securely after draining coolant.
- 8) Pour cooling system conditioner through the filler neck.

Cooling system protecting agent:

**Cooling system conditioner
(Part No. SOA635071)**

- 9) Slowly pour the coolant from radiator filler port to neck of filler. Then, pour the coolant into reservoir tank up to "FULL" level.

Coolant capacity (fill up to "FULL" level)

Turbo AT model

Approx. 7.3 ℓ (7.7 US qt, 6.4 Imp qt)

Turbo MT model

Approx. 7.4 ℓ (7.8 US qt, 6.5 Imp qt)

Non-turbo AT model

Approx. 6.8 ℓ (7.2 US qt, 6.0 Imp qt)

Non-turbo MT model

Approx. 6.9 ℓ (7.3 US qt, 6.1 Imp qt)

NOTE:

The SUBARU Genuine Coolant containing anti-freeze and anti-rust agents is especially made for SUBARU engine, which has an aluminum crankcase. Always use SUBARU genuine coolant or phosphoric acid type coolant of equivalent quality, since other coolant may cause corrosion.

CAUTION:

Be careful not to spill engine coolant on the exhaust pipe to prevent it from emitting smoke or causing a fire. If engine coolant spilled, wipe it off completely.

- 10) Close the radiator cap (on non-turbo models) or the coolant filler tank cap (on turbo models), start the engine and race 5 to 6 times at less than 3,000 rpm, then stop the engine. (Complete this operation within 40 seconds.)

- 11) Wait for one minute after the engine stops, then open the radiator cap (on non-turbo models) or the coolant filler tank cap (on turbo models). If the engine coolant level drops, add engine coolant into the radiator filler neck (on non-turbo models) or the coolant filler tank filler neck (on turbo models) up to the filler neck position.

- 12) Perform the procedures 10) and 11) again.

- 13) Close the radiator cap (on non-turbo models) or the coolant filler tank cap (on turbo models), and the reservoir tank cap.

- 14) Start the engine and operate the heater at maximum hot position and the blower speed setting to "LO".

- 15) Run the engine at 2,000 rpm or less until radiator fan starts and stops.

NOTE:

Be careful with the engine coolant temperature gauge to prevent overheating.

- 16) Stop the engine and wait until the engine coolant temperature lowers to 30°C (86°F).

- 17) Open the radiator cap (on non-turbo models) or the coolant filler tank cap (on turbo models). If the engine coolant level drops, add engine coolant into the radiator filler neck (on non-turbo models) or the coolant filler tank filler neck (on turbo models) up to the filler neck position.

Then, pour the coolant into reservoir tank up to "FULL" level.

- 18) Close the radiator cap (on non-turbo models) or the coolant filler tank cap (on turbo models), and the reservoir tank cap.

- 19) Set the heater setting to maximum hot position and the blower speed setting to "LO" and start the engine. Perform racing at less than 3,000 rpm. If the flowing sound is heard, repeat the procedures from 15) again.

Engine Coolant

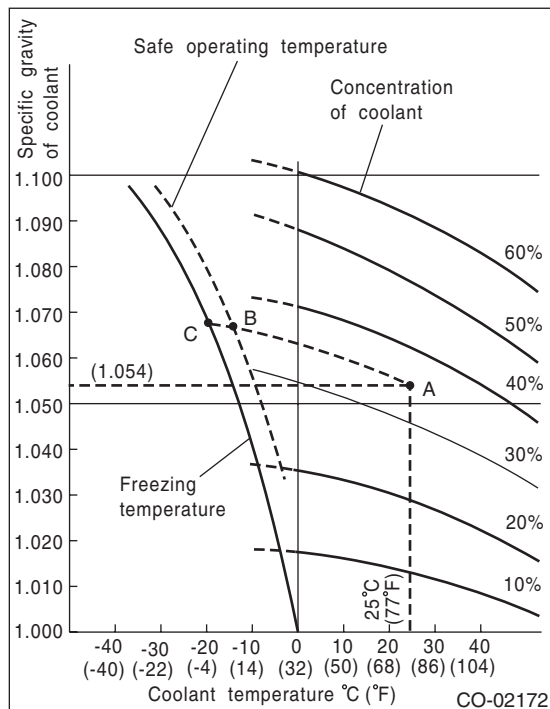
PERIODIC MAINTENANCE SERVICES

2. RELATIONSHIP OF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERATURE

The concentration and safe operating temperature of the SUBARU coolant is shown in the diagram. Measuring the temperature and specific gravity of the coolant will provide this information.

[Example]

If the coolant temperature is 25°C (77°F) and its specific gravity is 1.054, the concentration is 35% (point A), the safe operating temperature is -14°C (7°F) (point B), and the freezing temperature is -20°C (-4°F) (point C).



3. PROCEDURE TO ADJUST THE CONCENTRATION OF THE COOLANT

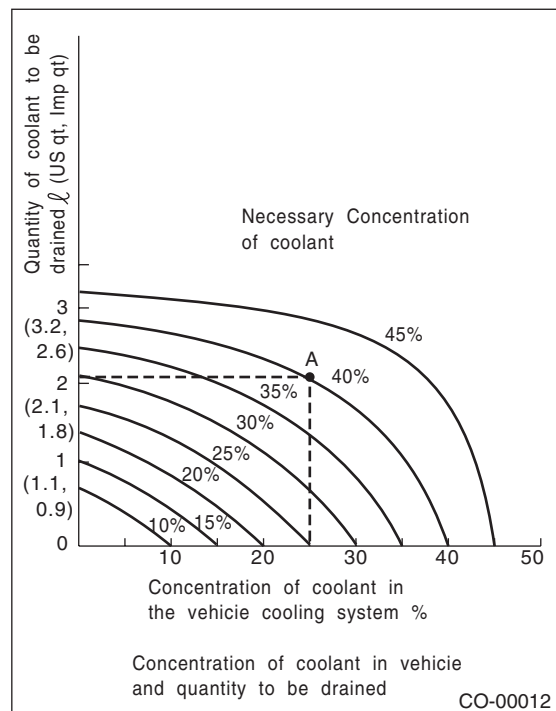
To adjust the concentration of coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with an undiluted solution of SUBARU genuine coolant (concentration 50%).

The amount of engine coolant that should be replaced can be determined using the diagram.

[Example]

Assume that the engine coolant concentration must be increased from 25% to 40%. Find point A, where the 25% line of engine coolant concentration intersects with the 40% curve of the necessary engine coolant concentration, and read the scale on the vertical axis of the graph at height A. The quantity of coolant to be drained is 2.1 ℓ (2.2 US qt, 1.8 Imp qt). Drain 2.1 ℓ (2.2 US qt, 1.8 Imp qt) of coolant from the cooling system and add 2.1 ℓ (2.2 US qt, 1.8 Imp qt) of the undiluted solution of SUBARU coolant.

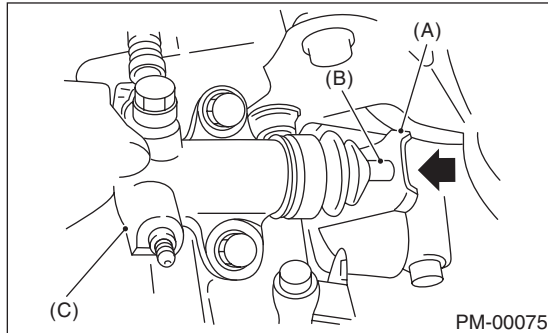
If a coolant concentration of 50% is needed, drain all the coolant and refill with the undiluted solution only.



13. Clutch System

A: INSPECTION AND ADJUSTMENT

1) Push the release lever to retract the push rod of the operating cylinder and check if the fluid level in the clutch reservoir tank rises.



- (A) Release lever
- (B) Push rod
- (C) Operating cylinder

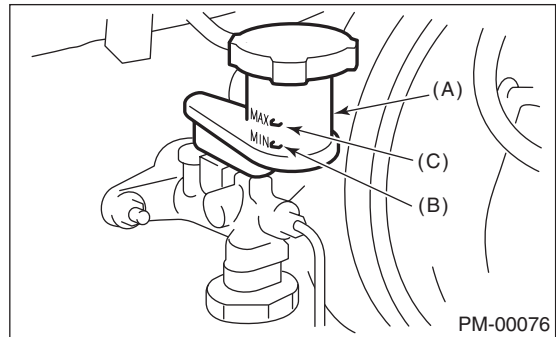
2) If the fluid level rises, pedal free play is correct.
 3) If the fluid level does not rise, or the push rod cannot be retracted, adjust the clutch pedal. <Ref. to CL-24, Clutch Pedal.>
 4) Check the fluid level using the scale on the outside of the clutch reservoir tank (A). If the level is below "MIN" (B), inspect the clutch master cylinder, operating cylinder and hydraulic line for fluid leaks. If fluid leaks are found, repair or replace. If fluid leaks are not found, add clutch fluid to bring it up to "MAX" (C) of clutch reservoir tank.

Recommended clutch fluid:

FMVSS No. 116, New part DOT3 or DOT4 brake fluid

CAUTION:

- Prevent the clutch fluid from being splashed over vehicle body. If the clutch fluid is splashed over vehicle body, flush it, and then wipe it up.
- If the fluid spilled on the exhaust pipe, wipe it off completely.
- Avoid mixing different brands of brake fluid to prevent degradation of the fluid.
- Be careful not to allow dirt or dust to get into the reservoir tank.



- (A) Reservoir tank
- (B) MIN. level
- (C) MAX. level

14. Transmission Gear Oil

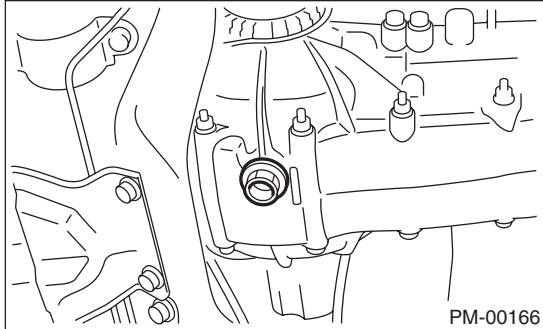
A: REPLACEMENT

1. MANUAL TRANSMISSION

1) Drain the gear oil by removing drain plug.

CAUTION:

- Before starting work, cool off the transmission gear oil well.
- If transmission gear oil adheres to the exhaust pipe, wipe it off completely.



2) Replace the gasket with new part, and then tighten the drain plug to specified torque.

Tightening torque:

Copper gasket

70 N·m (7.1 kgf·m, 51.6 ft·lb)

Aluminum gasket

44 N·m (4.5 kgf·m, 32.5 ft·lb)

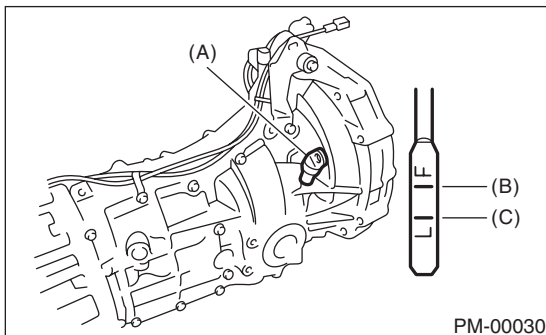
3) Fill the transmission gear oil through the oil level gauge hole up to the upper point of level gauge.

CAUTION:

Each oil manufacturer has its base oil and additives. Thus, do not mix two or more brands.

Gear oil capacity:

3.5 ℓ (3.7 US qt, 3.1 Imp qt)



- (A) Oil level gauge
- (B) Upper level
- (C) Lower level

15.Hill-holder System

A: INSPECTION AND ADJUSTMENT

1) Move the hill holder up an inclination of more than 3° to confirm the stopping and starting functions.

(1) When the vehicle does not stop:

Tighten the PHV cable adjustment nuts.

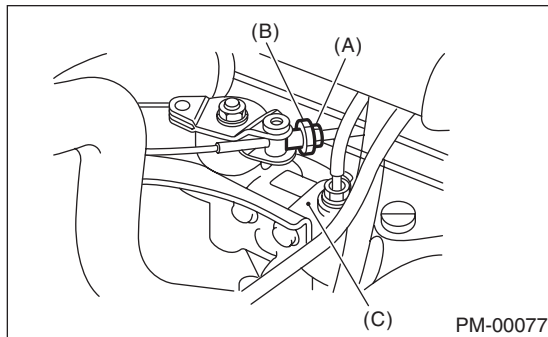
(2) When the vehicle does not start:

A: When the hill holder is released later than engagement of clutch (engine tends to stall): Loosen the adjusting nut gradually until smooth starting is enabled.

B: When the hill holder is released earlier than engagement to clutch (vehicle slips down slightly): Tighten the adjusting nut so that hill holder is released later than engagement of clutch (status in A). Then make adjustment the same as in A.

CAUTION:

- When turning the adjusting nuts, use a pliers to hold the inner cable to prevent over-turning.
- Replace the pressure hold valve (PHV) or PHV cable with new parts if there is a problem or damage.



- (A) Lock nut
- (B) Adjusting nut
- (C) Pressure hold valve

16.ATF

A: INSPECTION

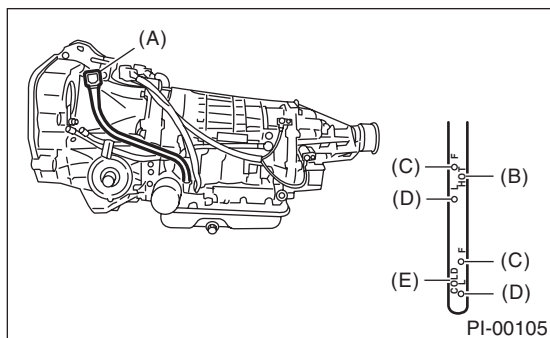
CAUTION:

The level of ATF varies with fluid temperature. Pay attention to the fluid temperature when checking ATF level.

1) Raise the ATF temperature by driving a distance of 5 — 10 km (3 — 6 miles). Otherwise, idle the engine to raise ATF temperature to 70 — 80°C (158 — 176°F) on Subaru Select Monitor.<Ref. to 4AT(D)(diag)-14, READ CURRENT DATA, OPERATION, Subaru Select Monitor.>

2) Make sure the vehicle is level.

3) After selecting all positions (P, R, N, D, 3, 2, 1), set the select lever in “P” range. Idle the engine for 1 or 2 minutes, and measure the ATF level.



- (A) Level gauge
- (B) Inspection position when “HOT” (70 — 80°C (158 — 176°F))
- (C) Upper level
- (D) Lower level
- (E) Inspection position when “COLD” (20 — 30°C (68 — 86°F))

4) Make sure that ATF level is between the upper level and lower level.

NOTE:

When the transmission is hot, the level should be above the center of upper and lower marks, and when it is cold, the level should be found below the center of these two marks.

5) If the ATF level is below the center between upper and lower marks, add the recommended ATF until the ATF level reaches the upper level.

CAUTION:

- Use care not to exceed the upper limit level.
- Be sure not to add ATF up to the upper limit mark when the transmission is cold because that will be the cause for excessive filling of ATF, and will cause transmission failure.

6) Check the ATF level as instructed in step 3), after raising ATF temperature to 70 — 80°C (158 — 176°F) by running the vehicle or by idling the engine again.

7) Check the ATF for leaks.

Check for leaks inside of the transmission. If there are leaks, repair or replace the gasket, oil seals, plugs or other parts.

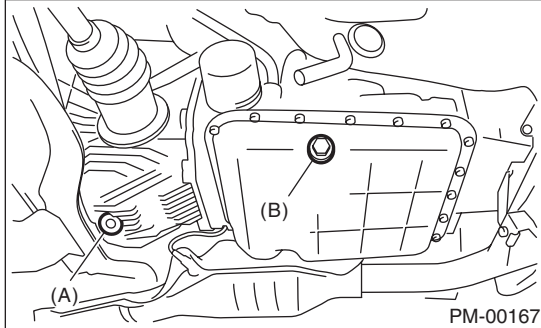
B: REPLACEMENT

1. AUTOMATIC TRANSMISSION FLUID

1) Drain the ATF by removing drain plug.

NOTE:

Before starting work, cool off the ATF well.



- (A) Front differential drain plug
- (B) ATF drain plug

CAUTION:

Be careful not to spill ATF on the exhaust pipe to prevent it from emitting smoke or causing a fire. If ATF spilled, wipe it off completely.

2) Replace the gasket with new part, and then tighten the drain plug to specified torque.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)

3) Pour ATF through gauge hole.

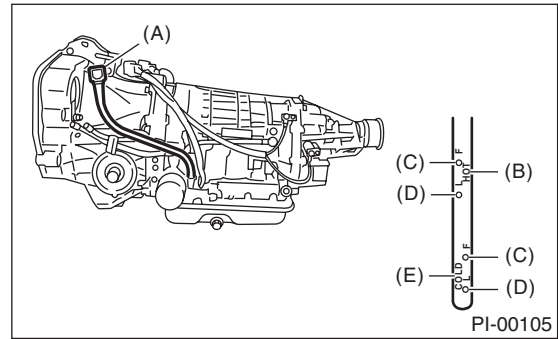
Recommended fluid:

SUBARU ATF <Ref. to RM-4, FLUID, RECOMMENDED MATERIALS, Recommended Materials.>

Fluid capacity:

Fill the same amount of ATF drained from ATF drain plug hole.

4) Check the ATF level. <Ref. to PM-26, INSPECTION, ATF.>



- (A) Level gauge
- (B) Inspection position when "HOT" (70 — 80°C (158 — 176°F))
- (C) Upper level
- (D) Lower level
- (E) Inspection position when "COLD" (20 — 30°C (68 — 86°F))

2. ATF FILTER

NOTE:

ATF filter needs replacement when it is physically damaged or ATF leaked.

For the replacement procedure of ATF filter, refer to "ATF FILTER". <Ref. to 4AT-60, ATF Filter.>

Front & Rear Differential Gear Oil

PERIODIC MAINTENANCE SERVICES

17. Front & Rear Differential Gear Oil

A: REPLACEMENT

1. FRONT DIFFERENTIAL (MT MODEL)

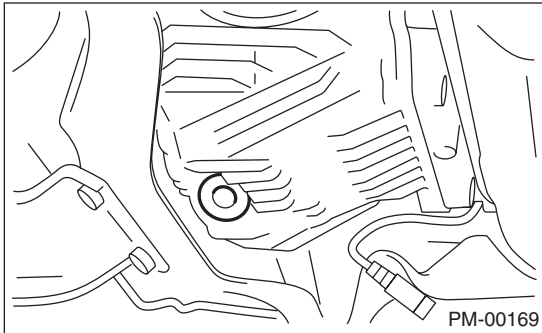
For MT model, differential gear oil works as manual transmission gear oil to lubricate differential. <Ref. to PM-24, Transmission Gear Oil.>

2. FRONT DIFFERENTIAL (AT MODEL)

1) Drain the differential gear oil by removing drain plug using TORX® T70.

CAUTION:

- Before starting work, cool off the differential gear oil well.
- Be careful not to spill oil on the exhaust pipe to prevent it from emitting smoke or causing a fire. If the oil spilled, wipe it off completely.



2) Replace the gasket with new part, and then tighten the drain plug to specified torque.

Tightening torque:

Aluminum gasket

44 N·m (4.5 kgf·m, 32.5 ft·lb)

Copper gasket

70 N·m (7.1 kgf·m, 51.6 ft·lb)

3) Fill differential gear oil through the oil level gauge hole up to the upper point of level gauge.

CAUTION:

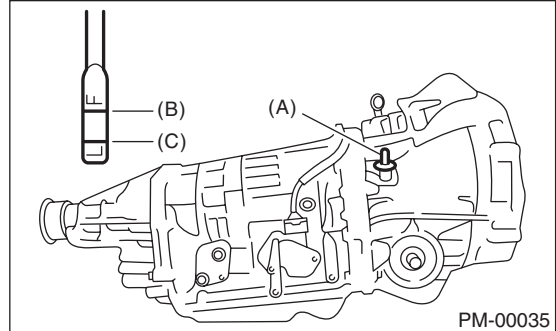
Each oil manufacturer has its base oil and additives. Thus, do not mix two or more brands.

Recommended oil:

<Ref. to RM-3, LUBRICANTS, RECOMMENDED MATERIALS, Recommended Materials.>

Gear oil capacity:

1.1 — 1.3 ℓ (1.2 — 1.4 US qt, 1.0 — 1.1 Imp qt)



(A) Oil level gauge

(B) Upper level

(C) Lower level

3. REAR DIFFERENTIAL

- 1) Remove the drain plug, and drain the differential gear oil.
- 2) Remove the filler plug for quick draining oil.
- 3) Install the drain plug after draining oil.

NOTE:

Apply liquid gasket to the drain plug threads.

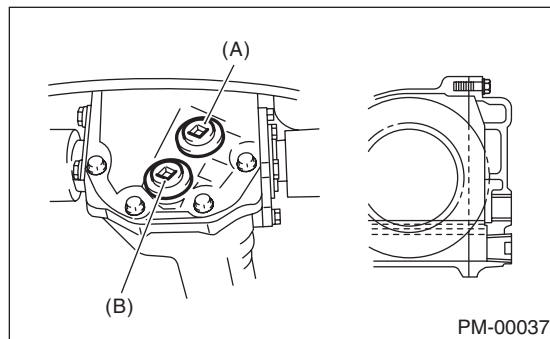
Liquid gasket:

THREE BOND 1105 (Part No. 004403010)

Tightening torque:

49.0 N·m (5.0 kgf-m, 36.2 ft-lb)

- 4) After installing drain plug onto rear differential gear case firmly, fill oil up fully to the mouth of filler plug.



- (A) Filler plug
- (B) Drain plug

Oil capacity:

0.8 ℓ (0.8 US qt, 0.7 Imp qt)

CAUTION:

Each oil manufacturer has its base oil and additives. Thus, do not mix two or more brands.

- 5) Install the filler plug onto rear differential gear case firmly.

NOTE:

Apply liquid gasket to the threads of the filler plug screws.

Liquid gasket:

THREE BOND 1105 (Part No. 004403010)

Tightening torque:

49.0 N·m (5.0 kgf-m, 36.2 ft-lb)

18. Brake Line

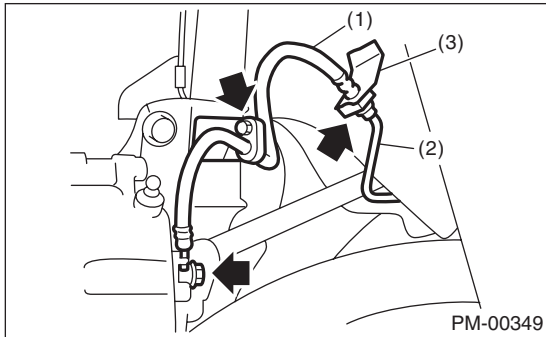
A: INSPECTION

1. BRAKE LINE

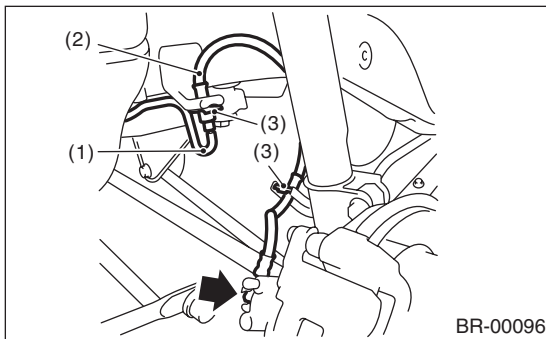
- 1) Check for scratches, swelling, corrosion, traces of fluid leakage on the brake hoses or pipe joints.
- 2) Check the possibility of adjacent parts interfering with brake pipes/hoses during driving, and loose connections/clamps.
- 3) Check any trace of fluid leakage, scratches, etc. on master cylinder, wheel cylinder and pressure control valve.

NOTE:

- When the brake fluid level in the reservoir tank is lower than specified limit, the brake warning light on the combination meter will come on.
- Visually check the brake hose for damage. (Use a mirror where it is difficult to see)



- (1) Front brake hose
- (2) Front brake pipe
- (3) Clamp



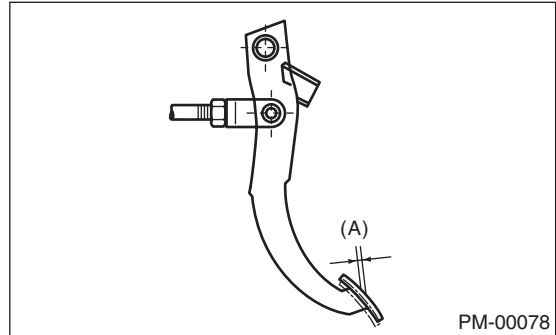
- (1) Brake pipe
- (2) Rear brake hose
- (3) Clamp

2. SERVICE BRAKE

- 1) Check the free play of brake pedal with a force of less than 10 N (1 kgf, 2 lb).

Brake pedal free play:

0.5 — 2.0 mm (0.02 — 0.08 in)



(A) Pedal free play

- 2) If the free play is out of the specifications values, adjust the brake pedal as follows.

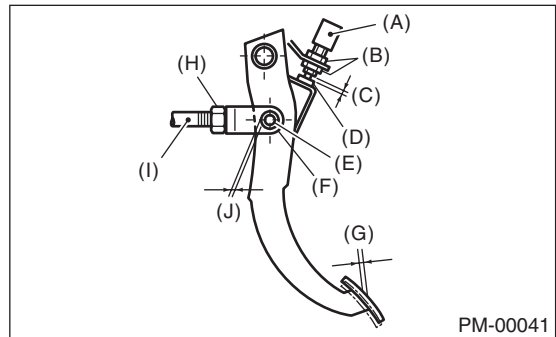
(1) Make sure the engine is off. (No vacuum is applied to brake booster.)

(2) Inspect that there is play between brake booster clevis and pin at brake pedal installing portion.

[Depress brake pedal pad with a force of less than 10 N (1 kgf, 2 lb) to a stroke of 0.5 to 2.0 mm (0.02 to 0.08 in).]

(3) Depress the surface of brake pad by hand.

(4) If there is no free play between clevis pin and clevis, turn brake switch adjusting nut until the clearance between stopper and screw of brake switch becomes 0.3 mm (0.012 in).



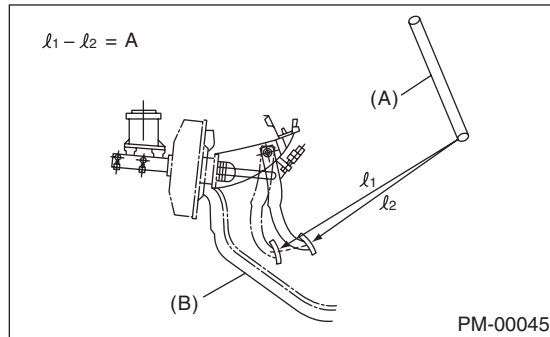
- (A) Brake switch
- (B) Adjusting nut
- (C) 0.3 mm (0.012 in)
- (D) Stopper
- (E) Clevis pin
- (F) Clevis
- (G) Pedal free play
- (H) Lock nut
- (I) Brake booster operating rod
- (J) Play at pin

3) Check the pedal stroke.

While the engine is idling, depress the brake pedal with a 490 N (50 kgf, 110 lb) load and measure the distance between the brake pedal and steering wheel. With the brake pedal released, measure the distance between pedal and steering wheel again. The difference between the two measured values must be less than specified value. If the measured value is more than specification, there is possibility of entering air in hydraulic unit.

Brake pedal stroke A

105 mm (4.13 in) or less/ 490 N (50 kgf, 110 lb)



- (A) Steering wheel
- (B) Toe board

4) Check to see if air is in the hydraulic brake line by the feel of pedal operation. If air appears to exist in the line, bleed it from the system.

5) Check for even operation of all brakes, using a brake tester or by driving the vehicle for a short distance on a straight road.

3. BRAKE SERVO SYSTEM

1) With the engine off, depress the brake pedal several times applying the same pedal force. Make sure the travel distance should not change.

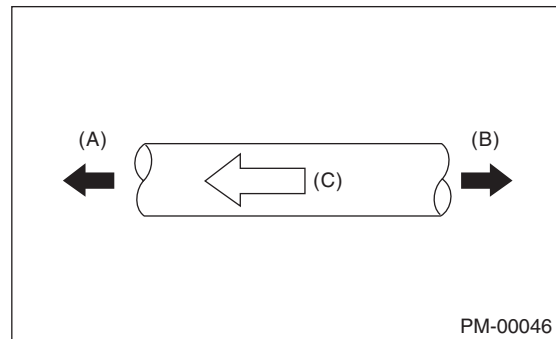
2) With the brake pedal depressed, start the engine. Check that the pedal moves slightly toward the floor.

3) With the brake pedal depressed, stop the engine and keep the pedal depressed for 30 seconds. Check that the pedal height does not change.

4) A check valve is built into the vacuum hose. Remove the vacuum hose to inspect function of the check valve.

Blow air into vacuum hose from its brake booster side. Check that the air flows out to the engine side of the air hose. Next blow air into hose from engine side: Check that the air does not flow out to the brake booster side.

Replace the both check valve and vacuum hose if the check valve is faulty. Engine side of vacuum hose is indicated by marking "ENG" as shown.



- (A) Engine side
- (B) Brake booster side
- (C) ENG

5) Check the vacuum hose for cracks or other damage.

CAUTION:

When installing the vacuum hose on the engine and brake booster, do not use soapy water or lubricating oil on their connections.

6) Check that the vacuum hose is securely mounted.

19.Brake Fluid

A: INSPECTION

1) Check that the brake fluid level remains between MIN and MAX. If out of the specified range, refill or drain fluid. If the fluid level becomes close to MIN, check the brake pad for wear and refill fluid.

CAUTION:

If the brake fluid spilled on the exhaust pipe, wipe it off completely.

2) Check the fluid for discoloration. If the fluid color has excessively changed, drain the fluid and refill with new fluid.

B: REPLACEMENT

CAUTION:

- Do not let brake fluid come into contact with the painted surface of the vehicle body. Wash away with water immediately and wipe off if it is spilled by accident.
- Avoid mixing brake fluid of different brands to prevent fluid performance from degrading.
- Be careful not to allow dirt or dust to enter into reservoir tank.

NOTE:

- While working, keep the reservoir tank filled with brake fluid to eliminate entry of air.
 - Operate the brake pedal slowly.
 - For convenience and safety, perform work with 2 people.
 - The required amount of brake fluid is approximately 500 mℓ (16.9 US fl oz, 17.6 Imp fl oz) for entire brake system.
- 1) Lift-up the vehicle and set rigid racks at the specified locations, or keep the vehicle lifted.
 - 2) Remove both the front and rear wheels.
 - 3) Drain the brake fluid from the reservoir tank.
 - 4) Refill the reservoir tank with recommended brake fluid.

Recommended brake fluid:

Refer to SPECIFICATION of General Description. <Ref. to BR-2, SPECIFICATION, General Description.>

Repeat the same procedure as for bleeding air from the brake line, until new brake fluid comes out from vinyl tube. <Ref. to BR-42, PROCEDURE, Air Bleeding.>

20. Disc Brake Pad and Disc

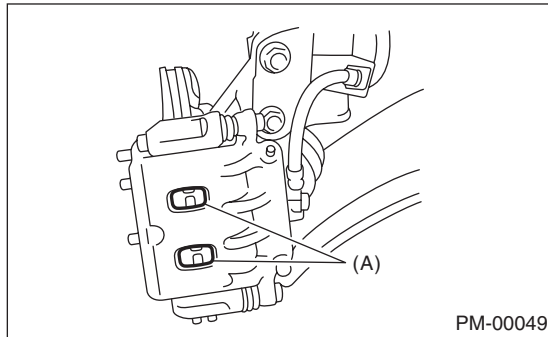
A: INSPECTION

1. DISC BRAKE PADS AND DISCS

- 1) Lift up the vehicle, and remove the wheels.
- 2) Visually check the pad thickness through inspection hole of disc brake assembly. Replace the pad if necessary.

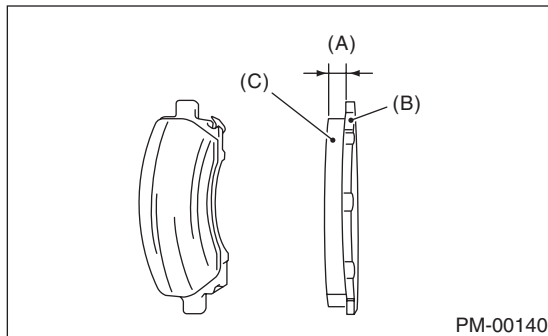
CAUTION:

When replacing a pad, always replace the pads for both the left and right wheels at the same time. Also replace the pad clips if they are twisted or worn.



(A) Inspection hole

Pad thickness	mm (in)	
	Front	Rear
Standard	11 (0.43)	9 (0.35)
Wear limit	1.5 (0.059)	1.5 (0.059)



- (A) Pad thickness
- (B) Back metal
- (C) Lining

- 3) Check the disc rotor, and correct or replace if it is damaged or worn.

Brake disc thickness	mm (in)	
	Front	Rear
Standard	24 (0.94)	10 (0.39)
Wear limit	22 (0.87)	8.5 (0.335)

- 4) Remove the caliper body. <Ref. to BR-18, Front Disc Brake Assembly.> <Ref. to BR-24, Rear Disc Brake Assembly.>
- 5) Tighten the wheel nuts to secure disc rotor.
- 6) Set a dial gauge at a point less than 10 mm (0.39 in) from outer periphery of the rotor, and then measure the disc rotor runout.

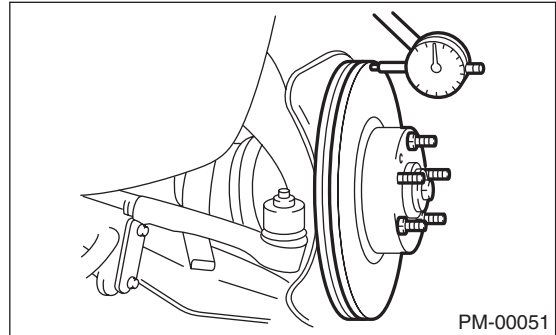
Disc rotor runout limit:

Front

0.075 mm (0.0030 in)

Rear

0.070 mm (0.0028 in)



Brake Lining and Drum

PERIODIC MAINTENANCE SERVICES

21. Brake Lining and Drum

A: INSPECTION

1. REAR DRUM BRAKE

1) Remove the brake drum and check for fluid leaks from the wheel cylinder.

If fluid leaks are found in the wheel cylinder, check the wheel cylinder and repair or replace it.

2) Inspect the brake shoes for damage or deformation and check the brake linings for wear beyond limit values.

CAUTION:

- Always replace the wheel leading and trailing brake shoes for the left and right wheels at the same time.
- When replacing either the left or the right brake assembly, always replace the leading shoe and the trailing shoe of one side.

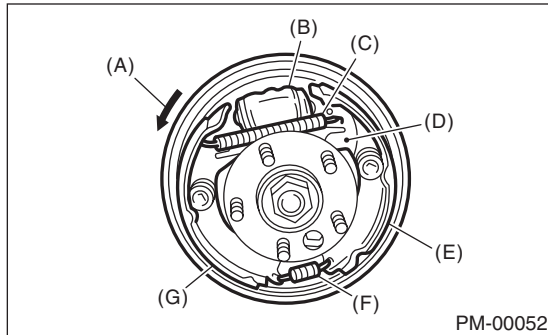
Thickness of lining (except for back metal)

Standard:

4.1 mm (0.161 in)

Service limit:

1.5 mm (0.059 in)



- (A) Direction of drum rotation (Forward)
- (B) Wheel cylinder
- (C) Upper shoe return spring
- (D) Adjusting lever
- (E) Trailing shoe
- (F) Lower shoe return spring
- (G) Leading shoe

3) Check the brake drum for wear, dents or other damage.

If the inside surface of brake drum is streaked, correct the surface with emery cloth (#200 or more). If it is unevenly worn or tapered, or the outer surface of the brake drum is damaged, repair or replace it.

Brake drum inside diameter:

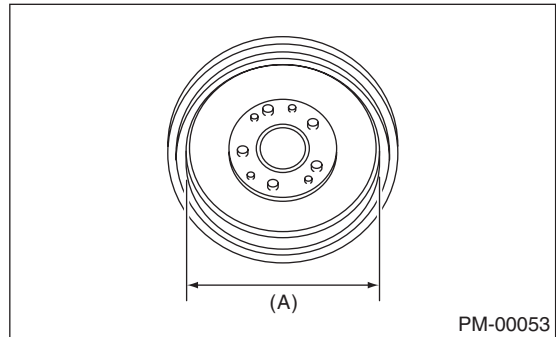
Standard:

228.6 mm (9.000 in)

Service limit:

230.6 mm (9.079 in)

If the deformation or wear of back plate, shoe, etc. is noticeable, replace problem parts.



(A) Inside diameter

2. PARKING BRAKE (REAR DISC BRAKE)

Inspect the brake linings and disc rotor of both sides of the rear brake at the same time by removing disc rotor.

1) Inspect the brake shoes for damage or deformation and check the brake linings for wear beyond limit values.

CAUTION:

Always replace both primary and secondary brake shoes for the left and right wheels at the same time.

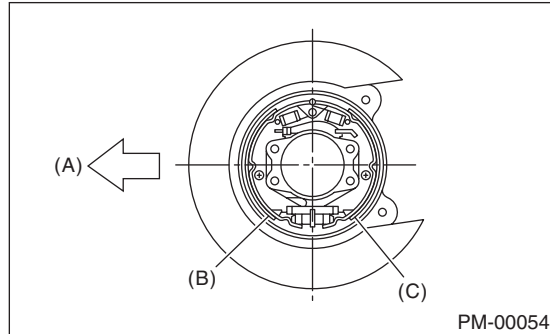
Thickness of brake lining (except for back metal):

Standard:

3.2 mm (0.126 in)

Service limit:

1.5 mm (0.059 in)



- (A) Forward
- (B) Brake shoe (Primary side)
- (C) Brake shoe (Secondary side)

2) Check the inside of disc rotor for wear, dents or other damage. If the inside surface of dick rotor is streaked, correct the surface with emery cloth (#200 or more). If it is unevenly worn or tapered, correct or replace it.

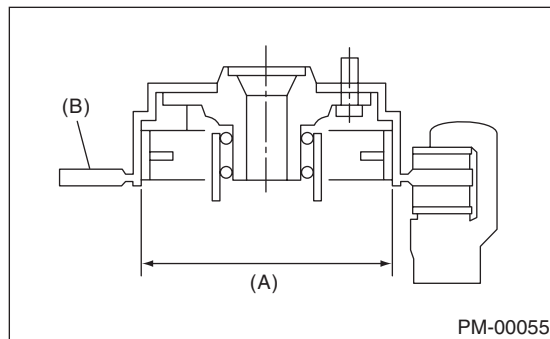
Brake drum inside diameter:

Standard:

170 mm (6.69 in)

Service limit:

171 mm (6.73 in)



- (A) Inside diameter
- (B) Disc

3) If the deformation or wear of back plate, shoe, etc. is noticeable, replace problem parts.

4) When the shoe return spring tension is excessively weakened, replace it.

B: ADJUSTMENT

1. REAR DRUM BRAKE

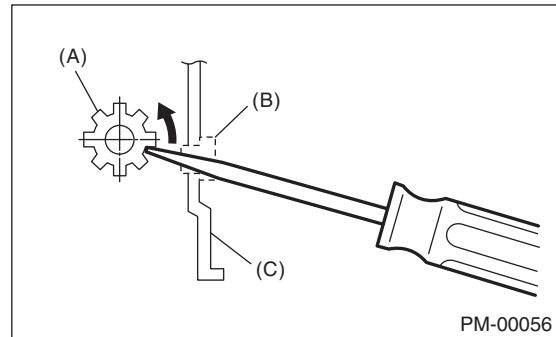
The main brake automatically adjusts itself, so no adjustments are needed.

2. PARKING BRAKE (REAR DISC BRAKE)

For rear disc brake, adjust the parking brake after bleeding air.

1) Remove the rear cover (rubber) installed at back plate.

2) Turn the adjuster toward arrow mark (upward) until it is locked slightly, by using flat-tip screwdriver as shown in the figure.



- (A) Adjuster
- (B) Rear cover (rubber)
- (C) Back plate

3) Turn back (downward) the adjuster 3 to 4 notches.

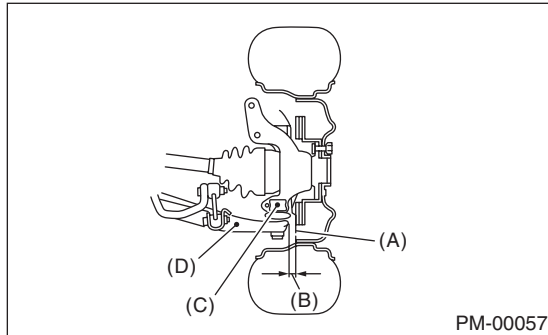
4) Install the rear cover (rubber) in original position correctly.

22. Suspension

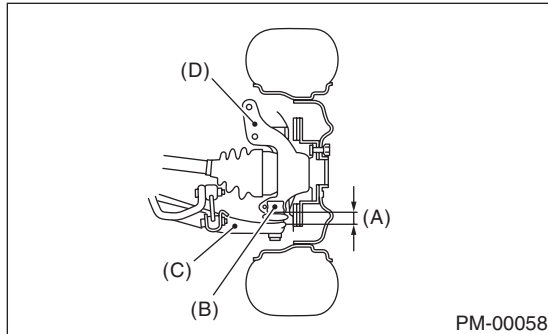
A: INSPECTION

1. SUSPENSION BALL JOINT

- 1) Lift up the vehicle until front wheels are off ground.
- 2) Grasp the bottom of tire and move it in and out. If relative movement (B) is observed between the brake disc cover (A) and end of transverse link (D), ball joint (C) may be excessively worn.



- 3) Next, grasp the end of transverse link (C) and move it up and down. Relative movement (A) between the housing (D) and transverse link (C) boss indicates ball joint (B) may be excessively worn.



- 4) If the relative movement is observed in the preceding two steps, remove and inspect the ball joint. If the free play exceeds standard value, replace the ball joint. <Ref. to FS-16, Front Ball Joint.>

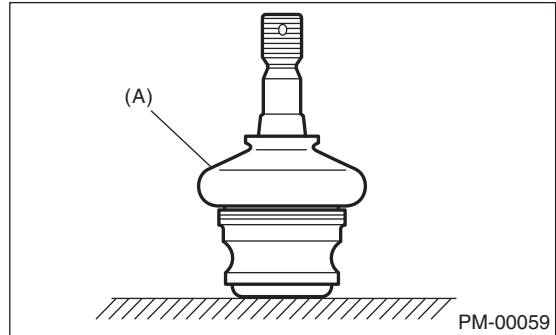
5) Damage of dust seal

Visually inspect the ball joint dust seal. When there is damage, remove the transverse link to measure the play of ball joint. <Ref. to FS-14, Front Transverse Link.> <Ref. to FS-16, Front Ball Joint.>

- (1) When looseness exceeds standard value, replace the ball joint.
- (2) If the dust seal is damaged, replace it with a new ball joint.

NOTE:

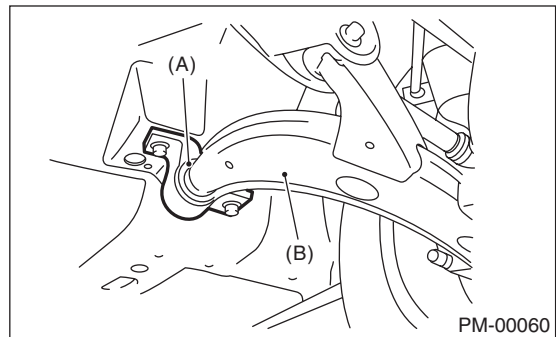
When the transverse link ball joint has been removed or replaced, check the toe-in of front wheel. If it is not within the specified value, adjust the toe-in. <Ref. to FS-6, Wheel Alignment.>



(A) Dust seal

2. TRANSVERSE LINK REAR BUSHING

Check around the rear bushing for oil leaks. If oil leaks, replace bushing.



(A) Rear bushing
(B) Transverse link

3. WHEEL ARCH HEIGHT

- 1) Unload the cargoes and set the vehicle in curb weight (empty) condition.
- 2) Then, check the wheel arch height of front and rear suspensions to ensure that they are within specified values. <Ref. to FS-6, Wheel Alignment.>
- 3) When the wheel arch height is out of standard, visually inspect the following components and replace deformed parts.

- Suspension components [Front strut assembly and rear strut assembly]
 - Parts connecting suspension and body
- 4) When no components are deformed, adjust wheel arch height by replacing coil spring in the suspension whose wheel arch height is out of standard. <Ref. to FS-6, Wheel Alignment.> <Ref. to RS-6, Wheel Alignment.>

4. WHEEL ALIGNMENT OF FRONT SUSPENSION

1) Check the alignment of front suspension to make sure the following items are within tolerance.

- Toe-in
- Camber
- Caster
- Steering angle

<Ref. to FS-6, Wheel Alignment.>

2) When the caster angle does not conform to the reference value obviously, visually inspect the following components and replace deformed parts.

- Suspension components [Strut assembly, crossmember, transverse link, etc.]
- Parts connecting suspension and body

3) When the toe-in and camber are out of tolerance value, adjust them so that they conform to tolerance value.

4) If steering is not within the specified value, adjust it to standard value.

5. WHEEL ALIGNMENT OF REAR SUSPENSION

1) Check the alignment of rear suspension to make sure the following items are within tolerance.

- Toe-in
- Camber
- Thrust angle

<Ref. to RS-6, Wheel Alignment.>

2) When the camber is out of the tolerance value, visually inspect the following components and replace deformed parts.

- Suspension components [Shock absorber, front lateral link, rear lateral link, and trailing link]
- Parts connecting suspension and body

3) When the toe-in and thrust angle are out of tolerance value, adjust them so that they conform to tolerance value.

6. OIL LEAKAGE OF STRUT

Visually inspect the front strut and rear strut for oil leakage. If there is a bad oil leak, replace the front strut and rear strut.

7. TIGHTNESS OF BOLTS AND NUTS

Check the bolts and nuts for looseness. Retighten the bolts and nuts to specified torque. If the self-locking nuts and bolts are removed, replace them with new parts.

Front suspension: <Ref. to FS-2, General Description.>

Rear suspension: <Ref. to RS-2, General Description.>

8. DAMAGE TO SUSPENSION PARTS

Check the following parts and the fastening portion of the vehicle body for deformation or excessive rusting which impairs the suspension. If necessary, replace the damaged parts with new parts. If minor rust, pitting, etc. are noted, remove the rust and take rust prevention measure.

- Front suspension
 - Transverse link
 - Crossmember
 - Strut
- Rear suspension
 - Crossmember
 - Lateral link
 - Trailing link
 - Strut
- In the area where salt is sprayed to melt snow on a road in winter, check suspension parts for damage caused by rust every 12 months after lapse of 60 months. Also, take rust prevention measure as required.

23. Wheel Bearing

A: INSPECTION

1. FRONT WHEEL BEARING

NOTE:

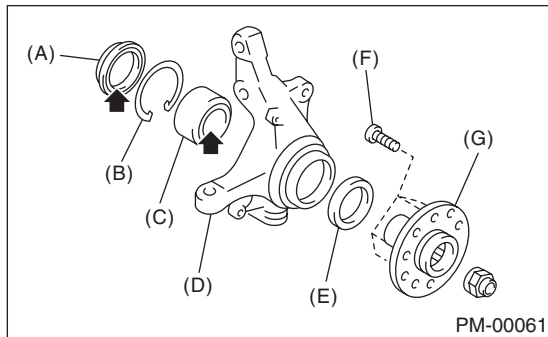
Inspect the condition of front wheel bearing grease.

- 1) Lift-up the vehicle.
- 2) While holding the front wheel by hand, swing it in and out to check that there is no bearing free play.
- 3) Loosen the wheel nuts, and remove the front wheel.
- 4) If the bearing free play exists in step 2) above, attach a dial gauge to hub and measure the looseness in the axial direction.

Service limit:

0.05 mm (0.0020 in) Max.

- 5) Remove the bolts and self-locking nuts, and extract transverse link from the front crossmember.
 - 6) Remove the AARi of front drive shaft from transmission. <Ref. to DS-16, Front Axle.>
 - 7) While supporting the front drive shaft horizontally with one hand, turn the hub with the other hand to check for noise or binding.
- If the hub is noisy or binds, disassemble the front axle and replace the oil seals or bearing.



- (A) Inner oil seal
- (B) Snap ring
- (C) Bearing
- (D) Housing
- (E) Outer oil seal
- (F) Hub bolt
- (G) Hub

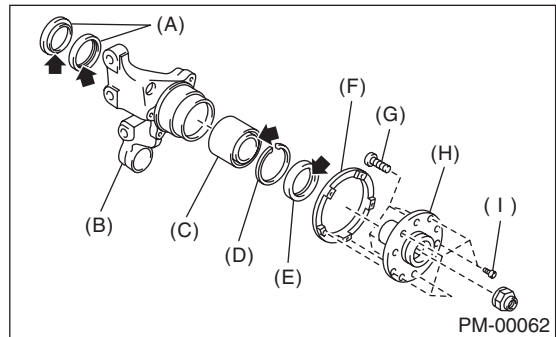
2. REAR WHEEL BEARING

- 1) Lift-up the vehicle.
- 2) While holding the rear wheel by hand, swing it in and out to check that there is no bearing free play.
- 3) Loosen the wheel nuts, and remove the rear wheel.
- 4) If the bearing free play exists in step 2) above, attach a dial gauge to hub COMPL and measure the looseness in the axial direction.

Service limit:

0.05 mm (0.0020 in) Max.

- 5) Remove the DOJ of rear drive shaft from rear differential. <Ref. to DS-34, Rear Drive Shaft.>
 - 6) While supporting rear drive shaft horizontally with one hand, turn the hub COMPL with the other to check for noise or binding.
- If the hub COMPL is noisy or binds, disassemble the rear axle and replace the oil seals or bearing.



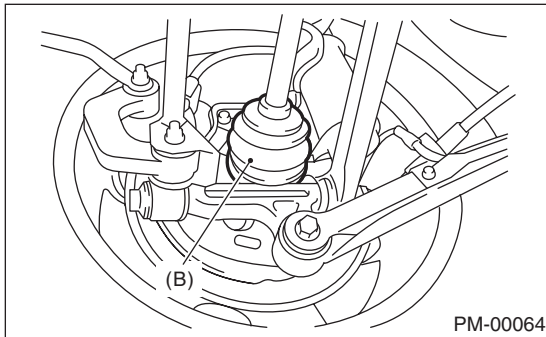
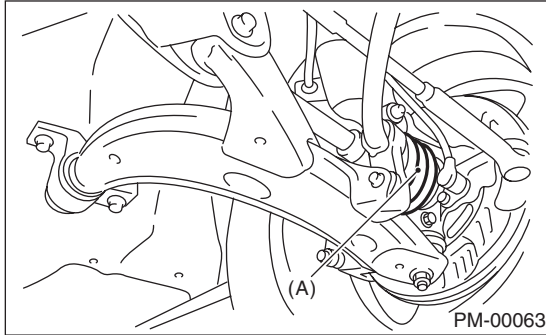
- (A) Inner oil seal
- (B) Rear housing
- (C) Bearing
- (D) Snap ring
- (E) Outer oil seal
- (F) Tone wheel
- (G) Hub bolt
- (H) Hub
- (I) Socket bolt

24. Axle Boots & Joints

A: INSPECTION

1. FRONT AND REAR AXLE BOOTS

Inspect the front axle boots (A) and rear axle boots (B) for deformation, damage or failure. If faulty, replace with new part. <Ref. to DS-29, Front Drive Shaft.> <Ref. to DS-34, Rear Drive Shaft.>



2. PROPELLER SHAFT

Inspect the propeller shaft for damage or failure. If faulty, replace with new part. <Ref. to DS-12, Propeller Shaft.>

25. Tire Rotation

A: INSPECTION

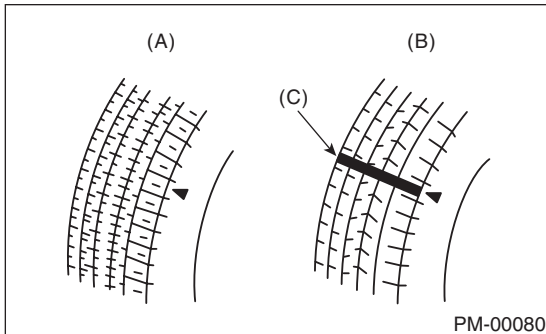
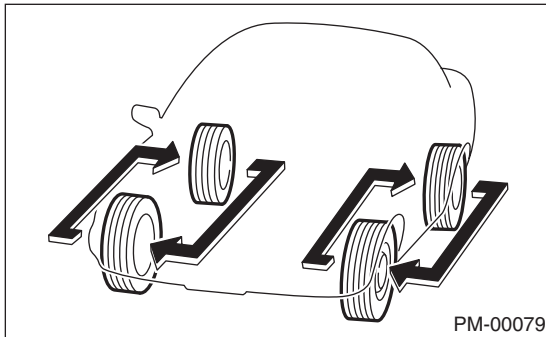
1) If the depth of tread is less than 1.6 mm (0.063 in), or the tread wear indicator has appeared across the tire tread, replace the tire.

CAUTION:

Replace the left and right sides at the same time.

2) If unevenly worn, adjust the alignment.

3) To make tire wear uniform, rotate the front and rear tires as shown in the figure below every 12,500 km (7,500 miles).



- (A) New tread
- (B) Worn tread
- (C) Tread wear indicator

26. Steering System (Power Steering)

A: INSPECTION

1. STEERING WHEEL

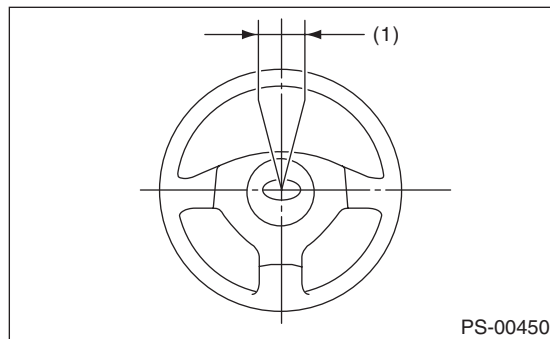
1) Set the steering wheel in a straight-ahead position, and check the wheel spokes to make sure they are correctly set in their specified positions.

2) Lightly turn the steering wheel to the left and right to determine the point where front wheels start to move.

Measure the distance of the movement of steering wheel (outer periphery).

Steering wheel free play:

0 — 17 mm (0 — 0.67 in)



(1) Steering wheel free play

Move the steering wheel vertically toward the shaft to check if there is play in the direction.

Limit of play:

0.5 mm (0.020 in)

3) Drive the vehicle and check the following items.

(1) Steering force:

The effort required for steering should be smooth and even at all points, and should not vary.

(2) Pulled to one side:

Steering wheel should not be pulled to either side while driving on a level surface.

(3) Wheel runout:

Steering wheel should not show any sign of runout.

(4) Return shape:

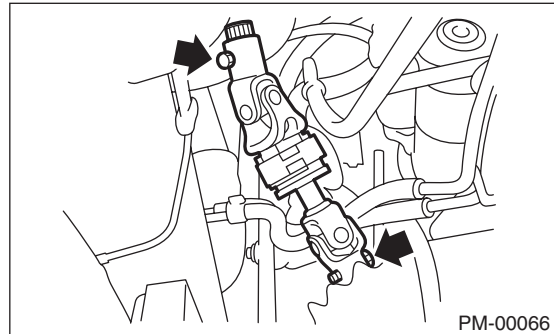
The steering wheel should return to its original position after it has been turned by hand and then released.

2. STEERING SHAFT JOINT

When the steering wheel free play is excessive, disconnect the universal joint of steering shaft and check it for any play and yawing torque (at the point of the crossing direction). Also inspect for any damage to sealing or worn serrations. If the joint is loose, retighten the mounting bolts to the specified torque.

Tightening torque:

24 N·m (2.4 kgf-m, 17.4 ft-lb)

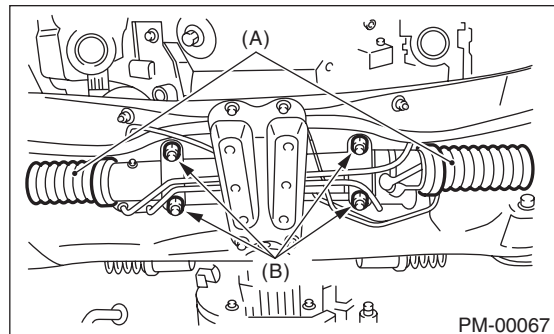


3. GEARBOX

1) Set the steering wheel in the straight position, then rotate it 90° in both the left and right directions. While steering wheel is being rotated, check the looseness of the gear box.

Tightening torque:

60 N·m (6.1 kgf-m, 44.3 ft-lb)



(A) Boot

(B) Gearbox mounting bolt

2) Check the boot for damage, cracks or deterioration.

3) With the vehicle stopped on a level surface, quickly turn the steering wheel to the left and right. While steering wheel is being rotated, check the gear backlash. If any noise is noticed, adjust the gear backlash in the following manner.

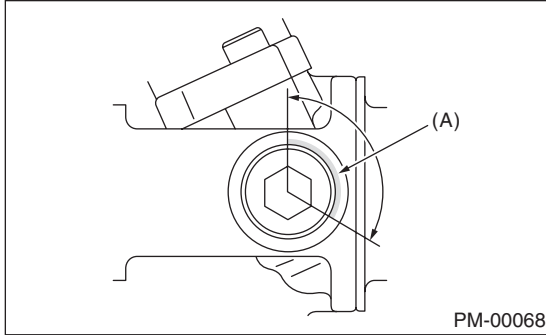
(1) Tighten the adjusting screw to 9.8 N·m (0.99 kgf-m, 7.2 ft-lb) and then loosen.

(2) Tighten the adjusting screw to 4.9 N·m (0.49 kgf-m, 3.6 ft-lb) and then loosen.

Steering System (Power Steering)

PERIODIC MAINTENANCE SERVICES

- (3) Tighten the adjusting screw to 4.9 N·m (0.49 kgf-m, 3.6 ft-lb) and then loosen 26°.
- (4) Apply liquid gasket to at least 1/3 of entire perimeter of adjusting screw thread.



- (A) Apply liquid gasket to at least 1/3 of entire thread.

- (5) Install the lock nut. While holding the adjusting screw with a wrench, tighten the lock nut using ST.

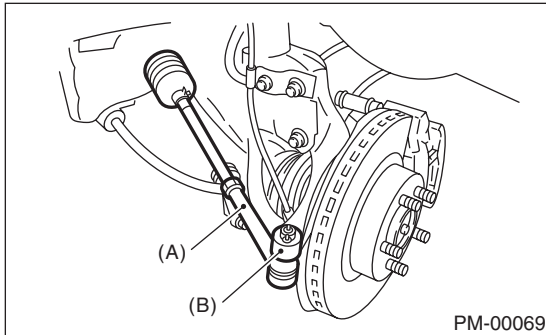
ST 926230000 SPANNER

Tightening torque (lock nut):
39 N·m (4.0 kgf-m, 29 ft-lb)

Hold the adjusting screw with a wrench to prevent it from turning while tightening the lock nut.

4. TIE-ROD

- 1) Check the tie-rod and tie-rod ends for bends, scratches or other damage.



- (A) Tie-rod end
(B) Knuckle arm

- 2) Check the connections of the knuckle ball joints for play, inspect for damage on dust seals, and check that there is no free play in the ball studs. If castle nut is loose, retighten it to the specified torque, then tighten further up to a maximum of 60° until the cotter pin hole is aligned.

Tightening torque:
27 N·m (2.75 kgf-m, 19.9 ft-lb)

- 3) Check the lock nut on the tie-rod end for tightness. If it is loose, retighten it to the specified value.

Tightening torque:
83 N·m (8.5 kgf-m, 61.5 ft-lb)

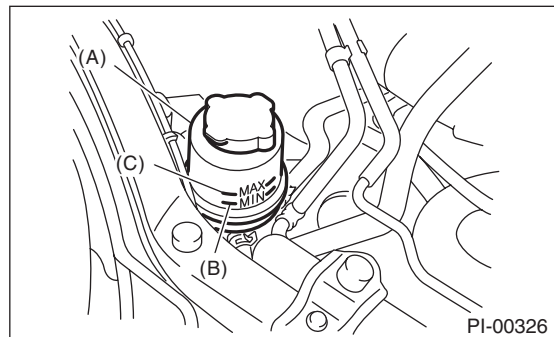
5. POWER STEERING FLUID LEVEL

NOTE:

- When power steering fluid temperature is 20°C (68°F), read the fluid level on the “COLD” side.
- When power steering fluid temperature is 80°C (176°F), read the fluid level on the “HOT” side.

- 1) Stop the engine to park the vehicle on a level surface.

- 2) Check the fluid level using the scale on the outside of the reservoir tank (A). If the level is below “MIN” (B), add fluid to bring it up to “MAX” (C).



NOTE:

If fluid level is at “MAX” level or above, drain fluid to keep the level in the specified range of indicator by using a syringe or the like.

Recommended fluid:
DEXRON III

Fluid capacity:
0.7 ℓ (0.7 US qt, 0.6 Imp qt)

6. POWER STEERING FLUID FOR LEAKS

Inspect the underside of oil pump and gearbox of power steering system, hoses, pipes and their couplings for fluid leaks.

If the fluid leaks are found, retighten their fitting bolts (or nuts) and/or replace their parts.

CAUTION:

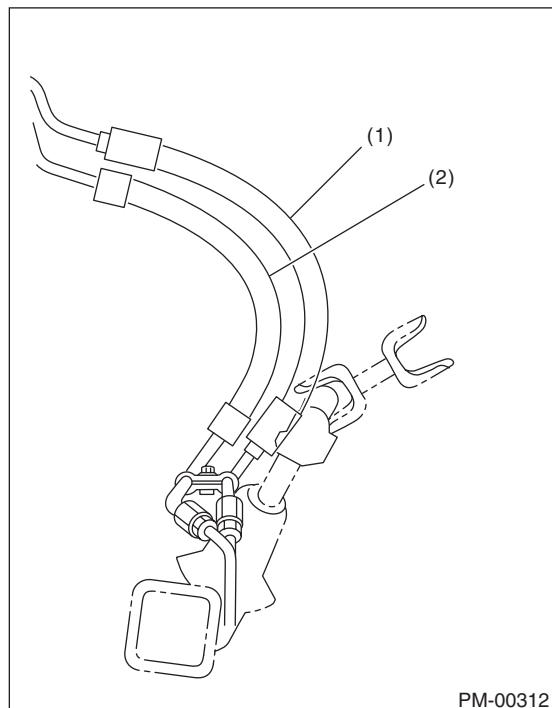
- Be careful not to spill the power steering fluid on exhaust pipe, to prevent causing a fire. If the power steering fluid spilled, wipe it off completely.
- Also pay attention to interference between hoses or pipes and other parts when inspecting fluid leaks.

7. HOSES OF OIL PUMP FOR DAMAGES

Check the pressure hose and return hose of oil pump for crack, swell or damage. Replace the hose with a new part if necessary.

CAUTION:

Prevent hoses from turning and/or bending when installing hoses.



- (1) Pressure hose
- (2) Return hose

8. POWER STEERING PIPES FOR DAMAGES

Check the power steering pipes for corrosion and damage. Replace the pipes with new parts if necessary.

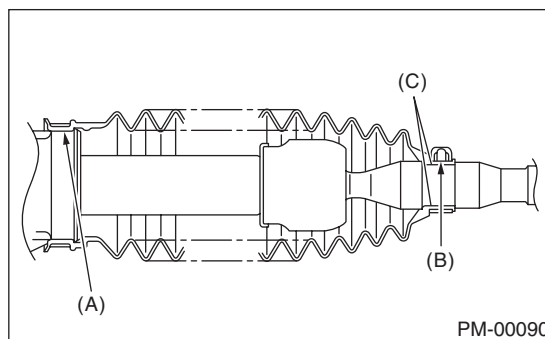
9. GEARBOX BOOTS

Inspect both sides of the gearbox boot as follows, and correct the defects if necessary.

- 1) The (A) and (B) positions of the gearbox boot are fitted in (A) and (C) grooves of gearbox and the rod.
- 2) Clips are fitted outside of positions (A) and (B) of boot.
- 3) Check that there is no cracks or holes in the boot.

NOTE:

Rotate (B) position of gearbox boot against the torsion produced by the adjustment of toe-in etc. Apply grease to the groove (C).



10. FITTING BOLTS AND NUTS

Inspect the installation bolts and nuts of the oil pump and bracket for looseness, and retighten them if necessary.

NOTE:

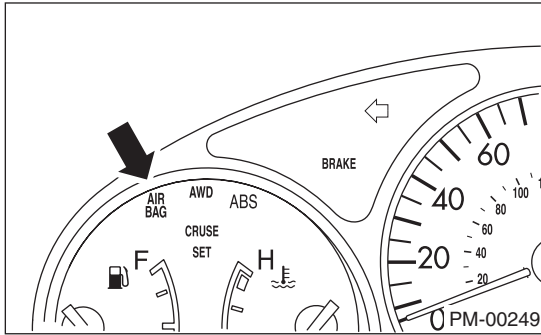
Inspect and/or retighten the bolts and nuts when the engine is cold.

27. Airbag System

A: INSPECTION

Check the airbag system according to the results of the self-diagnosis. <Ref. to AB(diag)-2, Basic Diagnostic Procedure.>

1) Make sure the airbag connector is connected. If not connected, connect correctly. When disconnected, and the ignition switch is ON, a problem occurs and the airbag warning light blinks.



2) Turn on the ignition switch and connect the service connector airbag diagnostics terminal (mounted below the lower cover) to the ground terminal.

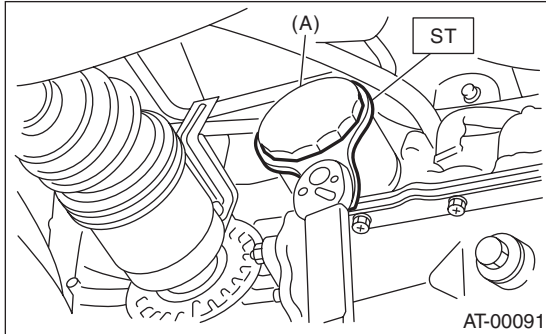
3) The warning light blinks and the DTC is displayed to identify the problem. When the airbag system is in good condition (when no trouble codes are stored in memory), the warning light blinks in 0.6 second intervals while the diagnostics terminal is connected to the ground terminal.

4) When the warning light displays the DTC, inspect the airbag system according to the diagnostic procedure. <Ref. to AB(diag)-2, Basic Diagnostic Procedure.>

28.ATF Filter

A: REMOVAL

- 1) Lift-up the vehicle.
 - 2) Using the ST, remove the ATF filter.
- ST 498545400 OIL FILTER WRENCH



(A) ATF filter

B: INSTALLATION

- 1) Apply a thin coat of ATF to the oil seal part of new ATF filter.
- 2) Install the ATF filter. Turn it by hand, being careful not to damage oil seal.
- 3) Tighten the ATF filter using ST.

Calculate the ATF filter tightening torque using following formula.

$$T2 = L2 / (L1 + L2) \times T1$$

T1: 14 N·m (1.4 kgf-m, 10.1 ft-lb)

[Required torque setting]

T2: Tightening torque

L1: ST length 78 mm (3.07 in)

L2: Torque wrench length

Example:

Torque wrench length mm (in)	Tightening torque N·m (kgf-m, ft-lb)
100 (3.94)	7.7 (0.79, 5.7)
150 (5.91)	9.0 (0.92, 6.7)
200 (7.87)	9.8 (1.0, 7.2)

NOTE:

Align the ST with the torque wrench while tightening the ATF filter.

ST 498545400 OIL FILTER WRENCH

- 4) Fill ATF.
- 5) Inspect the level of ATF. <Ref. to 4AT-28, Automatic Transmission Fluid.>

C: INSPECTION

- 1) Check for rust, holes, ATF leaks or other damage.
- 2) Replace the part if any damage is found in the inspection.

ATF Filter

PERIODIC MAINTENANCE SERVICES

General Description

FUEL INJECTION (FUEL SYSTEMS)

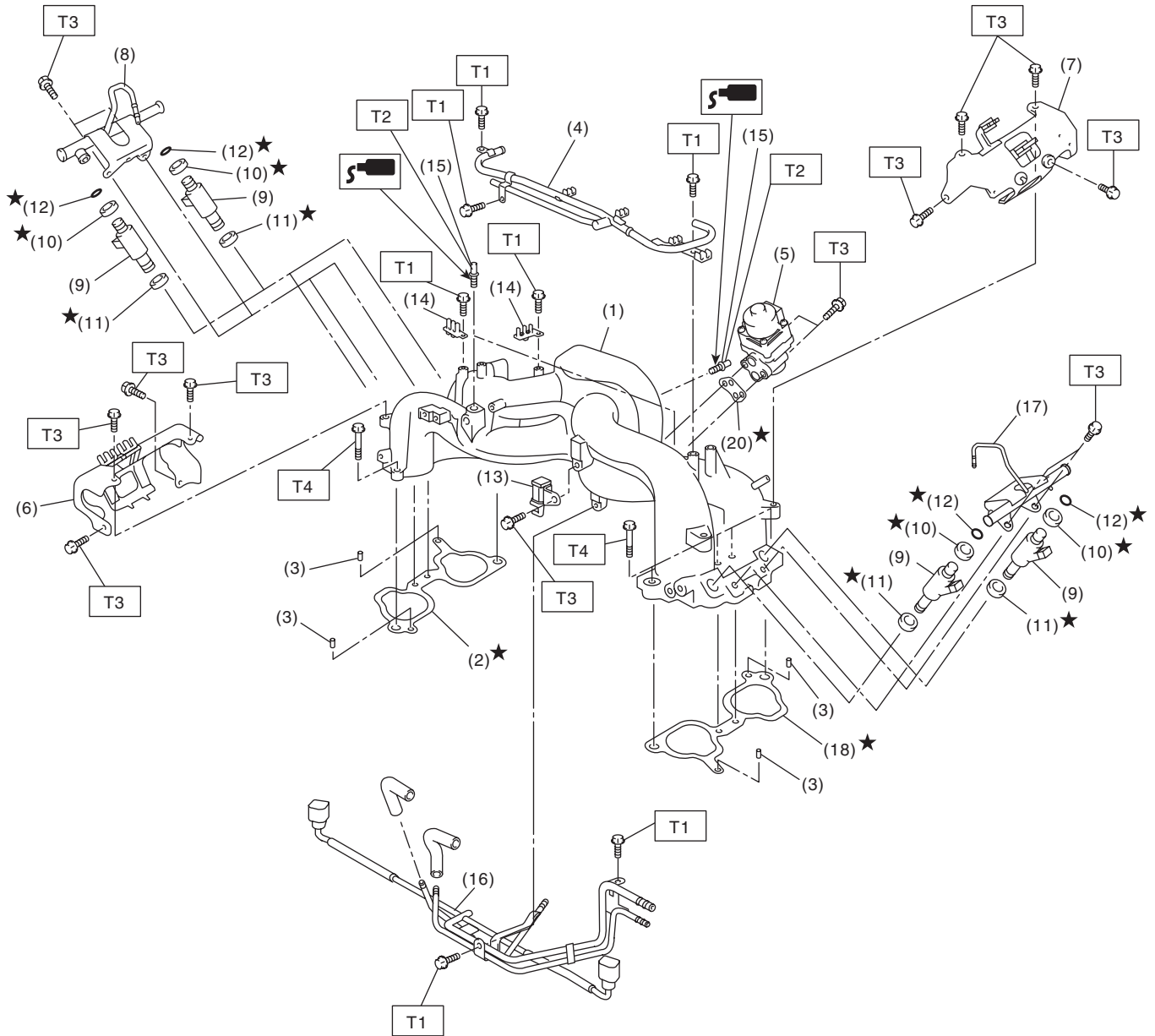
1. General Description

A: SPECIFICATION

Item		Specification
Fuel tank	Capacity	60 ℓ (15.9 US gal, 13.2 Imp gal)
	Locations	Under rear seat
Fuel pump	Type	Impeller
	Shutoff discharge pressure	370 — 677 kPa (3.77 — 6.9 kg/cm ² , 53.6 — 98 psi)
	Discharge rate	105 ℓ (27.7 US gal, 23.1 Imp gal)/h or more [300 kPa, 12 V (3.06 kg/cm ² , 43.5 psi)]
Fuel filter		Intank type

B: COMPONENT

1. INTAKE MANIFOLD



FU-02708

General Description

FUEL INJECTION (FUEL SYSTEMS)

- | | | |
|----------------------------|-----------------------------------|----------------------------|
| (1) Intake manifold | (9) Fuel injector | (17) Fuel injector pipe LH |
| (2) Gasket RH | (10) O-ring | (18) Gasket LH |
| (3) Guide pin | (11) O-ring | |
| (4) PCV pipe | (12) O-ring | |
| (5) EGR valve | (13) Purge control solenoid valve | |
| (6) Fuel pipe protector RH | (14) Plug cord holder | |
| (7) Fuel pipe protector LH | (15) Nipple | |
| (8) Fuel injector pipe RH | (16) Fuel pipe | |

Tightening torque:N·m (kgf·m, ft·lb)

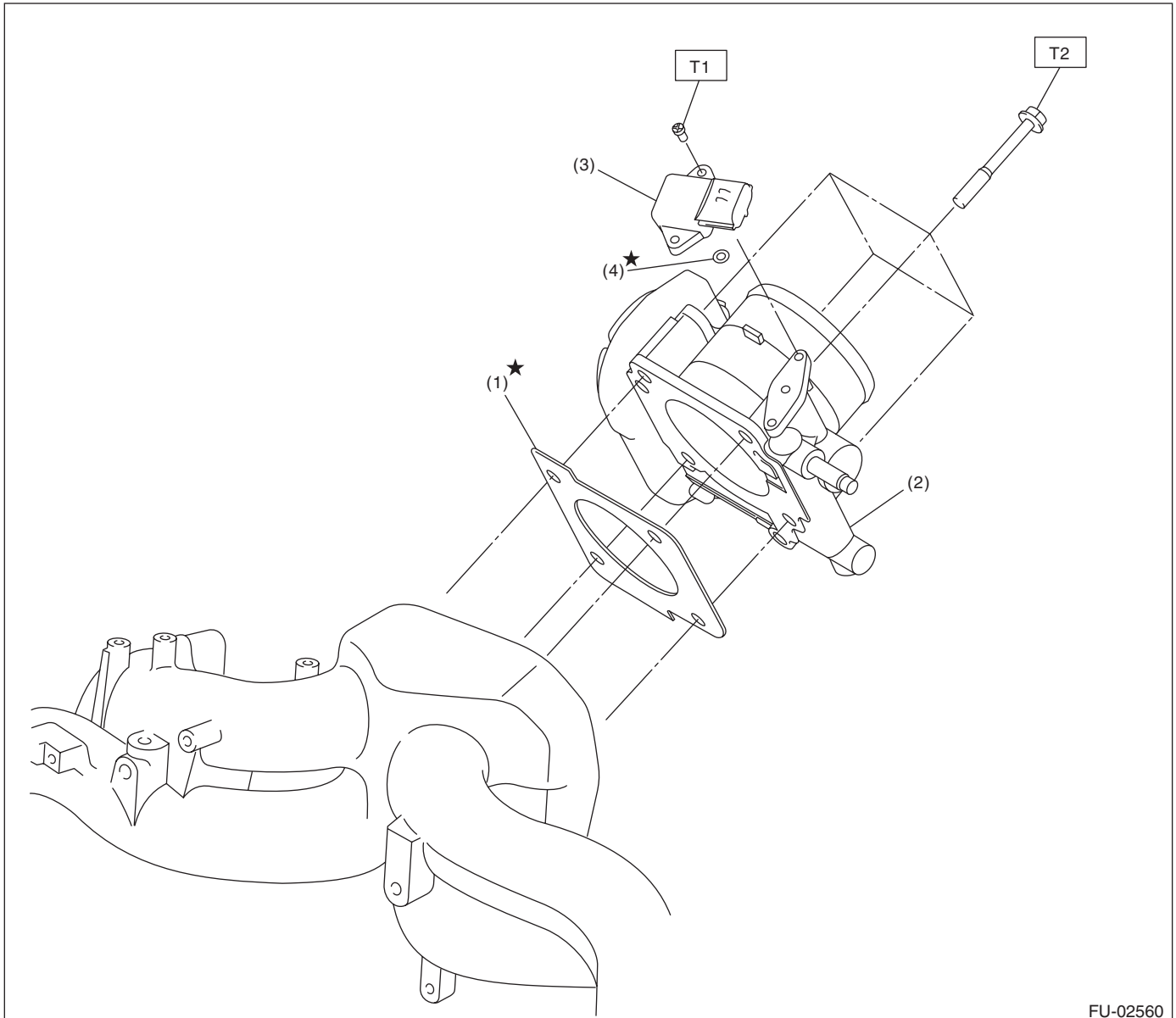
T1: 6.4 (0.65, 4.7)

T2: 17 (1.7, 12.5)

T3: 19 (1.9, 14.0)

T4: 25 (2.5, 18.1)

2. AIR INTAKE SYSTEM



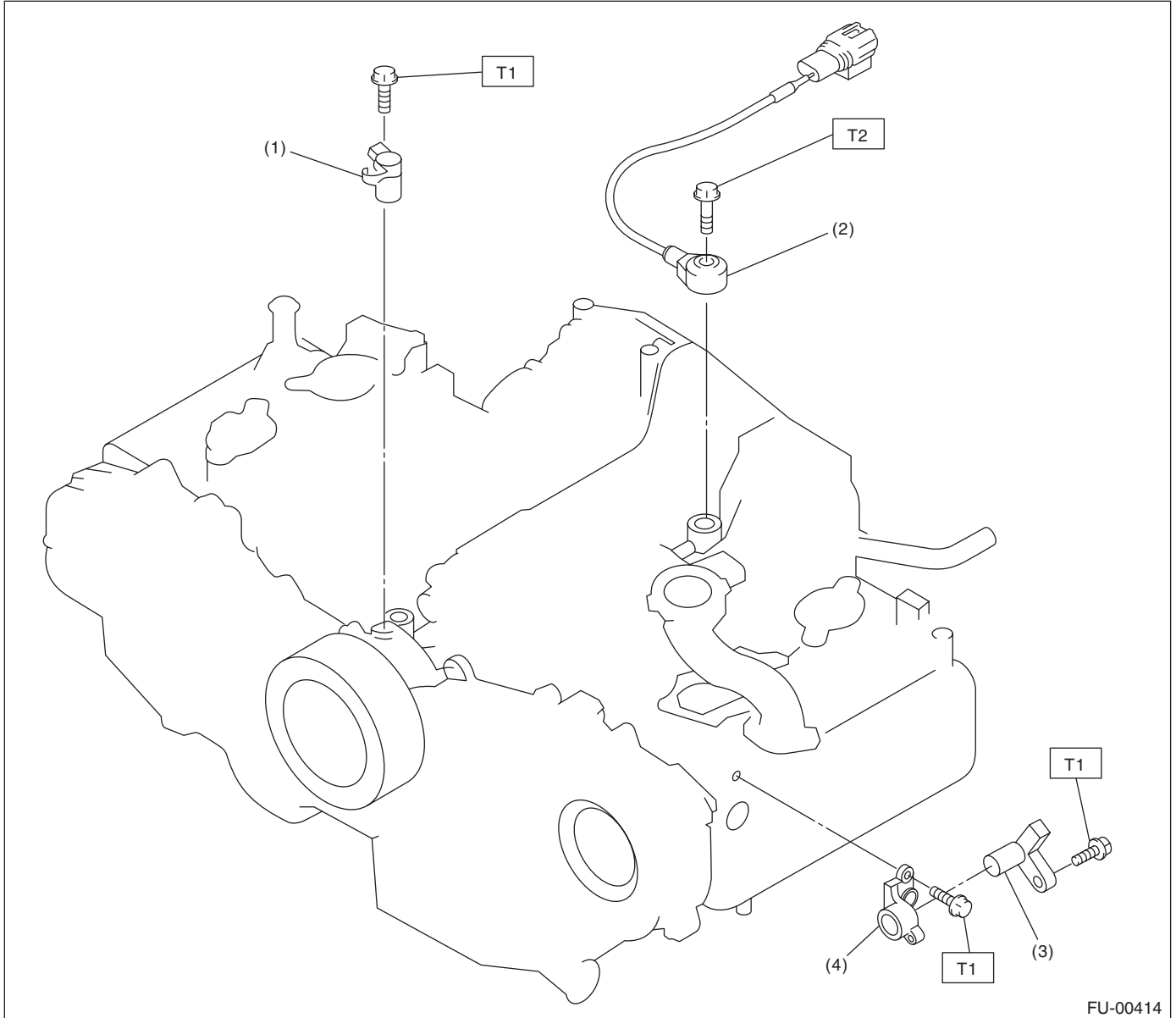
FU-02560

- | | | |
|-------------------|---------------------------------------|---|
| (1) Gasket | (3) Manifold absolute pressure sensor | Tightening torque:N·m (kgf·m, ft·lb) |
| (2) Throttle body | (4) O-ring | T1: 2.0 (0.20, 1.5) |
| | | T2: 8 (0.8, 5.8) |

General Description

FUEL INJECTION (FUEL SYSTEMS)

3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



FU-00414

(1) Crankshaft position sensor

(2) Knock sensor

(3) Camshaft position sensor

(4) Camshaft position sensor support

Tightening torque: N·m (kgf-m, ft-lb)

T1: 6.4 (0.65, 4.7)

T2: 24 (2.4, 17.4)

General Description

FUEL INJECTION (FUEL SYSTEMS)

(1) Heat shield cover	(18) Evaporation hose C	(34) Fuel tank pressure sensor hose
(2) Fuel tank band RH	(19) Evaporation pipe ASSY	(35) Vent valve gasket
(3) Protector LH	(20) Retainer	(36) Purge hose
(4) Protector RH	(21) Quick connector	(37) Clip
(5) Fuel tank	(22) Jet pump hose A	(38) Cover bracket
(6) Canister hose A	(23) Fuel level sensor	(39) Filler hose
(7) Clamp	(24) Fuel pipe ASSY	(40) Clip
(8) Fuel pump gasket	(25) Jet pump hose B	(41) Fuel tank band LH
(9) Fuel pump ASSY	(26) Evaporation hose D	(42) Evaporation hose E
(10) Fuel cut valve gasket	(27) Fuel sub level sensor gasket	(43) Evaporation hose F
(11) Fuel cut valve	(28) Jet pump filter	
(12) Evaporation hose A	(29) Fuel sub level sensor	
(13) Clip	(30) Protect cover	
(14) Joint pipe	(31) Evaporation hose D	
(15) Evaporation hose B	(32) Vent valve	
(16) Fuel delivery tube	(33) Fuel tank pressure sensor	
(17) Clamp		

Tightening torque:N·m (kgf·m, ft·lb)

T1: 4.4 (0.45, 3.3)

T2: 7.4 (0.75, 5.4)

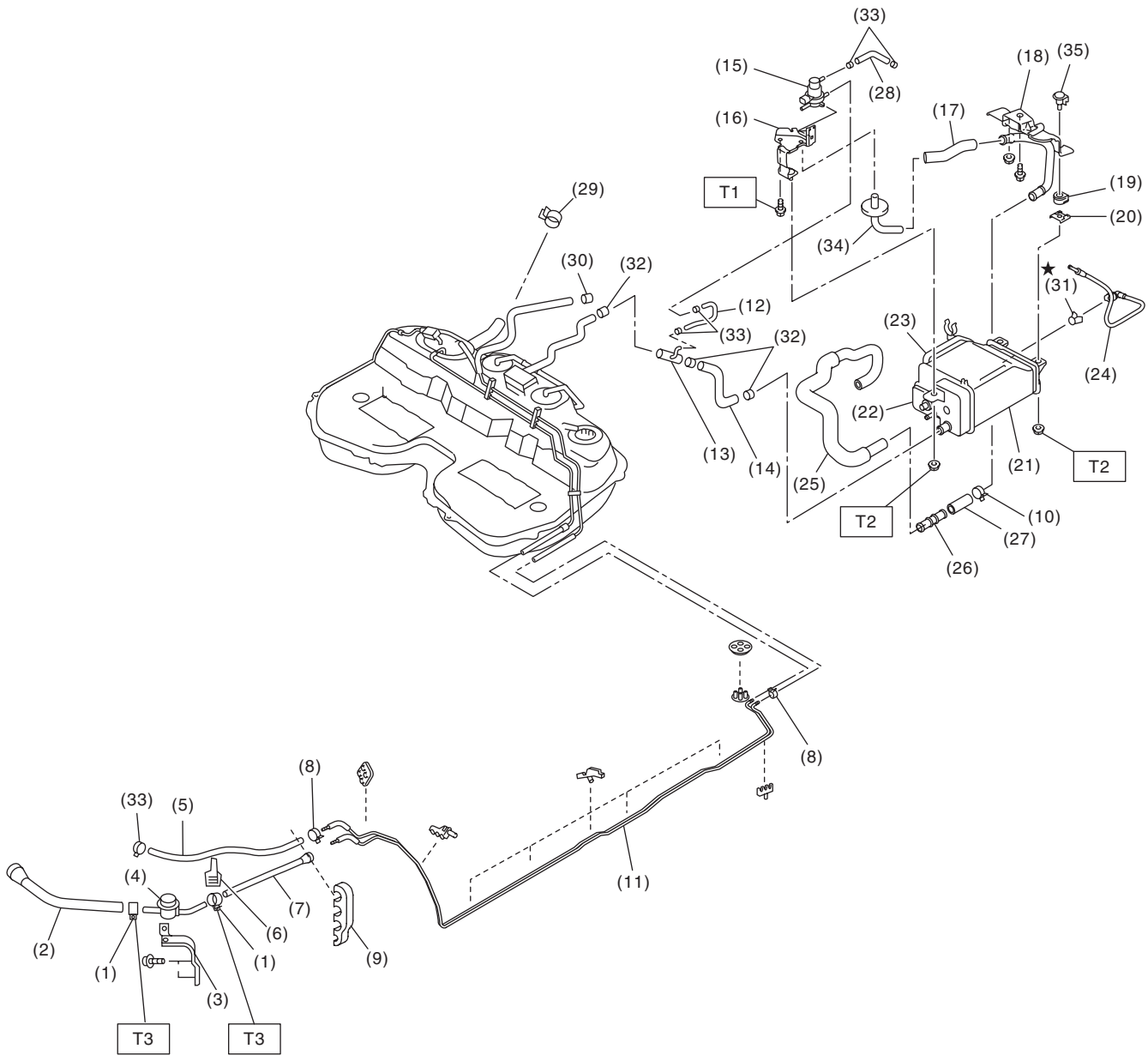
T3: 33 (3.4, 25)

T4: 1.96 (0.20, 1.45)

General Description

FUEL INJECTION (FUEL SYSTEMS)

5. FUEL LINE



FU-02988

FU(H4SO)-8

General Description

FUEL INJECTION (FUEL SYSTEMS)

(1) Clamp	(15) Pressure control solenoid valve	(28) Pressure control solenoid valve hose
(2) Fuel delivery hose A	(16) Pressure control solenoid valve bracket	(29) Clamp
(3) Fuel damper valve bracket	(17) Drain hose C	(30) Clamp
(4) Fuel damper valve	(18) Canister upper bracket	(31) Retainer
(5) Evaporation hose A	(19) Cushion rubber	(32) Clamp
(6) Clip	(20) Canister lower bracket	(33) Clamp
(7) Fuel delivery hose B	(21) Canister	(34) Drain pipe
(8) Clip	(22) Drain valve	(35) Canister bracket spacer
(9) Clip	(23) Drain filter	
(10) Clamp	(24) Pressure control solenoid valve tube	
(11) Fuel pipe ASSY	(25) Drain hose A	
(12) Evaporation hose B	(26) Drain connector	
(13) Joint pipe	(27) Drain hose B	
(14) Canister hose A		

Tightening torque:N·m (kgf-m, ft-lb)

T1: 25 (2.5, 18.1)

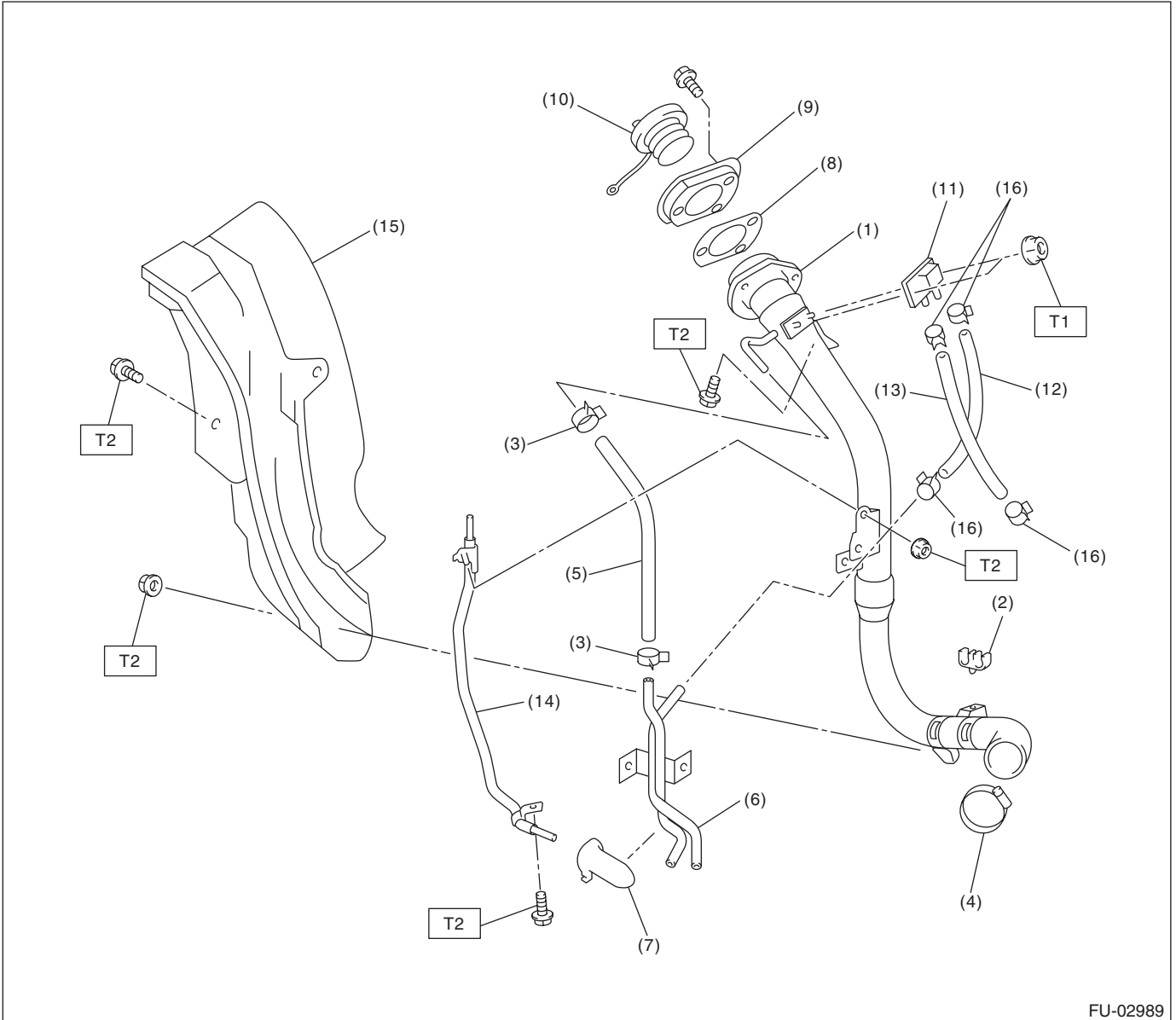
T2: 23 (2.3, 16.6)

T3: 1.25 (0.13, 0.94)

General Description

FUEL INJECTION (FUEL SYSTEMS)

6. FUEL FILLER PIPE



FU-02989

- | | | |
|-----------------------------|-------------------------|---------------------------------|
| (1) Fuel filler pipe ASSY | (8) Filler pipe packing | (15) Fuel filler pipe protector |
| (2) Evaporation hose holder | (9) Filler ring | (16) Clamp |
| (3) Clamp | (10) Filler cap | |
| (4) Clamp | (11) Shut valve | |
| (5) Evaporation hose A | (12) Evaporation hose B | |
| (6) Evaporation pipe | (13) Evaporation hose C | |
| (7) Evaporation pipe holder | (14) Joint pipe | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 4.4 (0.45, 3.3)

T2: 7.5 (0.76, 5.5)

General Description

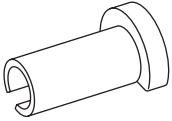
FUEL INJECTION (FUEL SYSTEMS)

C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.

- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from the battery.
- Place "NO FIRE" signs near the working area.
- Prepare a container and cloth to prevent scattering of fuels when performing work where fuels can be spilled. If the fuel spills, wipe it off immediately to prevent from penetrating into floor or flowing out for environmental protection.
- Follow all government and local regulations concerning disposal of refuse when disposing fuel.

D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST42099AE000	42099AE000	CONNECTOR REMOVER	Used for removing the quick connector.

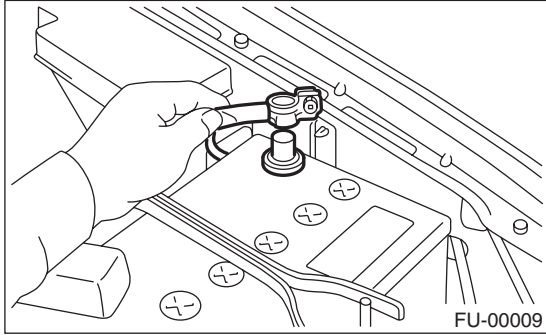
Throttle Body

FUEL INJECTION (FUEL SYSTEMS)

2. Throttle Body

A: REMOVAL

1) Disconnect the ground cable from the battery.

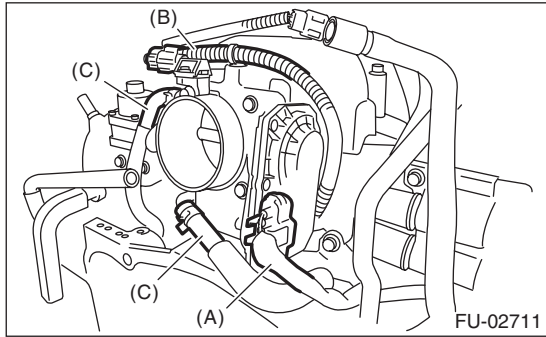


2) Remove the air intake chamber. <Ref. to IN (H4SO)-6, REMOVAL, Air Intake Chamber.>

3) Disconnect the connectors from throttle position sensor and manifold absolute pressure sensor.

4) Disconnect the engine coolant hoses from throttle body.

5) Remove the bolts which install throttle body to the intake manifold.



- (A) Throttle position sensor
- (B) Manifold absolute pressure sensor
- (C) Engine coolant hose

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Use a new gasket.

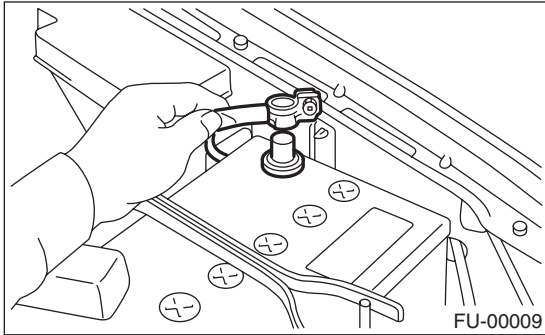
Tightening torque:

8 N·m (0.8 kgf·m, 5.8 ft·lb)

3. Intake Manifold

A: REMOVAL

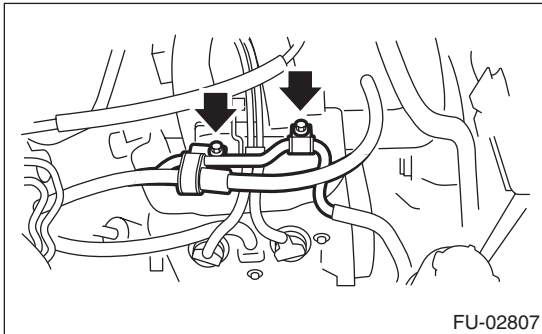
- 1) Release the fuel pressure.
<Ref. to FU(H4SO)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Disconnect the ground cable from the battery.



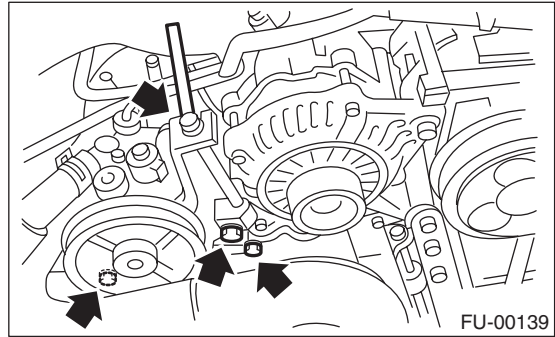
- 3) Open the fuel filler flap lid, and remove the fuel filler cap.
- 4) Remove the air intake duct, air cleaner case and air intake chamber. <Ref. to IN (H4SO)-7, REMOVAL, Air Intake Duct.> <Ref. to IN (H4SO)-5, REMOVAL, Air Cleaner Case.> <Ref. to IN (H4SO)-6, REMOVAL, Air Intake Chamber.>
- 5) Remove the generator. <Ref. to SC (H4SO)-14, REMOVAL, Generator.>
- 6) Remove the power steering pump and power steering reservoir tank.
 - (1) Remove the bolts which hold the power steering pipes onto the fuel pipe protector RH.

NOTE:

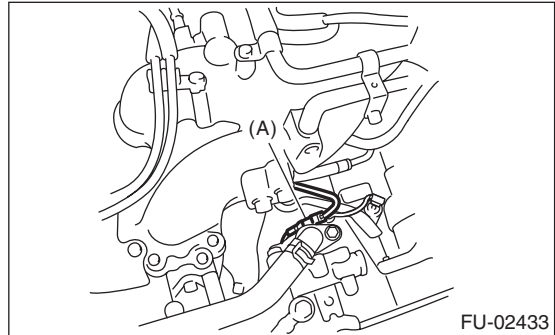
Do not disconnect the power steering hose.



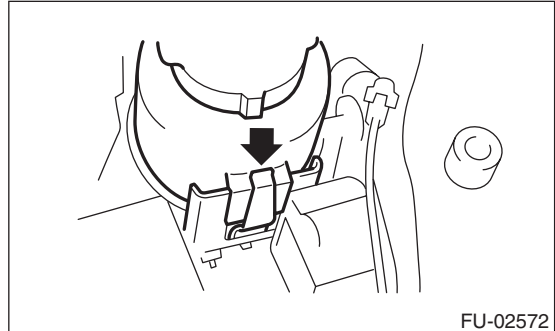
- (2) Remove the installation bolt installing the power steering pump bracket.



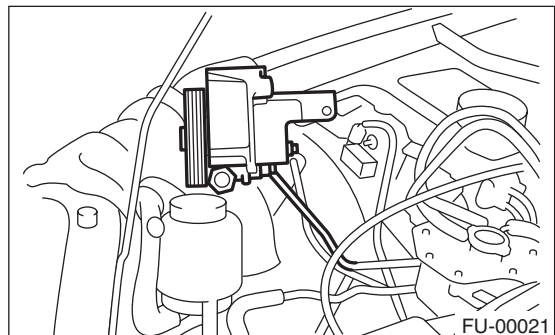
- (3) Disconnect the connector (A) from power steering pump switch.



- (4) Remove the power steering reservoir tank from the bracket by pulling it upward.



- (5) Place the power steering pump on the right side wheel apron.

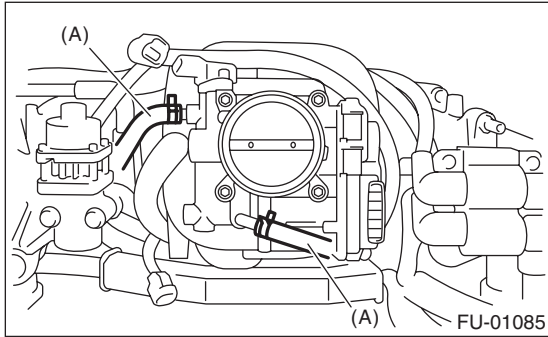


- 7) Remove the spark plug cords from the spark plugs by pulling the plug caps. (Do not pull the cord.)

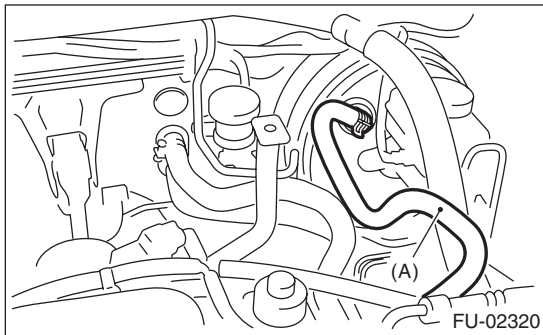
Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

8) Disconnect the engine coolant hoses (A) from throttle body.

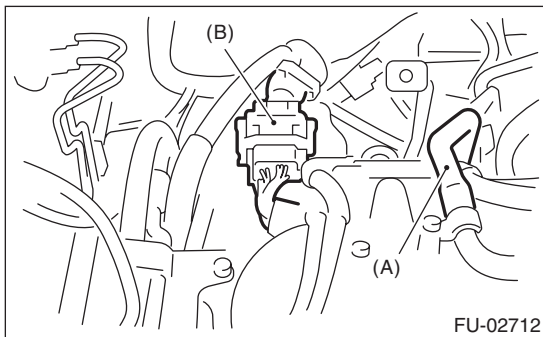


9) Disconnect the brake booster hose (A).

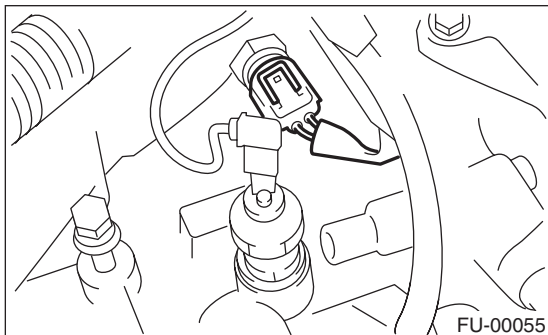


10) Disconnect the PCV hose (A) from intake manifold.

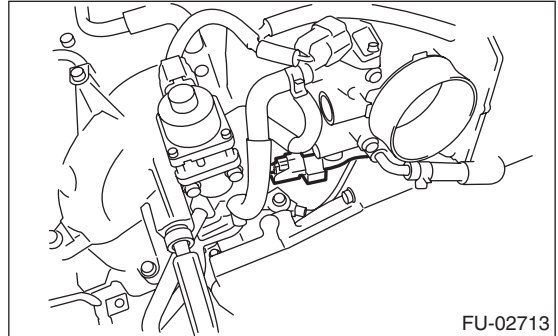
11) Disconnect the engine harness connectors (B) from bulkhead harness connectors.



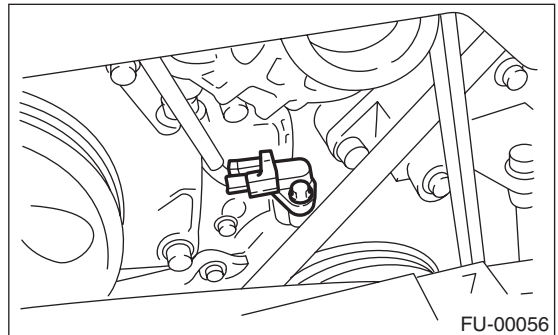
12) Disconnect the connectors from the engine coolant temperature sensor.



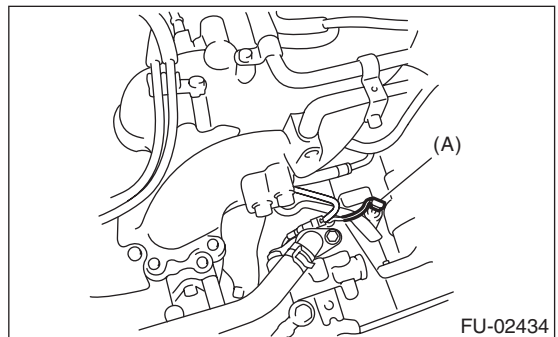
13) Disconnect the knock sensor connector.



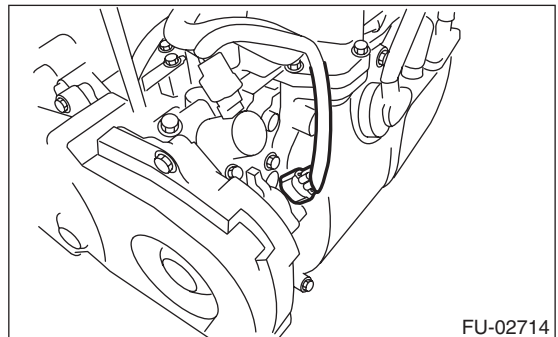
14) Disconnect the connector from crankshaft position sensor.



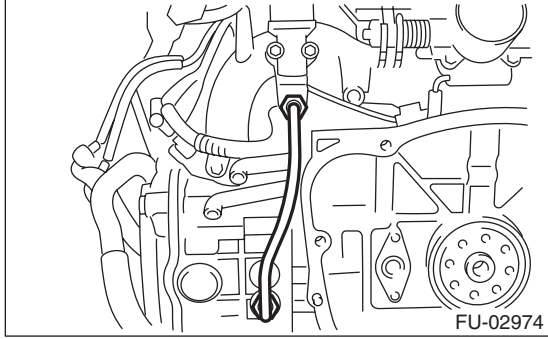
15) Disconnect the connector from the oil pressure switch (A).



16) Disconnect the connector from camshaft position sensor.



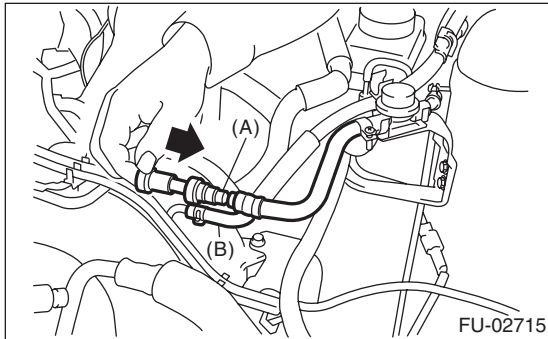
17) Remove the EGR pipe from intake manifold.



18) Disconnect the fuel hoses from fuel pipe.
 (1) Disconnect the quick connector on the fuel delivery line by pushing the ST in the direction of the arrow.
 ST 42099AE000 CONNECTOR REMOVER
 (2) Remove the clip and disconnect the evaporation hose from the pipe.

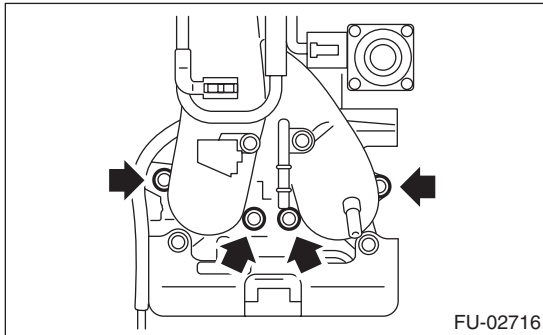
CAUTION:

- Be careful not to spill fuel.
- Catch the fuel from hoses using a container or cloth.



- (A) Fuel delivery hose
- (B) Evaporation hose

19) Remove the bolts which secure intake manifold to cylinder head.



20) Remove the intake manifold.

B: INSTALLATION

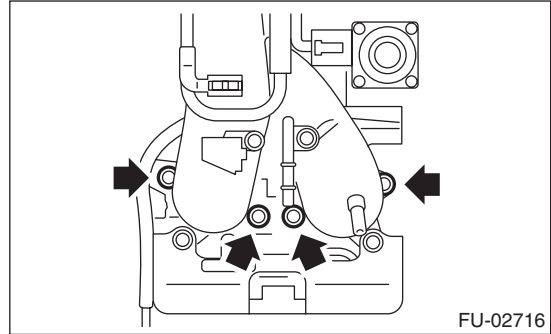
1) Install the intake manifold onto cylinder heads.

NOTE:

Use a new gasket.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)



2) Connect the fuel hose and evaporation hose to the fuel pipe.

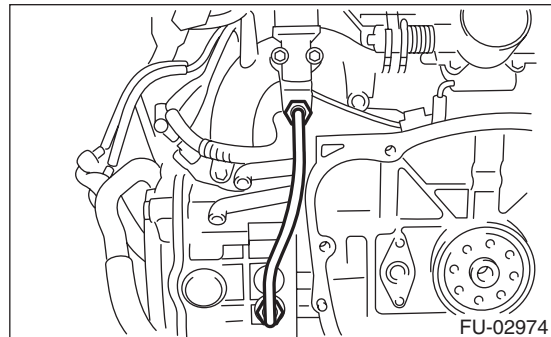
NOTE:

If fuel hoses are damaged, replace them with new parts.

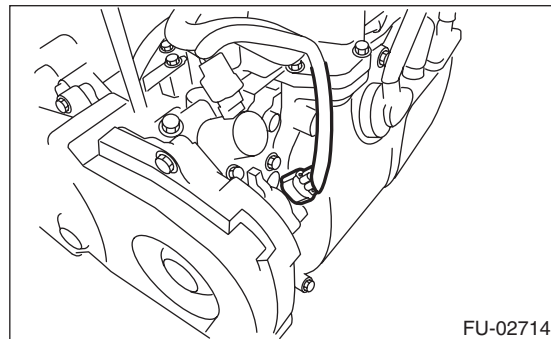
3) Install the EGR pipe to intake manifold.

Tightening torque:

34 N·m (3.4 kgf-m, 24.6 ft-lb)



4) Connect the connectors to camshaft position sensor.

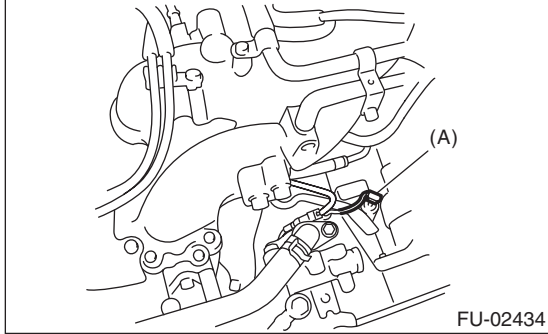


5) Connect the connector to the power steering pump switch.

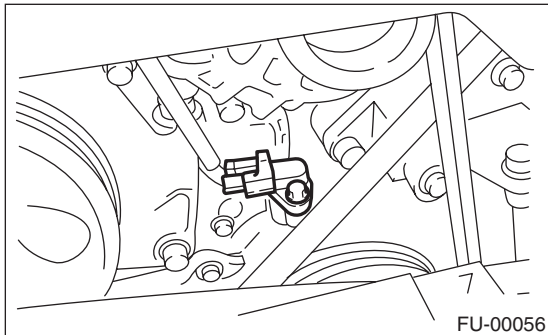
Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

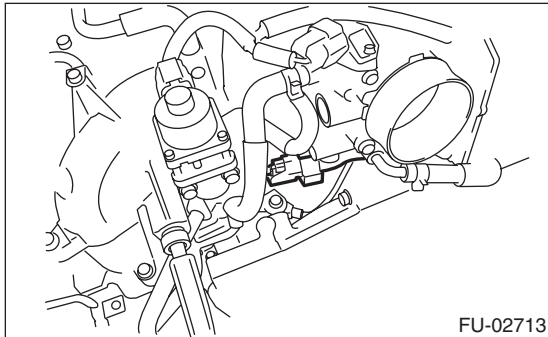
6) Connect the connector to oil pressure switch (A).



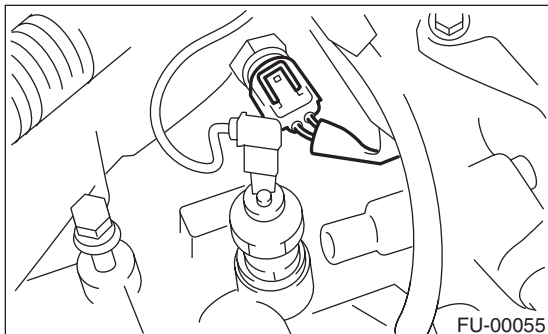
7) Connect the connector to crankshaft position sensor.



8) Connect the knock sensor connector.

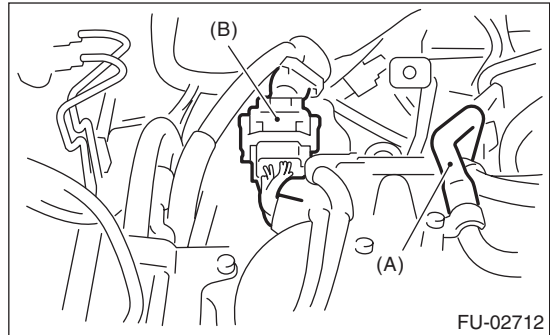


9) Connect the connector to engine coolant temperature sensor.

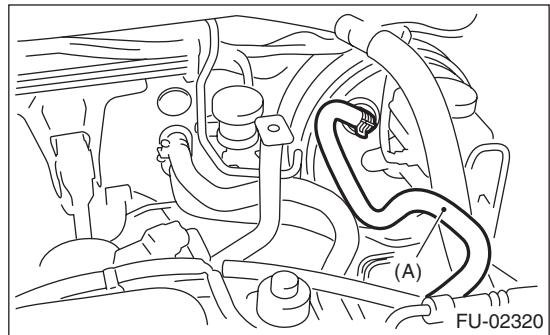


10) Connect the PCV hose (A) to intake manifold.

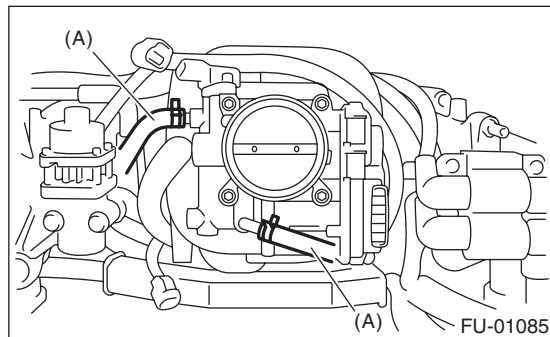
11) Connect the engine harness connectors (B) to bulkhead harness connectors.



12) Connect the brake booster hose (A).



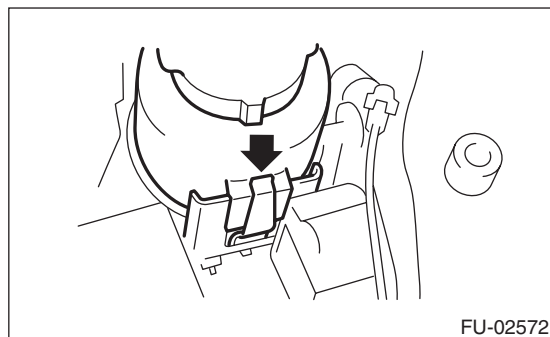
13) Connect the engine coolant hoses (A) to throttle body.



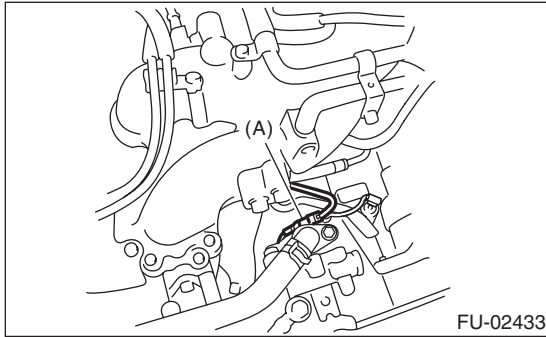
14) Connect the spark plug cords to spark plugs.

15) Install the power steering pump and power steering reservoir tank.

(1) Install the power steering reservoir tank to the bracket.



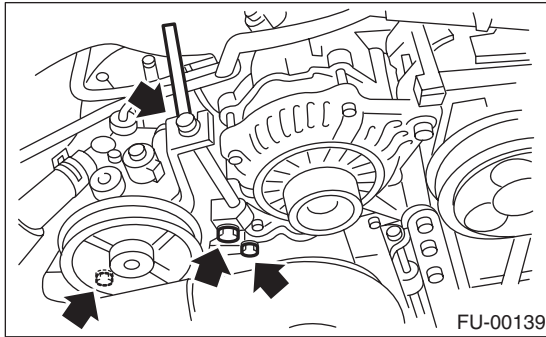
(2) Connect the power steering pump switch to the connector (A).



(3) Install the installation bolt of the power steering pump bracket.

Tightening torque:

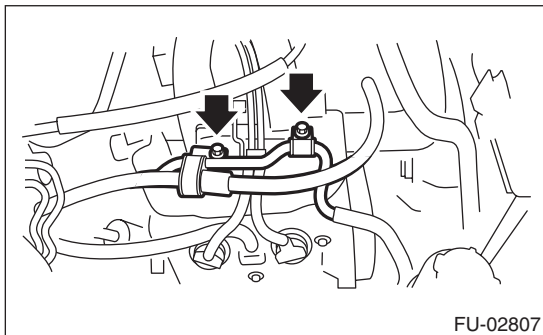
22 N·m (2.2 kgf-m, 15.9 ft-lb)



(4) Install the power steering pipes onto the fuel pipe protector RH.

Tightening torque:

13 N·m (1.3 kgf-m, 9.4 ft-lb)

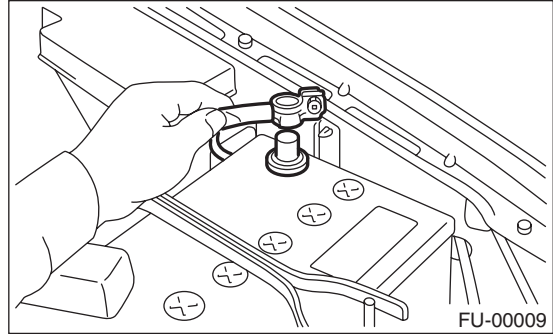


16) Install the generator. <Ref. to SC (H4SO)-14, INSTALLATION, Generator.>

17) Install the air intake duct, air cleaner case and air intake chamber. <Ref. to IN (H4SO)-7, INSTALLATION, Air Intake Duct.> <Ref. to IN (H4SO)-5, INSTALLATION, Air Cleaner Case.> <Ref. to IN (H4SO)-6, INSTALLATION, Air Intake Chamber.>

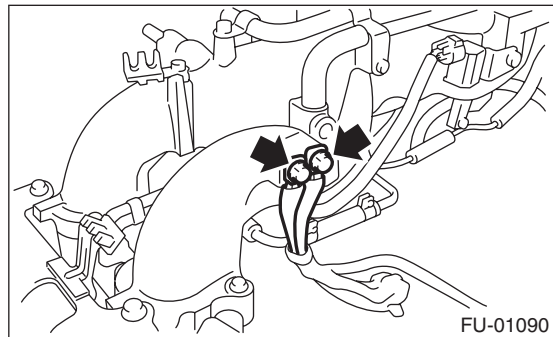
18) Connect the connector to fuel pump relay.

19) Connect the ground cable to the battery.



C: DISASSEMBLY

1) Disconnect the engine ground terminal from intake manifold.

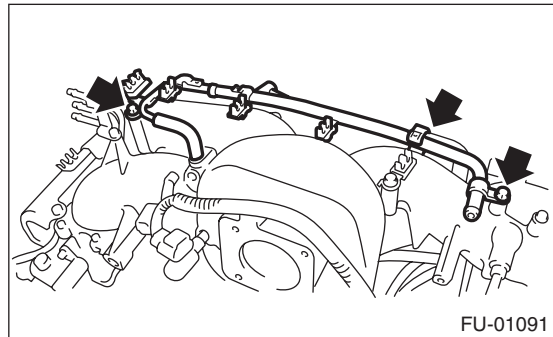


2) Remove the ignition coil and ignitor assembly. <Ref. to IG(H4SO)-6, REMOVAL, Ignition Coil and Ignitor Assembly.>

3) Remove the throttle body. <Ref. to FU(H4SO)-12, REMOVAL, Throttle Body.>

4) Remove the EGR valve. <Ref. to FU(H4SO)-29, REMOVAL, EGR Valve.>

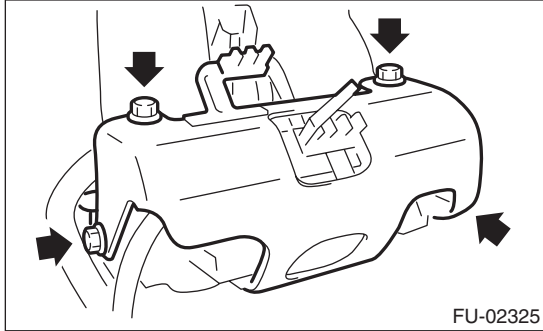
5) Remove the PCV pipe.



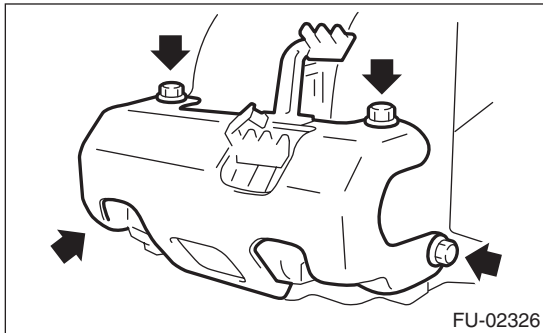
Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

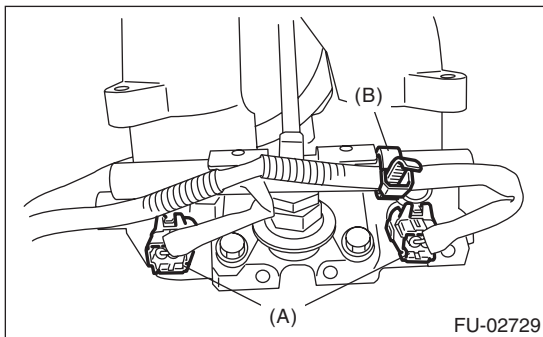
6) Remove the fuel pipe protector LH.



7) Remove the fuel pipe protector RH.

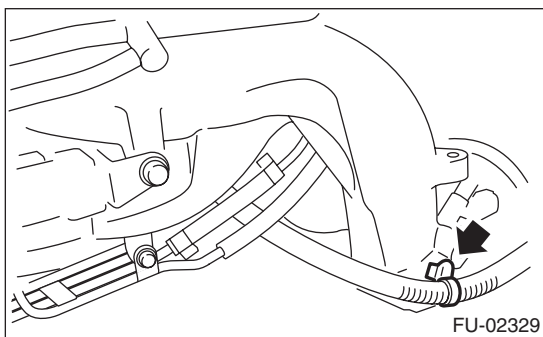


8) Disconnect the connectors (A) from fuel injector.
9) Remove the harness band (B) which holds the engine harness to injector pipe.

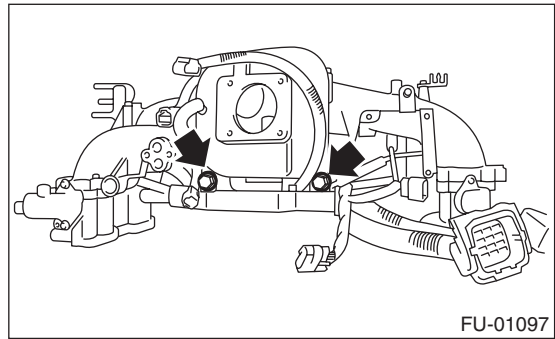


10) Remove the purge control solenoid valve.
<Ref. to EC(H4SO)-7, REMOVAL, Purge Control Solenoid Valve.>

11) Remove the harness band clips which install the engine harness.



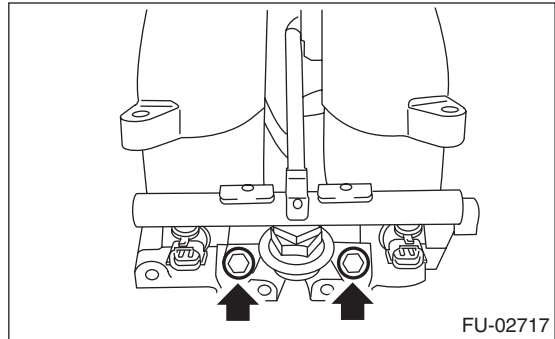
12) Remove the bolts which hold engine harness to intake manifold.



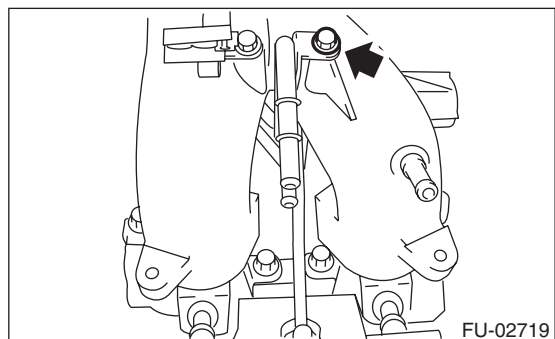
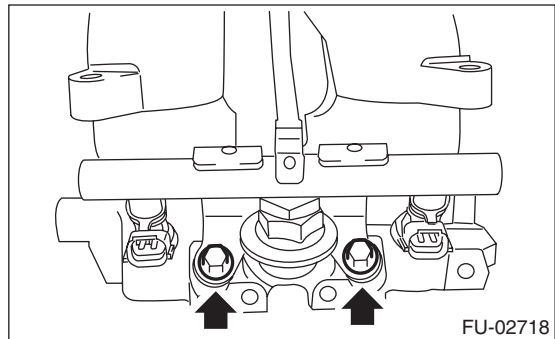
13) Remove the engine harness from intake manifold.

14) Remove the bolts which install injector pipe on the intake manifold as shown in the figure.

• RH side



• LH side

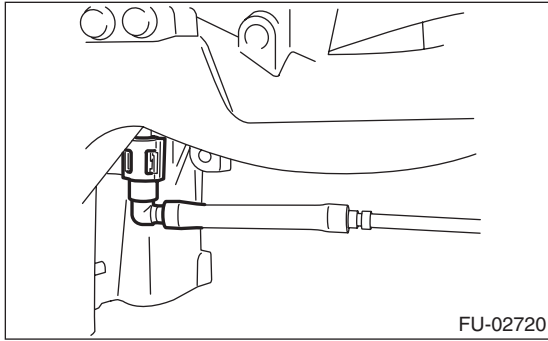


15) Remove the fuel injectors from injector pipe.

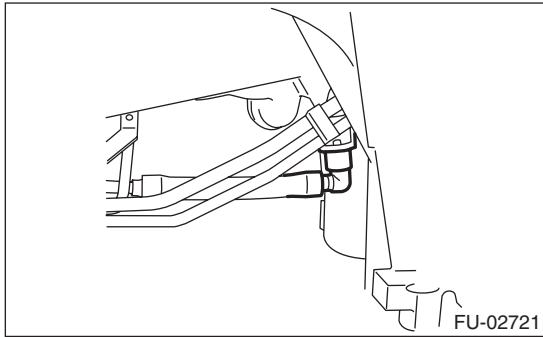
Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

16) Disconnect the quick connector that fastens the fuel injector pipe RH to the fuel pipe.

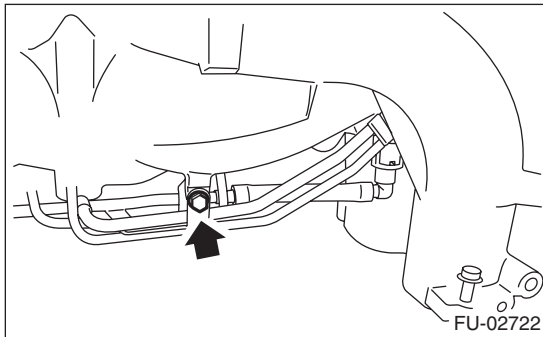


17) Disconnect the quick connector that fastens the fuel injector pipe LH to the fuel pipe.



18) Remove the fuel injector pipe RH and LH.

19) Remove the bolts which install fuel pipes on intake manifold.



20) Remove the fuel pipe from intake manifold.

D: ASSEMBLY

NOTE:

When assembling the nipple, apply liquid gasket.

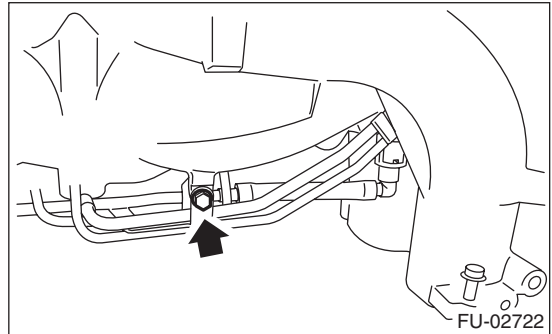
Liquid gasket:

THREE BOND 1105 (Part No. 004403010)

1) Tighten the bolts which install fuel pipes on intake manifold.

Tightening torque:

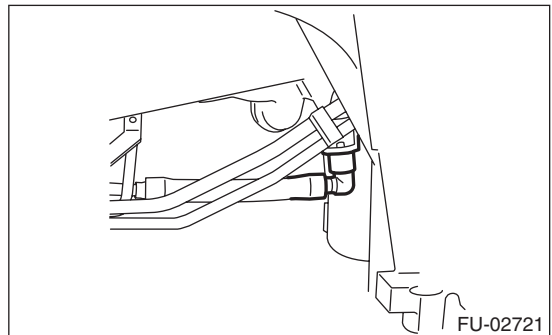
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



2) Connect the fuel injector pipe LH to the fuel pipe.

NOTE:

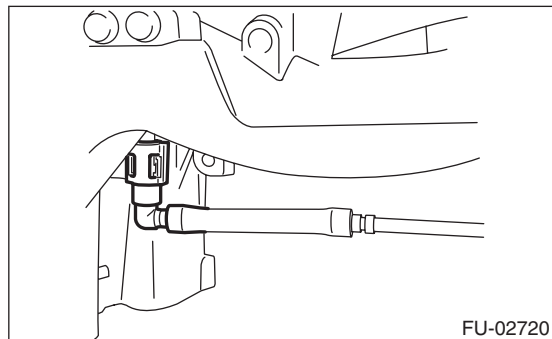
Connect the quick connector securely.



3) Connect the fuel injector pipe RH to the fuel pipe.

NOTE:

Connect the quick connector securely.



4) Install the fuel injector.

Intake Manifold

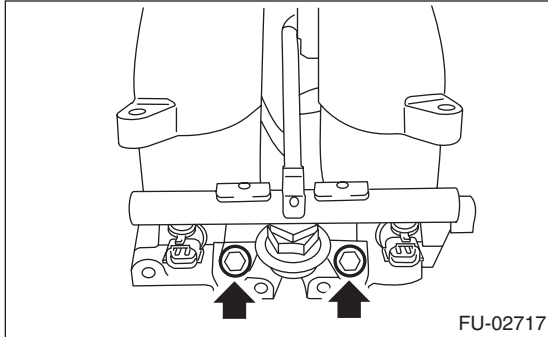
FUEL INJECTION (FUEL SYSTEMS)

5) Tighten the bolts which install injector pipe on intake manifold.

- RH side

Tightening torque:

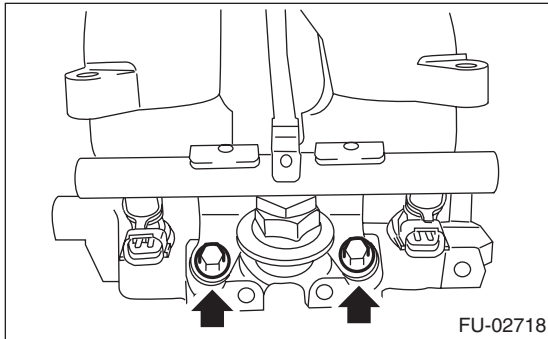
19 N·m (1.9 kgf-m, 14.0 ft-lb)



- LH side

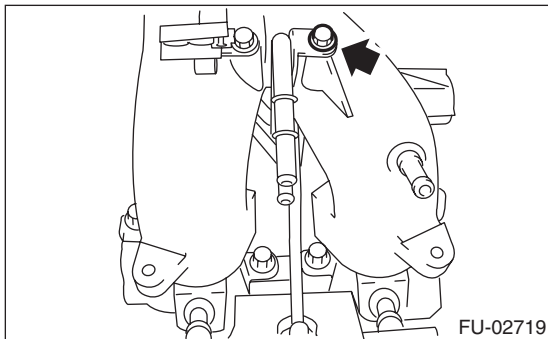
Tightening torque:

19 N·m (1.9 kgf-m, 14.0 ft-lb)



Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

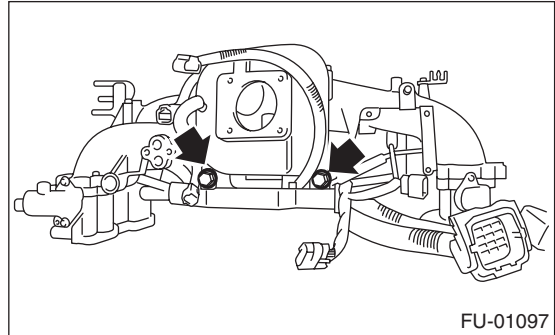


6) Install the engine harness onto intake manifold.

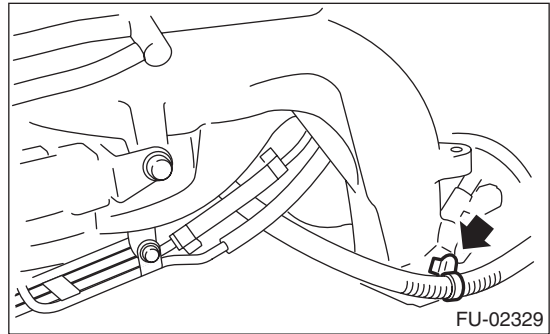
7) Tighten the bolts which install engine harness on intake manifold.

Tightening torque:

19 N·m (1.9 kgf-m, 14.0 ft-lb)



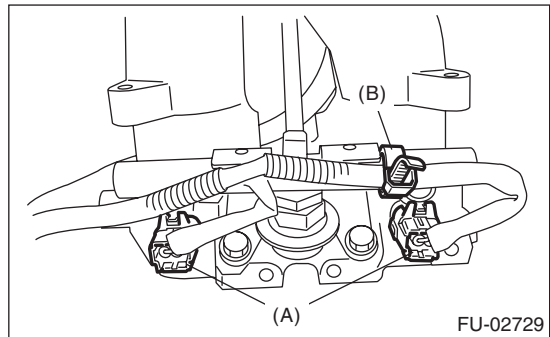
8) Hold the engine harness using the harness band clips.



9) Install the purge control solenoid valve. <Ref. to EC(H4SO)-7, INSTALLATION, Purge Control Solenoid Valve.>

10) Connect the connectors (A) to fuel injector.

11) Hold the engine harness to injector pipe by harness band (B).



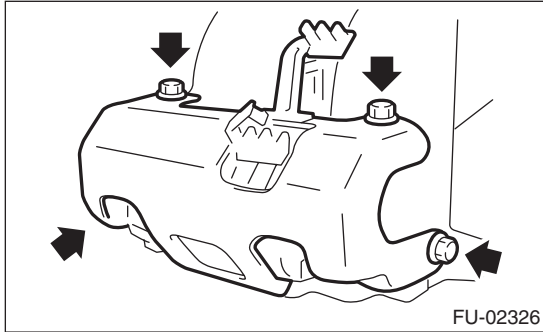
Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

12) Install the fuel pipe protector RH.

Tightening torque:

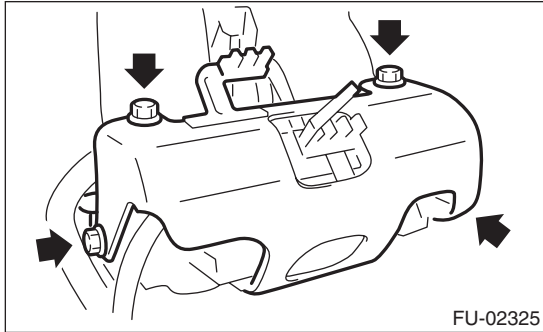
19 N·m (1.9 kgf-m, 14.0 ft-lb)



13) Install the fuel pipe protector LH.

Tightening torque:

19 N·m (1.9 kgf-m, 14.0 ft-lb)

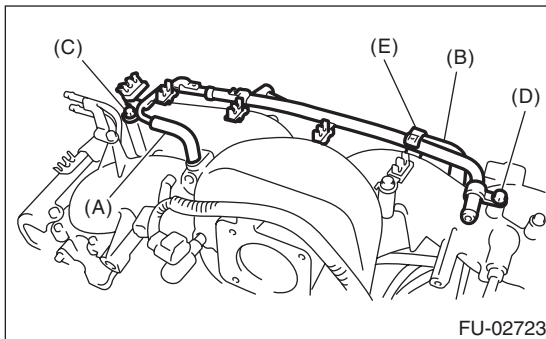


14) Install the PCV pipe.

- (1) Connect the hose (A) and (B) to intake manifold.
- (2) Tighten the bolts (C) through (E) in alphabetical sequence.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



15) Install the EGR valve. <Ref. to FU(H4SO)-29, INSTALLATION, EGR Valve.>

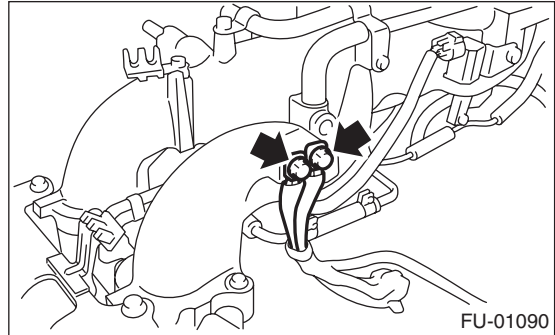
16) Install the throttle body to the intake manifold. <Ref. to FU(H4SO)-12, INSTALLATION, Throttle Body.>

17) Install the ignition coil and ignitor assembly. <Ref. to IG(H4SO)-6, INSTALLATION, Ignition Coil and Ignitor Assembly.>

18) Install the engine ground terminal to intake manifold.

Tightening torque:

19 N·m (1.9 kgf-m, 14.0 ft-lb)



E: INSPECTION

Make sure the fuel pipe and fuel hoses are not damaged and the connections are tightened firmly.

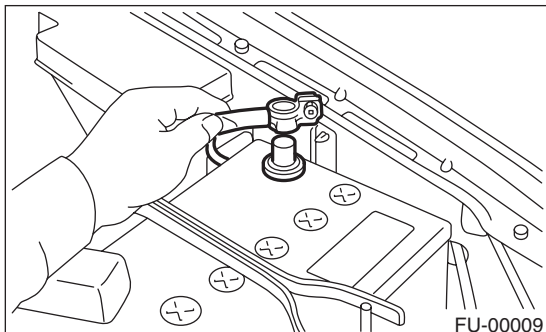
Engine Coolant Temperature Sensor

FUEL INJECTION (FUEL SYSTEMS)

4. Engine Coolant Temperature Sensor

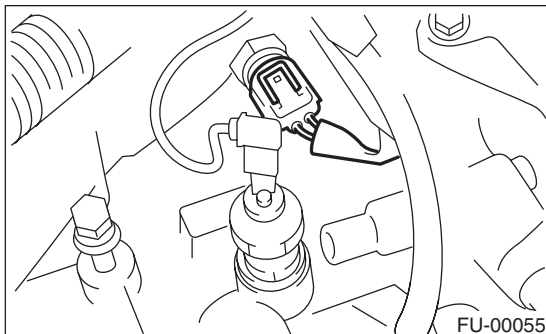
A: REMOVAL

1) Disconnect the ground cable from the battery.



2) Remove the generator. <Ref. to SC (H4SO)-14, REMOVAL, Generator.>

3) Disconnect the connectors from the engine coolant temperature sensor.



4) Remove the engine coolant temperature sensor.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Use a new gasket.

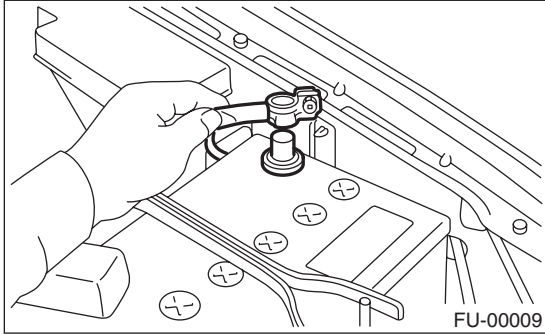
Tightening torque:

18 N·m (1.8 kgf·m, 13.0 ft·lb)

5. Crankshaft Position Sensor

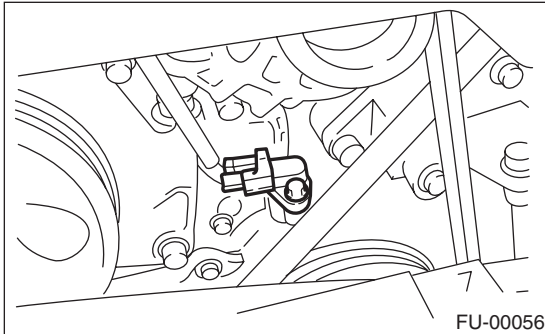
A: REMOVAL

- 1) Disconnect the ground cable from the battery.

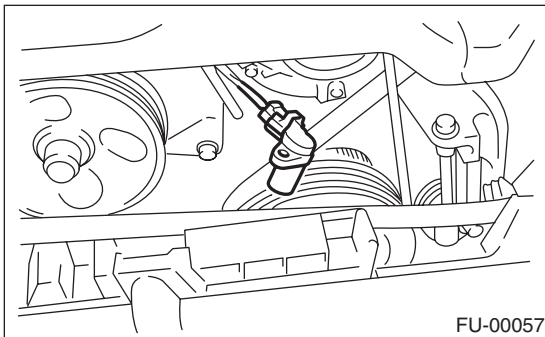


- 2) Remove the generator. <Ref. to SC (H4SO)-14, REMOVAL, Generator.>

- 3) Remove the bolt which installs crankshaft position sensor to cylinder block.



- 4) Remove the crankshaft position sensor, and then disconnect the connector from it.

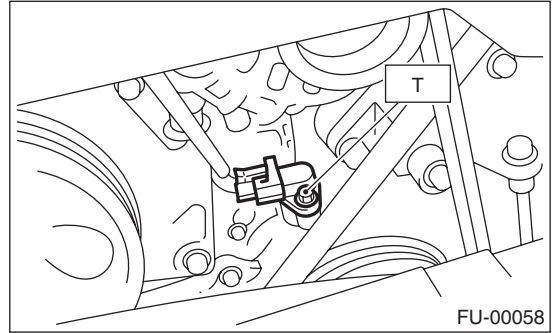


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



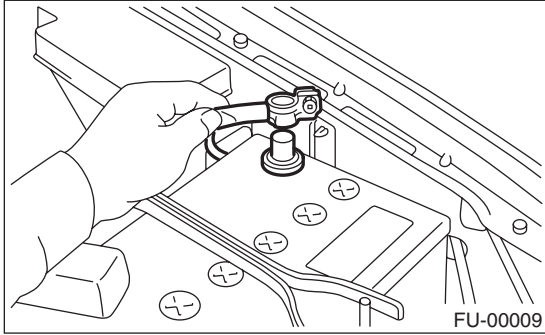
Camshaft Position Sensor

FUEL INJECTION (FUEL SYSTEMS)

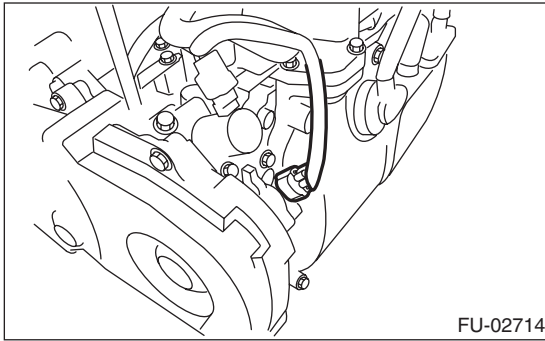
6. Camshaft Position Sensor

A: REMOVAL

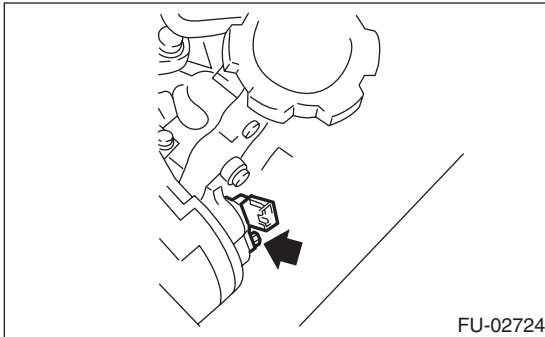
1) Disconnect the ground cable from the battery.



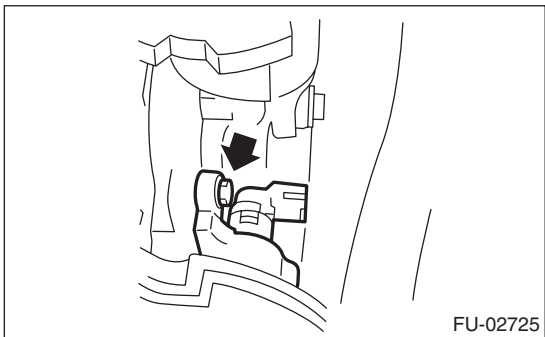
2) Disconnect the connector from camshaft position sensor.



3) Remove the bolt which installs camshaft position sensor to support.

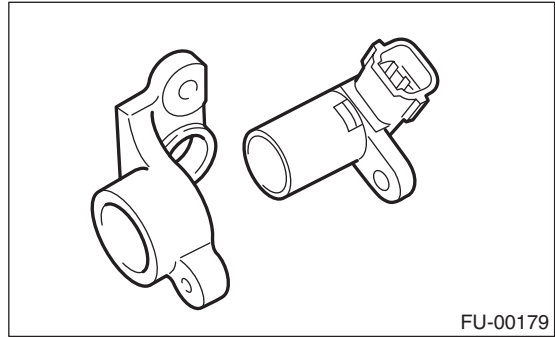


4) Remove the bolt which installs camshaft position sensor support to camshaft cap LH.



5) Remove the camshaft position sensor and the support as a unit.

6) Remove the camshaft position sensor from the support.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

Camshaft position sensor support

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

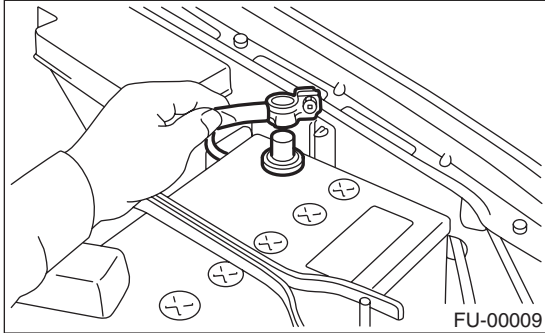
Camshaft position sensor

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

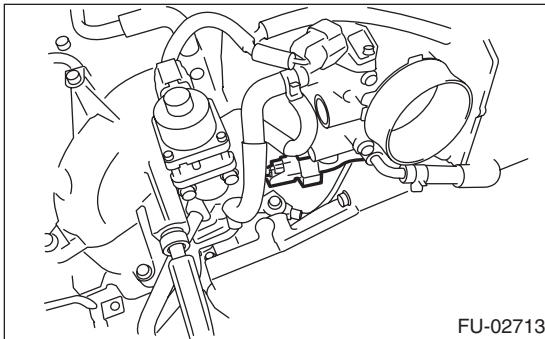
7. Knock Sensor

A: REMOVAL

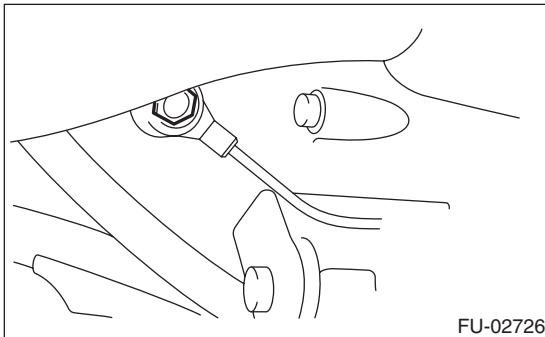
- 1) Disconnect the ground cable from the battery.



- 2) Remove the air intake chamber. <Ref. to IN (H4SO)-6, REMOVAL, Air Intake Chamber.>
- 3) Disconnect the knock sensor connector.



- 4) Remove the knock sensor from cylinder block.



B: INSTALLATION

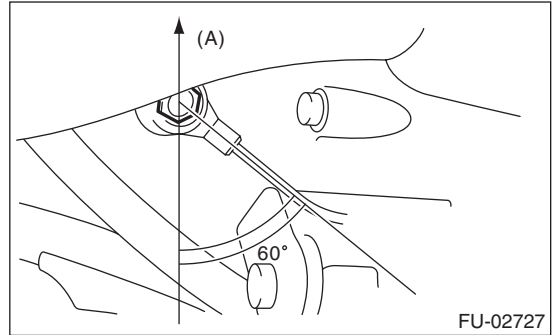
- 1) Install the knock sensor to cylinder block.

NOTE:

Extraction area of knock sensor cord must be positioned at a 60° angle relative to the engine rear.

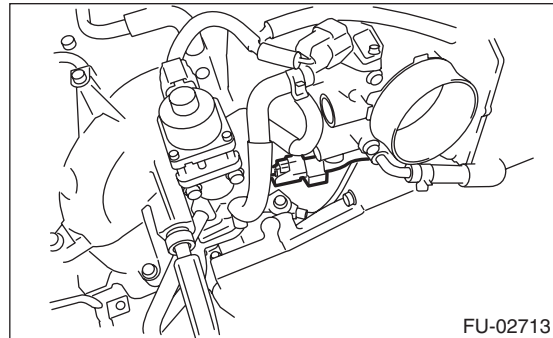
Tightening torque:

24 N·m (2.4 kgf-m, 17.4 ft-lb)

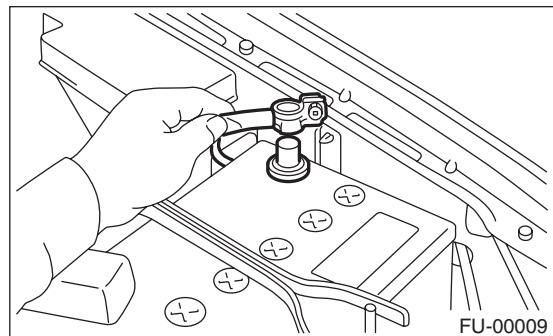


(A) Front side

- 2) Connect the knock sensor connector.



- 3) Install the air intake chamber. <Ref. to IN (H4SO)-6, INSTALLATION, Air Intake Chamber.>
- 4) Connect the ground cable to the battery.



Throttle Position Sensor

FUEL INJECTION (FUEL SYSTEMS)

8. Throttle Position Sensor

A: SPECIFICATION

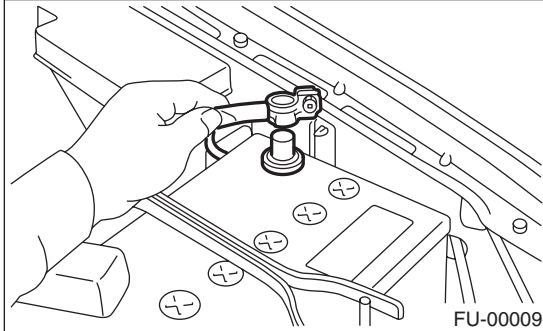
Throttle body is a non-disassembled part, so do not remove the throttle position sensor from throttle body.

Refer to “Throttle Body” for removal and installation procedures. <Ref. to FU(H4SO)-12, REMOVAL, Throttle Body.> <Ref. to FU(H4SO)-12, INSTALLATION, Throttle Body.>

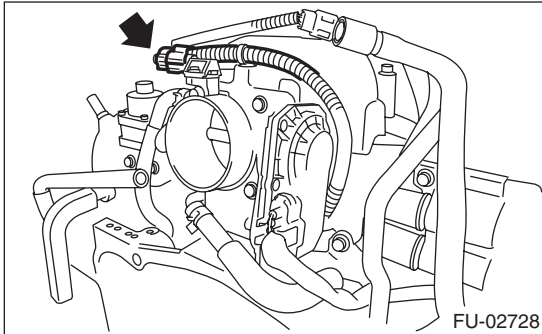
9. Manifold Absolute Pressure Sensor

A: REMOVAL

- 1) Disconnect the ground cable from the battery.



- 2) Disconnect the connector from manifold absolute pressure sensor.



- 3) Remove the manifold absolute pressure sensor from throttle body.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Use new O-rings.

Tightening torque:

2.0 N·m (0.20 kgf-m, 1.5 ft-lb)

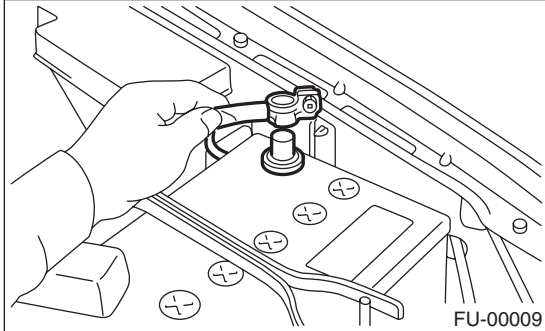
Mass Air Flow and Intake Air Temperature Sensor

FUEL INJECTION (FUEL SYSTEMS)

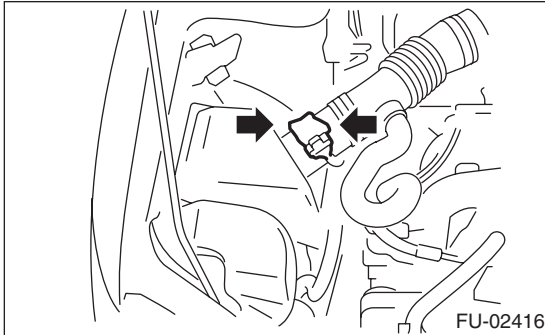
10. Mass Air Flow and Intake Air Temperature Sensor

A: REMOVAL

- 1) Disconnect the ground cable from the battery.



- 2) Disconnect the connector from the mass air flow and intake air temperature sensor.
- 3) Remove the mass air flow and intake air temperature sensor.



B: INSTALLATION

Install in the reverse order of removal.

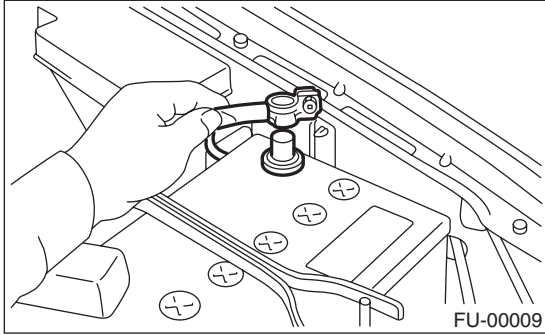
Tightening torque:

1.0 N·m (0.10 kgf·m, 0.74 ft·lb)

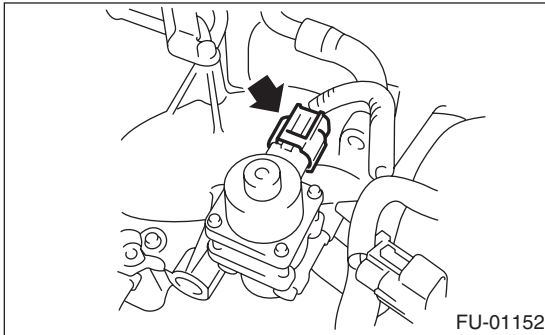
11.EGR Valve

A: REMOVAL

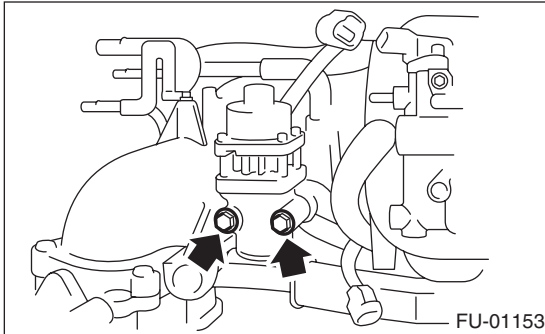
- 1) Disconnect the ground cable from the battery.



- 2) Disconnect the connector from EGR valve.



- 3) Remove the EGR valve from intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Use a new gasket.

Tightening torque:

19 N·m (1.9 kgf-m, 14.0 ft-lb)

Fuel Injector

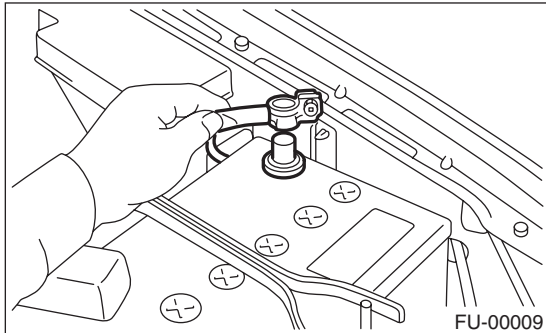
FUEL INJECTION (FUEL SYSTEMS)

12. Fuel Injector

A: REMOVAL

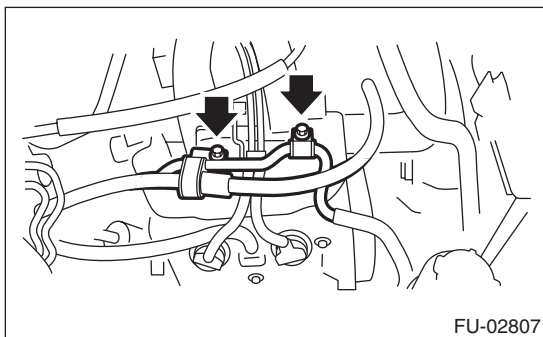
1. RH SIDE

- 1) Release the fuel pressure.
<Ref. to FU(H4SO)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Disconnect the ground cable from the battery.

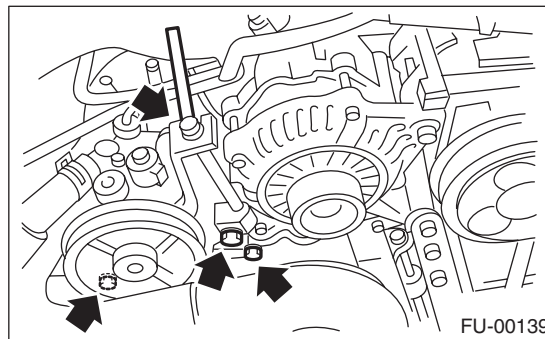


- 3) Open the fuel filler flap lid, and remove the fuel filler cap.
- 4) Remove the air intake duct and air cleaner case.
<Ref. to IN (H4SO)-7, REMOVAL, Air Intake Duct.>
<Ref. to IN (H4SO)-5, REMOVAL, Air Cleaner Case.>
- 5) Remove the power steering pump and power steering reservoir tank.
 - (1) Remove the front side V-belt. <Ref. to ME(H4SO)-40, REMOVAL, V-belt.>
 - (2) Remove the bolts which hold the power steering pipes onto the intake manifold protector RH.

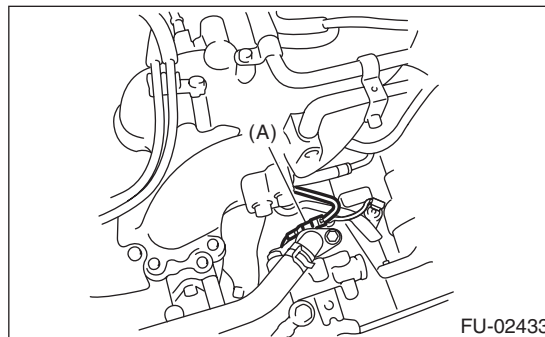
NOTE:
Do not disconnect the power steering hose.



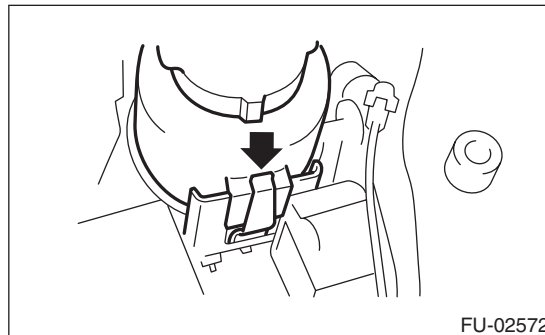
- (3) Remove the bolts which install the power steering pump to the bracket.



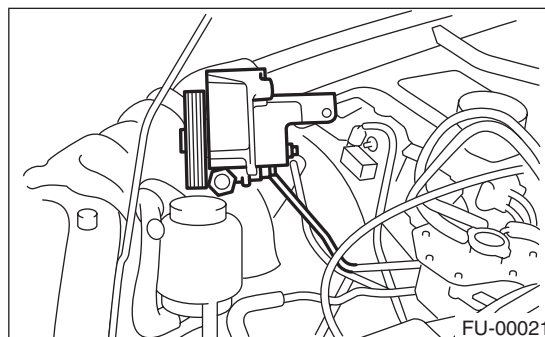
- (4) Disconnect the connector from power steering pump switch (A).



- (5) Remove the power steering reservoir tank from the bracket by pulling it upward.



- (6) Place the power steering pump and tank on the right side wheel apron.

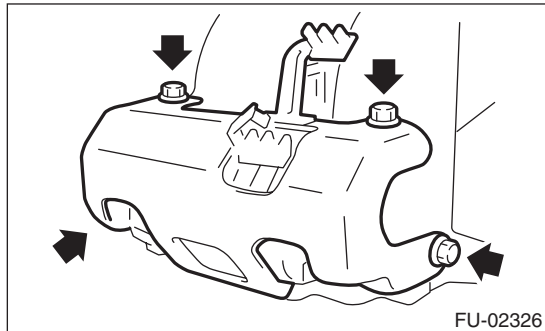


- 6) Remove the spark plug cords from spark plugs (#1 and #3 cylinders).

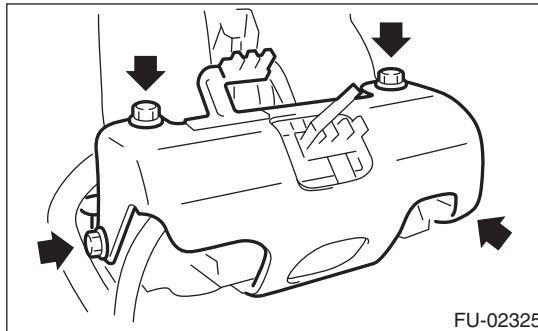
Fuel Injector

FUEL INJECTION (FUEL SYSTEMS)

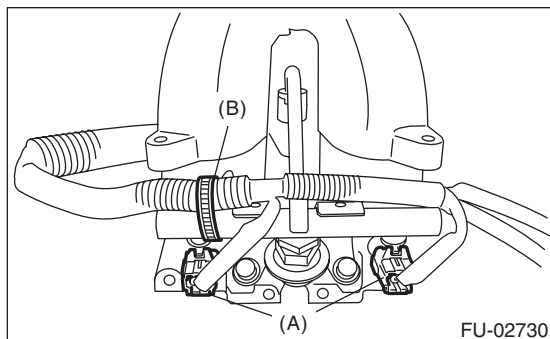
7) Remove the fuel pipe protector RH.



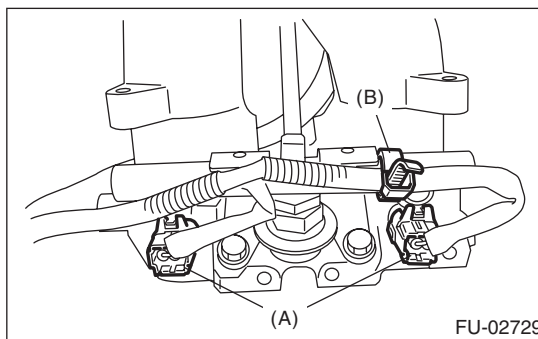
5) Remove the fuel pipe protector LH.



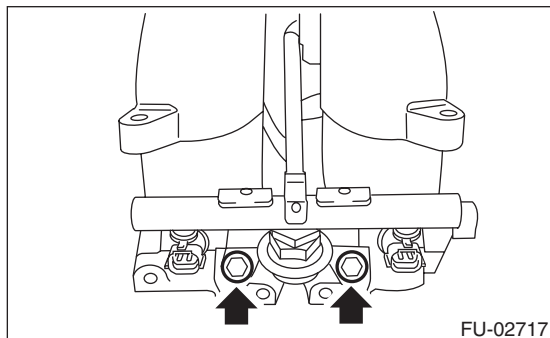
8) Disconnect the connectors (A) from fuel injector.
9) Remove the harness band (B) which holds the engine harness to injector pipe.



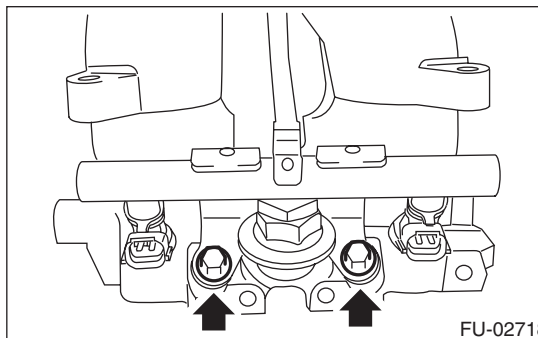
6) Disconnect the connectors (A) from fuel injector.
7) Remove the harness band (B) which holds the engine harness to injector pipe.



10) Remove the bolt which holds fuel injector pipe onto intake manifold.



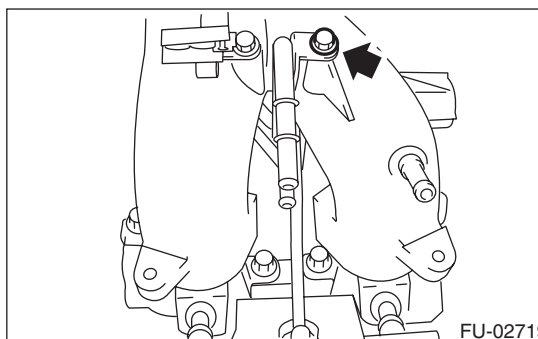
8) Remove the bolt which holds fuel injector pipe onto intake manifold.



11) Remove the fuel injector while lifting up the fuel injector pipe.

2. LH SIDE

- 1) Release the fuel pressure.
<Ref. to FU(H4SO)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Remove the battery. <Ref. to SC (H4SO)-20, REMOVAL, Battery.>
- 3) Open the fuel filler flap lid, and remove the fuel filler cap.
- 4) Remove the spark plug cords from spark plugs (#2 and #4 cylinders).



9) Remove the fuel injector while lifting up the fuel injector pipe.

Fuel Injector

FUEL INJECTION (FUEL SYSTEMS)

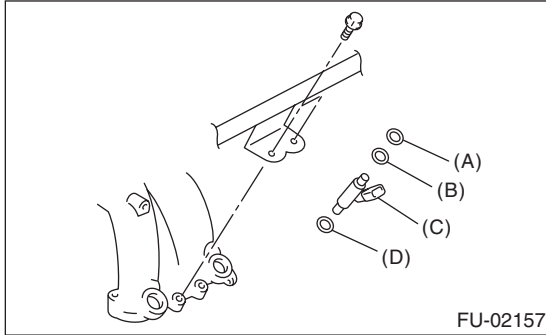
B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

NOTE:

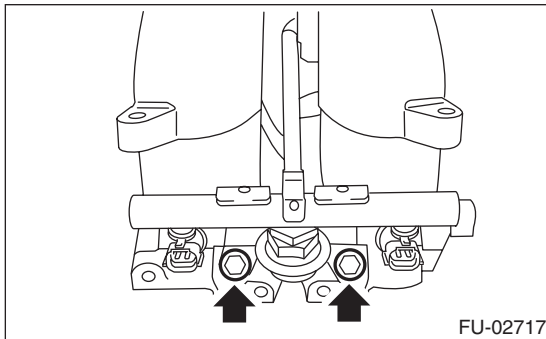
Use new O-rings.



- (A) O-ring
- (B) O-ring
- (C) Fuel injector
- (D) O-ring

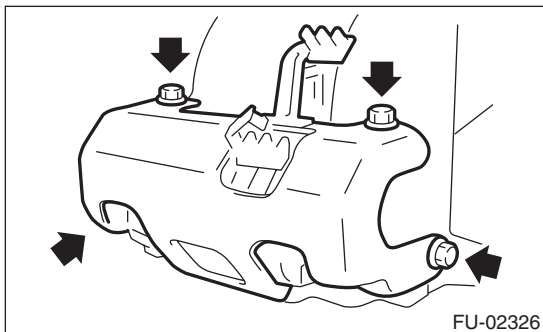
Tightening torque:

19 N·m (1.9 kgf-m, 14.0 ft-lb)



Tightening torque:

19 N·m (1.9 kgf-m, 14.0 ft-lb)

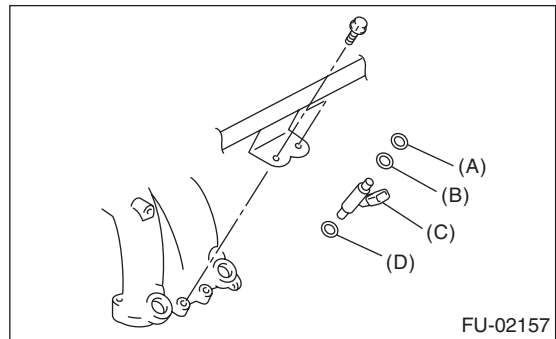


2. LH SIDE

Install in the reverse order of removal.

NOTE:

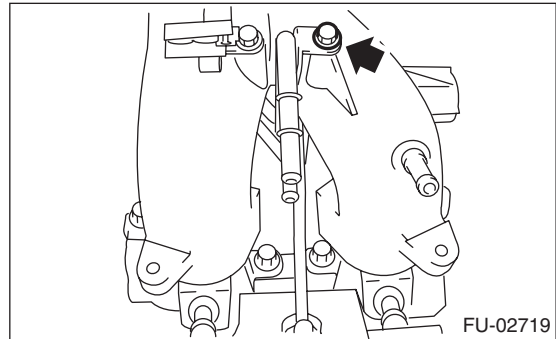
Use new O-rings.



- (A) O-ring
- (B) O-ring
- (C) Fuel injector
- (D) O-ring

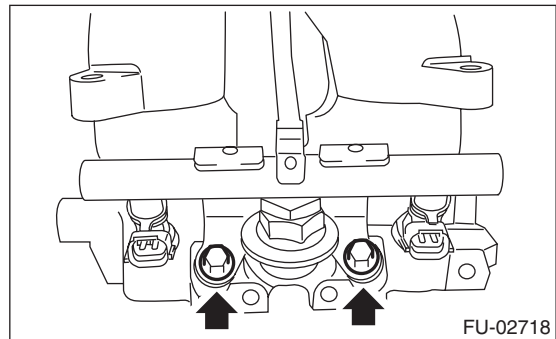
Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



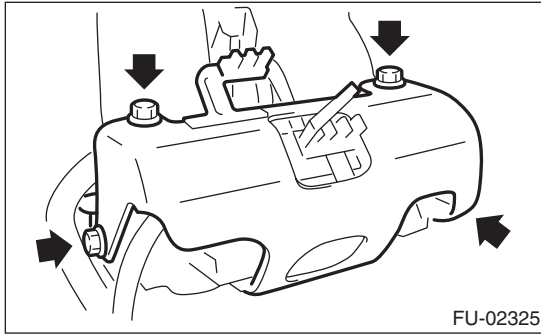
Tightening torque:

19 N·m (1.9 kgf-m, 14.0 ft-lb)



Tightening torque:

19 N·m (1.9 kgf-m, 14.0 ft-lb)



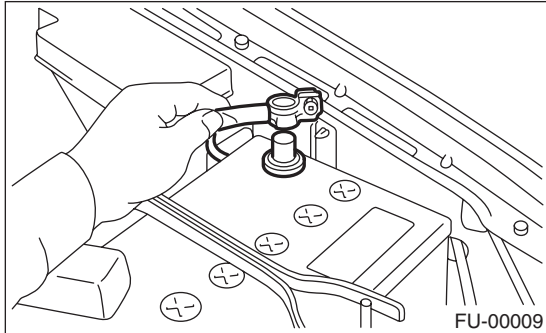
Variable Valve Lift Diagnosis Oil Pressure Switch

FUEL INJECTION (FUEL SYSTEMS)

13. Variable Valve Lift Diagnosis Oil Pressure Switch

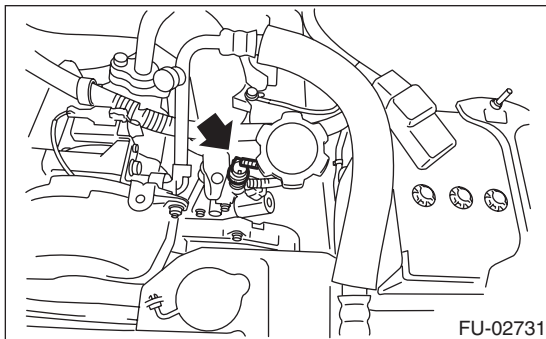
A: REMOVAL

- 1) Disconnect the ground cable from the battery.

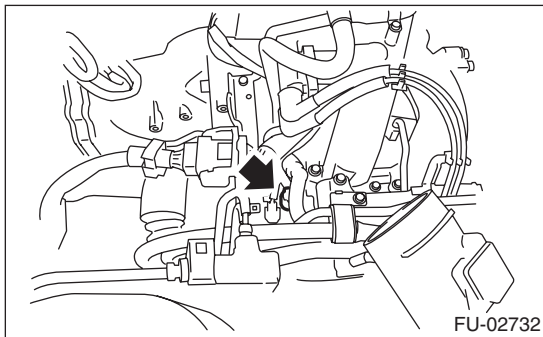


- 2) Remove the air intake chamber. <Ref. to IN (H4SO)-6, REMOVAL, Air Intake Chamber.>
- 3) Remove the engine harness connector from the bracket.
- 4) Disconnect the connector from the variable valve lift diagnosis oil pressure switch.
- 5) Remove the variable valve lift diagnosis oil pressure switch.

- LH side



- RH side



B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Apply liquid gasket to the variable valve lift diagnosis oil pressure switch threads.

Liquid gasket:

THREE BOND 1324 (Part No. 004403042) or equivalent

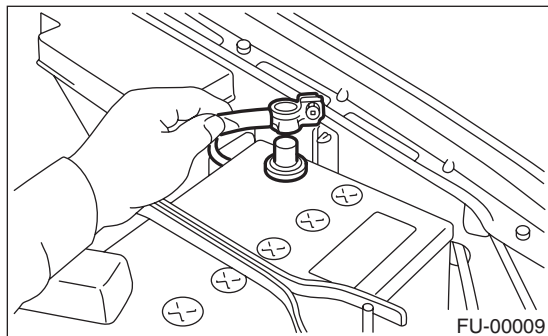
Tightening torque:

17 N·m (1.7 kgf-m, 12.5 ft-lb)

14. Oil Temperature Sensor

A: REMOVAL

- 1) Disconnect the ground cable from the battery.

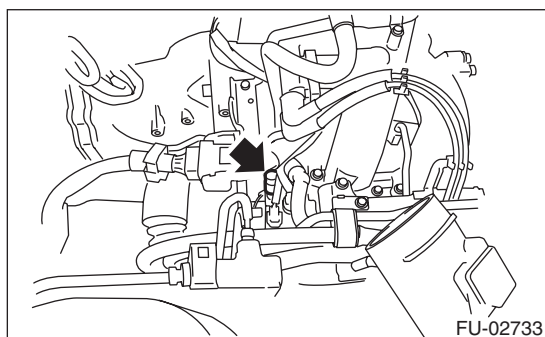


- 2) Remove the air intake chamber. <Ref. to IN (H4SO)-6, REMOVAL, Air Intake Chamber.>

- 3) Remove the engine harness connector from the bracket.

- 4) Disconnect the connector from engine oil temperature sensor.

- 5) Remove the oil temperature sensor.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

18 N·m (1.8 kgf·m, 13.3 ft·lb)

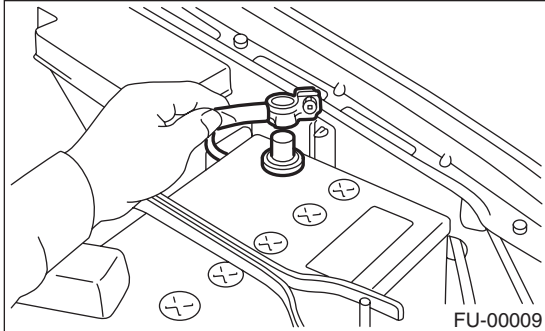
Front Oxygen (A/F) Sensor

FUEL INJECTION (FUEL SYSTEMS)

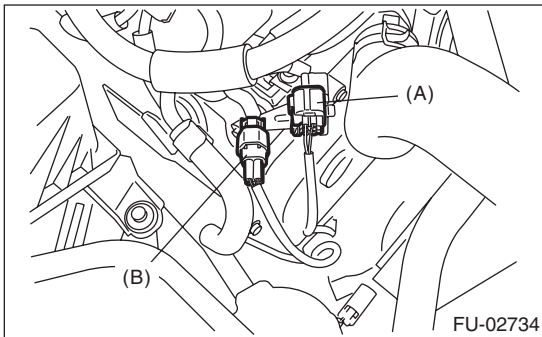
15. Front Oxygen (A/F) Sensor

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.



- 3) Remove the clip fastening the harness and disconnect the front oxygen (A/F) sensor connector.

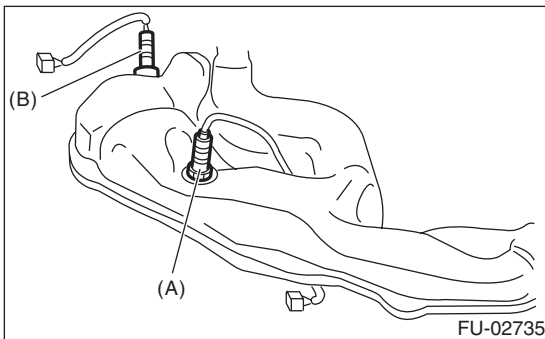


- (A) Front oxygen (A/F) sensor connector
- (B) Rear oxygen sensor connector

- 4) Lift-up the vehicle.
- 5) Remove the under cover.
- 6) Apply spray-type lubricant to the threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.
- 7) Remove the front oxygen (A/F) sensor.

CAUTION:

When removing the front oxygen (A/F) sensor, wait until exhaust pipe cools, because it can damage the exhaust pipe.



- (A) Front oxygen (A/F) sensor
- (B) Rear oxygen sensor

B: INSTALLATION

- 1) Before installing front oxygen (A/F) sensor, apply anti-seize compound only to the threaded portion of front oxygen (A/F) sensor to make the next removal easier.

CAUTION:

Never apply anti-seize compound to the protector of front oxygen (A/F) sensor.

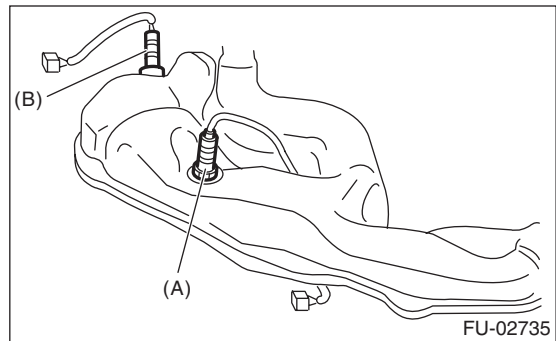
Anti-seize compound:

NEVER-SEEZ NSN, JET LUBE SS-30 or the equivalent

- 2) Install the front oxygen (A/F) sensor.

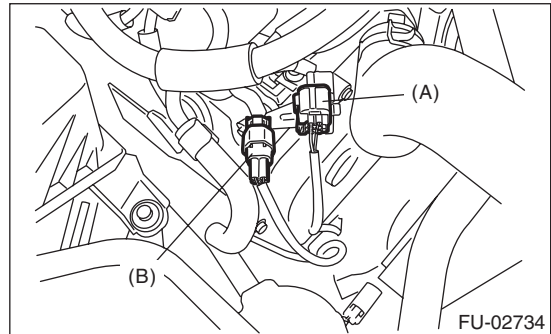
Tightening torque:

21 N·m (2.1 kgf-m, 15.2 ft-lb)



- (A) Front oxygen (A/F) sensor
- (B) Rear oxygen sensor

- 3) Install the under cover.
- 4) Lower the vehicle.
- 5) Connect the connector of front oxygen (A/F) sensor connector and fasten the harness with clips.

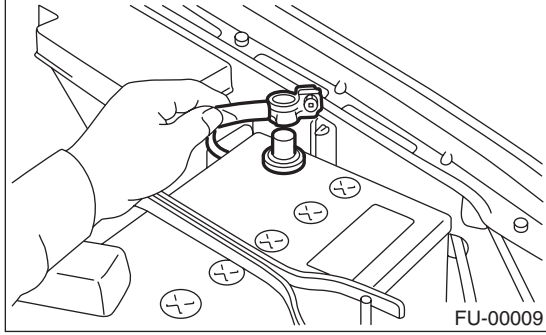


- (A) Front oxygen (A/F) sensor connector
- (B) Rear oxygen sensor connector

Front Oxygen (A/F) Sensor

FUEL INJECTION (FUEL SYSTEMS)

6) Connect the ground cable to the battery.



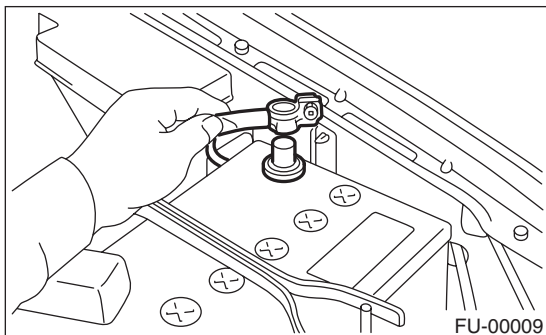
Rear Oxygen Sensor

FUEL INJECTION (FUEL SYSTEMS)

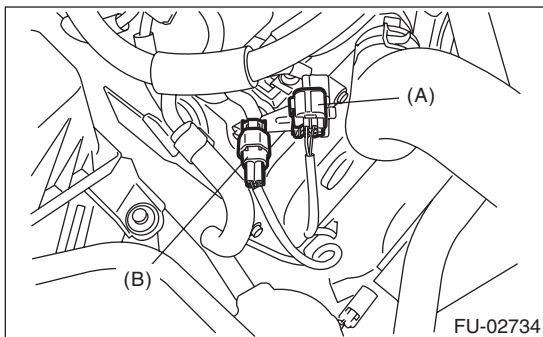
16. Rear Oxygen Sensor

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.



- 3) Remove the clip fastening the harness and disconnect the rear oxygen sensor connector.

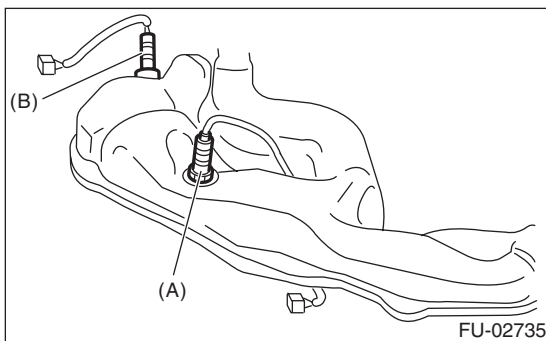


- (A) Front oxygen (A/F) sensor connector
- (B) Rear oxygen sensor connector

- 4) Lift-up the vehicle.
- 5) Remove the under cover.
- 6) Apply spray-type lubricant to the threaded portion of rear oxygen sensor, and leave it for one minute or more.
- 7) Remove the rear oxygen sensor.

CAUTION:

When removing the rear oxygen sensor, wait until exhaust pipe cools, because it can damage the exhaust pipe.



- (A) Front oxygen (A/F) sensor
- (B) Rear oxygen sensor

B: INSTALLATION

- 1) Before installing rear oxygen sensor, apply the anti-seize compound only to the threaded portion of rear oxygen sensor to make the next removal easier.

CAUTION:

Never apply anti-seize compound to the protector of rear oxygen sensor.

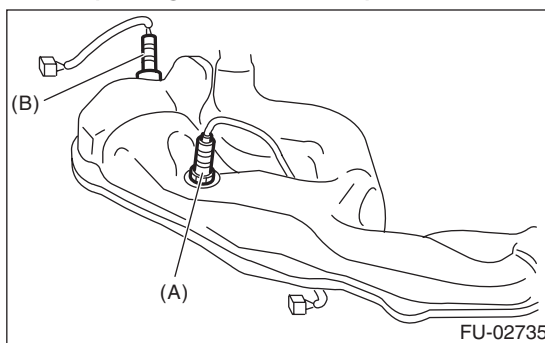
Anti-seize compound:

NEVER-SEEZ NSN, JET LUBE SS-30 or the equivalent

- 2) Install the rear oxygen sensor.

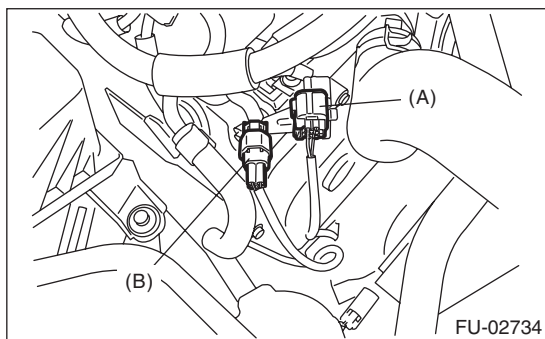
Tightening torque:

21 N·m (2.1 kgf-m, 15.2 ft-lb)



- (A) Front oxygen (A/F) sensor
- (B) Rear oxygen sensor

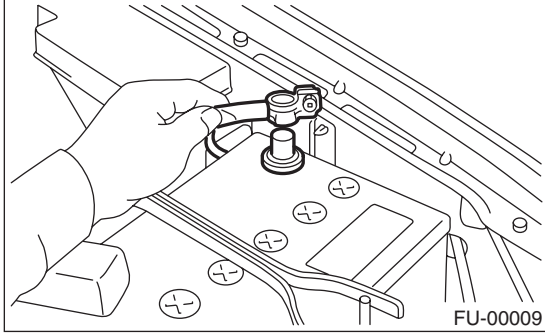
- 3) Install the under cover.
- 4) Lower the vehicle.
- 5) Connect the connector to rear oxygen sensor and mount the harness clips to the bracket for fastening.



- (A) Front oxygen (A/F) sensor connector
- (B) Rear oxygen sensor connector

Rear Oxygen Sensor

6) Connect the ground cable to the battery.



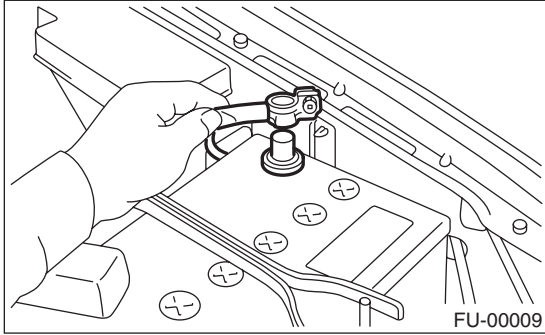
Engine Control Module (ECM)

FUEL INJECTION (FUEL SYSTEMS)

17.Engine Control Module (ECM)

A: REMOVAL

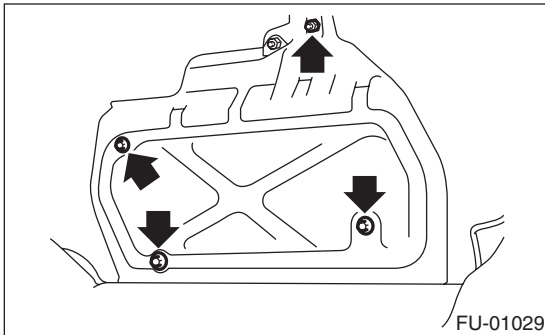
- 1) Disconnect the ground cable from the battery.



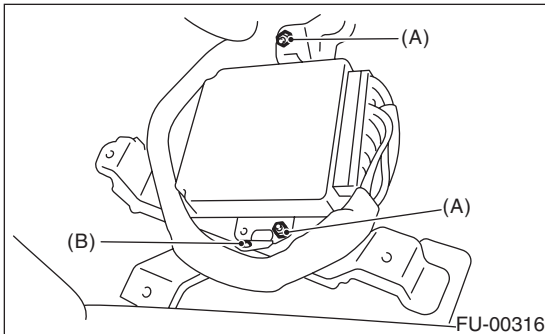
- 2) Remove the lower inner trim of passenger's side.

<Ref. to EI-43, REMOVAL, Lower Inner Trim.>

- 3) Detach the floor mat of passenger's seat.
- 4) Remove the protect cover.



- 5) Remove the nuts (A) which hold ECM to bracket.
- 6) Remove the clip (B) from bracket.



- 7) Disconnect the ECM connectors, and take out the ECM.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

- When replacing the ECM, be careful not to use the ECM for wrong specifications to avoid any damage to fuel injection system.
- When replacing the ECM, be careful not to damage the harnesses and connectors.

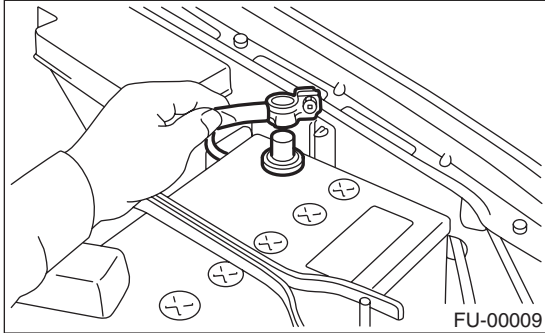
Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

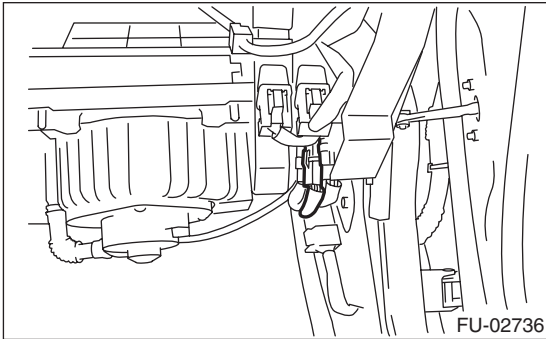
18.Main Relay

A: REMOVAL

- 1) Disconnect the ground cable from the battery.



- 2) Remove the glove box. <Ref. to EI-36, REMOVAL, Glove Box.>
- 3) Remove the passenger's side front side sill cover.
- 4) Disconnect the connectors from main relay.



- 5) Remove the main relay from the mounting bracket.

B: INSTALLATION

Install in the reverse order of removal.

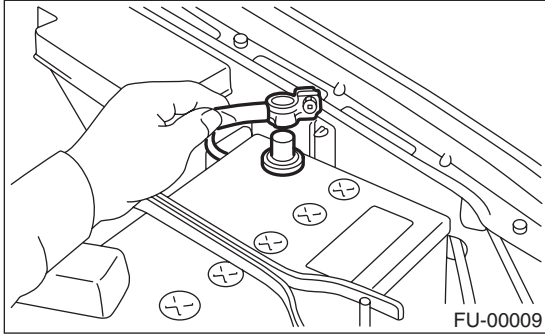
Fuel Pump Relay

FUEL INJECTION (FUEL SYSTEMS)

19. Fuel Pump Relay

A: REMOVAL

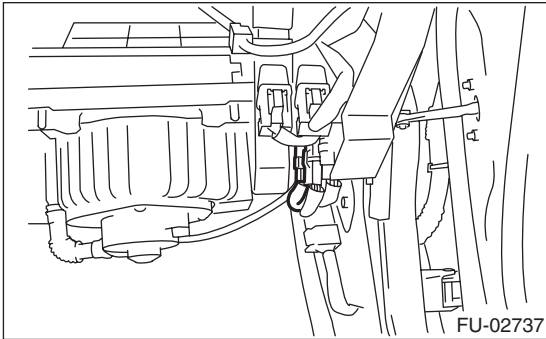
1) Disconnect the ground cable from the battery.



2) Remove the glove box. <Ref. to EI-36, REMOVAL, Glove Box.>

3) Remove the passenger's side front side sill cover.

4) Disconnect the connector from fuel pump relay.



5) Remove the fuel pump relay from the mounting bracket.

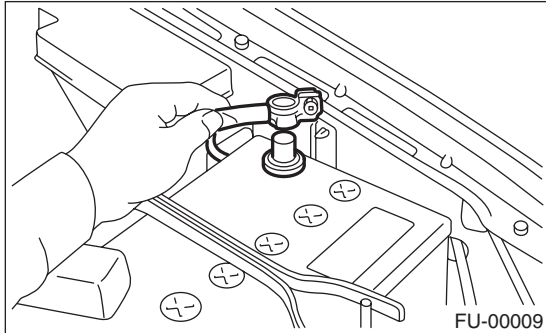
B: INSTALLATION

Install in the reverse order of removal.

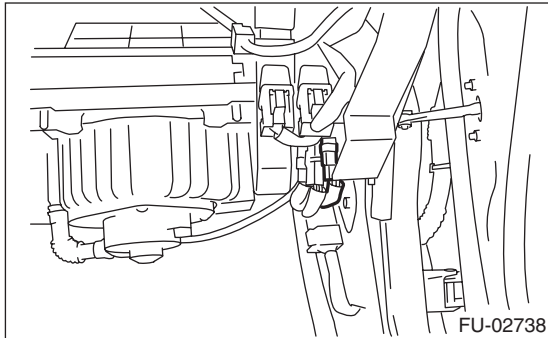
20. Electronic Throttle Control Relay

A: REMOVAL

- 1) Disconnect the ground cable from the battery.



- 2) Remove the glove box. <Ref. to EI-36, REMOVAL, Glove Box.>
- 3) Remove the passenger's side front side sill cover.
- 4) Disconnect the connector from electric throttle control relay.



- 5) Remove the electronic throttle control relay from the mounting bracket.

B: INSTALLATION

Install in the reverse order of removal.

21. Fuel

A: PROCEDURE

1. RELEASING OF FUEL PRESSURE

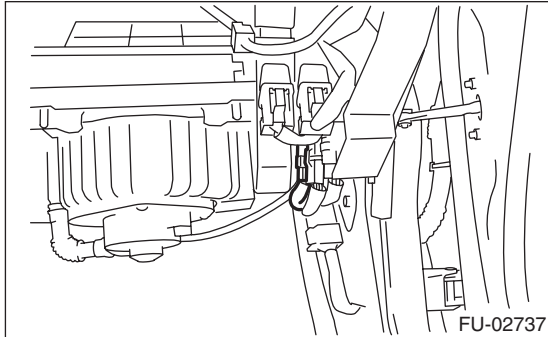
WARNING:

Place “NO FIRE” signs near the working area.

CAUTION:

Be careful not to spill fuel.

- 1) Disconnect the connector from fuel pump relay.



- 2) Start the engine and run it until it stalls.
- 3) After the engine stalls, crank it for five more seconds.
- 4) Turn the ignition switch to OFF.

2. DRAINING FUEL

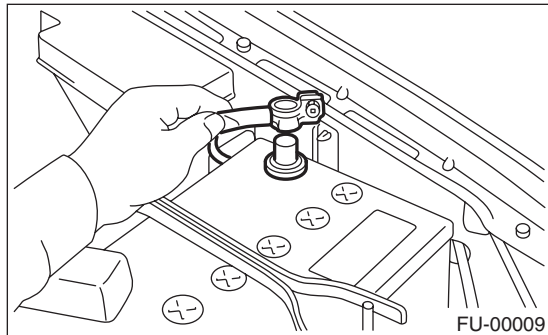
WARNING:

Place “NO FIRE” signs near the working area.

CAUTION:

Be careful not to spill fuel.

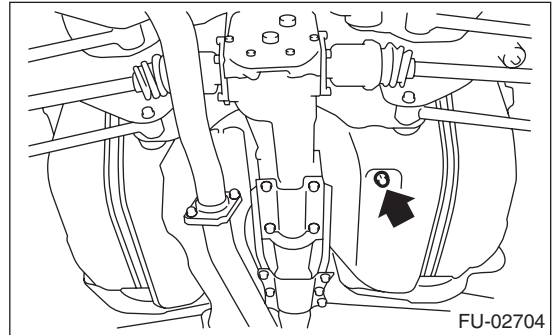
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.



- 3) Open the fuel filler flap lid, and remove the fuel filler cap.
- 4) Lift-up the vehicle.

- 5) Drain fuel from fuel tank.

Set a container under the vehicle and remove the fuel drain plug from the fuel tank.



- 6) Tighten the fuel drain plugs.

NOTE:

Use a new gasket.

Tightening torque:

26 N·m (2.65 kgf·m, 19.2 ft·lb)

22. Fuel Tank

A: REMOVAL

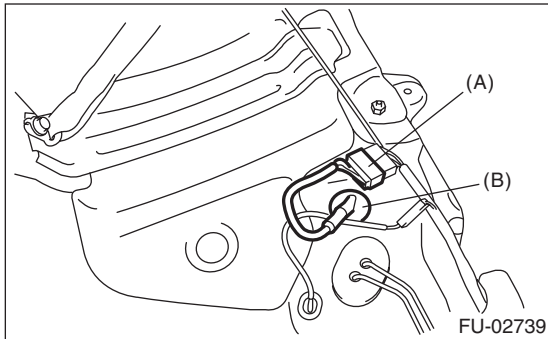
WARNING:

Place "NO FIRE" signs near the working area.

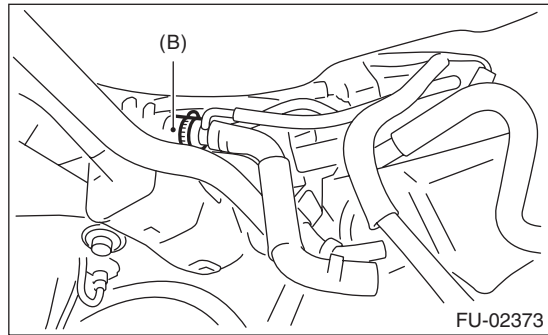
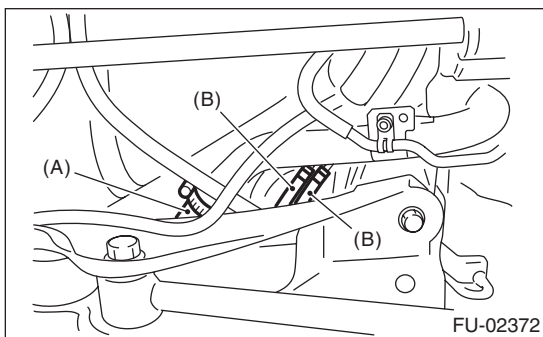
CAUTION:

Be careful not to spill fuel.

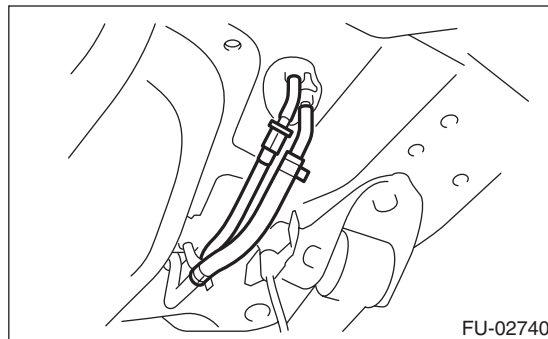
- 1) Set the vehicle on a lift.
- 2) Release the fuel pressure.
<Ref. to FU(H4SO)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 3) Drain fuel from fuel tank.
<Ref. to FU(H4SO)-44, DRAINING FUEL, PROCEDURE, Fuel.>
- 4) Remove the rear seat.
- 5) Disconnect the connector (A) between the fuel tank cord and the rear harness.
- 6) Push the grommet (B) which holds the fuel tank cord on the floor panel into under the body.



- 7) Remove the rear crossmember. <Ref. to RS-16, REMOVAL, Rear Crossmember.>
- 8) Remove the canisters. <Ref. to EC(H4SO)-6, REMOVAL, Canister.>
- 9) Disconnect the connector from the pressure control solenoid valve.
- 10) Loosen the clamp and disconnect the fuel filler hose (A) and evaporation hose (B) from the fuel filler pipe.



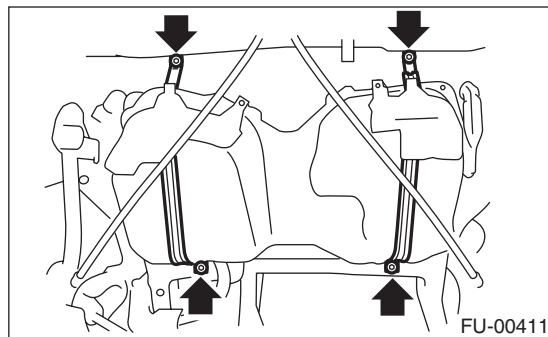
- 11) Move the retainer for fuel delivery tube, and disconnect the quick connector. <Ref. to FU(H4SO)-59, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
- 12) Move the clips, and disconnect the fuel hose.



- 13) Support the fuel tank with transmission jack, remove the bolts from bands and dismount the fuel tank from the vehicle.

WARNING:

- A helper is required to perform this work.
- Fuel may remain undrained in the side of the fuel tank without the drain plug. Be careful not to lose balance and drop the fuel tank when removing it, as this remaining fuel may offset the weight balance of the tank.



Fuel Tank

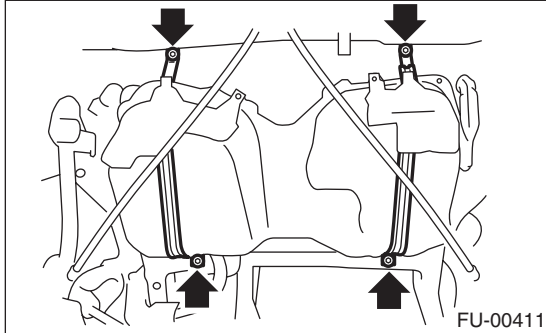
FUEL INJECTION (FUEL SYSTEMS)

B: INSTALLATION

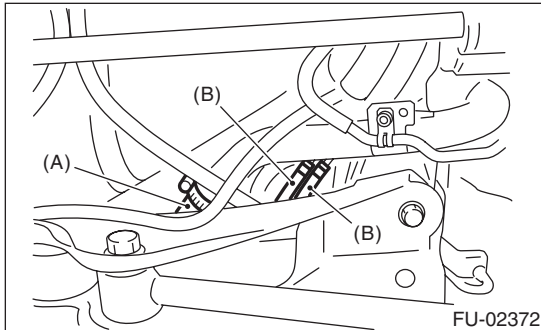
- 1) Support the fuel tank with transmission jack and push the fuel tank harness into access hole along with the grommet.
- 2) Set the fuel tank and temporarily tighten the bolts of fuel tank bands.

WARNING:

A helper is required to perform this work.

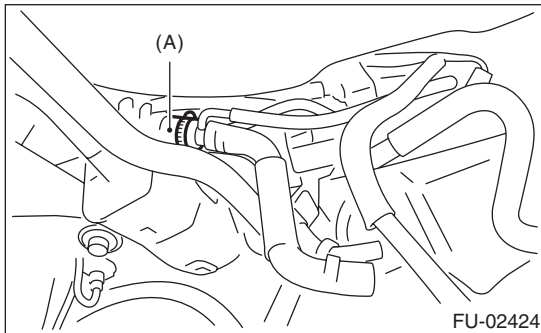


- 3) Insert the fuel filler hose (A) approx. 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe and tighten the clamp.
- 4) Insert the evaporation hose (B) into the lower end of evaporation pipe, and secure the clamps and clips.

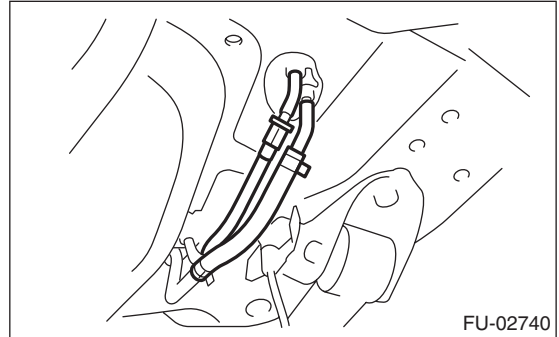


CAUTION:

Do not allow clips to touch hose (A) and rear suspension crossmember.



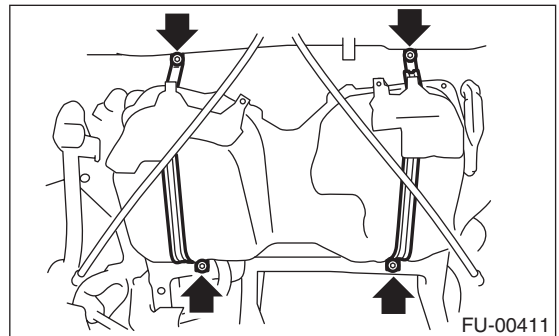
- 5) Connect the fuel hoses, and hold them with clips and quick connector. <Ref. to FU(H4SO)-59, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>



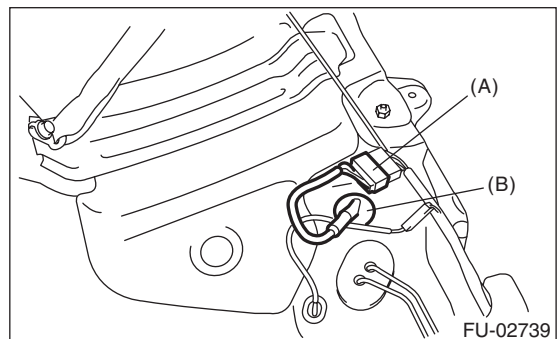
- 6) Connect the connector to pressure control solenoid valve.
- 7) Install the canister. <Ref. to EC(H4SO)-6, INSTALLATION, Canister.>
- 8) Tighten the band mounting bolts.

Tightening torque:

33 N·m (3.4 kgf-m, 25 ft-lb)

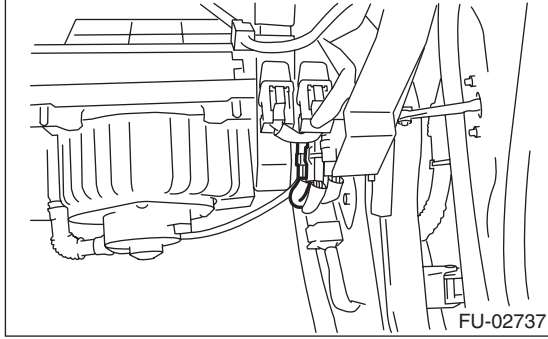


- 9) Install the rear crossmember. <Ref. to RS-16, INSTALLATION, Rear Crossmember.>
- 10) Connect the connector (A) to the fuel tank cord and plug the service hole with grommet (B).



- 11) Set the rear seat and floor mats.

12) Connect the connector to fuel pump relay.



C: INSPECTION

- 1) Check that there are no cracks, holes, or other damage on the fuel tank.
- 2) Make sure that the fuel pipe and fuel hose are not cracked and those connections are tight.

Fuel Filler Pipe

FUEL INJECTION (FUEL SYSTEMS)

23. Fuel Filler Pipe

A: REMOVAL

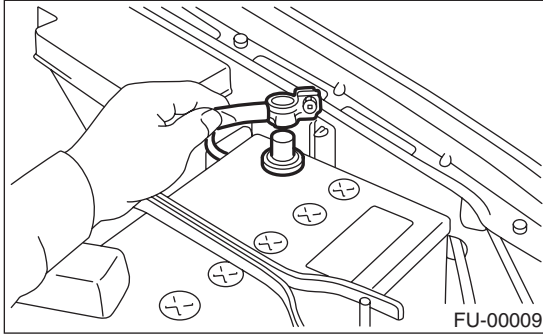
WARNING:

Place "NO FIRE" signs near the working area.

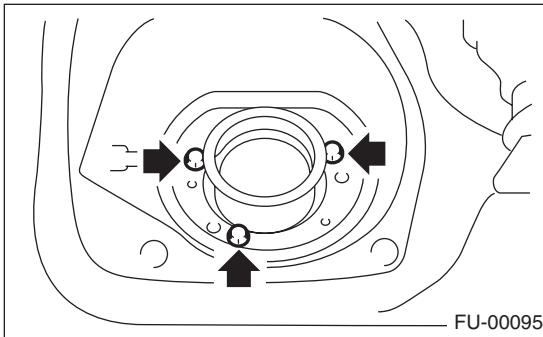
CAUTION:

Be careful not to spill fuel.

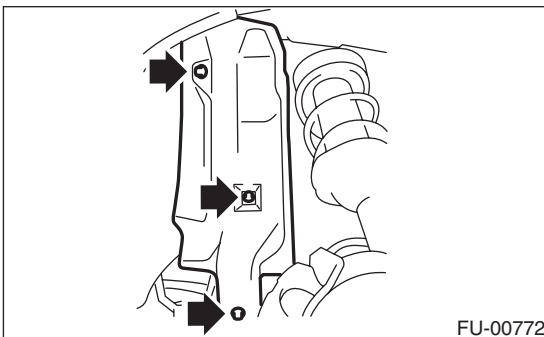
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.



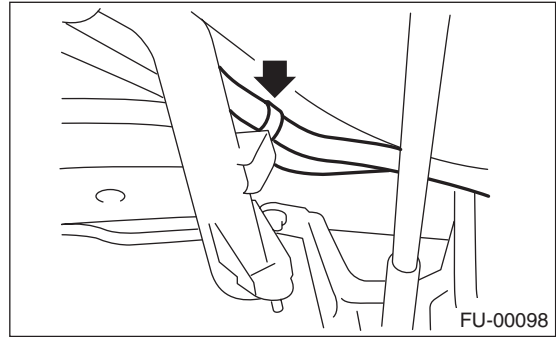
- 3) Open the fuel filler flap lid, and remove the filler cap.
- 4) Remove the screws which secure packing.



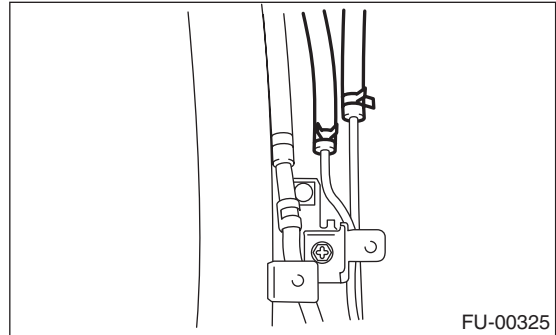
- 5) Remove the rear wheel RH.
- 6) Lift-up the vehicle.
- 7) Drain fuel from fuel tank.
<Ref. to FU(H4SO)-44, DRAINING FUEL, PROCEDURE, Fuel.>
- 8) Remove the fuel filler pipe protector.



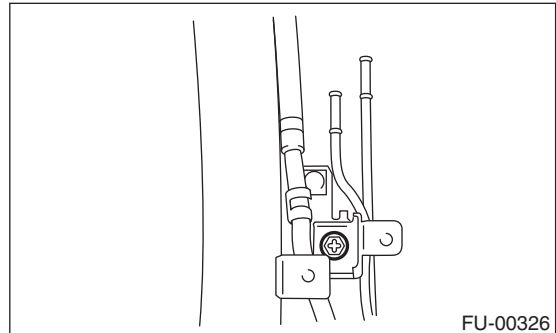
- 9) Disconnect the evaporation hose from the clip of fuel filler pipe.



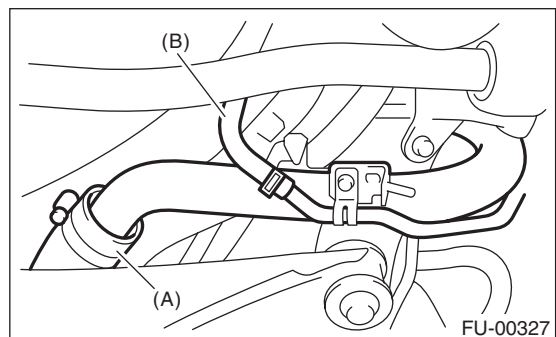
- 10) Disconnect the evaporation hose from fuel pipe.



- 11) Remove the bolts which hold fuel filler pipe bracket on the body.



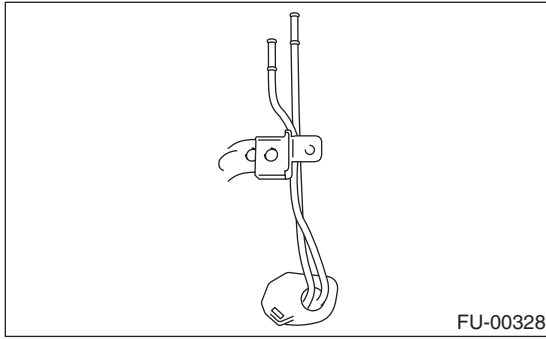
- 12) Loosen the clamp and separate the fuel filler hose (A) from the fuel filler pipe.
- 13) Move the clip and disconnect the evaporation hose (B).



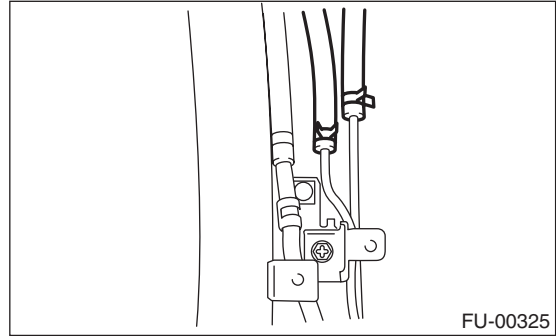
- 14) Remove the fuel filler pipe to the underside of the vehicle.

Fuel Filler Pipe

15) Remove the evaporation pipe together with clip from the body.



5) Connect the evaporation hose to the fuel pipe.

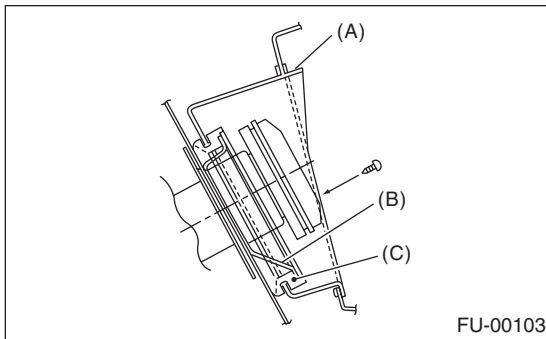


B: INSTALLATION

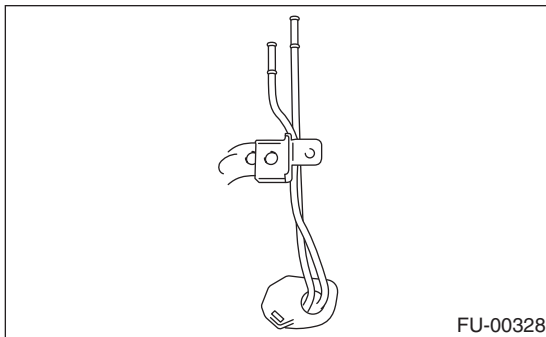
- 1) Open the fuel filler flap lid.
- 2) Set the fuel saucer (A) with rubber packing (C), and insert the fuel filler pipe into hole from the inner side of apron.
- 3) Align the holes in fuel filler pipe neck and set the cup (B), and tighten the screws.

NOTE:

If the edges of rubber packing are folded toward the inside, straighten it with a screwdriver.



4) Install the evaporation pipe.

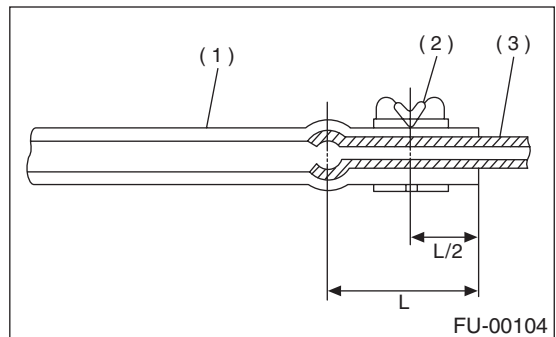
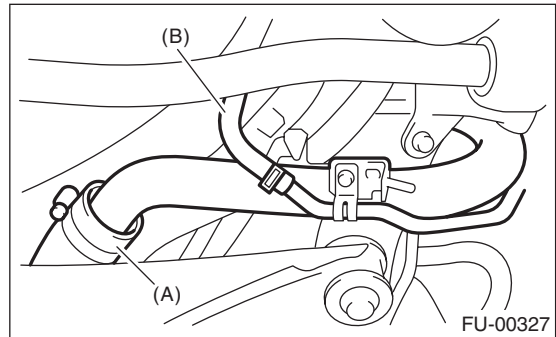


6) Connect the fuel filler hose (A) to the pipe with an overlap of 35 to 40 mm (1.38 to 1.57 in).

7) Connect the evaporation hose (B) to the pipe with an overlap of 25 to 30 mm (0.98 to 1.18 in).

CAUTION:

Do not allow clips to touch evaporation hose (B) and rear suspension crossmember.



- (1) Hose
- (2) Clip
- (3) Pipe

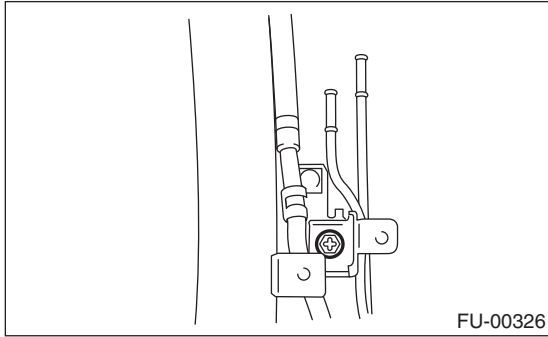
Fuel Filler Pipe

FUEL INJECTION (FUEL SYSTEMS)

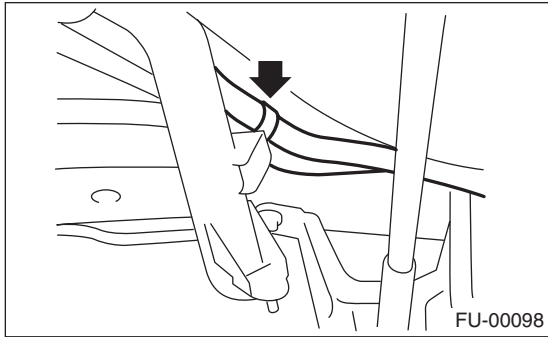
8) Tighten the bolts which hold fuel filler pipe bracket on the body.

Tightening torque:

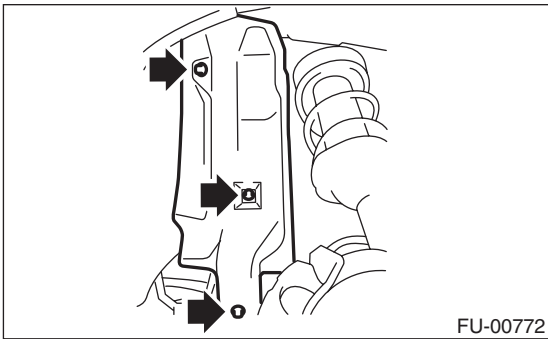
7.5 N·m (0.76 kgf·m, 5.5 ft·lb)



9) Fasten the evaporation hoses to the clip of fuel filler pipe.



10) Install the fuel filler pipe protector.



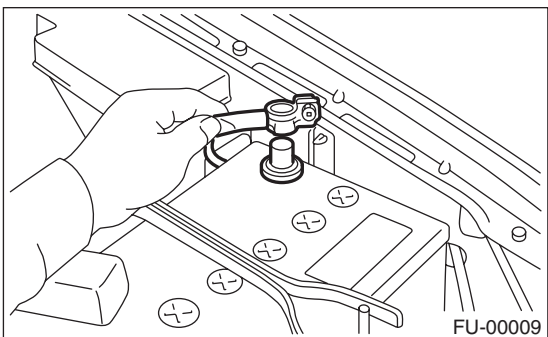
11) Lower the vehicle.

12) Install the rear wheel RH.

Tightening torque:

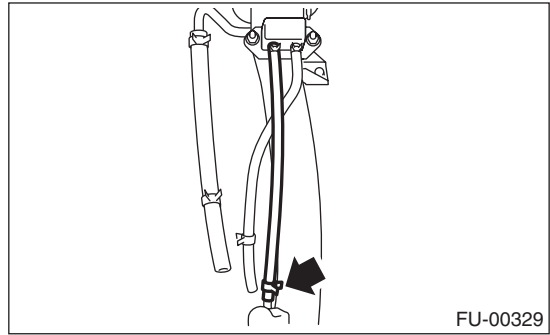
100 N·m (10.2 kgf·m, 73.8 ft·lb)

13) Connect the ground cable to the battery.

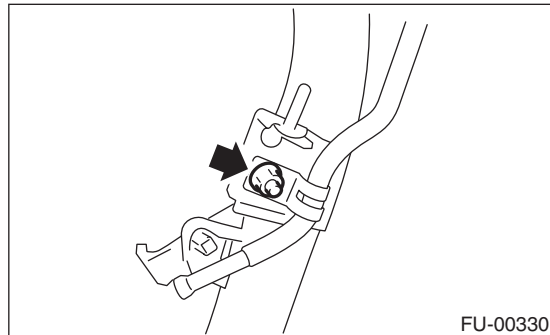


C: DISASSEMBLY

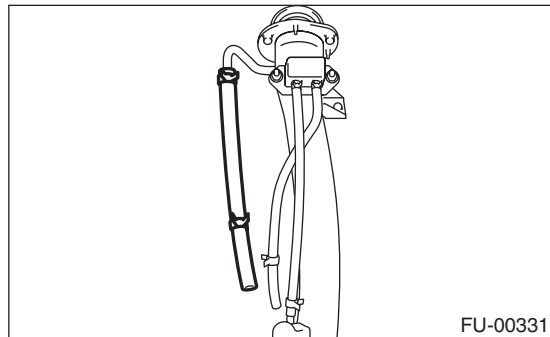
1) Move the clamp and disconnect the evaporation hose from the joint pipe.



2) Remove the bolts which install the joint pipe to the fuel filler pipe.



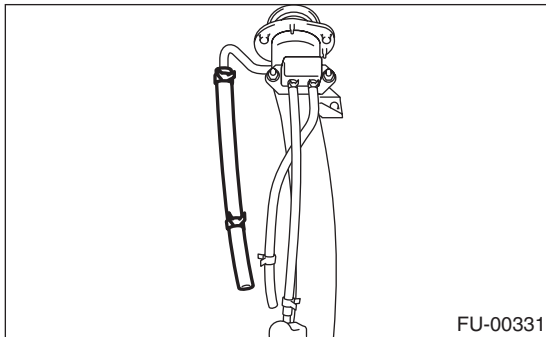
3) Disconnect the evaporation hose from fuel filler pipe.



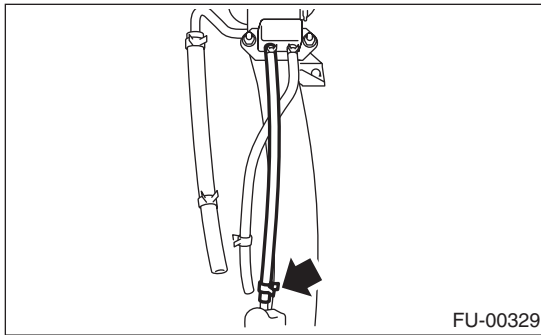
4) Remove the shut valve from the fuel filler pipe.
<Ref. to EC(H4SO)-16, REMOVAL, Shut Valve.>

D: ASSEMBLY

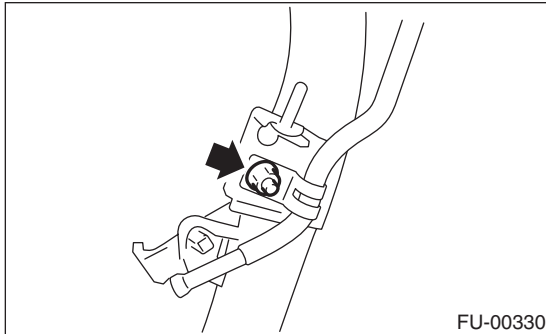
- 1) Install the shut pipe to the fuel filler pipe. <Ref. to EC(H4SO)-16, INSTALLATION, Shut Valve.>
- 2) Connect the evaporation hose to the fuel filler pipe.



- 3) Connect the evaporation hose to the evaporation pipe.



- 4) Install the evaporation pipe to the fuel filler pipe.



Fuel Pump

FUEL INJECTION (FUEL SYSTEMS)

24. Fuel Pump

A: REMOVAL

WARNING:

Place "NO FIRE" signs near the working area.

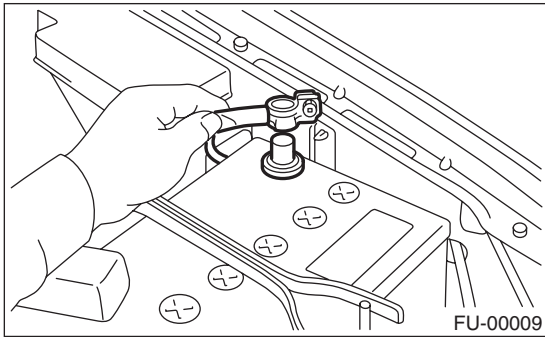
CAUTION:

Be careful not to spill fuel.

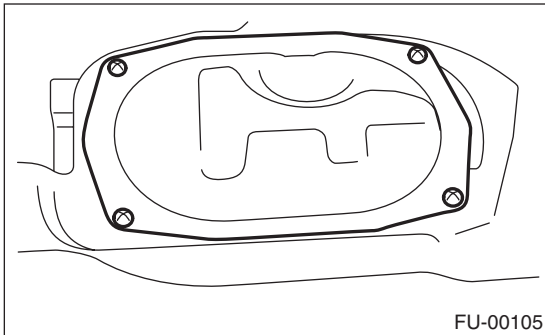
NOTE:

Fuel pump assembly consists of fuel pump, fuel filter and fuel level sensor.

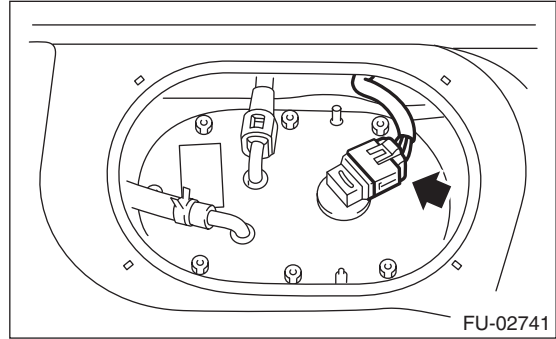
- 1) Set the vehicle on a lift.
- 2) Release the fuel pressure.
<Ref. to FU(H4SO)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 3) Disconnect the ground cable from the battery.



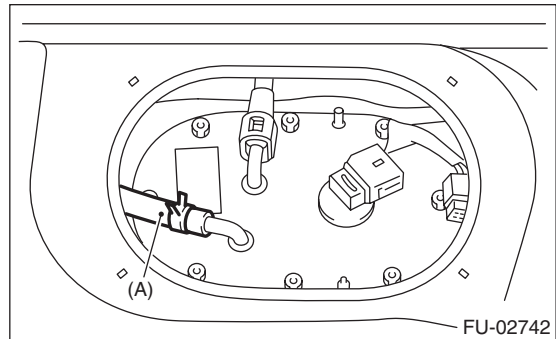
- 4) Open the fuel filler flap lid, and remove the fuel filler cap.
- 5) Lift-up the vehicle.
- 6) Drain fuel from fuel tank.
<Ref. to FU(H4SO)-44, DRAINING FUEL, PROCEDURE, Fuel.>
- 7) Remove the luggage floor mat. <Ref. to EI-49, REMOVAL, Luggage Floor Mat.>
- 8) Remove the service hole cover.



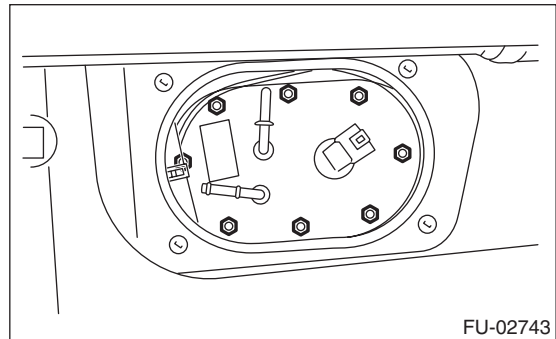
- 9) Disconnect the connector from fuel pump.



- 10) Disconnect the quick connector, then disconnect the fuel delivery hose. <Ref. to FU(H4SO)-59, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
- 11) Move the clips, and disconnect the jet pump hose (A).



- 12) Remove the nuts which install fuel pump assembly onto fuel tank.



- 13) Remove the fuel pump assembly from the fuel tank.

B: INSTALLATION

Install in the reverse order of removal while being careful of the following.

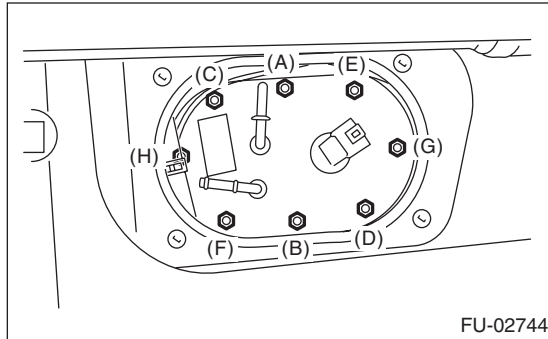
- Make sure the sealing portion is free from fuel or foreign matter before installation.
- Tighten the nuts in alphabetical sequence as shown in the figure to the specified torque.

NOTE:

Use a new gasket and retainer.

Tightening torque:

4.4 N·m (0.45 kgf·m, 3.3 ft·lb)

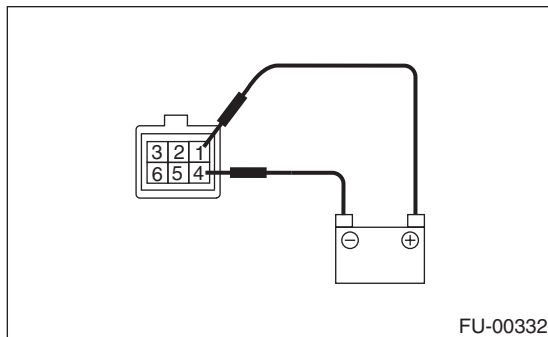


C: INSPECTION

Connect the lead harness to the connector terminal of fuel pump, and apply the battery power supply to check whether the pump operates.

CAUTION:

- Wipe off fuel completely.
- Keep the battery as far apart from fuel pump as possible.
- Be sure to turn the battery supply ON and OFF on the battery side.
- Do not run the fuel pump for a long time under non-load condition.



Fuel Level Sensor

FUEL INJECTION (FUEL SYSTEMS)

25. Fuel Level Sensor

A: REMOVAL

WARNING:

Place "NO FIRE" signs near the working area.

CAUTION:

Be careful not to spill fuel.

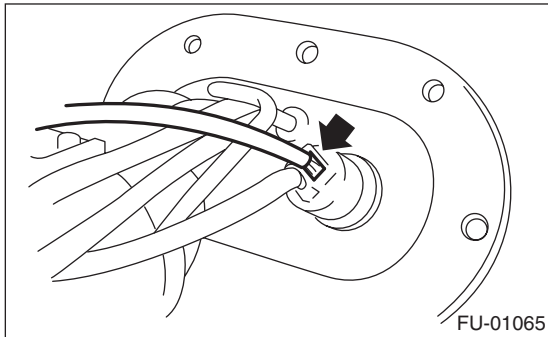
NOTE:

The fuel level sensor is built in fuel pump assembly.

1) Remove the fuel pump assembly.

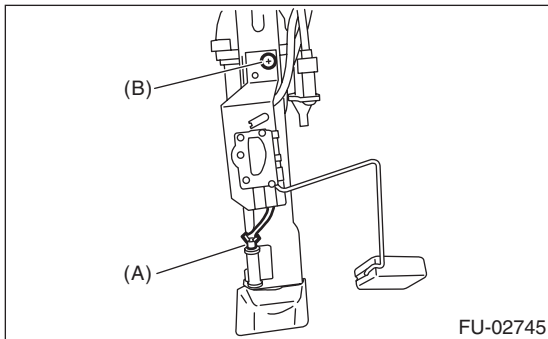
<Ref. to FU(H4SO)-52, REMOVAL, Fuel Pump.>

2) Disconnect the connector from fuel pump bracket.



3) Remove the fuel temperature sensor (A).

4) Remove the bolt (B) which installs the fuel level sensor on the mounting bracket.



B: INSTALLATION

Install in the reverse order of removal.

26. Fuel Sub Level Sensor

A: REMOVAL

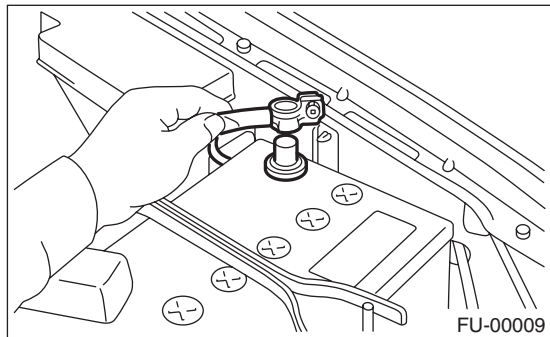
WARNING:

Place "NO FIRE" signs near the working area.

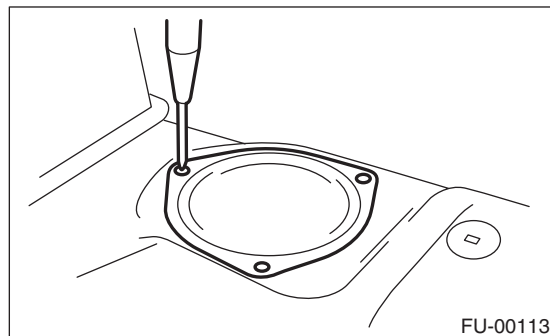
CAUTION:

Be careful not to spill fuel.

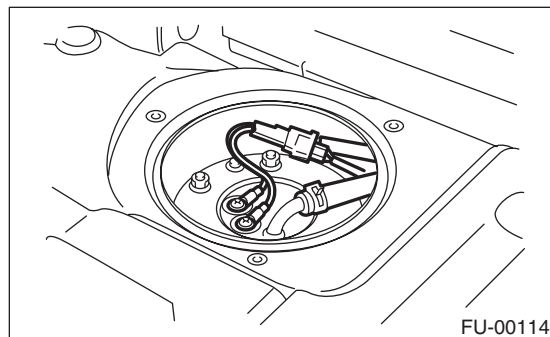
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.



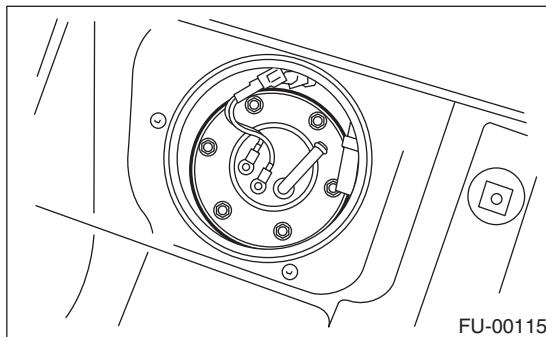
- 3) Lift-up the vehicle.
- 4) Drain fuel from fuel tank.
<Ref. to FU(H4SO)-44, DRAINING FUEL, PROCEDURE, Fuel.>
- 5) Remove the luggage floor mat. <Ref. to EI-49, REMOVAL, Luggage Floor Mat.>
- 6) Remove the service hole cover.



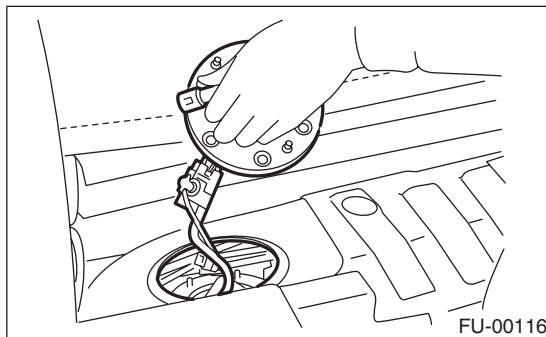
- 7) Disconnect the connector from the fuel sub level sensor.
- 8) Disconnect the fuel jet pump hose.



- 9) Remove the bolts which install fuel sub level sensor on fuel tank.



- 10) Remove the fuel sub level sensor.



B: INSTALLATION

Install in the reverse order of removal while being careful of the following.

- Make sure the sealing portion is free from fuel or foreign matter before installation.
- Tighten the bolts in the sequence shown in the figure to the specified torque.

NOTE:

Use a new gasket.

Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

Fuel Filter

FUEL INJECTION (FUEL SYSTEMS)

27. Fuel Filter

A: REMOVAL

WARNING:

Place “NO FIRE” signs near the working area.

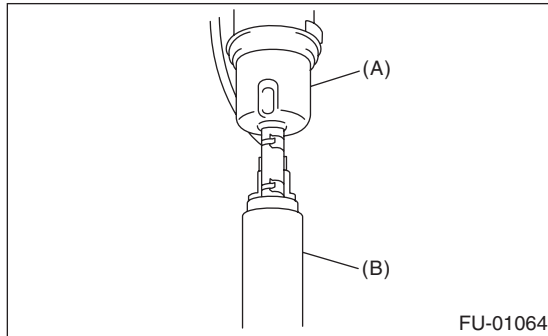
CAUTION:

Be careful not to spill fuel.

NOTE:

The fuel filter is assembled in fuel pump assembly.

- 1) Remove the fuel pump assembly. <Ref. to FU(H4SO)-52, REMOVAL, Fuel Pump.>
- 2) Separate the fuel pump and fuel filter.



(A) Fuel filter

(B) Fuel pump

B: INSTALLATION

CAUTION:

If fuel hoses or clamps are damaged, replace them with new parts.

Install in the reverse order of removal.

C: INSPECTION

- 1) Check the inside of fuel filter for dirt and water sediment.
- 2) If it is clogged, or if the replacement interval has been reached, replace it.

28. Fuel Cut Valve

A: REMOVAL

WARNING:

Place "NO FIRE" signs near the working area.

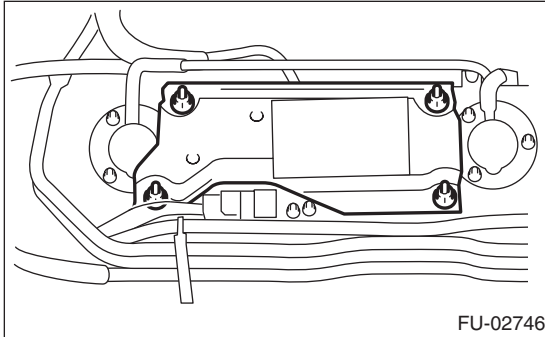
CAUTION:

Be careful not to spill fuel.

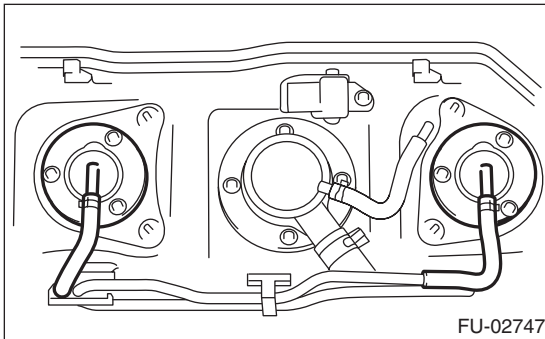
1) Remove the fuel tank.

<Ref. to FU(H4SO)-45, REMOVAL, Fuel Tank.>

2) Remove the protect cover.



3) Move the clip and disconnect the evaporation hose from the fuel cut valve.



4) Remove the bolts which install the fuel cut valve.

B: INSTALLATION

Install in the reverse order of removal while being careful of the following.

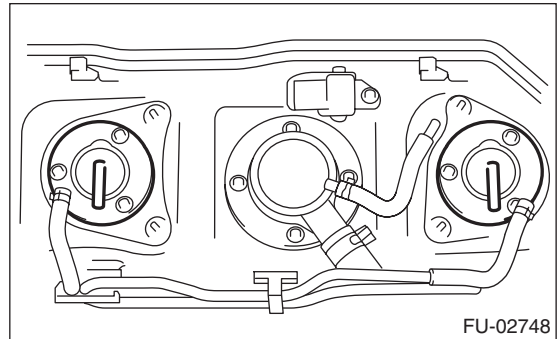
- Make sure the sealing portion is free from fuel or foreign matter before installation.

NOTE:

Use a new gasket.

Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



Fuel Damper Valve

FUEL INJECTION (FUEL SYSTEMS)

29. Fuel Damper Valve

A: REMOVAL

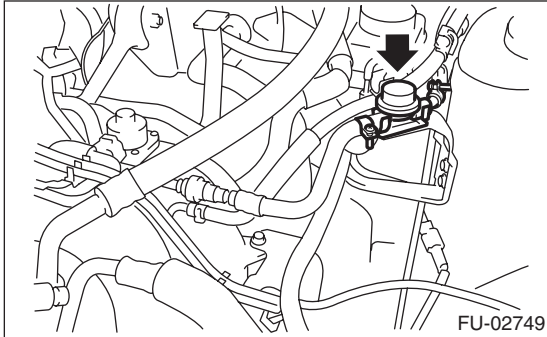
CAUTION:

- Be careful not to spill fuel.
- Catch the fuel from hoses using a container or cloth.

1) Release the fuel pressure.

<Ref. to FU(H4SO)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

2) Remove the fuel damper valve from the fuel delivery line.



B: INSTALLATION

CAUTION:

If fuel hoses or clamps are damaged, replace them with new parts.

Install in the reverse order of removal.

Tightening torque:

1.25 N·m (0.13 kgf·m, 0.94 ft·lb)

30. Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

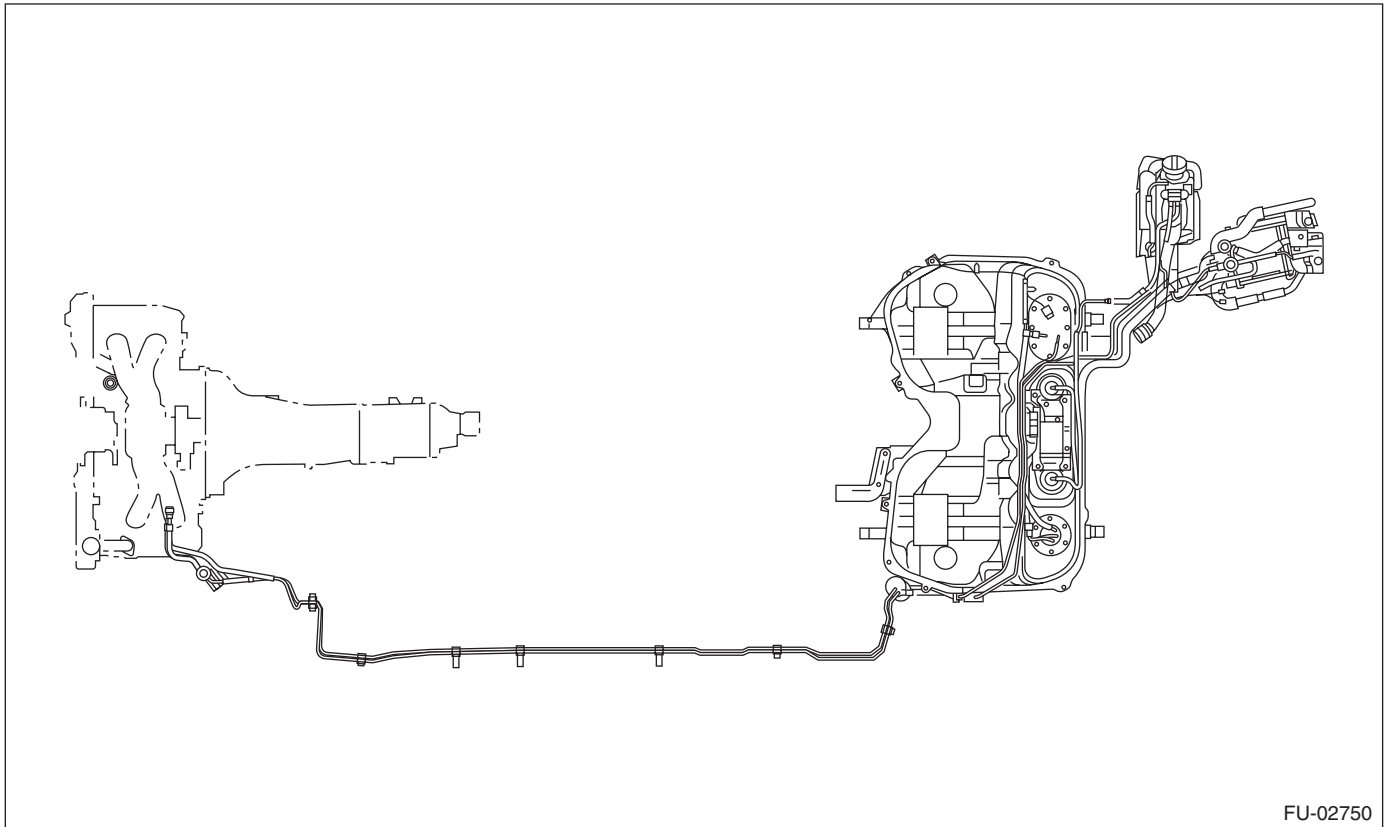
WARNING:

Place "NO FIRE" signs near the working area.

CAUTION:

Be careful not to spill fuel.

- 1) Set the vehicle on a lift.
- 2) Release the fuel pressure. <Ref. to FU(H4SO)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 3) Open the fuel filler flap lid, and remove the fuel filler cap.
- 4) Remove the floor mat. <Ref. to EI-48, REMOVAL, Floor Mat.>
- 5) Disconnect the fuel delivery pipes and hoses, and then disconnect the evaporation pipes and hoses.



6) In the engine room, disconnect the fuel delivery hose and evaporation hose.

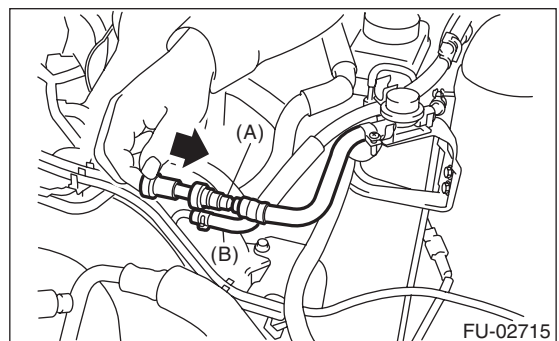
- (1) Disconnect the quick connector on the fuel delivery line by pushing the ST in the direction of the arrow.

ST 42099AE000 CONNECTOR REMOVER

- (2) Remove the clip and disconnect the evaporation hose from the pipe.

CAUTION:

- Be careful not to spill fuel.
- Catch the fuel from hoses using a container or cloth.



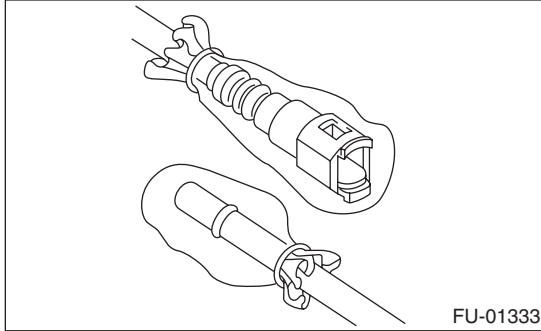
(A) Fuel delivery hose

(B) Evaporation hose

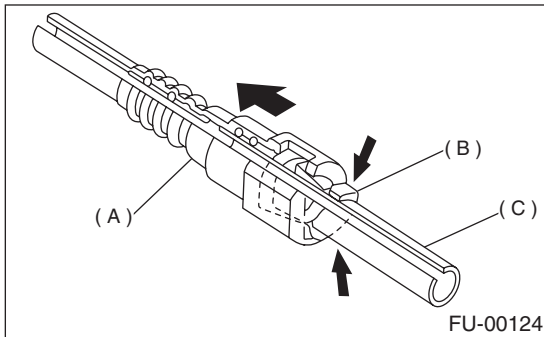
Fuel Delivery, Return and Evaporation Lines

FUEL INJECTION (FUEL SYSTEMS)

- 7) Lift-up the vehicle.
- 8) Disconnect the quick connector on the fuel line.
 - (1) Clean the pipe and connector, if they are covered with dust.
 - (2) To prevent from damaging or entering foreign matter, wrap the pipes and connectors with plastic bag etc.



- (3) Hold the connector (A) and push the retainer (B) down.
- (4) Pull out the connector (A) from the retainer (B).



- (A) Connector
- (B) Retainer
- (C) Pipe

B: INSTALLATION

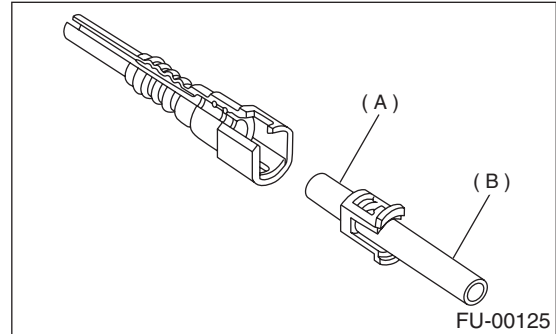
NOTE:

Replace the retainer other than in the engine room with a new part.

- 1) Connect the quick connector on fuel line.

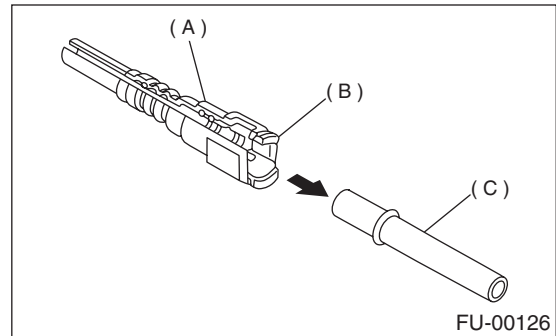
CAUTION:

Make sure there are no damage or dust on connections. If necessary, clean seal surface of pipe.



- (A) Seal surface
- (B) Pipe

- (1) Set the new retainer (B) to connector (A).
- (2) Push the pipe into the connector completely.



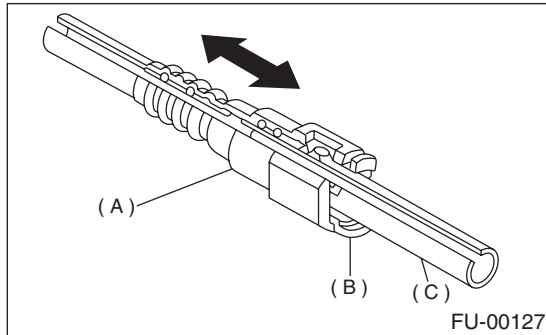
- (A) Connector
- (B) Retainer
- (C) Pipe

Fuel Delivery, Return and Evaporation Lines

FUEL INJECTION (FUEL SYSTEMS)

CAUTION:

- Pull the connector to ensure it is connected securely.
- Make sure the two retainer pawls are engaged in their mating positions in the connector.
- Be sure to inspect hoses and their connections for any leakage of fuel.



- (A) Connector
- (B) Retainer
- (C) Pipe

2) Connect the fuel delivery hose to the pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).

Type A: When the amount of inserting is specified.

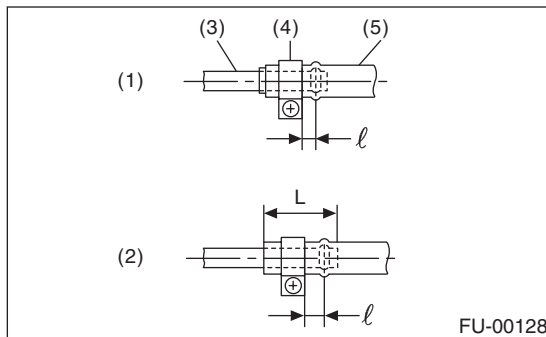
Type B: When the amount to be inserted is not specified.

$\varnothing : 2.5 \pm 1.5 \text{ mm } (0.098 \pm 0.059 \text{ in})$

$L : 22.5 \pm 2.5 \text{ mm } (0.886 \pm 0.098 \text{ in})$

CAUTION:

Be sure to inspect hoses and their connections for any leakage of fuel.

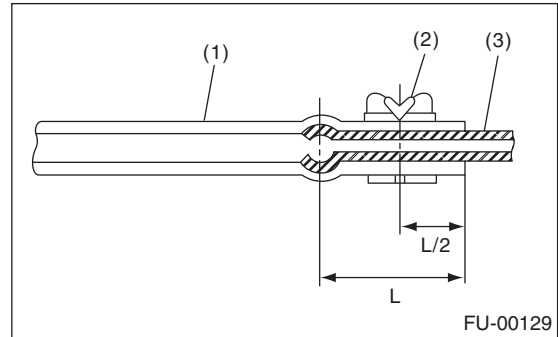


- (1) Type A
- (2) Type B
- (3) Pipe
- (4) Clamp
- (5) Hose

3) Connect the evaporation hose to the pipe with an overlap of 15 to 20 mm (0.59 to 0.79 in).

Fuel evaporation hose

$L = 17.5 \pm 2.5 \text{ mm } (0.689 \pm 0.098 \text{ in})$



- (1) Hose
- (2) Clip
- (3) Pipe

C: INSPECTION

1) Make sure that there are no cracks on the fuel pipes and fuel hoses.

2) Make sure the fuel pipe and fuel hose connections are tightened firmly.

Fuel System Trouble in General

FUEL INJECTION (FUEL SYSTEMS)

31. Fuel System Trouble in General

A: INSPECTION

Trouble and possible cause		Corrective action
1. Insufficient fuel supply to injector		
1)	Fuel pump does not operate.	
	○ Defective terminal contact	Inspect contact, especially ground, and tighten it securely.
	○ Trouble in electromagnetic or electronic circuit parts	Replace the faulty part.
2)	Decline of fuel pump function	Replace the fuel pump.
3)	Clogged dust or water in the fuel filter	Replace the fuel filter.
4)	Clogged or bent fuel pipe or hose	Clean, correct or replace fuel pipe or hose.
5)	Air is mixed in fuel system	Inspect or retighten each connection part.
6)	Clogged or bent air breather tube or pipe	Clean, correct or replace the air breather tube or pipe.
7)	Damaged diaphragm of pressure regulator	Replace.
2. Leakage or blow out of fuel		
1)	Loose joints of the fuel pipe	Retighten.
2)	Cracked fuel pipe, hose and fuel tank	Replace.
3)	Defective welding part on the fuel tank	Replace.
4)	Defective drain packing of the fuel tank	Replace.
5)	Clogged or bent air breather tube or air vent tube	Clean, correct or replace the air breather tube or air vent tube.
3. Gasoline smell inside of compartment		
1)	Loose joints at air breather tube, air vent tube and fuel filler pipe	Retighten.
2)	Problem in tightening of the fuel saucer packing air	Correct or replace the packing.
3)	Fuel pump trouble	Replace.
4. Defective fuel meter indicator		
1)	Defective operation of fuel level sensor	Replace.
2)	Defective operation of fuel meter	Replace.
5. Noise		
1)	Large operation noise or vibration of fuel pump	Replace.

NOTE:

- When the vehicle is left unattended for an extended period of time, water may accumulate in the fuel tank. Fill fuel fully to prevent the problem.
- In snow-covered areas, mountainous areas, skiing areas, etc. where ambient temperatures drop below 0°C (32°F) throughout the winter season, use a water removing agent in the fuel system to prevent freezing fuel system and accumulating water.
- When water is accumulated in fuel filter, fill the water removing agent in the fuel tank.
- Before using water removing agent, follow the cautions noted on the bottle.

General Description

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

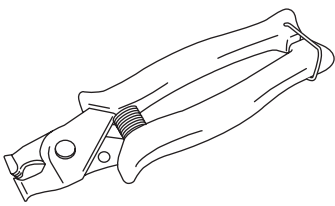
1. General Description

A: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from the battery.

B: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18353AA000	18353AA000	CLAMP PLIERS	<ul style="list-style-type: none">• Used for removing and installing the PCV hose.• This is a general tool made by the French company CAILLAU. (code) 54.0.000.205 To make this easier to obtain in the same way as genuine Subaru parts, it has been provided with a tool number as an ST.

Front Catalytic Converter

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

2. Front Catalytic Converter

A: REMOVAL

The front catalytic converter is integrated into front exhaust pipe as one unit; therefore, refer to “Front Exhaust Pipe” for removal procedure. <Ref. to EX (H4SO)-4, REMOVAL, Front Exhaust Pipe.>

B: INSTALLATION

The front catalytic converter is integrated into front exhaust pipe as one unit; therefore, refer to “Front Exhaust Pipe” for installation procedure. <Ref. to EX (H4SO)-5, INSTALLATION, Front Exhaust Pipe.>

C: INSPECTION

- 1) Check the connections and welds for exhaust leaks.
- 2) Make sure there are no holes or rusting.

Rear Catalytic Converter

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

3. Rear Catalytic Converter

A: REMOVAL

The rear catalytic converter is integrated into center exhaust pipe as one unit; therefore, refer to “Center Exhaust Pipe” for removal procedure. <Ref. to EX (H4SO)-7, REMOVAL, Center Exhaust Pipe.>

B: INSTALLATION

The rear catalytic converter is integrated into center exhaust pipe as one unit; therefore, refer to “Center Exhaust Pipe” for installation procedure. <Ref. to EX (H4SO)-7, INSTALLATION, Center Exhaust Pipe.>

C: INSPECTION

- 1) Check the connections and welds for exhaust leaks.
- 2) Make sure there are no holes or rusting.

4. EGR Valve

A: SPECIFICATION

Refer to "EGR valve" for removal and installation procedure. <Ref. to FU(H4SO)-29, EGR Valve.>

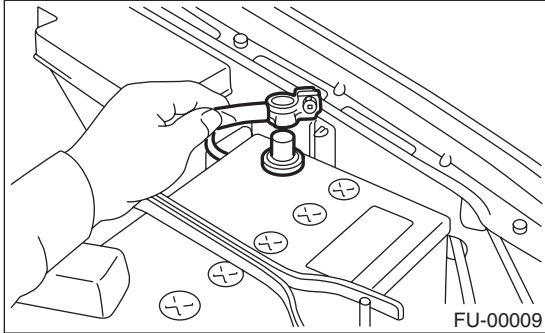
Canister

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

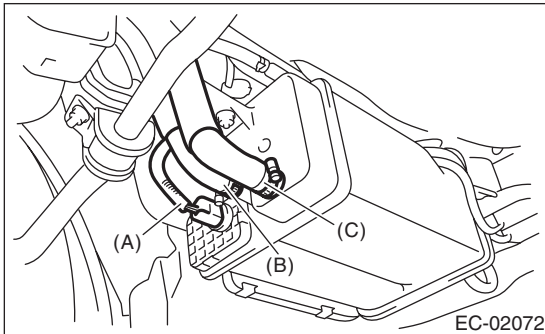
5. Canister

A: REMOVAL

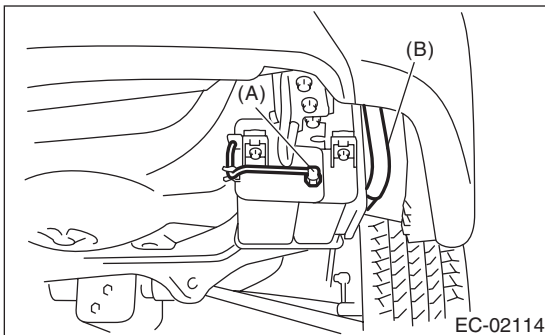
- 1) Disconnect the ground cable from the battery.



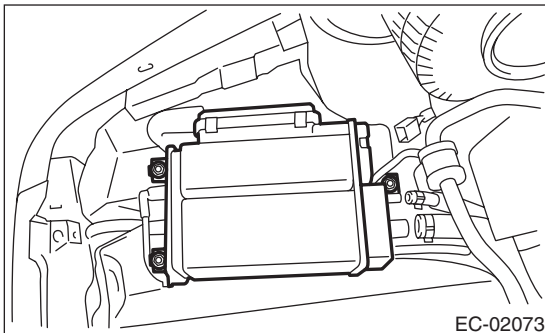
- 2) Lift-up the vehicle.
- 3) Disconnect the connector (A) from drain valve.
- 4) Disconnect the evaporation hoses (B) and (C) from the canister.



- 5) Disconnect the quick connector (A) from the canister.
- 6) Disconnect the drain hose (B) from the canister.



- 7) Remove the canister from the body.



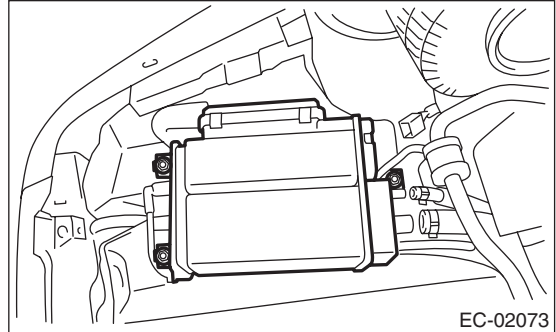
B: INSTALLATION

NOTE:

- Replace the retainer of quick connector with a new part.
- Install in the reverse order of removal.

Tightening torque:

23 N·m (2.3 kgf-m, 17 ft-lb)



C: INSPECTION

Make sure the canister and canister hoses are not cracked or loose.

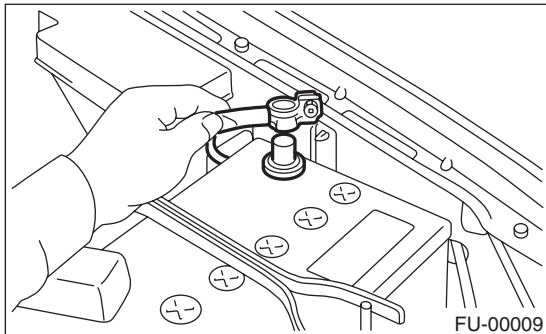
Purge Control Solenoid Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

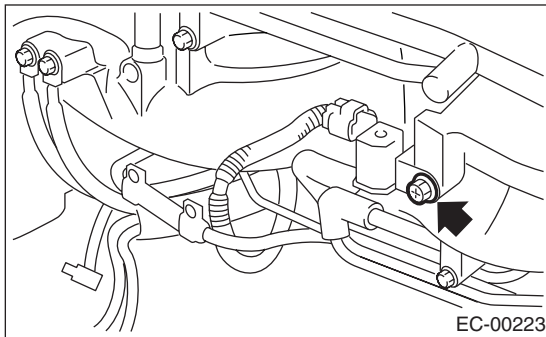
6. Purge Control Solenoid Valve

A: REMOVAL

1) Disconnect the ground cable from the battery.



2) Disconnect the connector and evaporation hoses of purge control solenoid valve, and then remove the purge control solenoid valve.

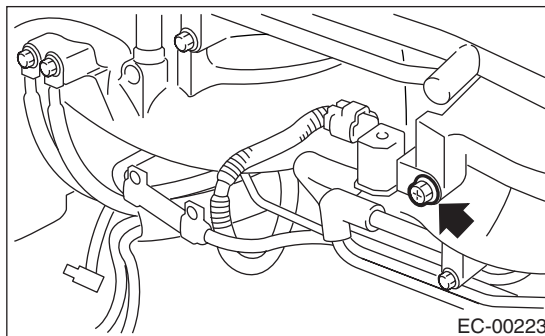


B: INSTALLATION

Install in the reverse order of removal.

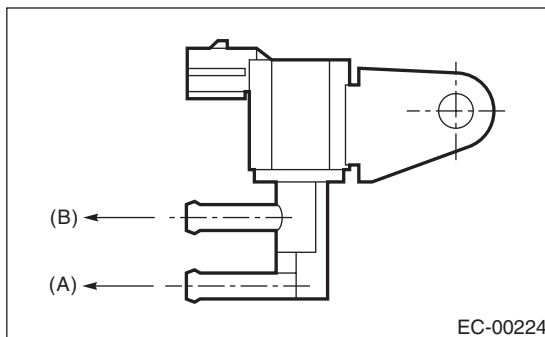
Tightening torque:

19 N·m (1.9 kgf-m, 14.0 ft-lb)



NOTE:

Connect the evaporation hose as shown in the figure.



(A) To fuel pipe (evaporation line)

(B) To intake manifold

C: INSPECTION

Make sure the hoses are not cracked or loose.

Fuel Level Sensor

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

7. Fuel Level Sensor

A: REMOVAL

Refer to the "FU" section for removal procedure.
<Ref. to FU(H4SO)-54, REMOVAL, Fuel Level Sensor.>

B: INSTALLATION

Refer to the "FU" section for installation procedure.
<Ref. to FU(H4SO)-54, INSTALLATION, Fuel Level Sensor.>

Fuel Temperature Sensor

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

8. Fuel Temperature Sensor

A: REMOVAL

The fuel temperature sensor and fuel level sensor are integrated into one unit; therefore, refer to "Fuel Level Sensor" for removal procedure. <Ref. to FU(H4SO)-54, REMOVAL, Fuel Level Sensor.>

B: INSTALLATION

The fuel temperature sensor is integrated into fuel level sensor as one unit; therefore, refer to "Fuel Level Sensor" for installation procedure. <Ref. to FU(H4SO)-54, INSTALLATION, Fuel Level Sensor.>

Fuel Sub Level Sensor

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

9. Fuel Sub Level Sensor

A: REMOVAL

Refer to the "FU" section for removal procedure.
<Ref. to FU(H4SO)-55, REMOVAL, Fuel Sub Level Sensor.>

B: INSTALLATION

Refer to the "FU" section for installation procedure.
<Ref. to FU(H4SO)-55, INSTALLATION, Fuel Sub Level Sensor.>

Fuel Tank Pressure Sensor

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

10. Fuel Tank Pressure Sensor

A: REMOVAL

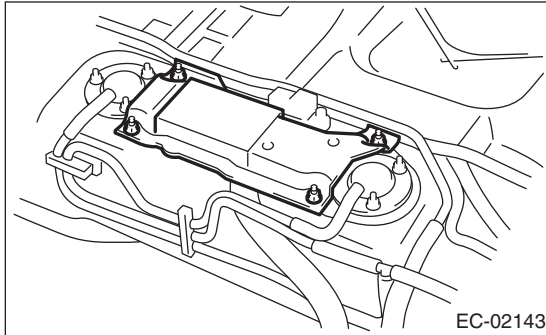
WARNING:

Place "NO FIRE" signs near the working area.

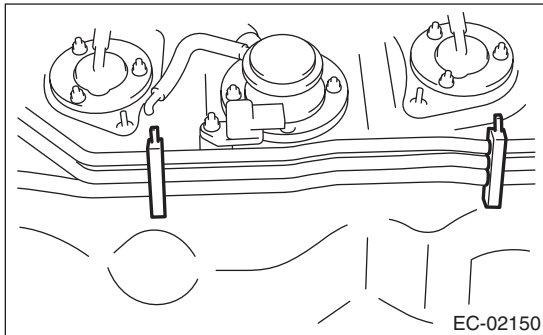
CAUTION:

Be careful not to spill fuel.

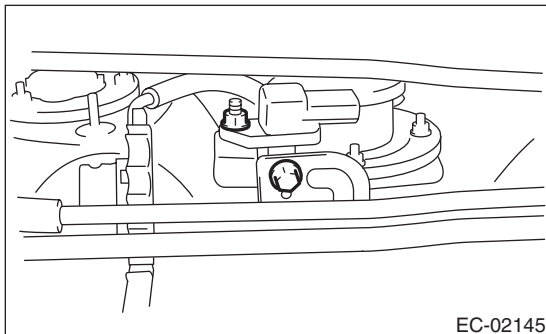
- 1) Remove the fuel tank. <Ref. to FU(H4SO)-45, REMOVAL, Fuel Tank.>
- 2) Remove the protect cover.



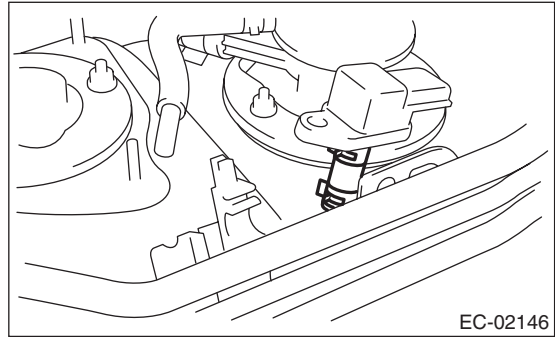
- 3) Disconnect the connector from the fuel tank pressure sensor.
- 4) Remove the clip which holds the fuel pipe to the fuel tank.



- 5) Remove the bolt and nut which secures the fuel tank pressure sensor to the bracket.



- 6) Disconnect the pressure hose from the fuel tank pressure sensor.

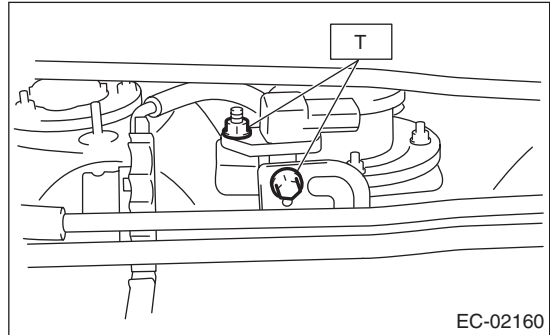


B: INSTALLATION

Install in the reverse order of removal.

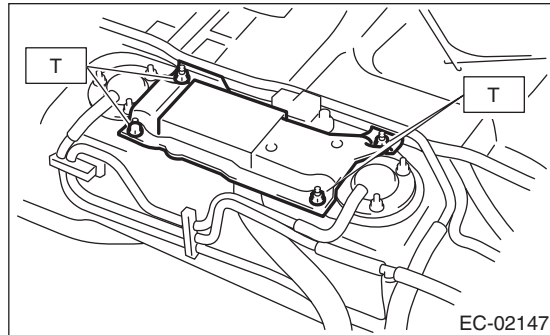
Tightening torque:

7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



C: INSPECTION

Make sure the hoses are not cracked or loose.

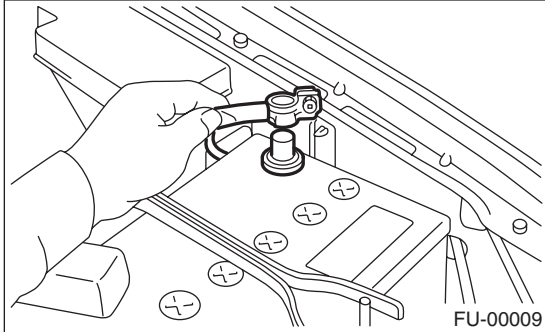
Pressure Control Solenoid Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

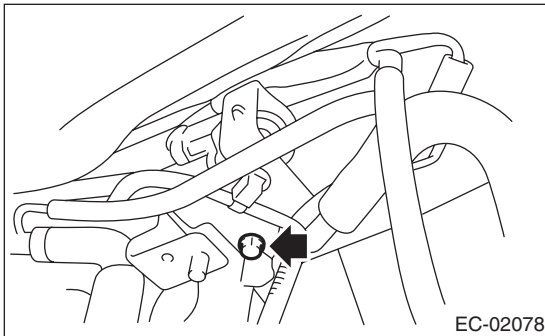
11. Pressure Control Solenoid Valve

A: REMOVAL

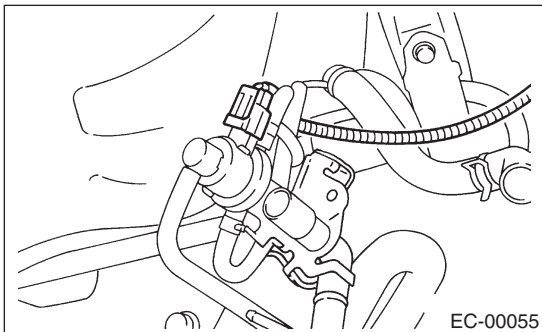
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.



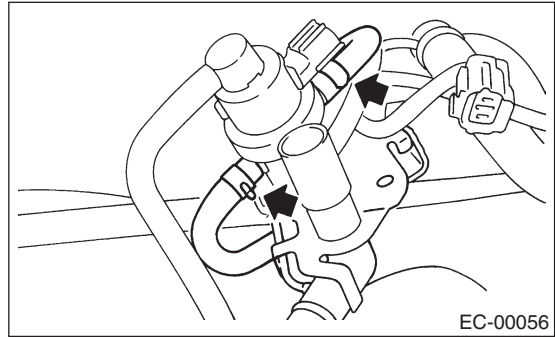
- 3) Lift-up the vehicle.
- 4) Remove the canisters. <Ref. to EC(H4SO)-6, REMOVAL, Canister.>
- 5) Remove the bolt which installs the pressure control solenoid valve holding bracket to the body.



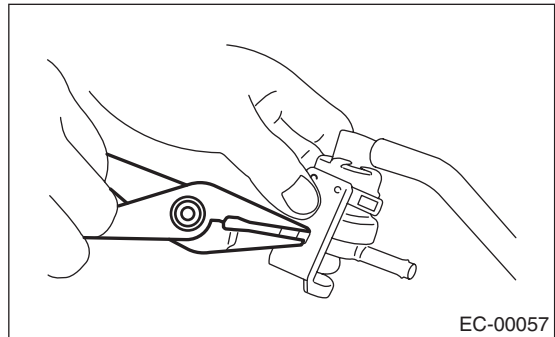
- 6) Remove the pressure control solenoid valve and the bracket as a unit.
- 7) Disconnect the connector from the pressure control solenoid valve.



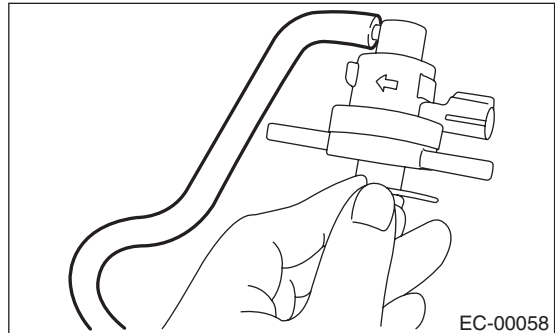
- 8) Disconnect the two evaporation hoses from the pressure control solenoid valve.



- 9) Remove the pressure control solenoid valve from the bracket.



- 10) Disconnect the hose from the pressure control solenoid valve.



Pressure Control Solenoid Valve

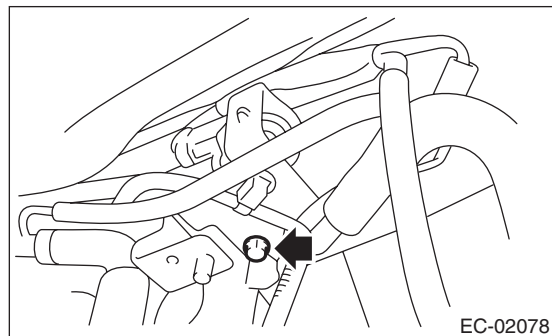
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

25 N·m (2.5 kgf-m, 18.4 ft-lb)



C: INSPECTION

Make sure the hoses are not cracked or loose.

Drain Filter

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

12.Drain Filter

A: SPECIFICATION

The drain filter is embedded in the canister and therefore cannot be disassembled.

Vent Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

13.Vent Valve

A: REMOVAL

WARNING:

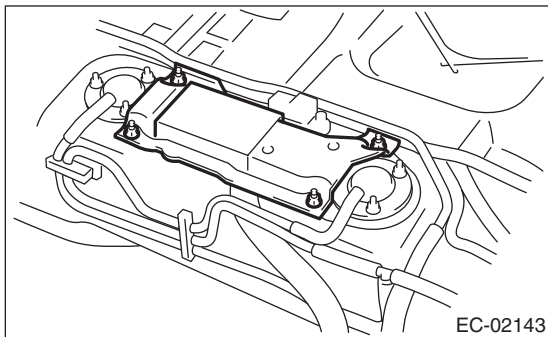
Place "NO FIRE" signs near the working area.

CAUTION:

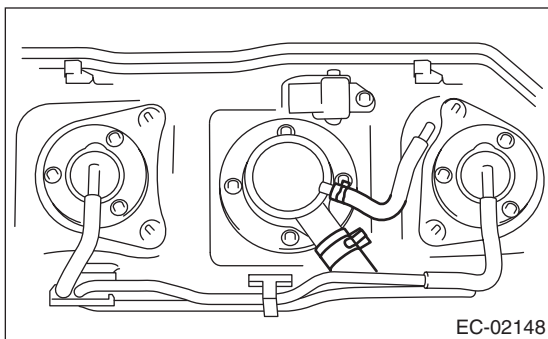
Be careful not to spill fuel.

1) Remove the fuel tank. <Ref. to FU(H4SO)-45, REMOVAL, Fuel Tank.>

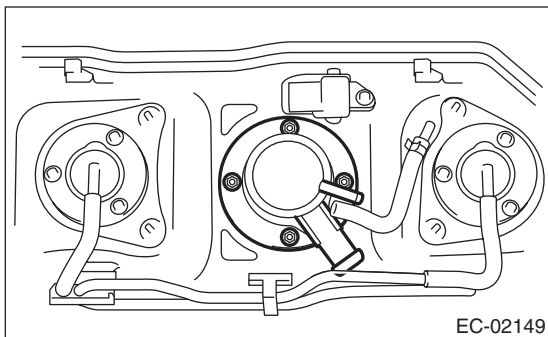
2) Remove the protect cover.



3) Remove the clip and disconnect the hose from the vent valve.



4) Remove the nut and then remove the vent valve.



B: INSTALLATION

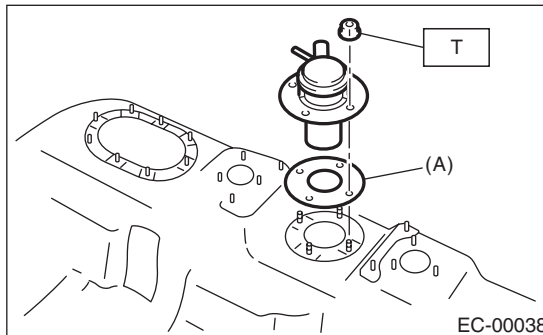
Install in the reverse order of removal.

NOTE:

Use a new gasket.

Tightening torque:

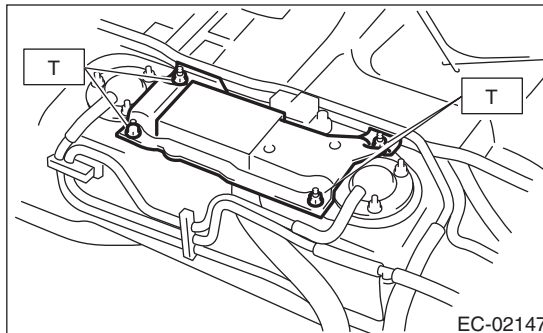
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



(A) Gasket

Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



C: INSPECTION

Make sure the hoses are not cracked or loose.

Shut Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

14. Shut Valve

A: REMOVAL

WARNING:

Place "NO FIRE" signs near the working area.

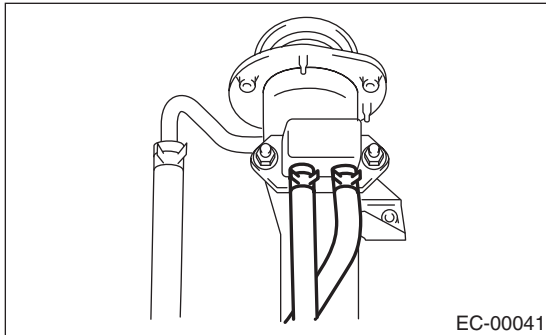
CAUTION:

Be careful not to spill fuel.

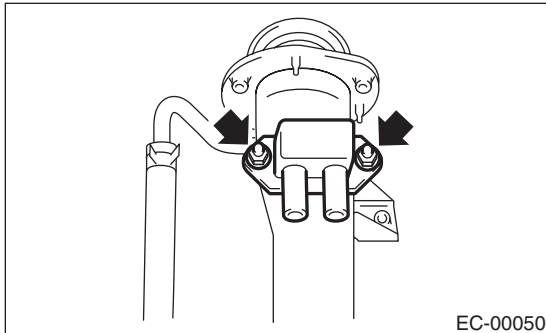
1) Remove the fuel filler pipe.

<Ref. to FU(H4SO)-48, REMOVAL, Fuel Filler Pipe.>

2) Disconnect the evaporation hose from the shut valve.



3) Remove the shut valve from the fuel filler pipe.

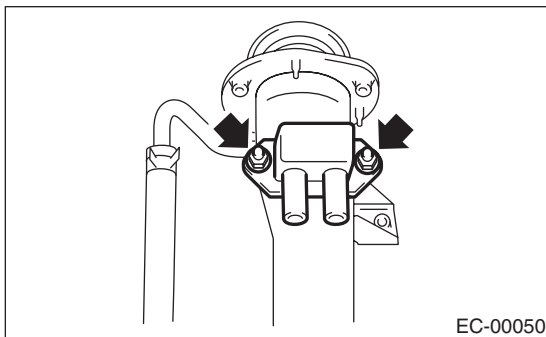


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

4.5 N·m (0.46 kgf-m, 3.3 ft-lb)



C: INSPECTION

Make sure the hoses are not cracked or loose.

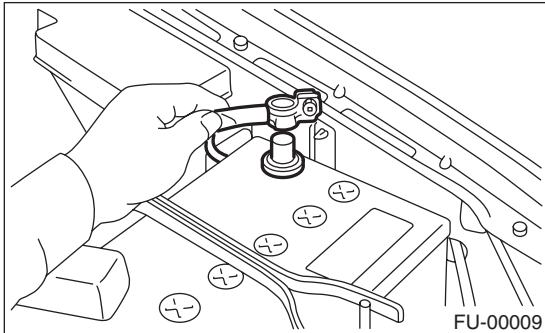
Drain Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

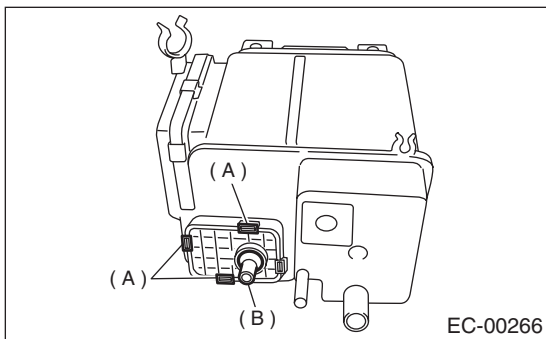
15. Drain Valve

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.



- 3) Lift-up the vehicle.
- 4) Remove the canisters. <Ref. to EC(H4SO)-6, REMOVAL, Canister.>
- 5) Disengage the clip (A), then remove the drain valve (B) from the canister.

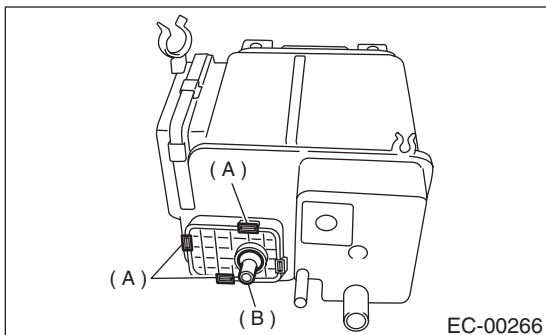


B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Replace clip (A) with a new part.



C: INSPECTION

- 1) Make sure that all hoses are properly connected.
- 2) Make sure the hoses are not cracked or loose.

PCV Hose Assembly

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

16.PCV Hose Assembly

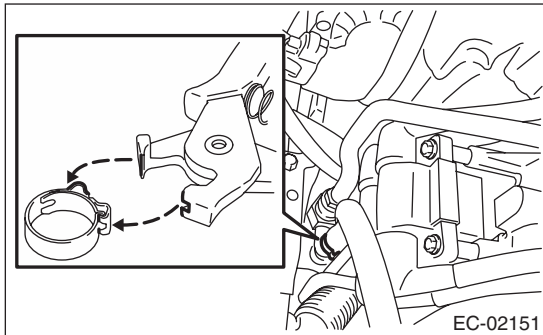
A: REMOVAL

CAUTION:

Do not remove PCV hose assembly except when the PCV hose, diagnostics connector and PCV valve are damaged.

- 1) Remove the air intake chamber.
<Ref. to IN (H4SO)-6, REMOVAL, Air Intake Chamber.>
- 2) Fit the depression in the ST with the protrusion on the clamp to unlock.
- 3) Remove the PCV hose assembly.

ST 18353AA000 CLAMP PLIERS



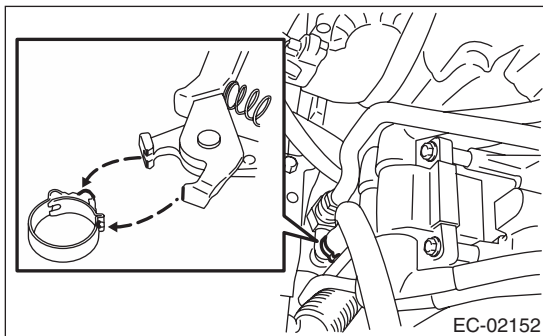
B: INSTALLATION

NOTE:

Replace the clamp with a new part.

- 1) Install the PCV hose assembly, then lock by fitting the ST on the clamp protrusion.

ST 18353AA000 CLAMP PLIERS



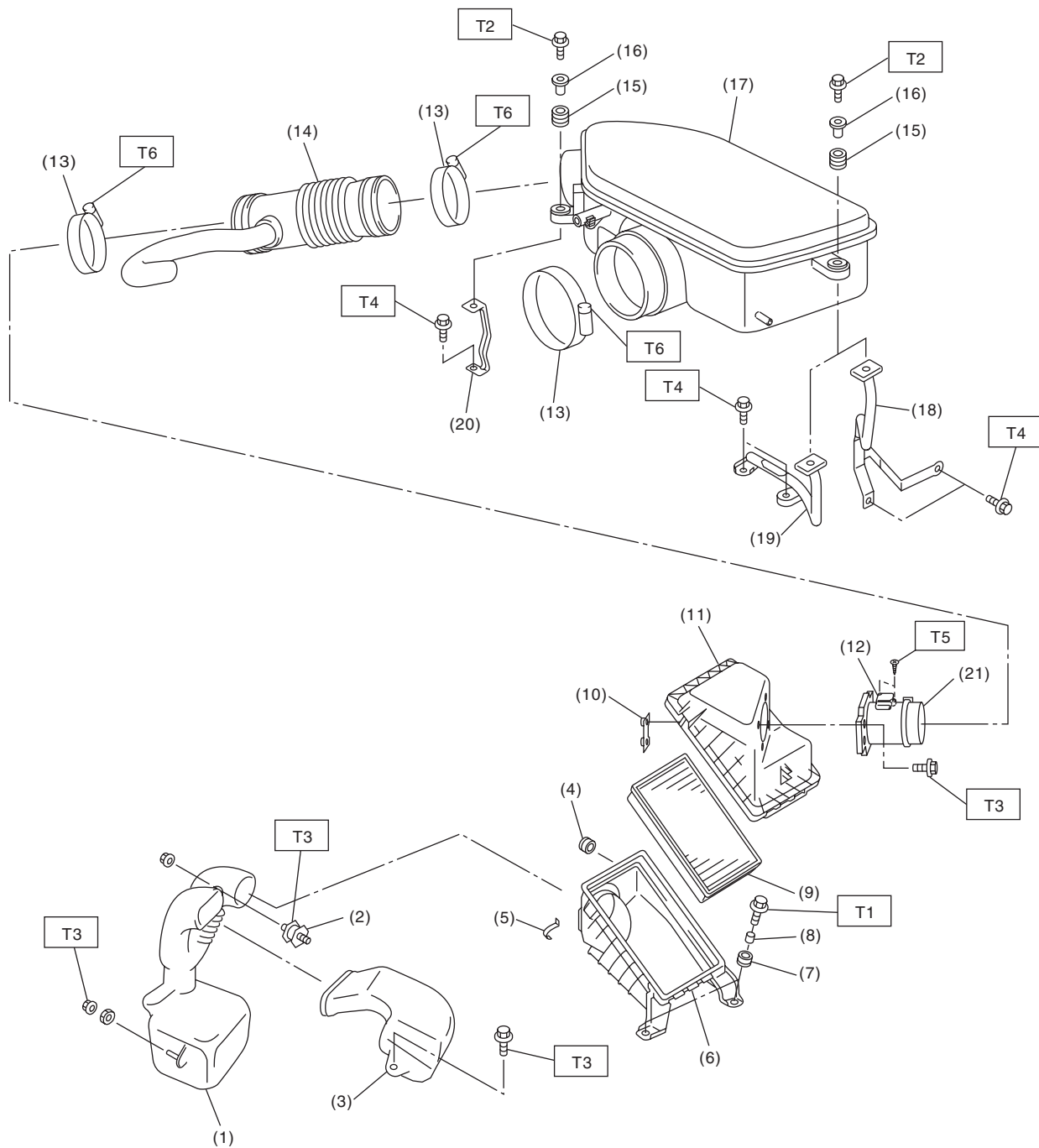
- 2) Install the air intake chamber.
<Ref. to IN (H4SO)-6, INSTALLATION, Air Intake Chamber.>

General Description

INTAKE (INDUCTION)

1. General Description

A: COMPONENT



IN-02202

IN (H4SO)-2

General Description

INTAKE (INDUCTION)

(1) Resonator chamber	(11) Air cleaner upper cover (with a HC adsorption filter: U5 model)	(20) Stay RH
(2) Cushion		(21) Duct
(3) Air intake duct	(12) Air flow sensor	
(4) Cushion	(13) Clamp	
(5) Clip	(14) Intake duct	
(6) Air cleaner lower case	(15) Cushion	
(7) Cushion	(16) Spacer	
(8) Spacer	(17) Air intake chamber	
(9) Air cleaner element	(18) Stay LH (MT model)	
(10) Guide	(19) Stay LH (AT model)	

Tightening torque: N·m (kgf·m, ft·lb)

T1: 33 (3.4, 24.6)

T2: 6.5 (0.66, 4.8)

T3: 7.5 (0.76, 5.5)

T4: 16 (1.6, 11.6)

T5: 1.0 (0.10, 0.7)

T6: 3.0 (0.3, 2.1)

B: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from the battery.

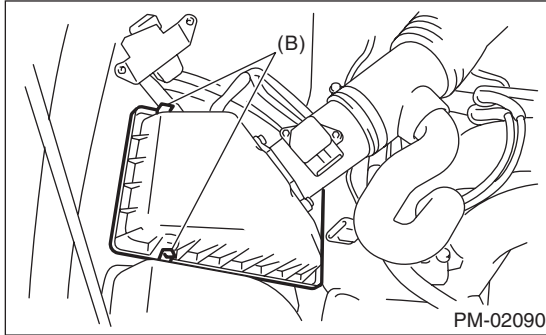
Air Cleaner Element

INTAKE (INDUCTION)

2. Air Cleaner Element

A: REMOVAL

1) Remove the clips (B) on air cleaner case.



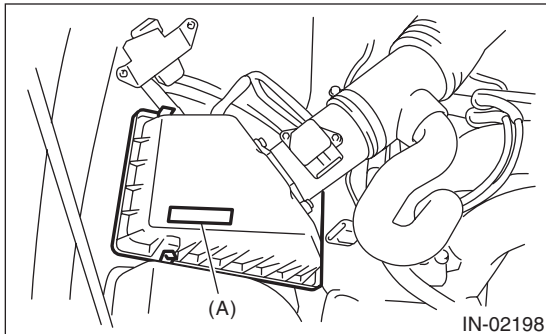
2) Remove the air cleaner element.

B: INSTALLATION

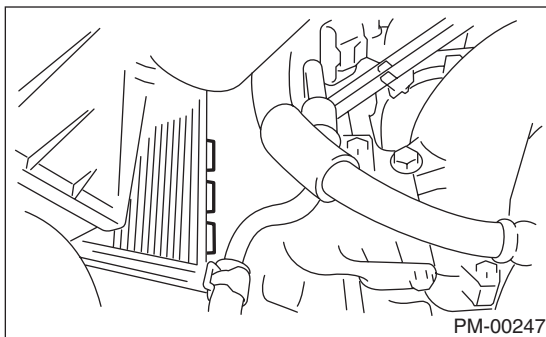
Install in the reverse order of removal.

NOTE:

- The air cleaner element differs depending on the destination market. For the specification of U5 model, refer to the NOTE (A) on the upper side of air cleaner upper cover.



- Fasten with a clip after inserting the lower tab of case.



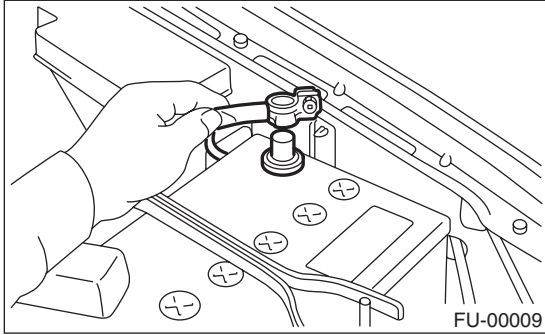
C: INSPECTION

- 1) Replace with a new part if the air cleaner element is extremely damaged or dirty.
- 2) Replace the air cleaner upper cover when the HC adsorption filter is damaged. (U5 model)

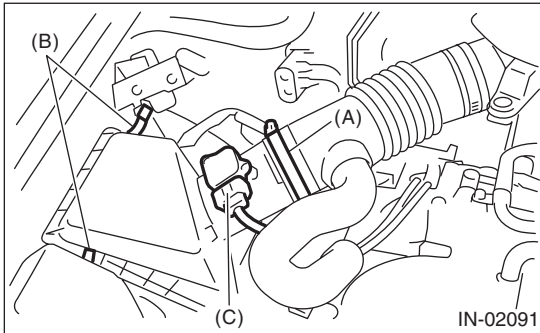
3. Air Cleaner Case

A: REMOVAL

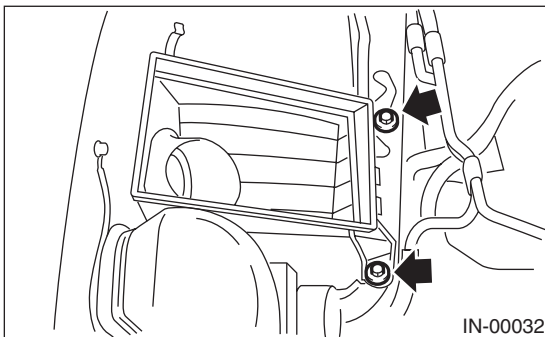
- 1) Disconnect the ground cable from the battery.



- 2) Loosen the clamps (A) which connect the air cleaner case and the intake duct.
- 3) Remove the clips (B) from air cleaner case.
- 4) Disconnect the connector (C) from mass air flow and intake air temperature sensor.



- 5) Remove the intake duct and upper cover from air cleaner case.
- 6) Remove the air cleaner element.
- 7) Remove the bolts which install air cleaner case to vehicle body.



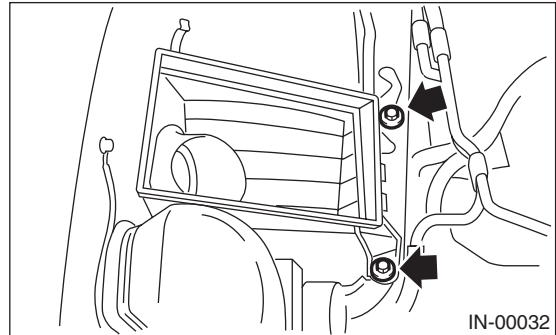
- 8) Remove the air cleaner case.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

33 N·m (3.4 kgf-m, 24.6 ft-lb)



C: INSPECTION

- 1) Check for cracks or loose connection.
- 2) Replace the air cleaner upper cover when the duct is damaged. (U5 model)

NOTE:

Do not remove the duct as it cannot be reinstalled. (U5 model)

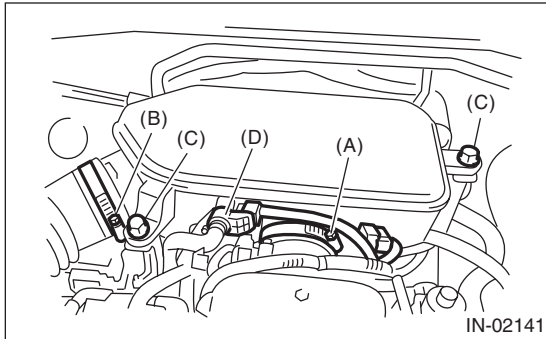
Air Intake Chamber

INTAKE (INDUCTION)

4. Air Intake Chamber

A: REMOVAL

- 1) Loosen the clamp (A) which connects air intake chamber to throttle body.
- 2) Loosen the clamp (B) which connects the duct to air intake chamber.
- 3) Remove the bolt (C) which secures air intake chamber to the stay.
- 4) Disconnect the connector (D).



- 5) Disconnect the blow-by hoses, and then remove air intake chamber.

B: INSTALLATION

Install in the reverse order of removal.

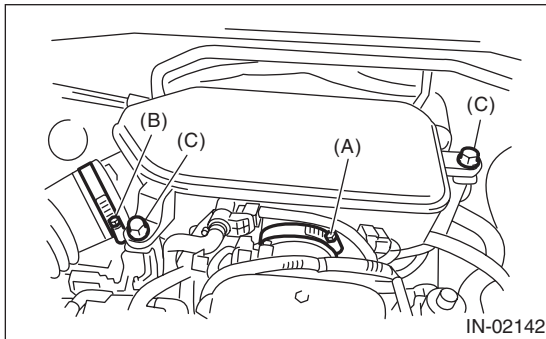
Tightening torque:

Clamp (A), (B)

3.0 N·m (0.3 kgf-m, 2.1 ft-lb)

Bolt (C)

6.5 N·m (0.66 kgf-m, 4.8 ft-lb)



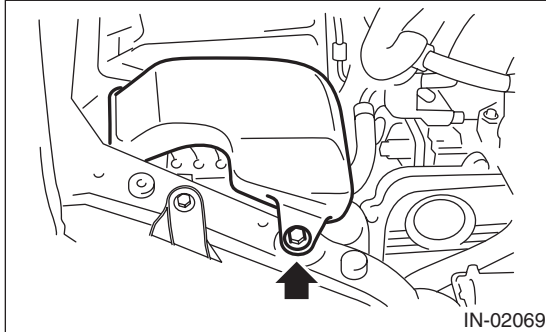
C: INSPECTION

- 1) Check for cracks or loose connection.
- 2) Inspect that no foreign objects are mixed in the air intake chamber.

5. Air Intake Duct

A: REMOVAL

- 1) Remove the bolts which install the air intake duct on the front side of body.
- 2) Remove the air intake duct.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

C: INSPECTION

- 1) Check for cracks or loose connection.
- 2) Inspect that no foreign objects in the air intake duct.

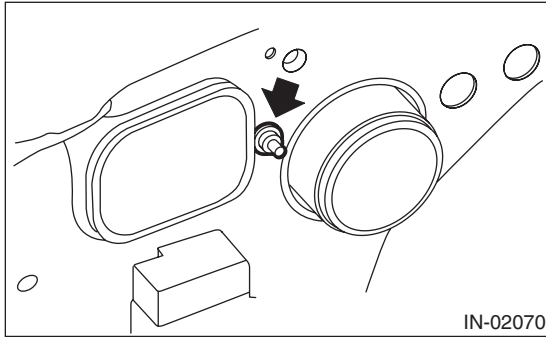
Resonator Chamber

INTAKE (INDUCTION)

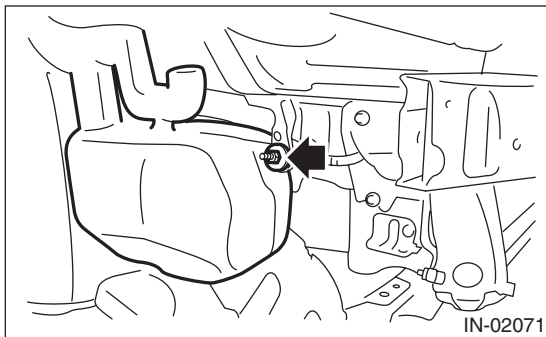
6. Resonator Chamber

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Remove the air intake duct.
- 3) Remove the air cleaner lower case.
<Ref. to IN (H4SO)-5, REMOVAL, Air Cleaner Case.>
- 4) Remove the resonator chamber attaching bolts on the right side of the engine room.



- 5) Remove the front wheel RH, and lift-up the vehicle.
- 6) Remove the front mudguard RH.
- 7) Remove the resonator chamber from the inside front fender.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

C: INSPECTION

- 1) Check for cracks or loose connection.
- 2) Check that no foreign objects are mixed in the resonator.

General Description

MECHANICAL

1. General Description

A: SPECIFICATION

		Model	2.5 L		
Engine	Cylinder arrangement		Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine		
	Valve system mechanism		Belt driven Single overhead camshaft 4-valve/cylinder		
	Bore × Stroke		mm (in)	99.5 × 79.0 (3.917 × 3.110)	
	Displacement		cm ³ (cu in)	2,457 (150)	
	Compression ratio			10.0	
	Compression pressure (at 350 rpm)		kPa (kg/cm ² , psi)	1,020 — 1,275 (10.4 — 13.0, 148 — 185)	
	Number of piston rings			Pressure ring: 2, Oil ring: 1	
	Intake valve timing		Constant	Open	BTDC 0°
				Close	ABDC 58°
			Low speed	Open	BTDC 0°
				Close	ABDC -50°
			High speed	Open	BTDC 14°
				Close	ABDC 62°
	Exhaust valve timing		Open	BBDC 54°	
			Close	ATDC 14°	
	Valve clearance		mm (in)	Intake	0.20±0.04 (0.0079±0.0016)
				Exhaust	0.25±0.04 (0.0098±0.0016)
	Idling speed [at neutral position on MT, or "P" or "N" position on AT]		rpm	MT	650±100 (No load) 850±100 (A/C ON)
AT				700±100 (No load) 850±100 (A/C ON)	
Ignition order			1 → 3 → 2 → 4		
Ignition timing		BTDC/rpm	MT	10°±8°/650	
			AT	15°±8°/700	

General Description

MECHANICAL

NOTE:

US: undersize OS: oversize

Belt tension adjuster	Protrusion of adjuster rod		mm (in)	5.2 — 6.2 (0.205 — 0.244)			
Belt tensioner	Spacer O.D.		mm (in)	17.955 — 17.975 (0.7069 — 0.7077)			
	Tensioner bushing I.D.		mm (in)	18.00 — 18.08 (0.7087 — 0.7118)			
	Clearance between spacer and bushing	mm (in)	Standard	0.025 — 0.125 (0.0010 — 0.0049)			
			Limit	0.175 (0.0069)			
	Side clearance of spacer	mm (in)	Standard	0.20 — 0.55 (0.0079 — 0.0217)			
Limit			0.81 (0.0319)				
Valve rocker arm	Clearance between shaft and arm		mm (in)	Standard	0.020 — 0.054 (0.0008 — 0.0021)		
				Limit	0.10 (0.0039)		
Camshaft	Bending limit		mm (in)	0.025 (0.0010)			
	Thrust clearance		mm (in)	Standard	0.030 — 0.090 (0.0012 — 0.0035)		
				Limit	0.10 (0.0039)		
	Cam lobe height	mm (in)	Intake	Constant	Standard	40.075 — 40.175 (1.5778 — 1.5817)	
					Limit	39.975 (1.5738)	
				Low speed	Standard	35.182 — 35.282 (1.3851 — 1.3891)	
			Limit		35.082 (1.3812)		
			Exhaust	mm (in)	High speed	Standard	40.315 — 40.415 (1.5872 — 1.5911)
						Limit	40.215 (1.5833)
	Camshaft journal O.D.		mm (in)	31.928 — 31.945 (1.2570 — 1.2577)			
	Camshaft journal hole I.D.		mm (in)	32.000 — 32.018 (1.2598 — 1.2605)			
	Oil clearance		mm (in)	Standard	0.055 — 0.090 (0.0022 — 0.0035)		
Limit				0.10 (0.0039)			
Cylinder head	Surface warpage limit (Mating surface with cylinder block)		mm (in)	0.03 (0.001)			
	Grinding limit		mm (in)	0.1 (0.004)			
	Standard height		mm (in)	97.5 (3.84)			
Valve seat	Seating angle			90°			
	Contacting width	mm (in)	Intake	Standard	0.8 — 1.4 (0.03 — 0.055)		
				Limit	1.7 (0.067)		
			Exhaust	Standard	1.2 — 1.8 (0.047 — 0.071)		
Limit				2.2 (0.087)			
Valve guide	Inside diameter		mm (in)	6.000 — 6.012 (0.2362 — 0.2367)			
	Protrusion above head		mm (in)	Intake	20.0 — 21.0 (0.787 — 0.827)		
				Exhaust	16.5 — 17.5 (0.650 — 0.689)		
Valve	Head edge thickness	mm (in)	Intake	Standard	0.8 — 1.2 (0.03 — 0.047)		
				Limit	0.6 (0.024)		
			Exhaust	Standard	1.0 — 1.4 (0.039 — 0.055)		
				Limit	0.6 (0.024)		
	Stem outer diameter		mm (in)	Intake	5.950 — 5.965 (0.2343 — 0.2348)		
				Exhaust	5.945 — 5.960 (0.2341 — 0.2346)		
	Valve stem gap	mm (in)	Standard	Intake	0.035 — 0.062 (0.0014 — 0.0024)		
				Exhaust	0.040 — 0.067 (0.0016 — 0.0026)		
		Limit	—	0.15 (0.0059)			
Overall length		mm (in)	Intake	120.6 (4.75)			
			Exhaust	121.7 (4.79)			

General Description

MECHANICAL

Valve spring	Free length		mm (in)	55.2 (2.173)		
	Squareness			2.5°, 2.4 mm (0.094 in) or less		
	Tension/ spring height	N (kgf, lb)/mm (in)	Set	235.3 — 270.7 (24 — 27.6, 52.9 — 60.8)/45.0 (1.772)		
			Lift	578.9 — 639.9 (59.1 — 65.3, 130.3 — 143.9)/34.7 (1.366)		
Cylinder block	Surface warpage limit (mating with cylinder head)		mm (in)	0.025 (0.00098)		
	Grinding limit		mm (in)	0.1 (0.004)		
	Standard height		mm (in)	201.0 (7.91)		
	Cylinder inner diameter	mm (in)	Standard	A	99.505 — 99.515 (3.9175 — 3.9179)	
				B	99.495 — 99.505 (3.9171 — 3.9175)	
	Taper	mm (in)		Standard	0.015 (0.0006)	
				Limit	0.050 (0.0020)	
	Out-of-roundness	mm (in)		Standard	0.010 (0.0004)	
				Limit	0.050 (0.0020)	
	Piston clearance	mm (in)		Standard	-0.010 — 0.010 (-0.00039 — 0.00039)	
Limit				0.030 (0.0012)		
Cylinder inner boring limit (diameter)		mm (in)	To 100.005 (3.9372)			
Piston	Outer diameter	mm (in)	Standard	A	99.505 — 99.515 (3.9175 — 3.9179)	
				B	99.495 — 99.505 (3.9171 — 3.9175)	
			0.25 (0.0098) OS			99.745 — 99.765 (3.9270 — 3.9278)
			0.50 (0.0197) OS			99.995 — 100.015 (3.9368 — 3.9376)
Piston pin specified diameter		mm (in)	23.000 — 23.006 (0.9055 — 0.9057)			
Piston pin	Outer diameter		mm (in)	22.994 — 23.000 (0.9053 — 0.9055)		
	Clearance between piston and piston pin:	mm (in)	Standard	0.004 — 0.008 (0.0002 — 0.0003)		
			Limit	0.020 (0.0008)		
	Degree of fit			Piston pin must be fitted into position with thumb at 20°C (68°F).		
Piston ring	Ring closed gap	mm (in)	Top ring	Standard	0.20 — 0.35 (0.0079 — 0.0138)	
				Limit	1.0 (0.039)	
			Second ring	Standard	0.37 — 0.52 (0.0144 — 0.0203)	
				Limit	1.0 (0.039)	
	Ring groove gap	mm (in)	Top ring	Standard	0.040 — 0.080 (0.0016 — 0.0031)	
				Limit	0.15 (0.0059)	
			Second ring	Standard	0.030 — 0.070 (0.0012 — 0.0028)	
				Limit	0.15 (0.0059)	
Connecting rod	Bend or twist per 100 mm (3.94 in) in length		mm (in)	Limit	0.10 (0.0039)	
	Side clearance of large end	mm (in)	Standard	0.070 — 0.330 (0.0028 — 0.0130)		
			Limit		0.4 (0.016)	
Bearing of large end	Oil clearance	mm (in)	Standard	0.016 — 0.044 (0.00063 — 0.0017)		
			Limit	0.05 (0.0020)		
	Bearing size (Thickness at center)	mm (in)	Standard	1.492 — 1.501 (0.0587 — 0.0591)		
			0.03 (0.0012) US	1.510 — 1.513 (0.0594 — 0.0596)		
			0.05 (0.0020) US	1.520 — 1.523 (0.0598 — 0.0600)		
			0.25 (0.0098) US	1.620 — 1.623 (0.0638 — 0.0639)		
Bushing of small end	Clearance between piston pin and bushing		mm (in)	Standard	0 — 0.022 (0 — 0.0009)	
				Limit	0.030 (0.0012)	

General Description

MECHANICAL

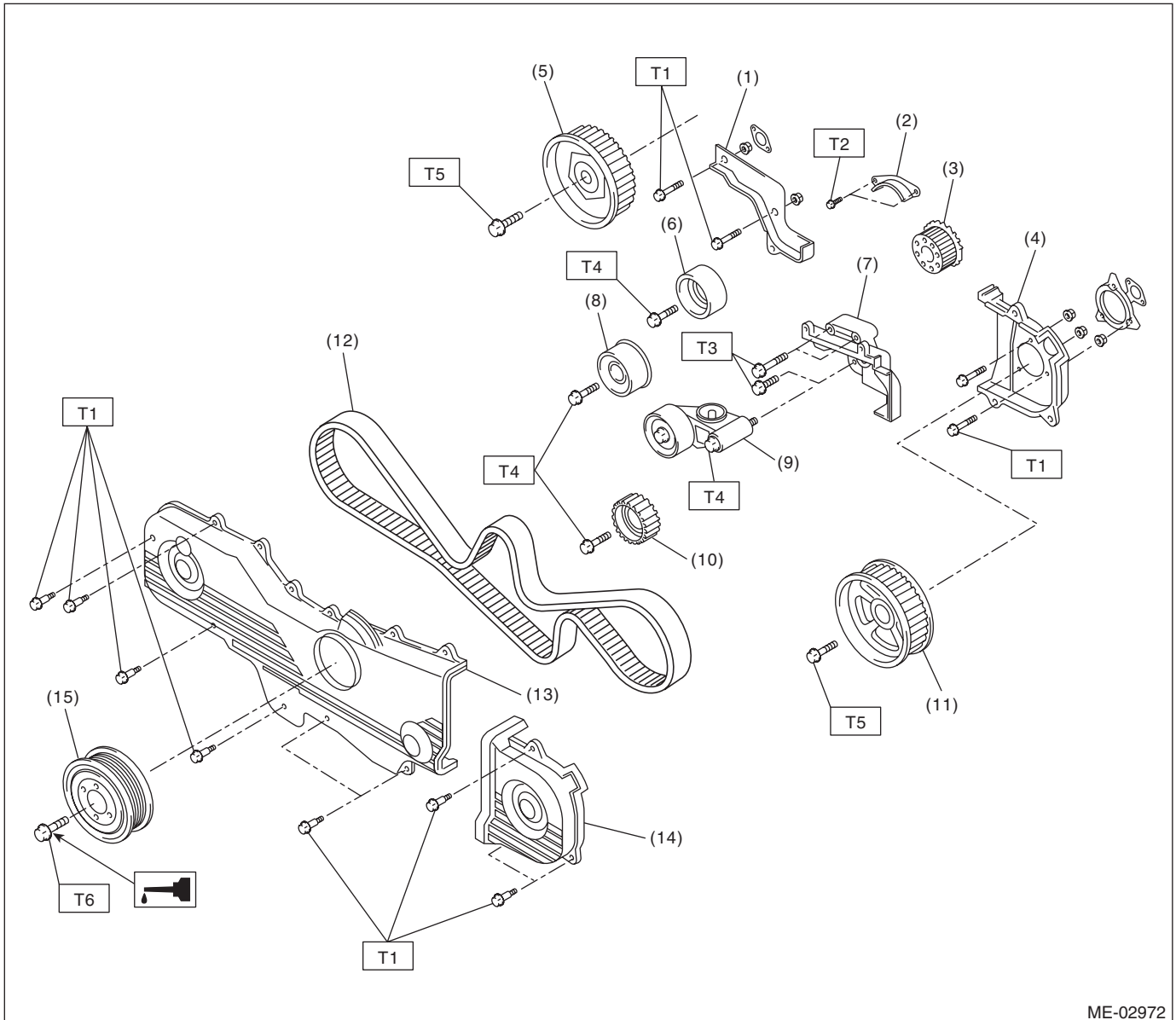
Crankshaft	Bend limit		mm (in)	0.035 (0.0014)		
	Crank pin	Out-of-roundness		mm (in)	0.003 (0.0001)	
		Cylindricality		mm (in)	0.004 (0.0002)	
		Grinding limit (dia.)		mm (in)	To 51.750 (2.0374)	
	Crank journal	Out-of-roundness		mm (in)	0.005 (0.0002)	
		Cylindricality		mm (in)	0.006 (0.0002)	
		Grinding limit (dia.)		mm (in)	To 59.758 (2.3527)	
	Crank pin outer diameter	mm (in)	Standard		51.984 — 52.000 (2.0466 — 2.0472)	
			0.03 (0.0012) US		51.954 — 51.970 (2.0454 — 2.0461)	
			0.05 (0.0020) US		51.934 — 51.950 (2.0446 — 2.0453)	
			0.25 (0.0098) US		51.734 — 51.750 (2.0368 — 2.0374)	
	Crank journal outer diameter	mm (in)	Standard		59.992 — 60.008 (2.3619 — 2.3625)	
			0.03 (0.0012) US		59.962 — 59.978 (2.3607 — 2.3613)	
			0.05 (0.0020) US		59.942 — 59.958 (2.3599 — 2.3605)	
			0.25 (0.0098) US		59.742 — 59.758 (2.3520 — 2.3527)	
	Thrust clearance	mm (in)	Standard		0.030 — 0.115 (0.0012 — 0.0045)	
Limit			0.25 (0.0098)			
Oil clearance	mm (in)	Standard		0.010 — 0.030 (0.0001 — 0.0012)		
		Limit		0.40 (0.016)		
Main bearing	Main bearing	#1, #3	mm (in)		Standard	1.998 — 2.011 (0.0787 — 0.0792)
			0.03 (0.0012) US		2.017 — 2.020 (0.0794 — 0.0795)	
			0.05 (0.0020) US		2.027 — 2.030 (0.0798 — 0.0799)	
			0.25 (0.0098) US		2.127 — 2.130 (0.0837 — 0.0839)	
		#2, #4, #5	mm (in)		Standard	2.000 — 2.013 (0.0787 — 0.0793)
			0.03 (0.0012) US		2.019 — 2.022 (0.0795 — 0.0796)	
			0.05 (0.0020) US		2.029 — 2.032 (0.0799 — 0.0800)	
			0.25 (0.0098) US		2.129 — 2.132 (0.0838 — 0.0839)	

General Description

MECHANICAL

B: COMPONENT

1. TIMING BELT



ME-02972

- | | |
|----------------------------------|--|
| (1) Timing belt cover No. 2 (RH) | (9) Automatic belt tension adjuster ASSY |
| (2) Timing belt guide (MT model) | (10) Belt idler No. 2 |
| (3) Crank sprocket | (11) Cam sprocket No. 2 |
| (4) Timing belt cover No. 2 (LH) | (12) Timing belt |
| (5) Cam sprocket No. 1 | (13) Front timing belt cover |
| (6) Belt idler (No. 1) | (14) Timing belt cover (LH) |
| (7) Tensioner bracket | (15) Crank pulley |
| (8) Belt idler (No. 2) | |

Tightening torque: N-m (kgf-m, ft-lb)

T1: 5 (0.5, 3.6)

T2: 9.75 (1.0, 7.2)

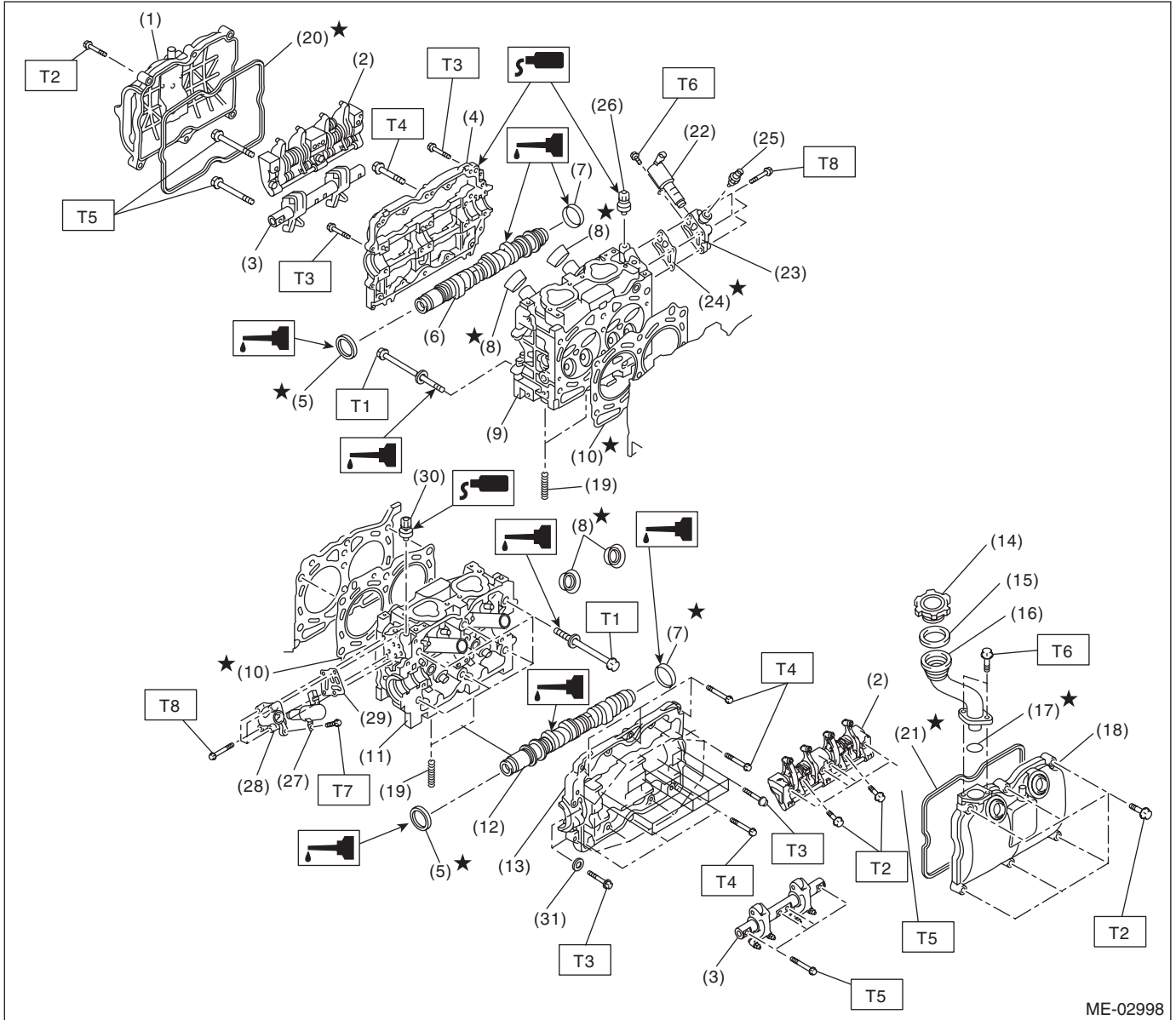
T3: 24.5 (2.5, 18.1)

T4: 39 (4.0, 28.9)

T5: 78 (8.0, 57.9)

T6: <Ref. to ME(H4SO)-42, INSTALLATION, Crank Pulley.>

2. CYLINDER HEAD AND CAMSHAFT

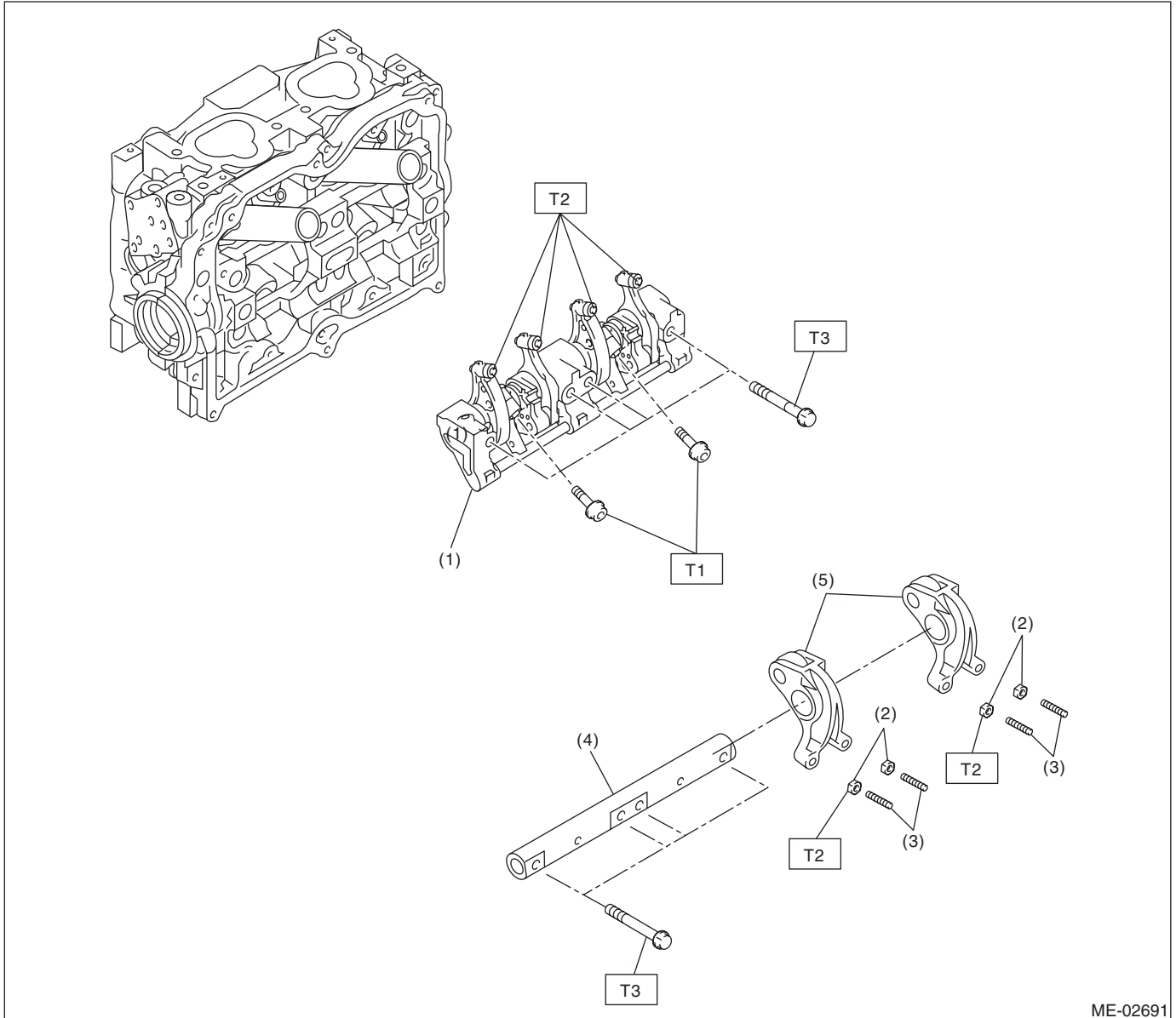


General Description

MECHANICAL

(1) Rocker cover (RH)	(17) O-ring	(30) Variable valve lift diagnosis oil pressure switch (LH)
(2) Intake valve rocker ASSY	(18) Rocker cover (LH)	(31) Seal washer
(3) Exhaust valve rocker ASSY	(19) Stud bolt	
(4) Camshaft cap (RH)	(20) Rocker cover gasket (RH)	
(5) Oil seal	(21) Rocker cover gasket (LH)	<hr/>
(6) Camshaft (RH)	(22) Oil switching solenoid valve (RH)	Tightening torque: N·m (kgf-m, ft-lb)
(7) Plug	(23) Oil switching solenoid valve holder (RH)	T1: <Ref. to ME(H4SO)-58, INSTALLATION, Cylinder Head.>
(8) Spark plug pipe gasket	(24) Gasket	T2: <Ref. to ME(H4SO)-51, INSTALLATION, Valve Rocker Assembly.>
(9) Cylinder head (RH)	(25) Oil temperature sensor	
(10) Cylinder head gasket	(26) Variable valve lift diagnosis oil pressure switch (RH)	T3: 9.75 (1.0, 7.2)
(11) Cylinder head (LH)	(27) Oil switching solenoid valve (LH)	T4: 18 (1.8, 13.0)
(12) Camshaft (LH)	(28) Oil switching solenoid valve holder (LH)	T5: 25 (2.5, 18.1)
(13) Camshaft cap (LH)	(29) Gasket	T6: 6.4 (0.65, 4.7)
(14) Oil filler cap		T7: 8 (0.8, 5.9)
(15) Gasket		T8: 10 (1.0, 7.4)
(16) Oil filler duct		<hr/>

3. VALVE ROCKER ASSEMBLY



ME-02691

- | | |
|----------------------------------|------------------------------|
| (1) Intake valve rocker arm ASSY | (4) Exhaust rocker shaft |
| (2) Valve rocker nut | (5) Exhaust valve rocker arm |
| (3) Valve rocker adjusting screw | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 6 (0.6, 4.3)

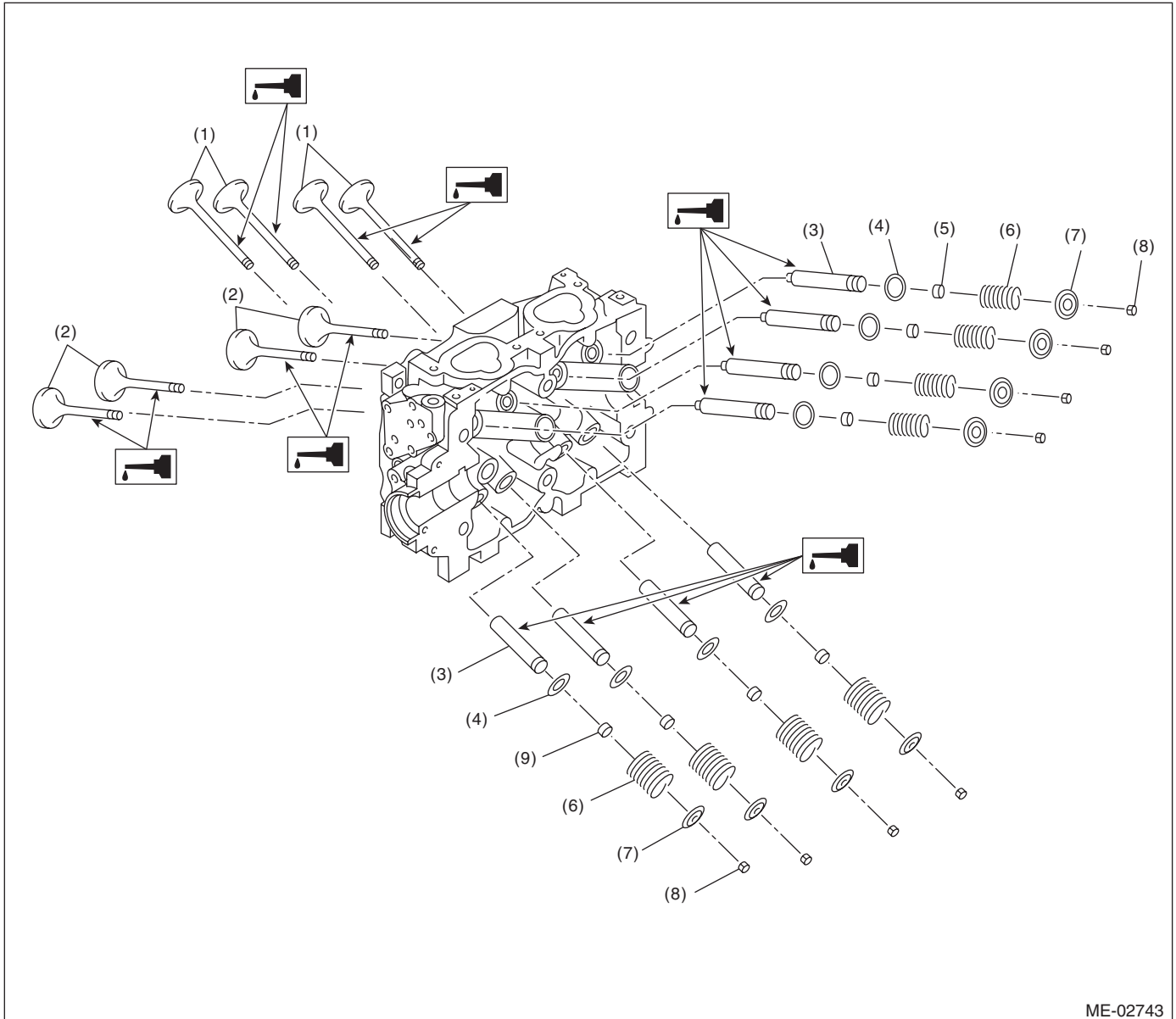
T2: 9.75 (1.0, 7.2)

T3: 25 (2.5, 18.1)

General Description

MECHANICAL

4. CYLINDER HEAD AND VALVE ASSEMBLY

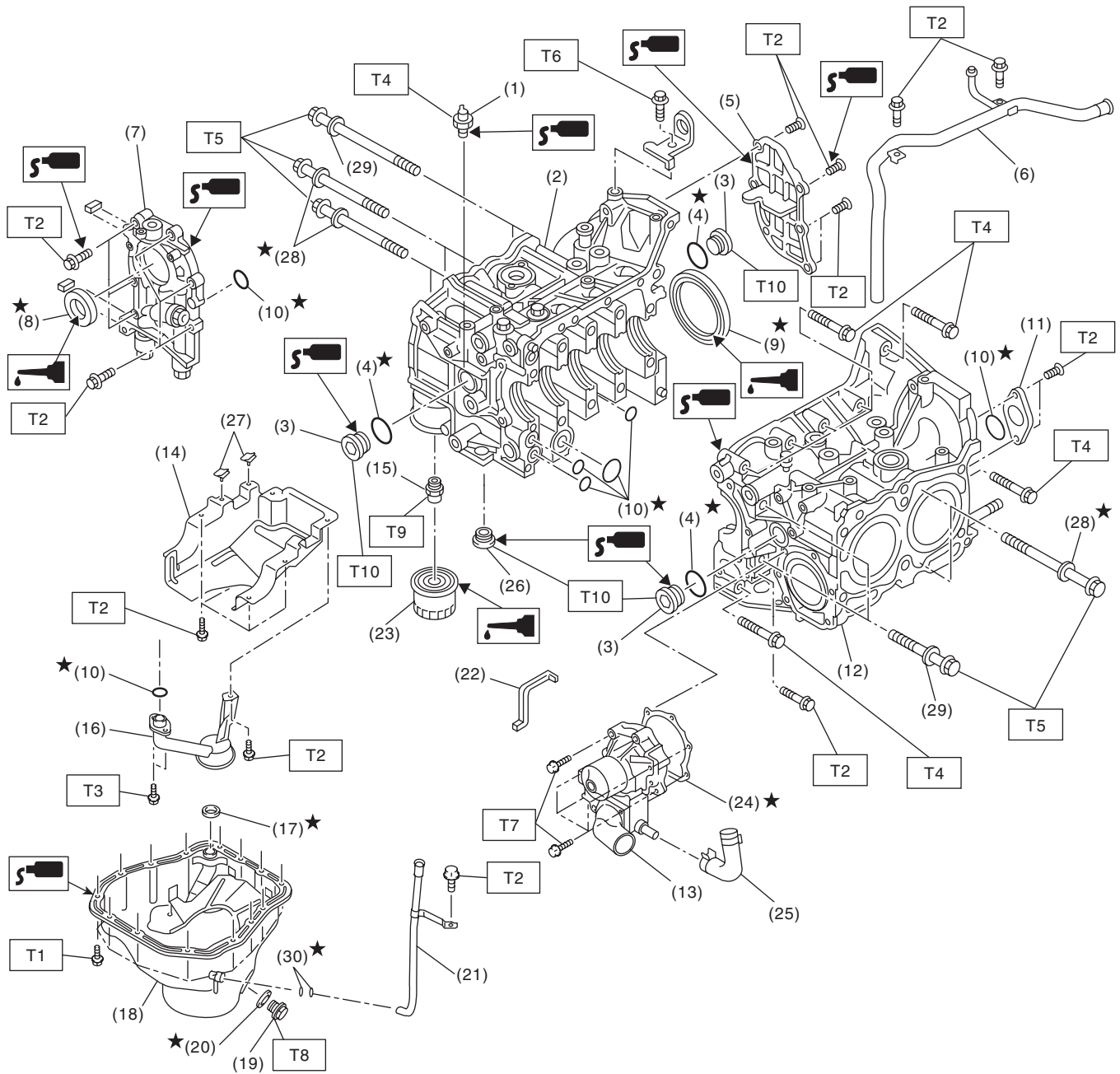


- (1) Exhaust valve
- (2) Intake valve
- (3) Valve guide

- (4) Valve spring seat
- (5) Intake valve oil seal
- (6) Valve spring

- (7) Retainer
- (8) Retainer key
- (9) Exhaust valve oil seal

5. CYLINDER BLOCK



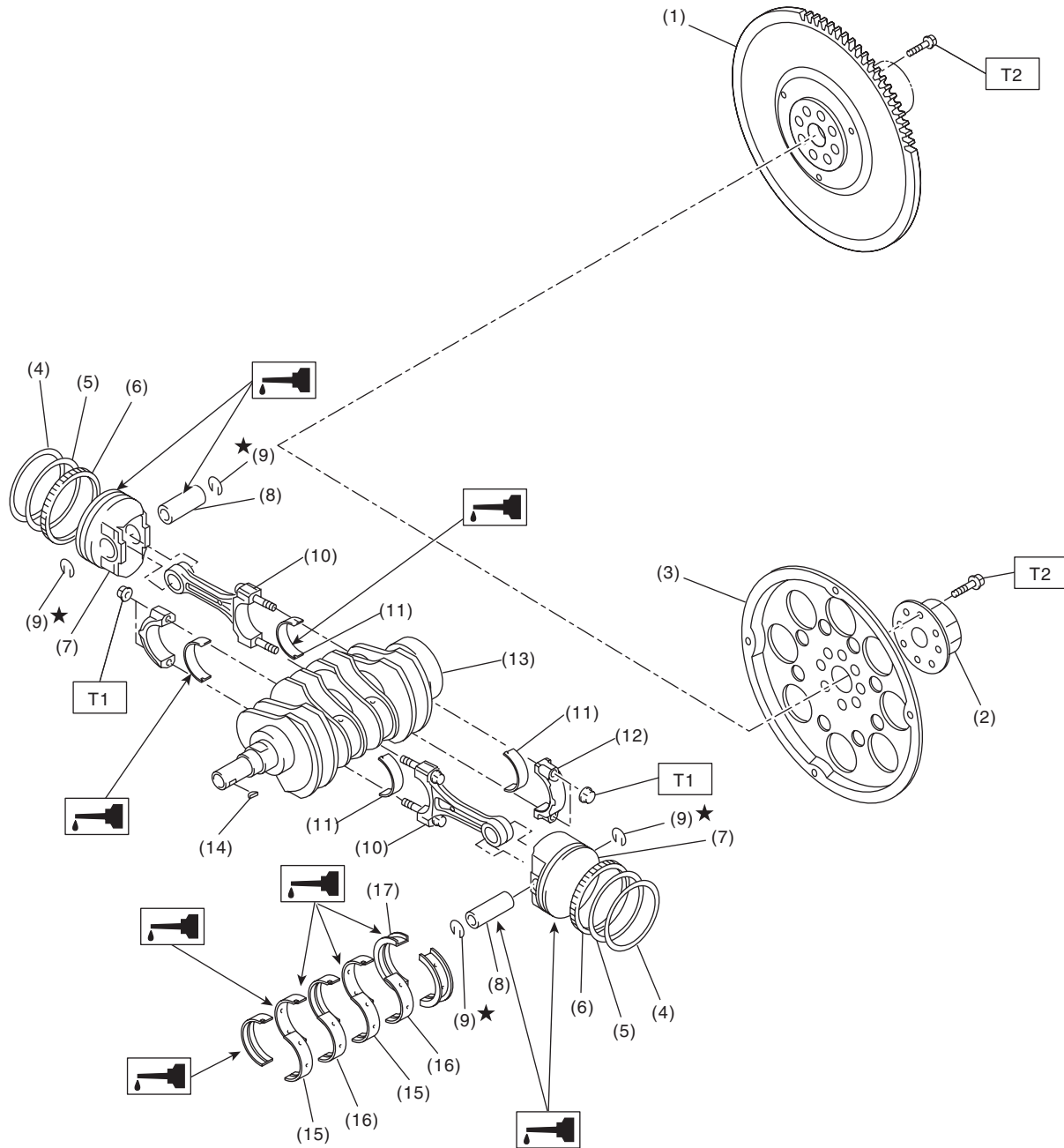
ME-03000

General Description

MECHANICAL

(1) Oil pressure switch	(16) Oil strainer	Tightening torque: N·m (kgf-m, ft-lb)
(2) Cylinder block (RH)	(17) Gasket	T1: 5 (0.5, 3.6)
(3) Service hole plug	(18) Oil pan	T2: 6.4 (0.65, 4.7)
(4) Gasket	(19) Drain plug	T3: 9.75 (1.0, 7.2)
(5) Oil separator cover	(20) Metal gasket	T4: 25 (2.5, 18.1)
(6) Water by-pass pipe	(21) Oil level gauge guide	T5: <Ref. to ME(H4SO)-69, INSTAL-
(7) Oil pump	(22) Water pump sealing	LATION, Cylinder Block.>
(8) Front oil seal	(23) Oil filter	T6: 16 (1.6, 11.6)
(9) Rear oil seal	(24) Gasket	T7: First 12 (1.2, 8.7)
(10) O-ring	(25) Water pump hose	Second 12 (1.2, 8.7)
(11) Service hole cover	(26) Plug	T8: 44 (4.5, 33)
(12) Cylinder block (LH)	(27) Seal	T9: 45 (4.6, 33.3)
(13) Water pump	(28) Seal washer	T10: 70 (7.1, 50.6)
(14) Baffle plate	(29) Washer	
(15) Oil filter connector	(30) O-ring	

6. CRANKSHAFT AND PISTON



ME-02974

- | | | |
|------------------------------|-----------------------------|--------------------------------|
| (1) Flywheel (MT model) | (8) Piston pin | (15) Crankshaft bearing #1, #3 |
| (2) Reinforcement (AT model) | (9) Snap ring | (16) Crankshaft bearing #2, #4 |
| (3) Drive plate (AT model) | (10) Connecting rod | (17) Crankshaft bearing #5 |
| (4) Top ring | (11) Connecting rod bearing | |
| (5) Second ring | (12) Connecting rod cap | |
| (6) Oil ring | (13) Crankshaft | |
| (7) Piston | (14) Woodruff key | |

Tightening torque: N·m (kgf·m, ft·lb)

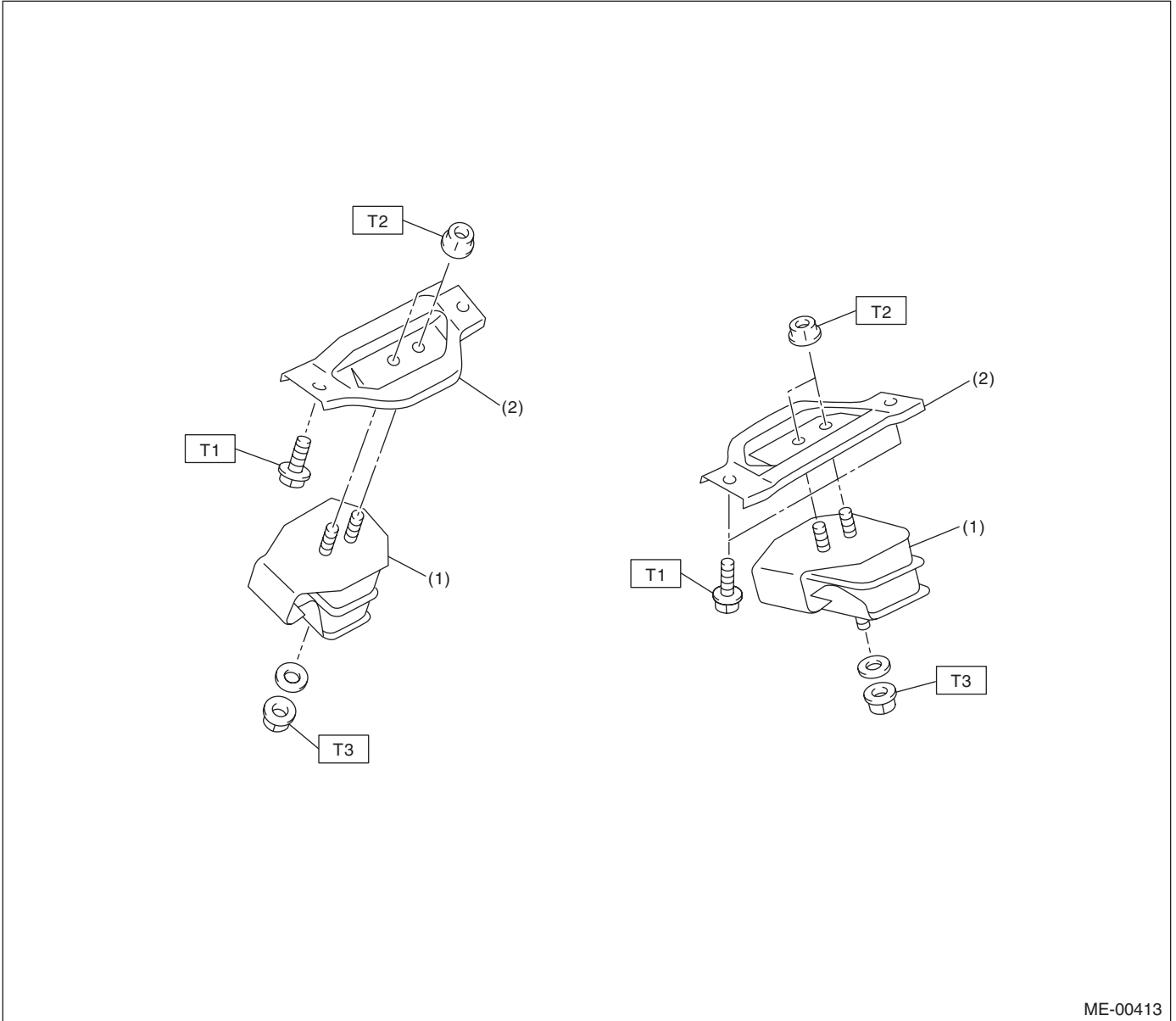
T1: 45 (4.6, 33.3)

T2: 72 (7.3, 52.8)

General Description

MECHANICAL

7. ENGINE MOUNTING



ME-00413

(1) Front cushion rubber

(2) Front engine mounting bracket

Tightening torque: N·m (kgf·m, ft·lb)

T1: 35 (3.6, 25.8)

T2: 42 (4.3, 31.0)

T3: 85 (8.7, 63)

C: CAUTION

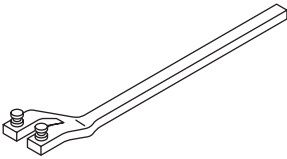
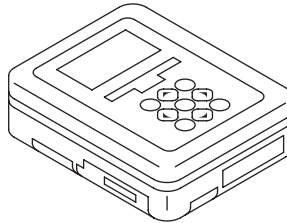
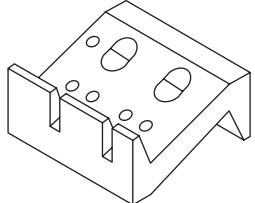
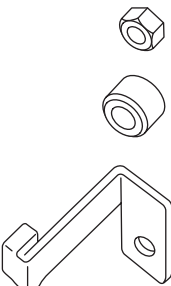
- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from the battery.
- All parts should be thoroughly cleaned, paying special attention to engine oil passages, pistons and bearings.
- Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
- Be careful not to let oil, grease or coolant contact the timing belt, clutch disc and flywheel.
- All removed parts, if to be reused, should be reinstalled in the original positions and directions.
- Bolts, nuts and washers should be replaced with new parts as required.
- Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.
- Remove or install the engine in an area where chain hoists, lifting devices, etc. are available for ready use.
- Be sure not to damage coated surfaces of body panels with tools, or not to stain seats and windows with coolant or oil. Place a cover over fender, as required, for protection.
- Prior to starting work, prepare the following:
Service tools, clean cloth, containers to catch coolant and oil, wire ropes, chain hoist, transmission jacks, etc.
- Lift-up or lower the vehicle when necessary. Make sure to support the correct positions.

General Description

MECHANICAL

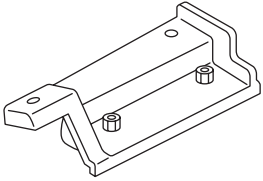
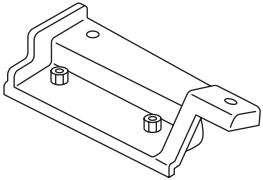
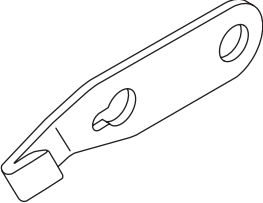
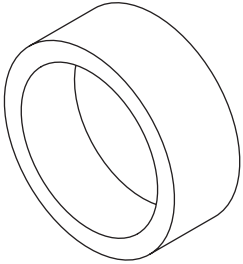
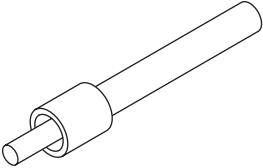
D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST18231AA010</p>	18231AA010	CAM SPROCKET WRENCH	<ul style="list-style-type: none"> Used for removing and installing cam sprocket. (LH side) CAMSHAFT SPROCKET WRENCH (499207100) can also be used.
 <p>ST1B020XU0</p>	1B020XU0	SUBARU SELECT MONITOR KIT	Used for troubleshooting the electrical system.
 <p>ST-498267800</p>	498267800	CYLINDER HEAD TABLE	<ul style="list-style-type: none"> Used for replacing valve guides. Used for removing and installing valve spring.
 <p>ST-498277200</p>	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.

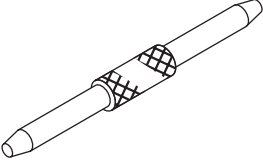
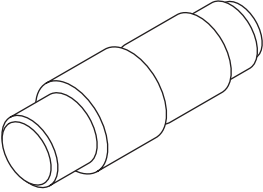
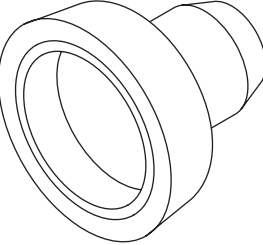
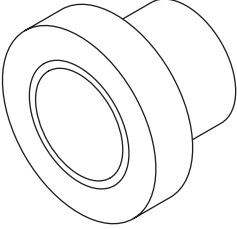
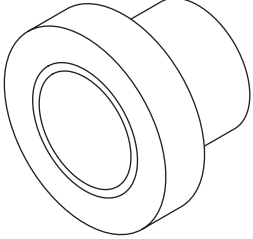
General Description

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST-498457000</p>	498457000	ENGINE STAND ADAPTER RH	Used together with ENGINE STAND (499817100).
 <p>ST-498457100</p>	498457100	ENGINE STAND ADAPTER LH	Used together with ENGINE STAND (499817100).
 <p>ST-498497100</p>	498497100	CRANKSHAFT STOPPER	Used for removing and installing the flywheel and the drive plate.
 <p>ST-498747300</p>	498747300	PISTON GUIDE	Used for installing piston in cylinder.
 <p>ST-498857100</p>	498857100	VALVE OIL SEAL GUIDE	Used for press-fitting of intake and exhaust valve guide oil seals.

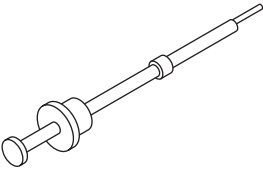
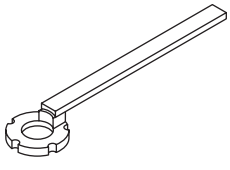
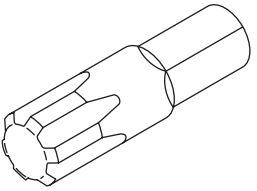
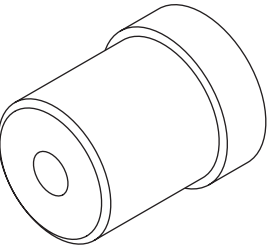
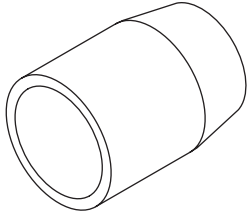
General Description

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-499017100</p>	499017100	PISTON PIN GUIDE	Used for installing piston pin, piston and connecting rod.
 <p style="text-align: center;">ST-499037100</p>	499037100	CONNECTING ROD BUSHING REMOVER AND INSTALLER	Used for removing and installing connecting rod bushing.
 <p style="text-align: center;">ST-499587200</p>	499587200	CRANKSHAFT OIL SEAL INSTALLER	<ul style="list-style-type: none"> • Used for installing crankshaft oil seal. • Used together with CRANKSHAFT OIL SEAL GUIDE (499597100).
 <p style="text-align: center;">ST-499587500</p>	499587500	OIL SEAL INSTALLER	<ul style="list-style-type: none"> • Used for installing camshaft oil seal. • Used together with OIL SEAL GUIDE (499597000).
 <p style="text-align: center;">ST-499587700</p>	499587700	CAMSHAFT OIL SEAL INSTALLER	Used for installing cylinder head plug.

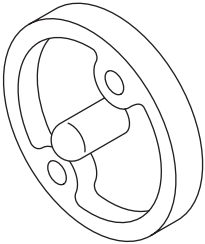
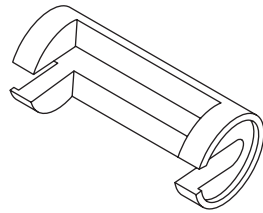
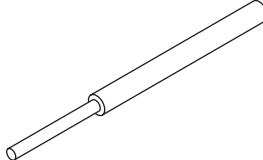
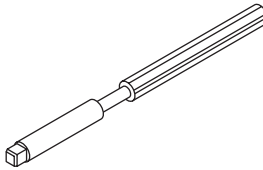
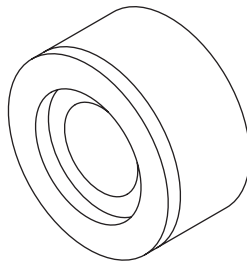
General Description

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST-499097700</p>	499097700	PISTON PIN REMOVER ASSY	Used for removing piston pin.
 <p>ST-499207400</p>	499207400	CAM SPROCKET WRENCH	Used for removing and installing cam sprocket. (RH side)
 <p>ST-499497000</p>	499497000	TORX® PLUS	Used for removing and installing camshaft cap.
 <p>ST-499587100</p>	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.
 <p>ST-499597000</p>	499597000	OIL SEAL GUIDE	<ul style="list-style-type: none"> • Used for installing camshaft oil seal. • Used together with camshaft OIL SEAL INSTALLER (499587500).

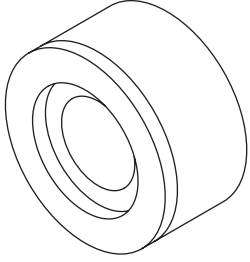
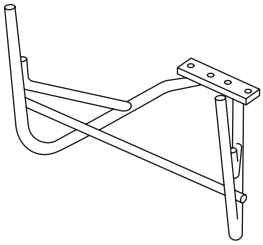
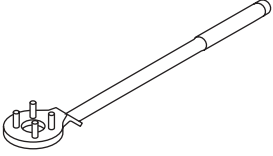
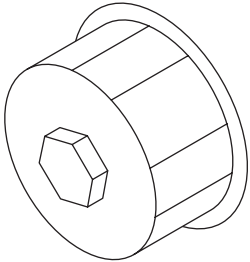
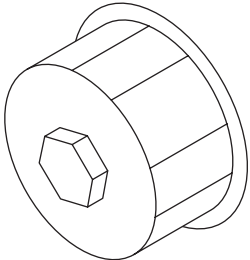
General Description

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-499597100</p>	499597100	CRANKSHAFT OIL SEAL GUIDE	<ul style="list-style-type: none"> • Used for installing crankshaft oil seal. • Used together with CRANKSHAFT OIL SEAL INSTALLER (499587200).
 <p style="text-align: center;">ST-499718000</p>	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.
 <p style="text-align: center;">ST-499767200</p>	499767200	VALVE GUIDE REMOVER	Used for removing valve guides.
 <p style="text-align: center;">ST-499767400</p>	499767400	VALVE GUIDE REAMER	Used for reaming valve guides.
 <p style="text-align: center;">ST-499767700</p>	499767700	VALVE GUIDE ADJUSTER	Used for installing valve guides. (Intake side)

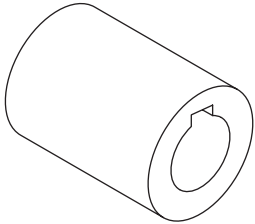
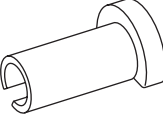
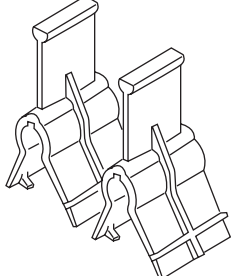
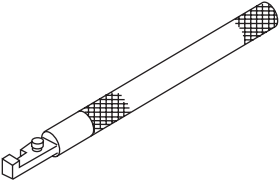
General Description

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST-499767800</p>	499767800	VALVE GUIDE ADJUSTER	Used for installing valve guides. (Exhaust side)
 <p>ST-499817100</p>	499817100	ENGINE STAND	<ul style="list-style-type: none"> • Stand used for engine disassembly and assembly. • Used together with ENGINE STAND ADAPTER RH (498457000) & LH (498457100).
 <p>ST-499977100</p>	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crank pulley when loosening/tightening crank pulley bolt.
 <p>ST18332AA000</p>	18332AA000	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 68 mm (2.68 in))
 <p>ST18332AA010</p>	18332AA010	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 65 mm (2.56 in))

General Description

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-499987500</p>	499987500	CRANKSHAFT SOCKET	Used for rotating crankshaft.
 <p style="text-align: center;">ST42099AE000</p>	42099AE000	CONNECTOR REMOVER	Used for removing the quick connector.
 <p style="text-align: center;">ST18354AA000</p>	18354AA000	VALVE ROCKER HOLDER	Used for installing the valve rocker assembly (intake). (2 sets)
 <p style="text-align: center;">ST18258AA000</p>	18258AA000	SPRING INSTALLER	Used for installing the valve rocker assembly (intake).

2. GENERAL TOOL

TOOL NAME	REMARKS
Compression gauge	Used for measuring compression.
Vacuum gauge	Used for measuring negative pressure.
Oil pressure gauge	Used for measuring oil pressure.
Fuel pressure gauge	Used for measuring fuel pressure.
Timing light	Used for measuring ignition timing.

E: PROCEDURE

It is possible to conduct the following service procedures with engine on vehicle, however, the procedures described in this section are based on the condition that the engine is removed from vehicle.

- V-belt
- Timing belt
- Valve rocker assembly
- Camshaft
- Cylinder head

2. Compression

A: INSPECTION

CAUTION:

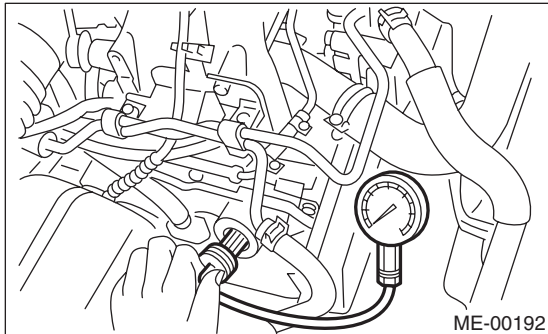
After warming-up, engine becomes very hot. Be careful not to burn yourself during measurement.

- 1) After warming-up the engine, turn the ignition switch to OFF.
- 2) Make sure that the battery is fully charged.
- 3) Release the fuel pressure.
<Ref. to FU(H4SO)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 4) Remove all spark plugs. <Ref. to IG(H4SO)-4, REMOVAL, Spark Plug.>
- 5) Fully open the throttle valve.
- 6) Check the starter motor for satisfactory performance and operation.
- 7) Hold the compression gauge tightly against the spark plug hole.

NOTE:

When using a screw-in type compression gauge, the screw (put into cylinder head spark plug hole) should be less than 18 mm (0.71 in) long.

- 8) Crank the engine by means of the starter motor, and read the maximum value on the gauge when the pointer is steady.



- 9) Perform at least two measurements per cylinder, and make sure that the values are correct.

Compression (350 rpm and fully open throttle):

Standard:

**1,020 — 1,275 kPa (10.4 — 13.0 kgf/cm²,
148 — 185 psi)**

Service limit:

1,020 kPa (10.4 kgf/cm², 148 psi)

Difference between cylinders:

49 kPa (0.5 kgf/cm², 7 psi), or less

3. Idle Speed

A: INSPECTION

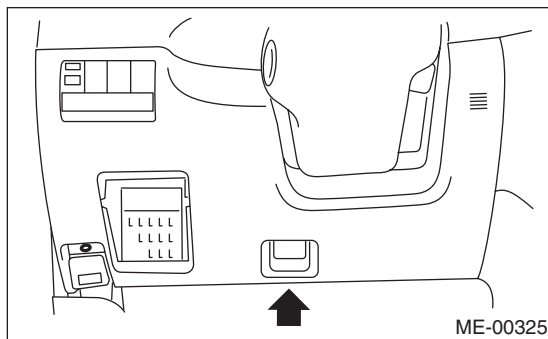
1) Before checking the idle speed, check the following item:

- (1) Check the air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and hoses are connected properly.
- (2) Check the malfunction indicator light does not illuminate.

2) Warm up the engine.

3) Stop the engine, and turn the ignition switch to OFF.

4) Connect the Subaru Select Monitor to the data link connector.



5) Turn the ignition switch to ON and run the Subaru Select Monitor.

6) Select {Each System Check} in Main Menu.

7) Select {Engine Control System} in Selection Menu.

8) Select {Current Data Display & Save} in Engine Control System Diagnosis.

9) Select {Data Display} in Data Display Menu.

10) Start the engine, and read the engine idle speed.

11) Check the idle speed when no-loaded. (Headlight, heater fan, rear defroster, radiator fan, A/C and etc. are OFF)

Idle speed [No load and gears in "N" or "P" range]:

650±100 rpm (MT model)

700±100 rpm (AT model)

12) Check the idle speed when loaded. (Turn the A/C switch ON and operate the compressor for at least one minute before measurement.)

Idle speed [A/C "ON" and gears in "N" or "P" range]:

850±100 rpm

NOTE:

Idle speed cannot be adjusted manually, because the idle speed is automatically adjusted. If the prescribed idle speed cannot be maintained, refer to the General On-board Diagnosis Table under "Engine Control System". <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>

4. Ignition Timing

A: INSPECTION

CAUTION:

After warming-up, engine becomes very hot. Be careful not to burn yourself at measurement.

1) Before checking the ignition timing, check the following item:

(1) Check the air cleaner element is free from clogging, spark plugs are in good condition, and hoses are connected properly.

(2) Make sure that the malfunction indicator light does not illuminate.

2) Warm-up the engine.

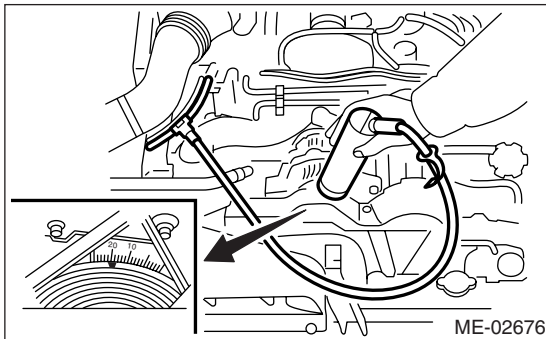
3) When checking the ignition timing, connect the timing light to the #1 cylinder spark plug cord and illuminate the timing mark with the timing light.

4) Start the engine and check the ignition timing at idle speed as shown below.

Ignition timing [BTDC/rpm]:

$10^{\circ} \pm 8^{\circ} / 650$ (MT model)

$15^{\circ} \pm 8^{\circ} / 700$ (AT model)



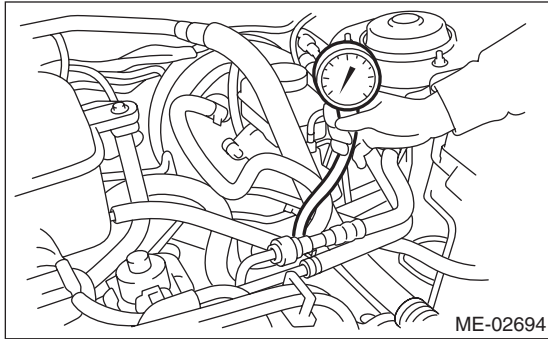
If the timing is not correct, check the ignition control system. <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>

5. Intake Manifold Vacuum

A: INSPECTION

- 1) Warm up the engine.
- 2) Disconnect the brake vacuum hose from intake manifold, and then install the vacuum gauge.
- 3) Keep the engine at idle speed and read the vacuum gauge indication.

By observing the gauge needle movement, internal condition of the engine can be diagnosed as described below.



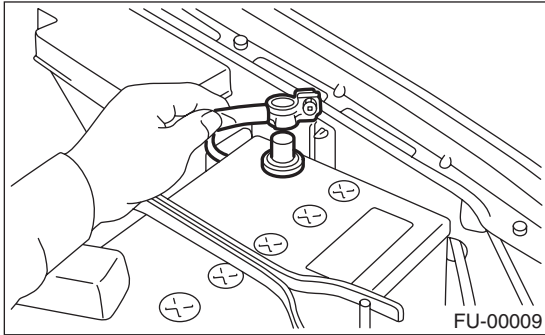
Vacuum pressure (at idling, A/C “OFF”):
–60.0 kPa (–450 mmHg, –17.72 inHg) or less

Diagnosis of engine condition by measurement of intake manifold vacuum	
Vacuum gauge indication	Possible engine condition
1. Needle is steady but lower than normal position. This tendency becomes more evident as engine temperature rises.	Air leakage around intake manifold gasket, disconnection or damage of vacuum hose
2. Needle intermittently drops to position lower than normal position.	Leakage around cylinder
3. Needle drops suddenly and intermittently from normal position.	Sticky valve
4. When engine speed is gradually increased, needle begins to vibrate rapidly at certain speed, and then vibration increases as engine speed increases.	Weak or broken valve springs
5. Needle vibrates above and below normal position in narrow range.	Defective ignition system

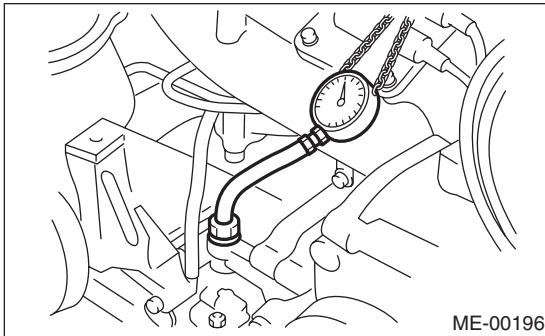
6. Engine Oil Pressure

A: INSPECTION

- 1) Remove the oil pressure switch. <Ref. to LU (H4SO)-21, REMOVAL, Oil Pressure Switch.>
- 2) Connect the oil pressure gauge to cylinder block.
- 3) Connect the ground cable to the battery.



- 4) Start the engine, and measure the oil pressure.



Oil pressure:

Standard:

98 kPa (1.0 kg/cm², 14 psi) or more at 600 rpm
294 kPa (3.0 kg/cm², 43 psi) or more at 5,000 rpm

CAUTION:

- If the oil pressure is out of standard values, check the oil pump, oil filter and lubrication line. <Ref. to LU (H4SO)-25, INSPECTION, Engine Lubrication System Trouble in General.>
- If the oil pressure warning light is turned on and oil pressure is in the specified range, check the oil pressure switch. <Ref. to LU (H4SO)-25, INSPECTION, Engine Lubrication System Trouble in General.>

NOTE:

Standard value is based on an engine oil temperature of 80°C (176°F).

- 5) After measuring the oil pressure, install the oil pressure switch. <Ref. to LU (H4SO)-21, INSTALLATION, Oil Pressure Switch.>

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)

7. Fuel Pressure

A: INSPECTION

CAUTION:

Before removing the fuel pressure gauge, release the fuel pressure.

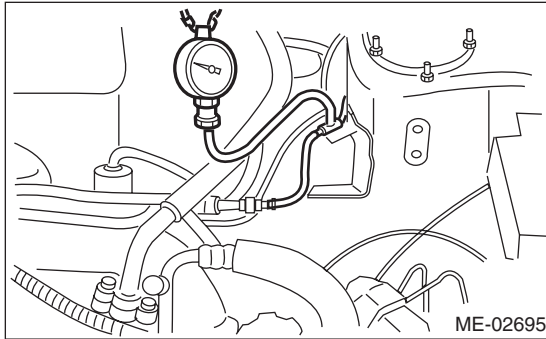
NOTE:

If the fuel pressure is out of specification, check or replace the fuel pump and fuel delivery line.

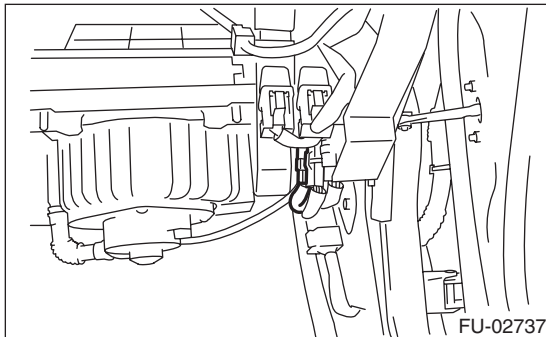
1) Release the fuel pressure.

<Ref. to FU(H4SO)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

2) Disconnect the fuel delivery hose from fuel damper, and connect fuel pressure gauge.



3) Connect the connector of fuel pump relay.



4) Start the engine.

5) Measure the fuel pressure after warming up the engine.

Fuel pressure:

Standard:

339.5 — 360.5 kPa (3.5 — 3.7 kg/cm², 49 — 52 psi)

NOTE:

The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kg/cm², 1 to 3 psi) higher than standard values during high-altitude operations.

Valve Clearance

MECHANICAL

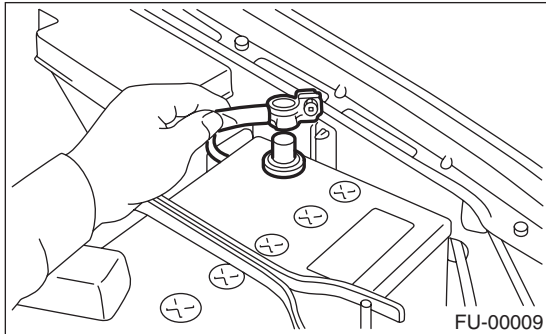
8. Valve Clearance

A: INSPECTION

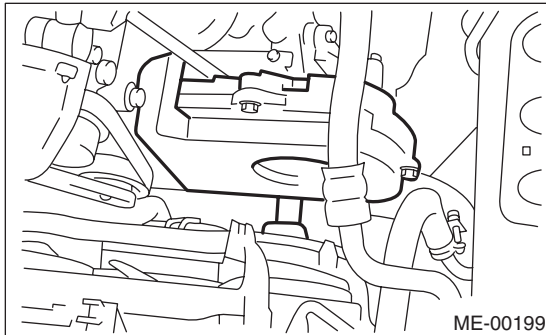
NOTE:

Inspection and adjustment of valve clearance should be performed while engine is cold.

- 1) Set the vehicle on a lift.
- 2) Lift-up the vehicle.
- 3) Remove the under cover.
- 4) Lower the vehicle.
- 5) Disconnect the ground cable from the battery.



- 6) Remove the timing belt cover (LH).



- 7) Remove the fuel injector. <Ref. to FU(H4SO)-30, REMOVAL, Fuel Injector.>

- 8) When inspecting #1 and #3 cylinders:

- (1) Disconnect the spark plug cords from spark plugs RH side. <Ref. to IG(H4SO)-4, RH SIDE, REMOVAL, Spark Plug.>
- (2) Disconnect the PCV hose from rocker cover (RH).
- (3) Remove the bolts, then remove the rocker cover (RH).

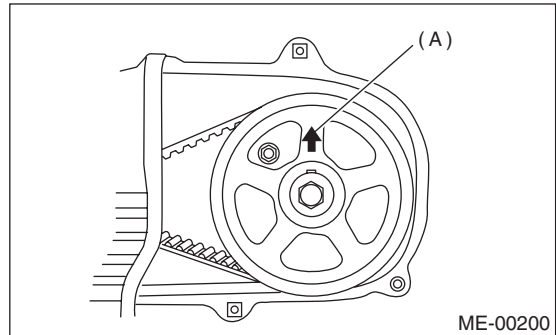
- 9) When inspecting #2 and #4 cylinders:

- (1) Disconnect the spark plug cords from spark plugs (LH side). <Ref. to IG(H4SO)-4, LH SIDE, REMOVAL, Spark Plug.>
- (2) Disconnect the PCV hose from rocker cover (LH).
- (3) Remove the bolts, then remove the rocker cover (LH).

- 10) Set #1 cylinder piston to top dead center of compression stroke by rotating the crank pulley clockwise using the socket wrench.

NOTE:

When the arrow mark (A) on cam sprocket (LH) comes exactly to the top, #1 cylinder piston is brought to the top dead center of compression stroke.



- 11) Measure #1 cylinder valve clearance by using thickness gauge (A).

NOTE:

- Insert a thickness gauge in as horizontally as possible with respect to the valve stem end face.
- Lift-up the vehicle and measure the exhaust valve clearance.

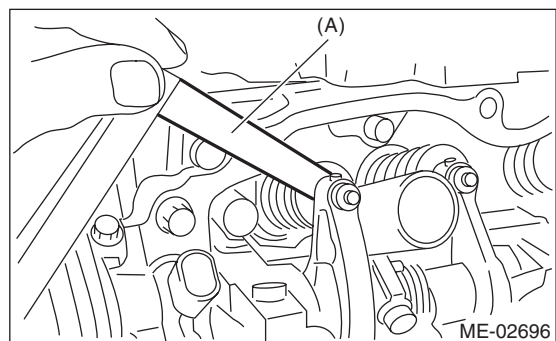
Valve clearance (standard):

Intake

0.20 ± 0.04 mm (0.0079 ± 0.0016 in)

Exhaust

0.25 ± 0.04 mm (0.0098 ± 0.0016 in)



- 12) If necessary, adjust the valve clearance. <Ref. to ME(H4SO)-31, ADJUSTMENT, Valve Clearance.>

13) Measure the valve clearance in #3, #2 and #4 cylinder in the same measurement procedure as #1 cylinder.

NOTE:

- Be sure to set the cylinder pistons to their respective top dead centers on compression stroke before measuring valve clearances.
- By rotating the crank pulley clockwise every 180° from the state that #1 cylinder piston is on the top dead center of compression stroke, #3, #2 and #4 cylinder pistons come to the top dead center of compression stroke in this order.

14) After inspection, install the related parts in the reverse order of removal.

B: ADJUSTMENT

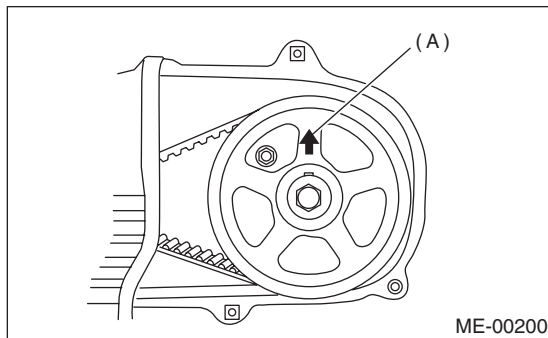
NOTE:

Adjustment of valve clearance should be performed while engine is cold.

1) Set #1 cylinder piston to top dead center of compression stroke by rotating the crank pulley clockwise using the socket wrench.

NOTE:

When the arrow mark (A) on cam sprocket (LH) comes exactly to the top, #1 cylinder piston is brought to the top dead center of compression stroke.



2) Adjust the #1 cylinder valve clearance.

- (1) Loosen the valve rocker nut and screw.
- (2) Set a suitable thickness gauge.
- (3) While noting the valve clearance, tighten the valve rocker adjusting screw.
- (4) When the specified valve clearance is obtained, tighten the valve rocker nut.

Tightening torque:

9.75 N·m (1.0 kgf·m, 7.2 ft·lb)

NOTE:

- Insert a thickness gauge in as horizontally as possible with respect to the valve stem end face.
- Lift-up the vehicle and adjust the exhaust valve clearance.

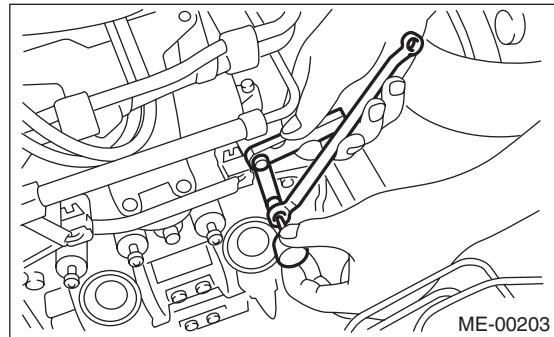
Valve clearance:

Intake

0.20±0.04 mm (0.0079±0.0016 in)

Exhaust

0.25±0.04 mm (0.0098±0.0016 in)



3) Adjust the valve clearance in #3, #2 and #4 cylinder in the same adjustment procedure as #1 cylinder.

NOTE:

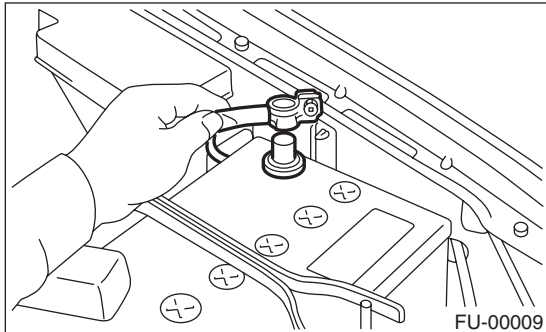
- Be sure to set the cylinder pistons to their respective top dead centers on compression stroke before adjusting valve clearances.
- By rotating the crank pulley clockwise every 180° from the state that #1 cylinder piston is on the top dead center of compression stroke, #3, #2 and #4 cylinder pistons come to the top dead center of compression stroke in this order.

4) Ensure the valve clearances of each cylinder are within specifications. If necessary, readjust the valve clearances.

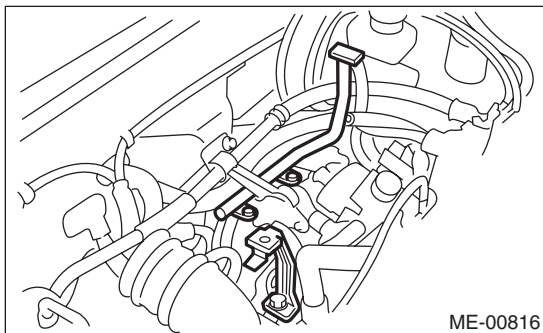
9. Engine Assembly

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Open the front hood fully and support with the front food stay.
- 3) Collect the refrigerant from the A/C system.
<Ref. to AC-19, PROCEDURE, Refrigerant Recovery Procedure.>
- 4) Release the fuel pressure.
<Ref. to FU(H4SO)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 5) Disconnect the ground cable from the battery.

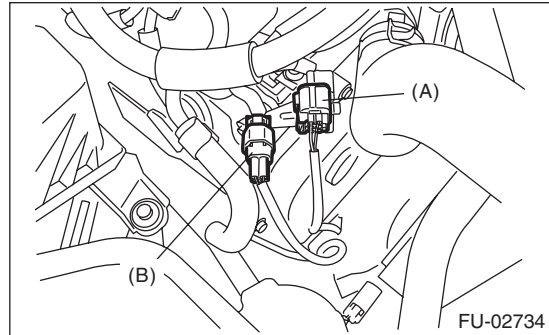


- 6) Open the fuel filler flap lid, and remove the fuel filler cap.
- 7) Remove the air intake duct, air cleaner case and air intake chamber.
<Ref. to IN (H4SO)-7, REMOVAL, Air Intake Duct.>
<Ref. to IN (H4SO)-5, REMOVAL, Air Cleaner Case.> <Ref. to IN (H4SO)-6, REMOVAL, Air Intake Chamber.>
- 8) Remove the under cover.
- 9) Remove the radiator from the vehicle. <Ref. to CO(H4SO)-27, REMOVAL, Radiator.>
- 10) Disconnect the A/C pressure hoses from A/C compressor.
- 11) Remove the air intake chamber stay.



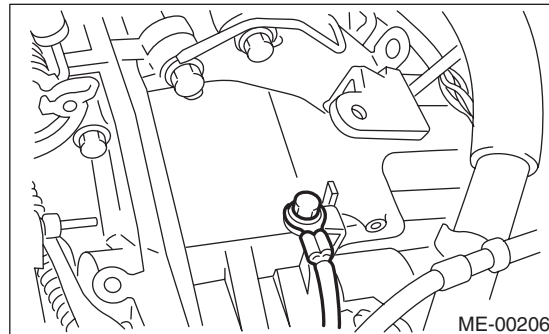
- 12) Disconnect the following connectors and cables.

- (1) Front oxygen (A/F) sensor connector
- (2) Rear oxygen sensor connector

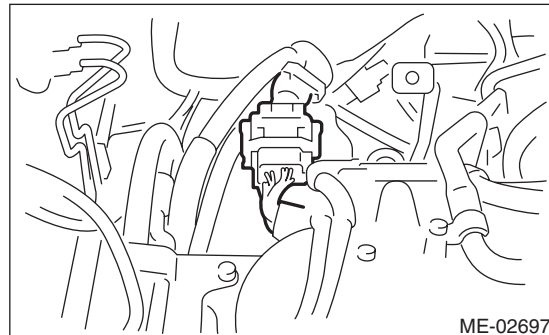


- (A) Front oxygen (A/F) sensor connector
(B) Rear oxygen sensor connector

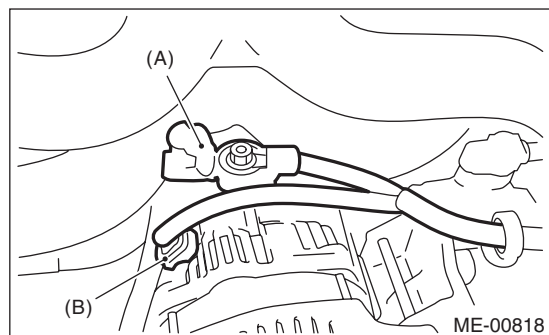
- (3) Engine ground cable



- (4) Engine harness connectors

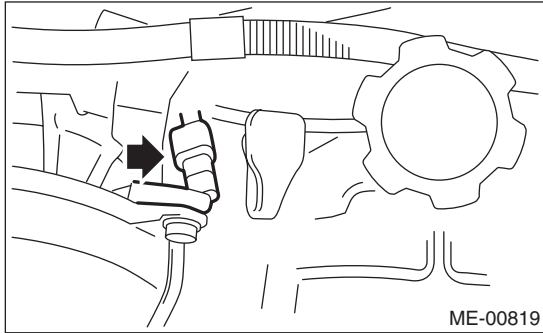


- (5) Generator connector and terminal

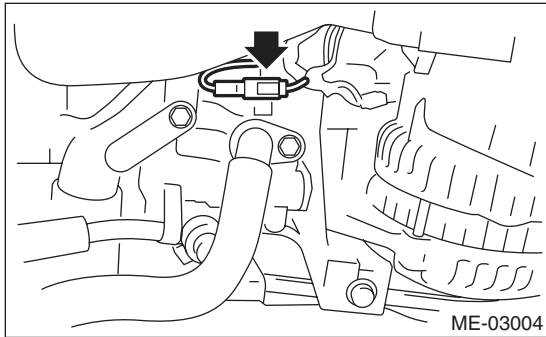


- (A) Terminals
(B) Generator connector

(6) A/C compressor connector

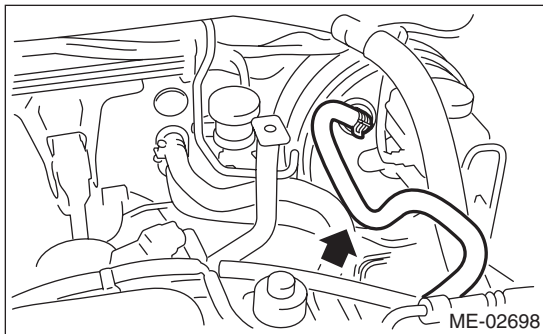


(7) Power steering switch connector



13) Disconnect the following hoses.

(1) Brake booster vacuum hose

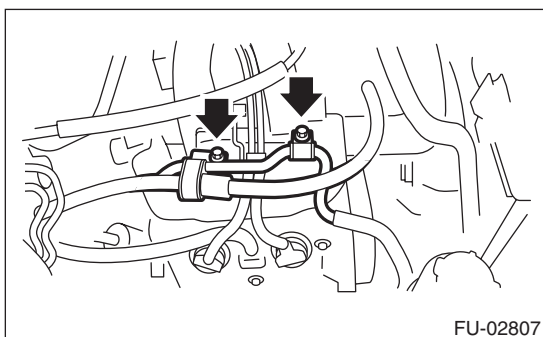


(2) Heater inlet and outlet hoses

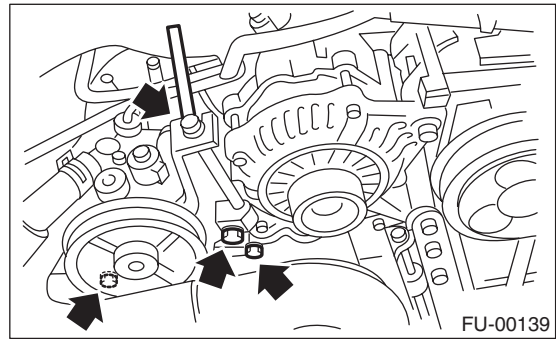
14) Remove the power steering pump.

(1) Remove the front side V-belts. <Ref. to ME(H4SO)-40, FRONT SIDE BELT, REMOVAL, V-belt.>

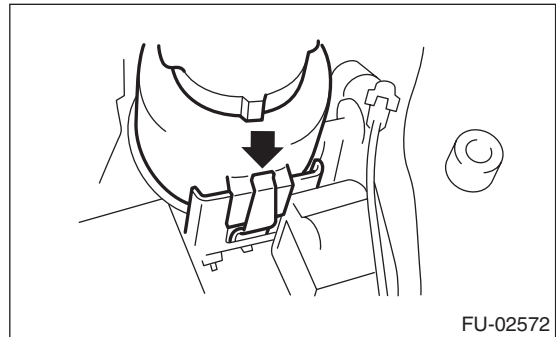
(2) Remove the bolts which hold the power steering pipes onto the fuel pipe protector RH.



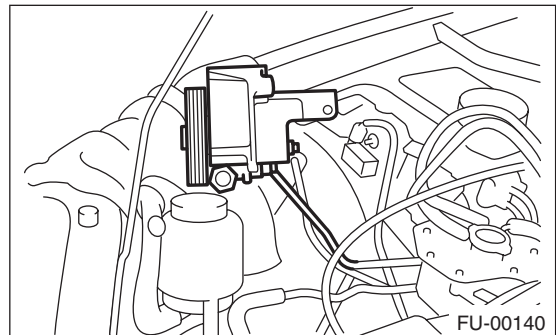
(3) Remove the bolts which secure the power steering pump to the bracket.



(4) Remove the power steering reservoir tank from the bracket by pulling it upwards.

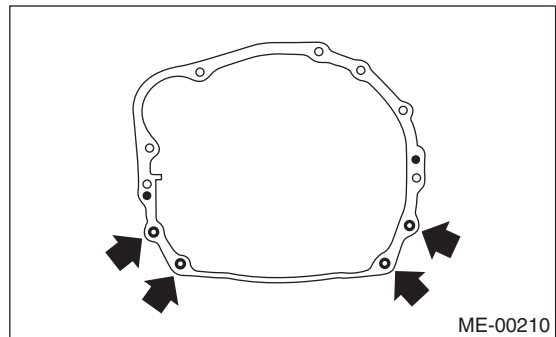


(5) Place the power steering pump on the right side wheel apron.



15) Remove the front and center exhaust pipes. <Ref. to EX (H4SO)-4, REMOVAL, Front Exhaust Pipe.>

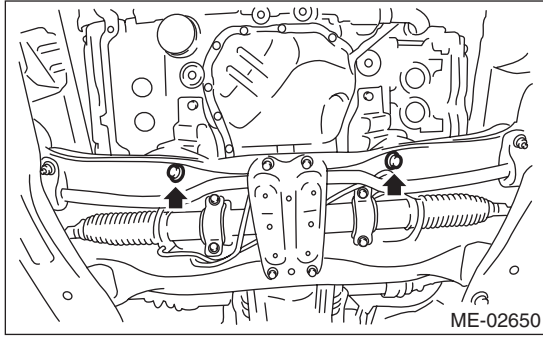
16) Remove the bolts and nuts which hold lower side of transmission to engine.



Engine Assembly

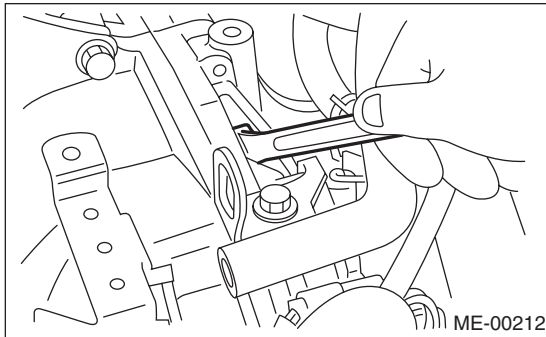
MECHANICAL

- 17) Remove the nuts which install front cushion rubber onto front crossmember.

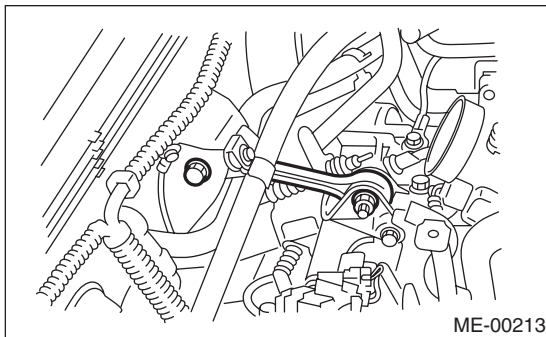


- 18) Separate the torque converter clutch from drive plate. (AT model)

- (1) Lower the vehicle.
- (2) Remove the service hole plug.
- (3) Remove the bolts which hold torque converter clutch to drive plate.
- (4) Remove other bolts while rotating the crankshaft using socket wrench.



- 19) Remove the pitching stopper.



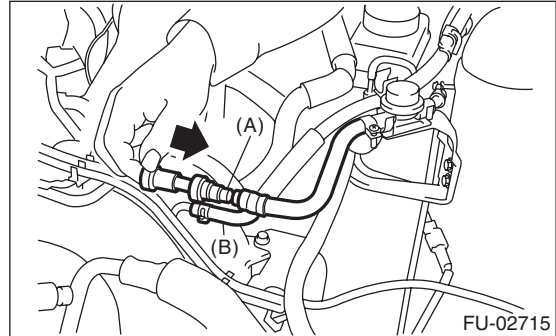
- 20) Disconnect the fuel hoses from fuel pipe.
(1) Disconnect the quick connector on the fuel delivery line by pushing the ST in the direction of the arrow.

ST 42099AE000 CONNECTOR REMOVER

- (2) Remove the clip and disconnect the evaporation hose from the pipe.

CAUTION:

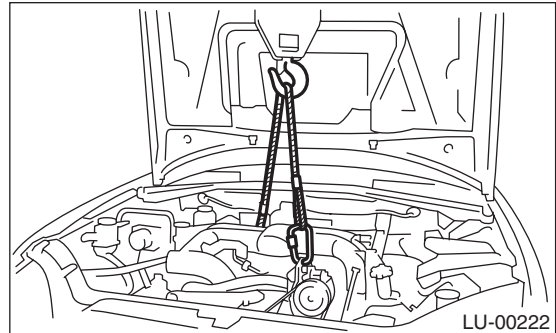
- Be careful not to spill fuel.
- Catch the fuel from hoses using a container or cloth.



(A) Fuel delivery hose

(B) Evaporation hose

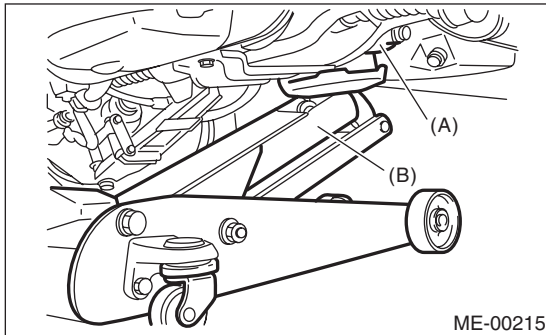
- 21) Support the engine with a lifting device and wire ropes.



22) Support the transmission with a garage jack.

CAUTION:

Be sure to always perform this work, in order to prevent the transmission from lowering for its own weight.



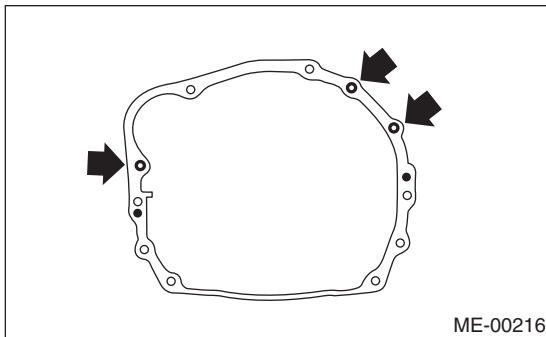
(A) Transmission
(B) Garage jack

CAUTION:

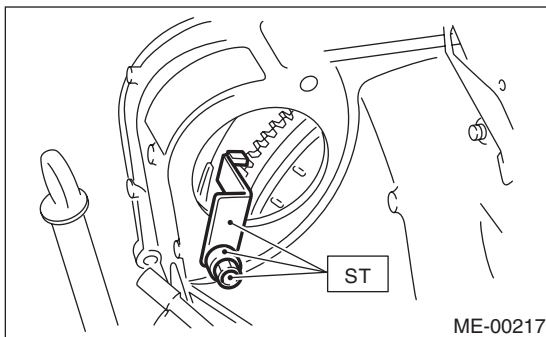
Before removing the engine away from transmission, check to be sure no work has been overlooked.

23) Separation of engine and transmission.

- (1) Remove the starter. <Ref. to SC (H4SO)-6, REMOVAL, Starter.>
- (2) Remove the bolts which hold upper side of transmission to engine.



24) Attach the ST to converter case. (AT model)
ST 498277200 STOPPER SET



25) Remove the engine from vehicle.

- (1) Slightly raise the engine.
- (2) Raise the transmission with garage jack.
- (3) Move the engine horizontally until main shaft is withdrawn from clutch cover.
- (4) Slowly lift the engine away from the engine compartment.

NOTE:

Be careful not to damage adjacent parts or body panels with crank pulley, oil level gauge, etc.

26) Remove the front cushion rubbers.

B: INSTALLATION

1) Install the front cushion rubbers.

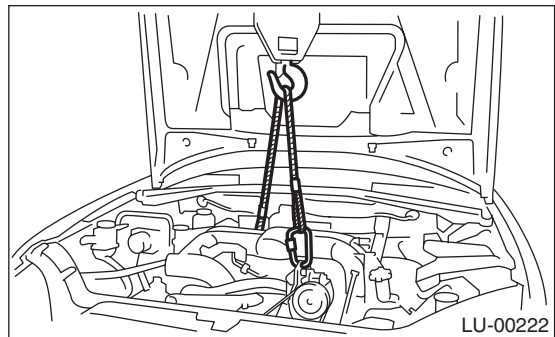
Tightening torque:

35 N·m (3.6 kgf-m, 25.8 ft-lb)

- 2) Apply a small amount of grease to splines of mainshaft. (MT model)
- 3) Position the engine in engine compartment and connect the engine to the transmission.

NOTE:

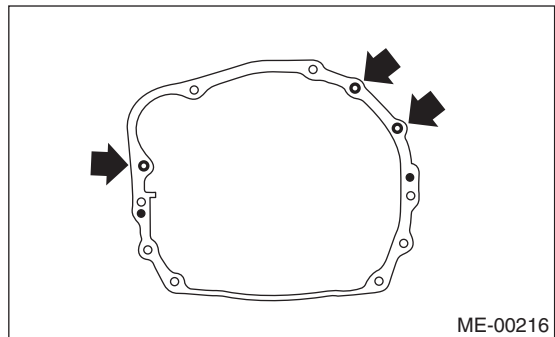
Be careful not to damage adjacent parts or body panels with crank pulley, oil level gauge, etc.



4) Tighten the bolts which hold upper side of transmission to engine.

Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)



- 5) Remove the lifting device and wire ropes.
- 6) Remove the garage jack.

Engine Assembly

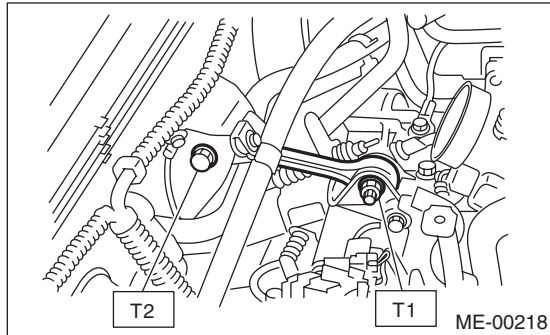
MECHANICAL

7) Install the pitching stopper.

Tightening torque:

T1: 50 N·m (5.1 kgf·m, 36.9 ft·lb)

T2: 58 N·m (5.9 kgf·m, 42.8 ft·lb)



8) Remove the ST from converter case. (AT model)

NOTE:

Be careful not to drop the ST into the converter case when removing the ST.

ST 498277200 STOPPER SET

9) Install the starter. <Ref. to SC (H4SO)-6, INSTALLATION, Starter.>

10) Install the torque converter clutch to drive plate. (AT model)

(1) Tighten the bolts which hold torque converter clutch to drive plate.

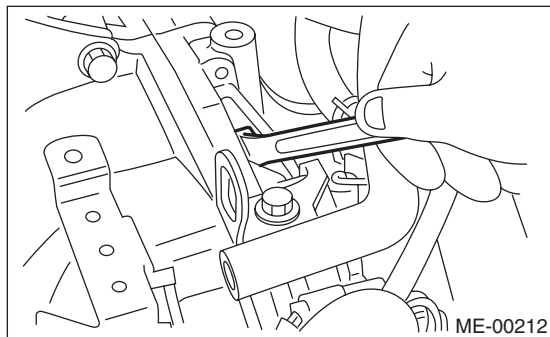
(2) Tighten other bolts while rotating the crankshaft using socket wrench.

NOTE:

Be careful not to drop bolts into the torque converter clutch housing.

Tightening torque:

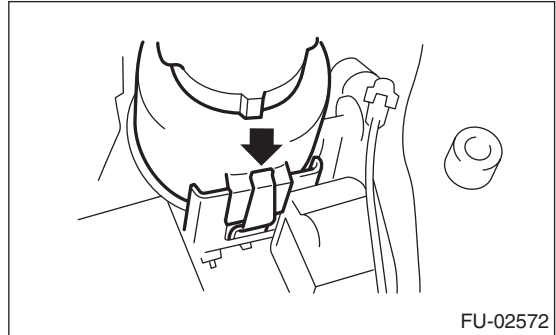
25 N·m (2.5 kgf·m, 18.1 ft·lb)



(3) Install the service hole plug to prevent getting foreign matter inside.

11) Install the power steering pump.

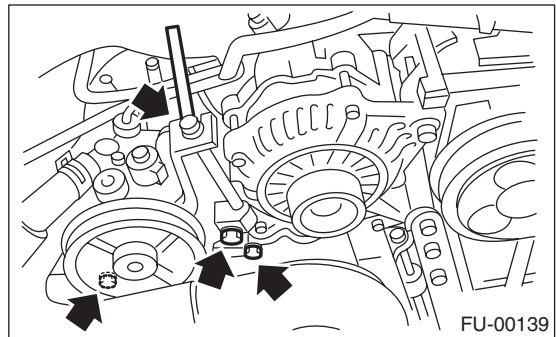
(1) Install the power steering reservoir tank to the bracket.



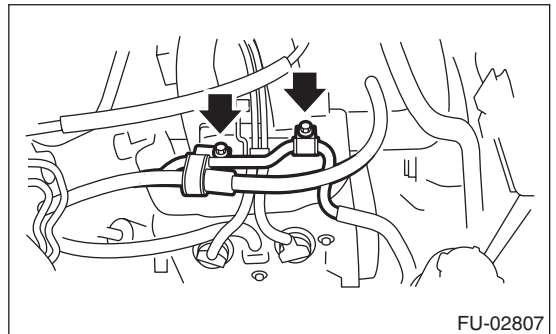
(2) Install the power steering pump to the bracket, and tighten the bolts.

Tightening torque:

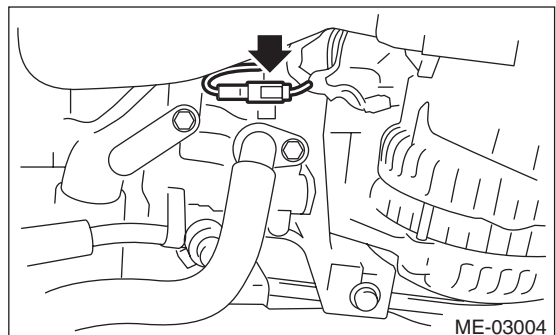
22 N·m (2.2 kgf·m, 16 ft·lb)



(3) Install the pipe along with the bracket.



(4) Connect the power steering switch connector.



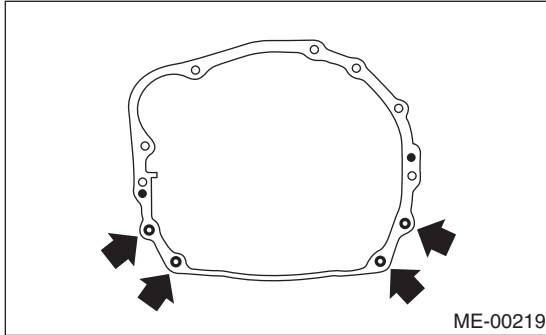
(5) Install and adjust the front side belt. <Ref. to ME(H4SO)-40, FRONT SIDE BELT, INSTALLATION, V-belt.>

12) Lift-up the vehicle.

13) Tighten the bolts and nuts which hold lower side of the transmission to engine.

Tightening torque:

50 N·m (5.1 kgf·m, 36.9 ft·lb)



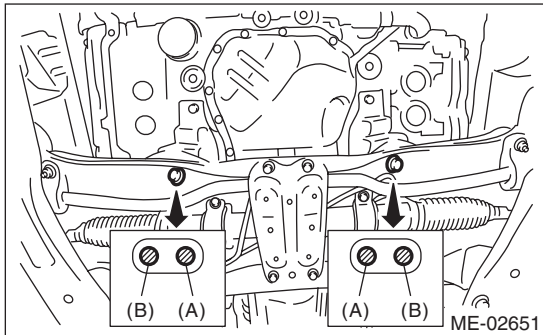
14) Tighten the nuts which install the front cushion rubber onto crossmember.

Tightening torque:

85 N·m (8.7 kgf·m, 63 ft·lb)

NOTE:

Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.



15) Install the front and center exhaust pipe. <Ref. to EX (H4SO)-5, INSTALLATION, Front Exhaust Pipe.>

16) Lower the vehicle.

17) Connect the following hoses.

- (1) Fuel delivery hose, and evaporation hose
- (2) Heater inlet and outlet hoses
- (3) Brake booster vacuum hose

18) Connect the following connectors.

- (1) Front oxygen (A/F) sensor connector
- (2) Rear oxygen sensor connector
- (3) Engine harness connectors
- (4) Generator connector and terminal
- (5) A/C compressor connector

19) Install the air intake chamber stay.

Tightening torque:

16 N·m (1.6 kgf·m, 11.6 ft·lb)

20) Tighten the engine ground cable.

Tightening torque:

14 N·m (1.4 kgf·m, 10.1 ft·lb)

21) Install the A/C pressure hoses. <Ref. to AC-34, INSTALLATION, Hose and Tube.>

22) Install the radiator to vehicle. <Ref. to CO(H4SO)-29, INSTALLATION, Radiator.>

23) Install the air intake duct, air cleaner case and air intake chamber. <Ref. to IN (H4SO)-7, INSTALLATION, Air Intake Duct.> <Ref. to IN (H4SO)-5, INSTALLATION, Air Cleaner Case.> <Ref. to IN (H4SO)-6, INSTALLATION, Air Intake Chamber.>

24) Install the under cover.

25) Install the battery in the vehicle, and connect cables.

26) Fill engine coolant.

<Ref. to CO(H4SO)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

27) Check the ATF level and replenish it if necessary.

<Ref. to 4AT-28, INSPECTION, Automatic Transmission Fluid.>

28) Charge the A/C system with refrigerant. <Ref. to AC-20, PROCEDURE, Refrigerant Charging Procedure.>

29) Remove the front hood stay, and close the front hood.

30) Lower the vehicle from lift.

C: INSPECTION

1) Check that pipes, hoses, connectors and clamps are installed firmly.

2) Check the engine coolant and ATF are at specified levels.

3) Start the engine and check for exhaust gas, engine coolant, leaks of fuel, etc. Also check for noise and vibrations.

10.Engine Mounting

A: REMOVAL

- 1) Remove the engine unit. <Ref. to ME(H4SO)-32, REMOVAL, Engine Assembly.>
- 2) Remove the engine mounting from engine assembly.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

Engine mounting

35 N·m (3.6 kgf-m, 25.8 ft-lb)

C: INSPECTION

Make sure that no crack or other damages do not exist.

11. Preparation for Overhaul

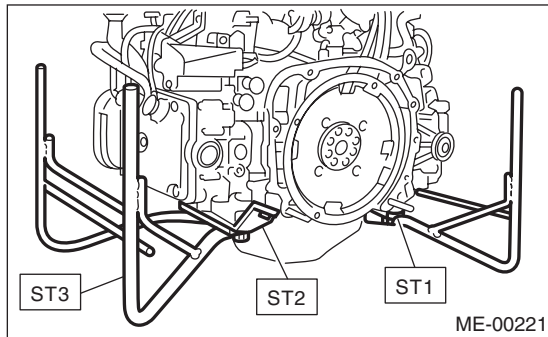
A: PROCEDURE

1) After removing the engine from body, secure it to ST in the following procedure.

ST1 498457000 ENGINE STAND ADAPTER
RH

ST2 498457100 ENGINE STAND ADAPTER
LH

ST3 499817100 ENGINE STAND



2) In this section the procedures described under each index are all connected and stated in order. The procedure for overhauling of the engine will be completed when you go through all steps in the process.

Therefore, in this section, to conduct the particular procedure within the flow of a section, you need to go back and conduct the procedure described previously in order to do that particular procedure.

12.V-belt

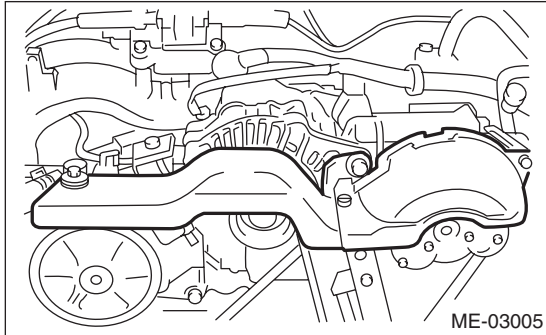
A: REMOVAL

NOTE:

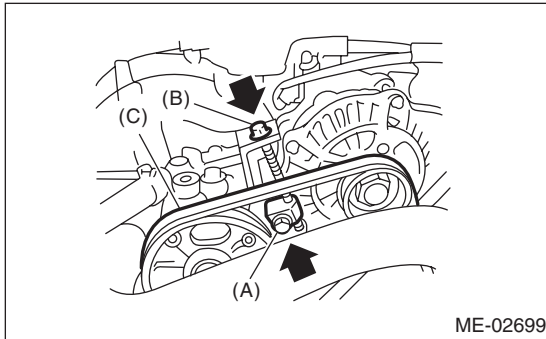
Perform the work with the engine installed to body when replacing a single part.

1. FRONT SIDE BELT

- 1) Remove the V-belt covers.

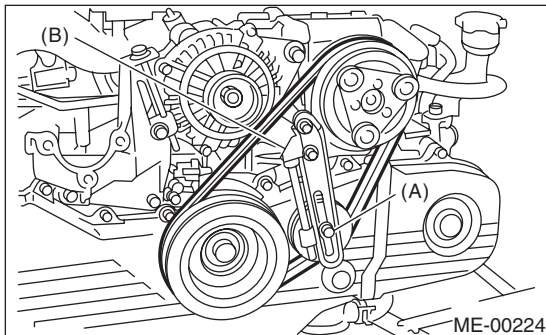


- 2) Loosen the lock bolt (A).
- 3) Loosen the slider bolt (B).
- 4) Remove the front side belt (C).



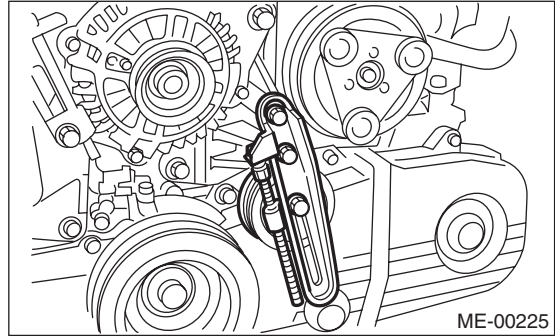
2. REAR SIDE BELT

- 1) Loosen the lock nut (A).
- 2) Loosen the slider bolt (B).



- 3) Remove the rear side belt.

- 4) Remove the belt tensioner.



B: INSTALLATION

CAUTION:

Wipe off any oil and water on the belt and pulley.

1. FRONT SIDE BELT

- 1) Install the front side belt (C), and tighten the slider bolt so as to obtain the specified belt tension. <Ref. to ME(H4SO)-41, INSPECTION, V-belt.>
- 2) Tighten the lock bolt (A).
- 3) Tighten the slider bolt (B).

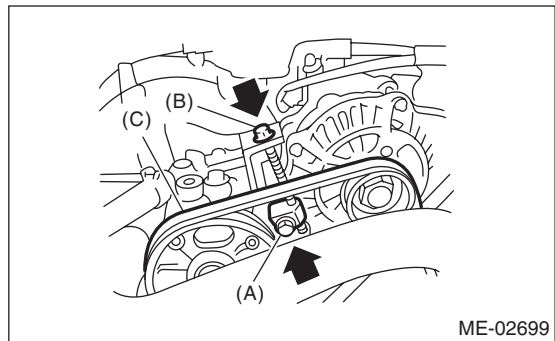
Tightening torque:

Lock bolt (A)

25 N·m (2.5 kgf-m, 18.1 ft-lb)

Slider bolt (B)

8 N·m (0.8 kgf-m, 5.8 ft-lb)



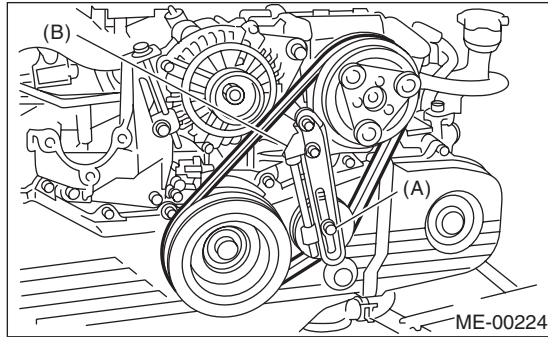
2. REAR SIDE BELT

- 1) Install the belt tensioner.
- 2) Install a rear side belt, and tighten the slider bolt (B) so as to obtain the specified belt tension.
<Ref. to ME(H4SO)-41, INSPECTION, V-belt.>
- 3) Tighten the lock nut (A).

Tightening torque:

Lock nut (A)

23 N·m (2.3 kgf·m, 17.0 ft·lb)



C: INSPECTION

- 1) Replace the belts, if crack, fraying or wear is found.
- 2) Remove the V-belt cover and reservoir tank. (with belt tension gauge)
- 3) Check the V-belt tension and adjust it if necessary by changing the generator installing position or idler pulley installing position.

Belt tension (with belt tension gauge):

(A)

When installing new parts

640 — 780 N (65 — 80 kgf, 144 — 175 lb)

At inspection

490 — 640 N (50 — 65 kgf, 110 — 144 lb)

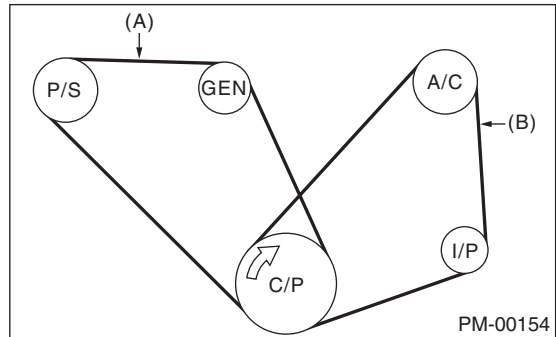
(B)

When installing new parts

650 — 750 N (66 — 76 kgf, 146 — 169 lb)

At inspection

350 — 450 N (36 — 46 kgf, 78 — 101 lb)



- (A) Front side belt
- (B) Rear side belt
- C/P Crank pulley
- GEN Generator
- P/S Power steering oil pump pulley
- A/C Air conditioning compressor pulley
- I/P Idler pulley

Belt tension (without belt tension gauge):

(A)

When installing new parts

7 — 9 mm (0.276 — 0.354 in)

At inspection

9 — 11 mm (0.354 — 0.433 in)

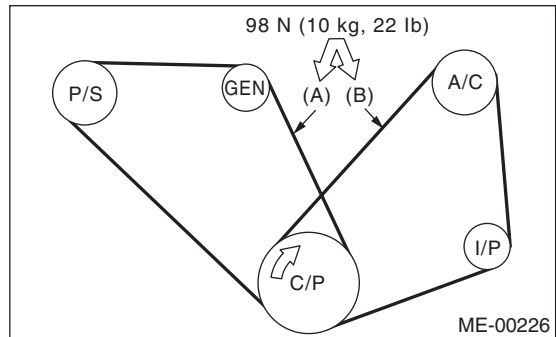
(B)

When installing new parts

7.5 — 8.5 mm (0.295 — 0.335 in)

At inspection

9.0 — 10.0 mm (0.354 — 0.394 in)



- (A) Front side belt
- (B) Rear side belt
- C/P Crank pulley
- GEN Generator
- P/S Power steering oil pump pulley
- A/C Air conditioning compressor pulley
- I/P Idler pulley

13.Crank Pulley

A: REMOVAL

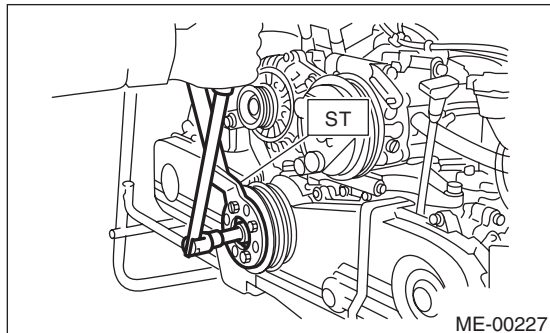
NOTE:

Perform the work with the engine installed to body when replacing a single part.

1) Remove the V-belts. <Ref. to ME(H4SO)-40, REMOVAL, V-belt.>

2) Remove the crank pulley bolt. To lock the crankshaft, use ST.

ST 499977100 CRANK PULLEY WRENCH



3) Remove the crank pulley.

B: INSTALLATION

1) Install the crank pulley.

2) Install the pulley bolt.

To lock the crankshaft, use ST.

ST 499977100 CRANK PULLEY WRENCH

(1) Clean the crankshaft thread using compressed air.

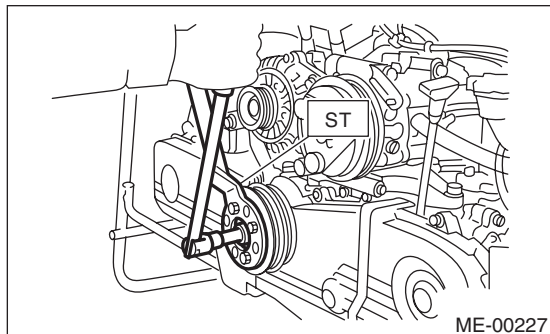
(2) Apply engine oil to the crank pulley bolt seat and thread.

(3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf·m, 33 ft·lb).

(4) Tighten the crank pulley bolts.

Tightening torque:

180 N·m (18.4 kgf·m, 132.8 ft·lb)



3) Check that the tightening angle of the clamp pulley bolt is a minimum of 65°. Perform the following procedure when less than 65°.

CAUTION:

If the tightening angle of crank pulley bolt is less than 65°, the bolt is damaged. In this case, the bolt must be replaced.

(1) Replace the crank pulley bolts and clean them.

Crank pulley bolt:

12369AA011

(2) Clean the crankshaft thread using compressed air.

(3) Apply engine oil to the crank pulley bolt seat and thread.

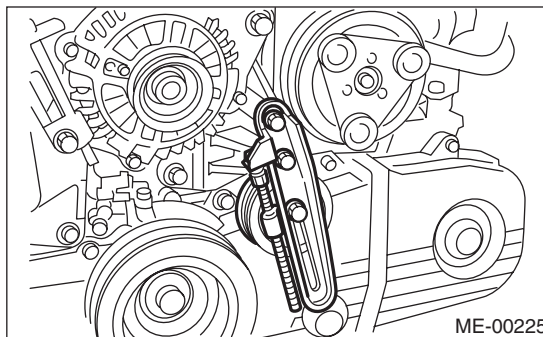
(4) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf·m, 33 ft·lb).

(5) Tighten the crank pulley bolt keeping them in an angle between 65° and 75°.

NOTE:

Conduct the tightening procedures by confirming the turning angle of crank pulley bolt referring to the gauge indicated on timing belt cover.

4) Install the belt tensioner.



5) Install the V-belts. <Ref. to ME(H4SO)-40, INSTALLATION, V-belt.>

C: INSPECTION

1) Make sure the V-belt is not worn or otherwise damaged.

2) Check the tension of the belt. <Ref. to ME(H4SO)-41, INSPECTION, V-belt.>

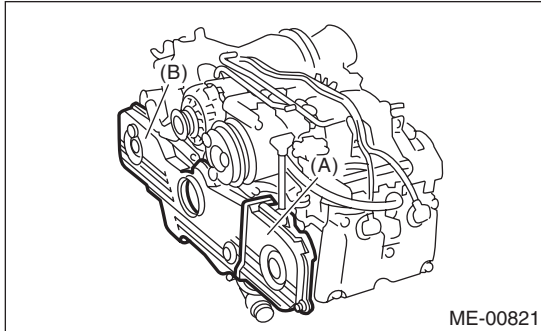
14. Timing Belt Cover

A: REMOVAL

NOTE:

Perform the work with the engine installed to body when replacing a single part.

- 1) Remove the V-belts. <Ref. to ME(H4SO)-40, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4SO)-42, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover (LH).
- 4) Remove the front timing belt cover.



(A) Timing belt cover (LH)

(B) Front timing belt cover

B: INSTALLATION

- 1) Install the front timing belt cover.

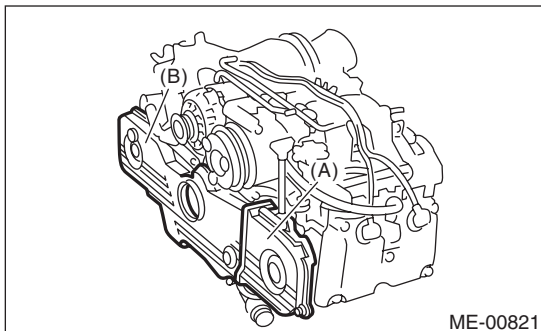
Tightening torque:

5 N·m (0.5 kgf·m, 3.6 ft·lb)

- 2) Install the timing belt cover (LH).

Tightening torque:

5 N·m (0.5 kgf·m, 3.6 ft·lb)



(A) Timing belt cover (LH)

(B) Front timing belt cover

- 3) Install the crank pulley. <Ref. to ME(H4SO)-42, INSTALLATION, Crank Pulley.>

- 4) Install the V-belts. <Ref. to ME(H4SO)-40, INSTALLATION, V-belt.>

C: INSPECTION

Check the cover for damage.

15. Timing Belt

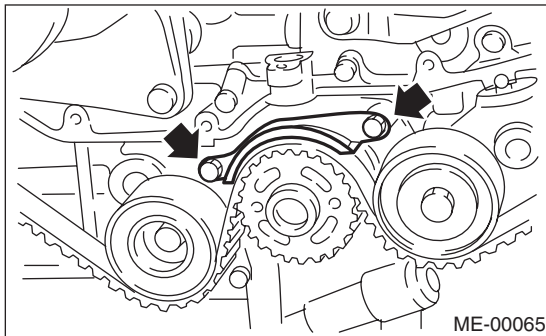
A: REMOVAL

1. TIMING BELT

NOTE:

Perform the work with the engine installed to body when replacing a single part. For operation procedures, refer to "Timing Belt" of the PM section. <Ref. to PM-12, Timing Belt.>

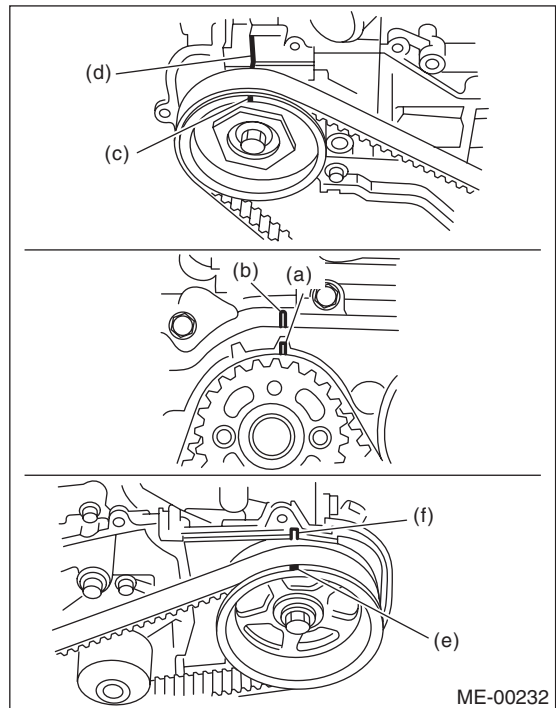
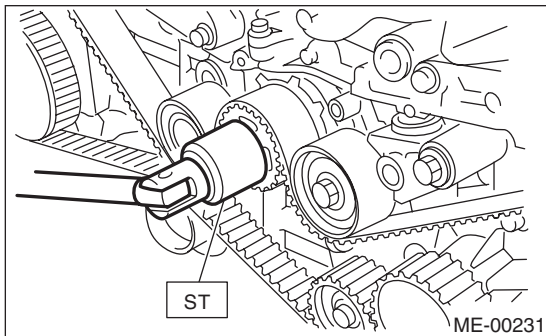
- 1) Remove the V-belts. <Ref. to ME(H4SO)-40, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4SO)-42, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(H4SO)-43, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt guide. (MT model)



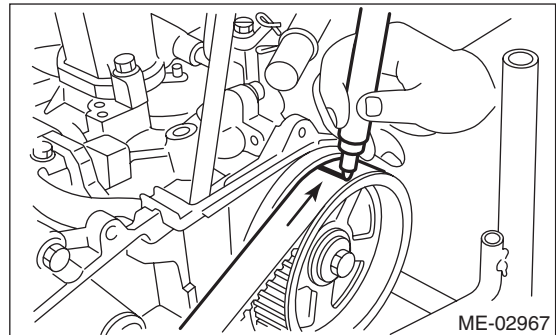
5) If the alignment mark or arrow mark (which indicates the direction of rotation) on timing belt fade away, put new marks before removing the timing belt as shown in procedures below.

- (1) Use the ST to turn crankshaft. Align the mark (a) of sprocket to the cylinder block notch (b), and then ensure the right side cam sprocket mark (c), cam cap and cylinder head matching surface (d) or left side cam sprocket mark (e), timing belt cover notch (f) are properly adjusted.

ST 499987500 CRANKSHAFT SOCKET



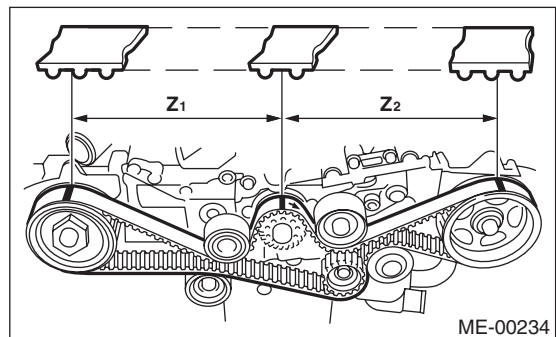
(2) Using white paint, put an alignment mark and an arrow mark on timing belts in relation to the crank sprocket and cam sprockets.



Specified data:

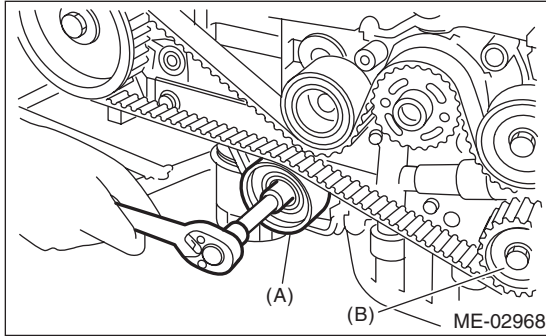
Z₁: Length of 46.8-teeth

Z₂: Length of 43.7-teeth

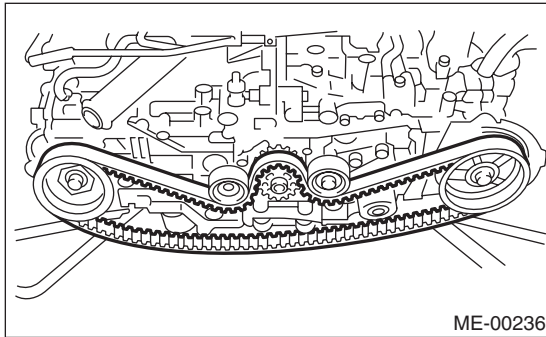


6) Remove the belt idler (A).

7) Remove the belt idler (B).

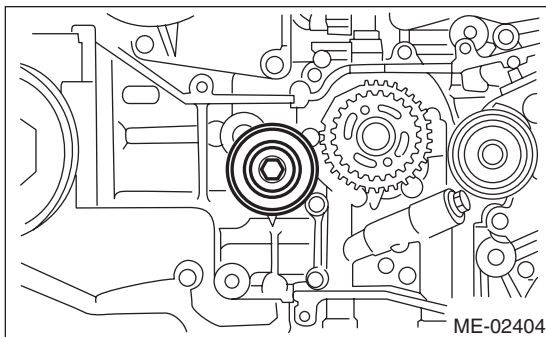


8) Remove the timing belt.

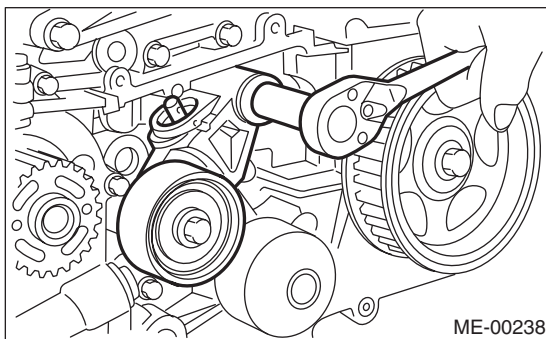


2. BELT IDLER AND AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY

1) Remove the belt idler (No. 1).



2) Remove the automatic belt tension adjuster assembly.



B: INSTALLATION

1. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

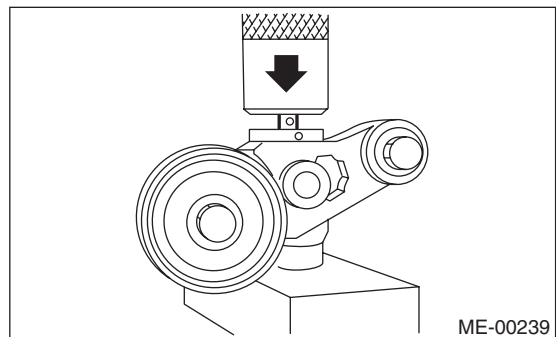
1) Preparation for installation of automatic belt tension adjuster assembly.

CAUTION:

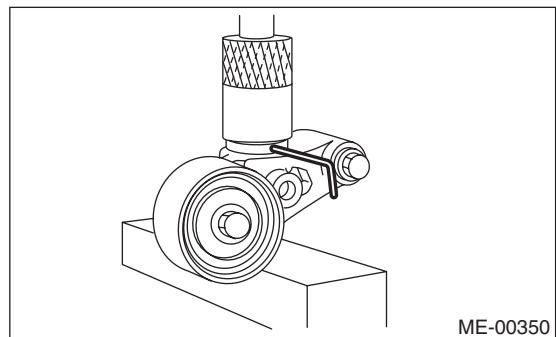
- Always use a vertical type pressing tool to move the adjuster rod down.
- Do not use a lateral type vise.
- Push the adjuster rod vertically.
- Press-in the push adjuster rod gradually taking more than three minutes.
- Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
- Press the adjuster rod as far as the end surface of the cylinder. Do not press the adjuster rod into cylinder. Doing so may damage the cylinder.
- Do not release the press pressure until stopper pin is completely inserted.

(1) Attach the automatic belt tension adjuster assembly to vertical pressing tool.

(2) Slowly move the adjuster rod down with a pressure of more than 294 N (30 kgf, 66 lb) until the adjuster rod is aligned with the stopper pin hole in the cylinder.



(3) With a 2 mm (0.08 in) dia. stopper pin or a 2 mm (0.08 in) (nominal) dia. hex wrench inserted into the stopper pin hole in cylinder, secure the adjuster rod.



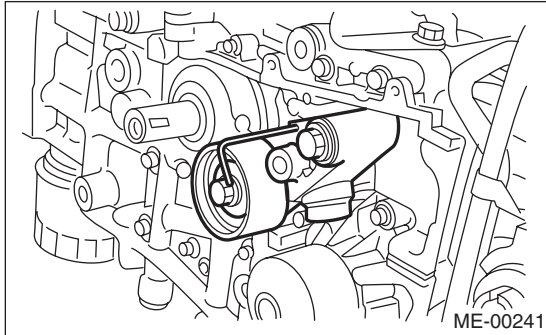
Timing Belt

MECHANICAL

2) Install the automatic belt tension adjuster assembly.

Tightening torque:

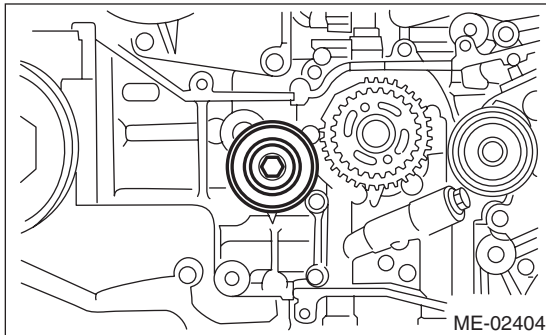
39 N·m (4.0 kgf·m, 28.9 ft·lb)



3) Install the belt idler (No. 1).

Tightening torque:

39 N·m (4.0 kgf·m, 28.9 ft·lb)



2. TIMING BELT

1) Prepare for installation of the automatic belt tension adjuster assembly. <Ref. to ME(H4SO)-45, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt.>

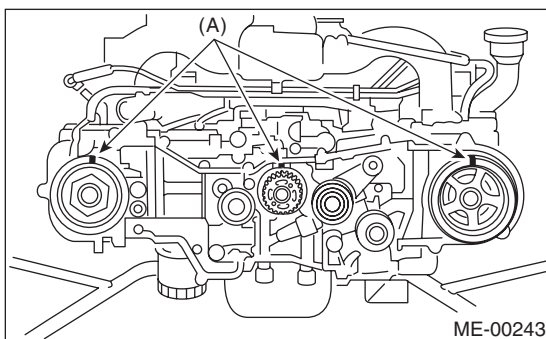
2) Turn the camshaft sprocket No. 2 using ST1, and turn the camshaft sprocket No. 1 using ST2 so that their alignment marks (A) come to top positions.

ST1 18231AA010 CAM SPROCKET WRENCH

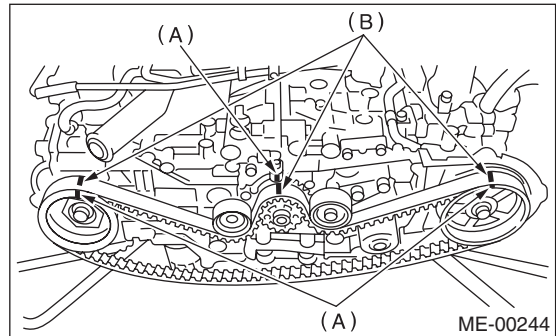
NOTE:

CAM SPROCKET WRENCH (499207100) can also be used.

ST2 499207400 CAM SPROCKET WRENCH



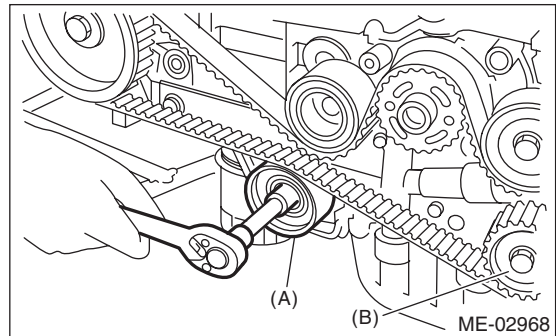
3) While aligning the alignment mark (B) on timing belt with the mark (A) on sprockets, position the timing belt properly.



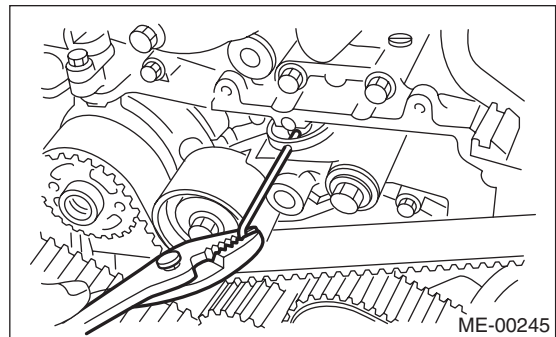
4) Install the belt idler (A) and (B).

Tightening torque:

39 N·m (4.0 kgf·m, 28.9 ft·lb)

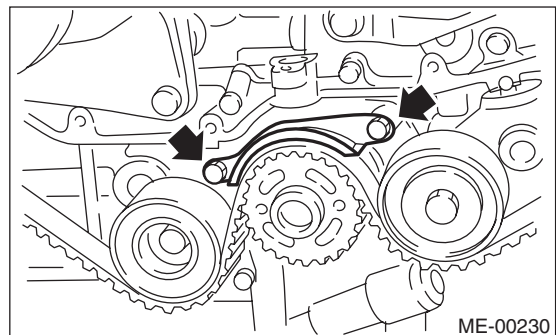


5) After ensuring the marks on timing belt and camshaft sprockets are aligned, remove the stopper pin from belt tension adjuster.



6) Install the timing belt guide. (MT model)

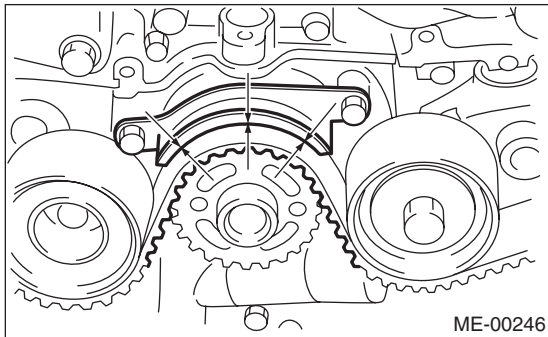
(1) Temporarily tighten the bolts mounting the timing belt guide.



(2) Check and adjust the clearance between timing belt and timing belt guide by using thickness gauge.

Clearance:

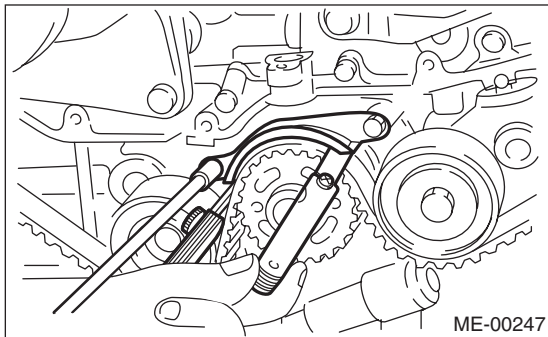
1.0 ± 0.5 mm (0.039 ± 0.020 in)



(3) Tighten the bolts mounting the timing belt guide.

Tightening torque:

9.75 N·m (1.0 kgf·m, 7.2 ft·lb)



- 7) Install the timing belt cover. <Ref. to ME(H4SO)-43, INSTALLATION, Timing Belt Cover.>
- 8) Install the crank pulley. <Ref. to ME(H4SO)-42, INSTALLATION, Crank Pulley.>
- 9) Install the V-belts. <Ref. to ME(H4SO)-40, INSTALLATION, V-belt.>

C: INSPECTION

1. TIMING BELT

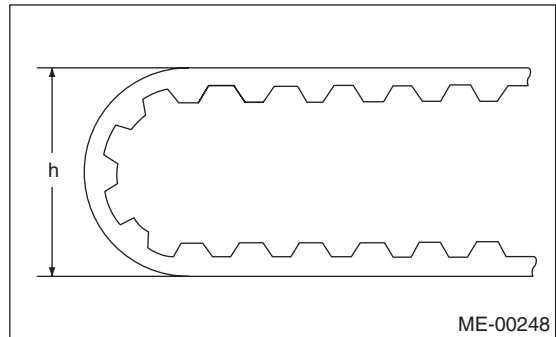
- 1) Check the timing belt teeth for breaks, cracks or wear. If any fault is found, replace the belt.
- 2) Check the condition of the backside of belt. If cracks are found, replace the belt.

CAUTION:

- Be careful not to let oil, grease or coolant contact the belt. Remove quickly and thoroughly if this happens.
- Do not bend the timing belt sharply.

In radial diameter h :

60 mm (2.36 in) or more



2. AUTOMATIC BELT TENSION ADJUSTER

1) Visually check the oil seals for leaks, and rod ends for abnormal wear and scratches. If necessary, replace the automatic belt tension adjuster assembly.

NOTE:

Slight traces of oil at rod's oil seal does not indicate a problem.

2) Check that the adjuster rod does not move when a pressure of 294 N (30 kgf, 66 lb) is applied to it. This is to check the adjuster rod stiffness.

3) If the adjuster rod is not stiff enough and moves freely when applying a pressure of 294 N (30 kgf, 66 lb), check it using the following procedures.

(1) Slowly press the adjuster rod down to the end surface of cylinder. Repeat this operation two to three times.

(2) With the adjuster rod moved all the way up, apply a pressure of 294 N (30 kgf, 66 lb) to it. Check the adjuster rod movement.

(3) If the adjuster rod is not stiff enough and moves down, replace the automatic belt tension adjuster assembly with a new part.

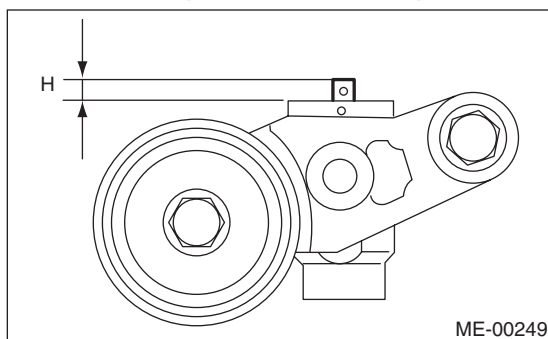
CAUTION:

- Always use a vertical type pressing tool to move the adjuster rod down.
- Do not use a lateral type vise.
- Push the adjuster rod vertically.
- Press the adjuster rod gradually taking more than three minutes.
- Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
- Press the adjuster rod to the end surface of the cylinder. Do not press the adjuster rod into cylinder. Doing so may damage the cylinder.

4) Measure the rod protrusion amount (H) from the body edge. If it is not within specified range, replace with new part.

Amount of rod protrusion H:

5.2 — 6.2 mm (0.204 — 0.244 in)



3. BELT TENSION PULLEY

1) Check the mating surfaces of timing belt and contact point of adjuster rod for abnormal wear or scratches. Replace the automatic belt tension adjuster assembly if faulty.

2) Check the belt tension pulley for smooth rotation. Replace if noise or excessive play occurs.

3) Check the belt tension pulley for grease leakage.

4. BELT IDLER

1) Check the belt idler for smooth rotation. Replace if noise or excessive play occurs.

2) Check the outer contacting surfaces of idler pulley for abnormal wear and scratches.

3) Check the belt idler for grease leakage.

16. Cam Sprocket

A: REMOVAL

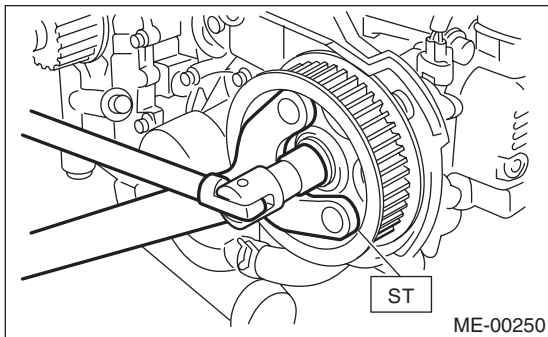
NOTE:

Perform the work with the engine installed to body when replacing a single part.

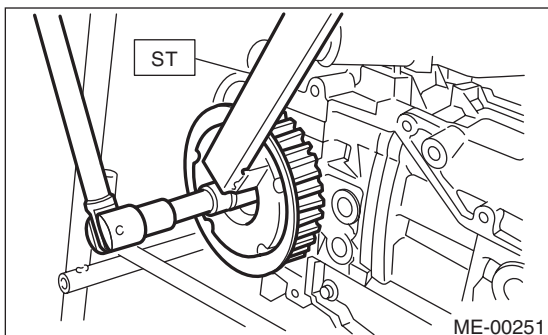
- 1) Remove the V-belts. <Ref. to ME(H4SO)-40, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4SO)-42, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(H4SO)-43, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt. <Ref. to ME(H4SO)-44, REMOVAL, Timing Belt.>
- 5) Remove the camshaft position sensor. <Ref. to FU(H4SO)-24, REMOVAL, Camshaft Position Sensor.>
- 6) Remove the cam sprocket No. 2. To lock the camshaft, use the ST.
ST 18231AA010 CAM SPROCKET WRENCH

NOTE:

CAM SPROCKET WRENCH (499207100) can also be used.



- 7) Remove the cam sprocket No. 1. To lock the camshaft, use the ST.
ST 499207400 CAM SPROCKET WRENCH



B: INSTALLATION

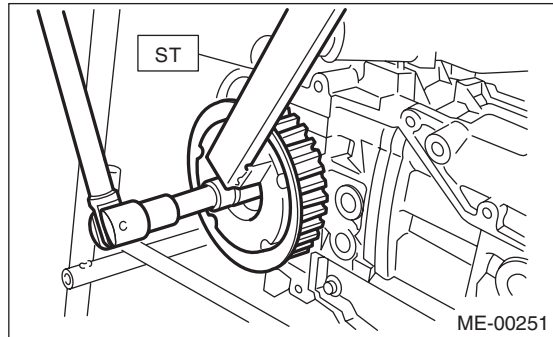
- 1) Install the cam sprocket No. 1. To lock the camshaft, use the ST.
ST 499207400 CAM SPROCKET WRENCH

Tightening torque:

78 N·m (8.0 kgf·m, 57.9 ft·lb)

NOTE:

Do not confuse left and right side cam sprockets during installation. Identify by L or R markings.



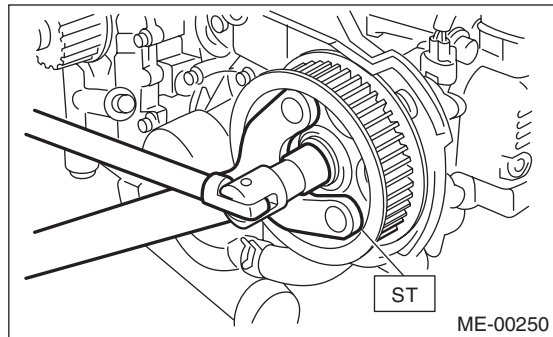
- 2) Install the cam sprocket No. 2. To lock the camshaft, use the ST.
ST 18231AA010 CAM SPROCKET WRENCH

NOTE:

CAM SPROCKET WRENCH (499207100) can also be used.

Tightening torque:

78 N·m (8.0 kgf·m, 57.9 ft·lb)



- 3) Install the camshaft position sensor. <Ref. to FU(H4SO)-24, INSTALLATION, Camshaft Position Sensor.>
- 4) Install the timing belt. <Ref. to ME(H4SO)-45, INSTALLATION, Timing Belt.>
- 5) Install the timing belt cover. <Ref. to ME(H4SO)-43, INSTALLATION, Timing Belt Cover.>
- 6) Install the crank pulley. <Ref. to ME(H4SO)-42, INSTALLATION, Crank Pulley.>
- 7) Install the V-belts. <Ref. to ME(H4SO)-40, INSTALLATION, V-belt.>

C: INSPECTION

- 1) Check the cam sprocket teeth for abnormal wear and scratches.
- 2) Make sure there is no free play between cam sprocket and key.
- 3) Check the cam sprocket protrusion used for sensor for damage and contamination of foreign matter.

Crank Sprocket

MECHANICAL

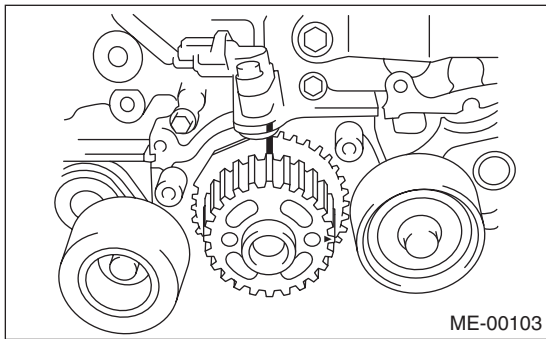
17.Crank Sprocket

A: REMOVAL

NOTE:

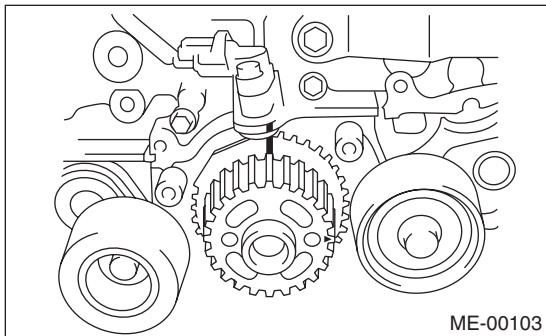
Perform the work with the engine installed to body when replacing a single part.

- 1) Remove the V-belts. <Ref. to ME(H4SO)-40, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4SO)-42, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(H4SO)-43, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt. <Ref. to ME(H4SO)-44, REMOVAL, Timing Belt.>
- 5) Remove the crank sprocket.



B: INSTALLATION

- 1) Install the crank sprocket.



- 2) Install the timing belt. <Ref. to ME(H4SO)-45, INSTALLATION, Timing Belt.>
- 3) Install the timing belt cover. <Ref. to ME(H4SO)-43, INSTALLATION, Timing Belt Cover.>
- 4) Install the crank pulley. <Ref. to ME(H4SO)-42, INSTALLATION, Crank Pulley.>
- 5) Install the V-belts. <Ref. to ME(H4SO)-40, INSTALLATION, V-belt.>

C: INSPECTION

- 1) Check the crank sprocket teeth for abnormal wear and scratches.
- 2) Make sure there is no free play between crank sprocket and key.
- 3) Check the crank sprocket protrusion used for sensor for damage and contamination of foreign matter.

18. Valve Rocker Assembly

A: REMOVAL

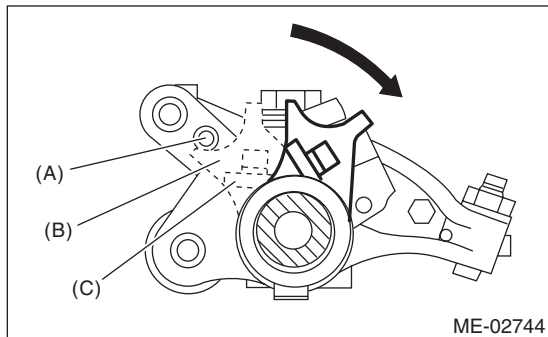
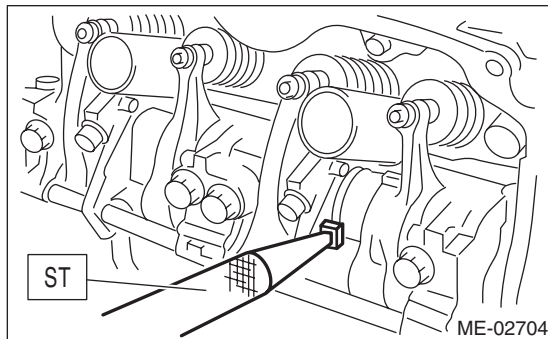
NOTE:

Perform the work with the engine installed to body when replacing a single part. Refer to "Valve Clearance" for preparation. <Ref. to ME(H4SO)-30, Valve Clearance.>

- 1) Remove the V-belts. <Ref. to ME(H4SO)-40, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4SO)-42, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(H4SO)-43, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt. <Ref. to ME(H4SO)-44, REMOVAL, Timing Belt.>
- 5) Remove the cam sprocket. <Ref. to ME(H4SO)-49, REMOVAL, Cam Sprocket.>
- 6) Disconnect the PCV hose and remove the rocker cover.
- 7) Remove the valve rocker assembly.

(1) Use the ST to rotate the spring stopper in the direction of the arrow to remove it from adjuster pin.

ST 18258AA000 SPRING INSTALLER

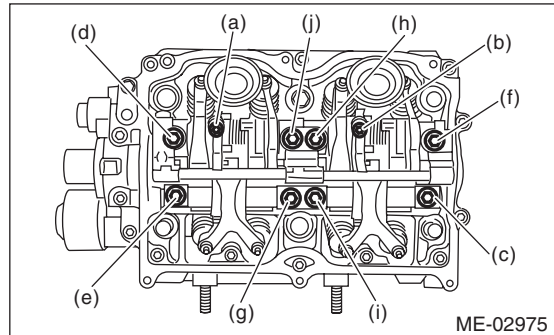


- (A) Adjuster pin
- (B) Spring stopper
- (C) Spring

(2) Remove the bolts (a) through (j) in alphabetical sequence.

NOTE:

Leave two or three threads of bolts (i) and (j) engaged in order to retain the valve rocker assembly.

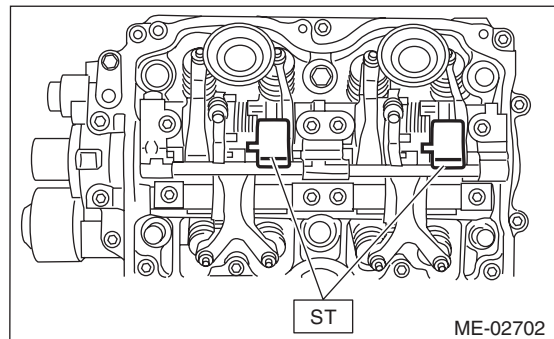


(3) Remove the valve rocker assembly.

NOTE:

Set the ST in the position shown in the drawing to remove the intake valve rocker assembly.

ST 18354AA000 VALVE ROCKER HOLDER



B: INSTALLATION

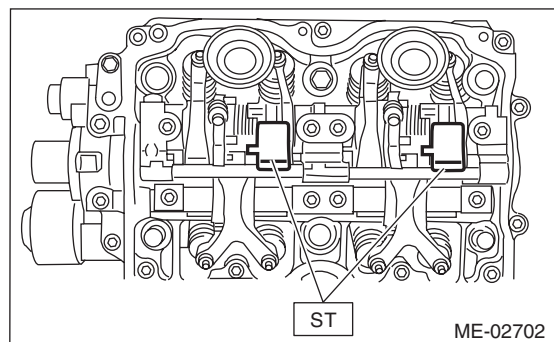
1) Install the valve rocker assembly.

(1) Temporarily tighten the bolts equally in alphabetical order as shown in the figure.

NOTE:

- Do not temporarily tighten the bolts (i) and (j).
- Set the ST in the position shown in the drawing to mount the intake valve rocker assembly.

ST 18354AA000 VALVE ROCKER HOLDER



Valve Rocker Assembly

MECHANICAL

(2) Tighten the bolts (a) through (h) to specified torque.

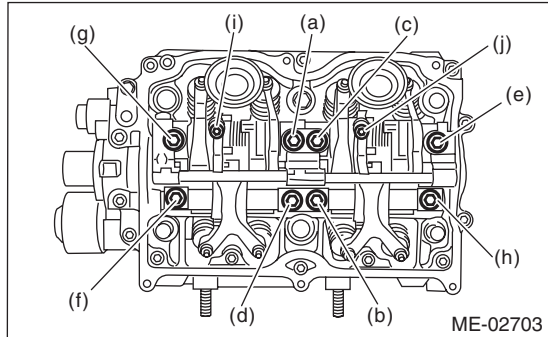
Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)

(3) Tighten the bolts (i) through (j) to specified torque.

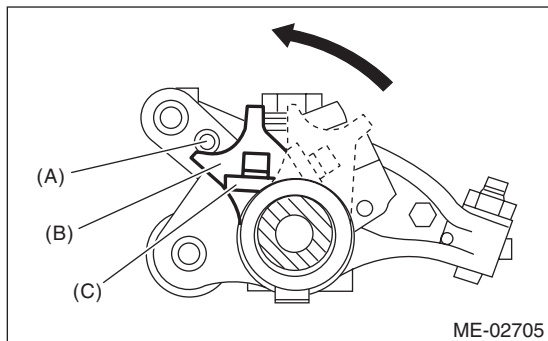
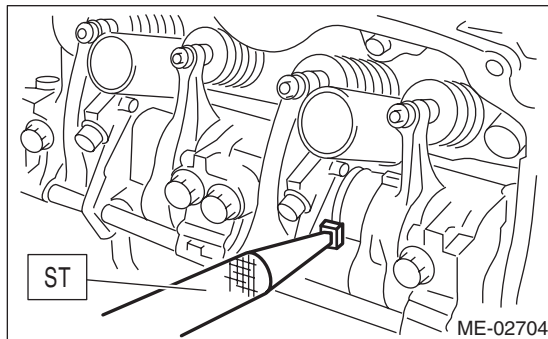
Tightening torque:

6 N·m (0.6 kgf-m, 4.3 ft-lb)



(4) Use the ST to rotate the spring stopper in the direction of the arrow to fasten the adjuster pin.

ST 18258AA000 SPRING INSTALLER



- (A) Adjuster pin
- (B) Spring stopper
- (C) Spring

2) Install the cam sprocket. <Ref. to ME(H4SO)-49, INSTALLATION, Cam Sprocket.>

3) Install the timing belt. <Ref. to ME(H4SO)-45, INSTALLATION, Timing Belt.>

4) Adjust the valve clearance. <Ref. to ME(H4SO)-31, ADJUSTMENT, Valve Clearance.>

5) Install the rocker cover and rocker cover gasket, and then connect PCV hose.

NOTE:

- Use a new rocker cover gasket.
- Tighten the bolts in two stages in alphabetical sequence as shown in figure.

Tightening torque:

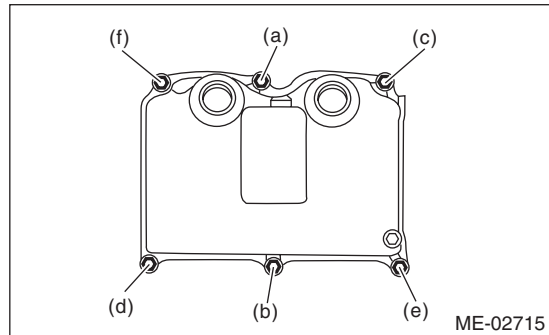
First time

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

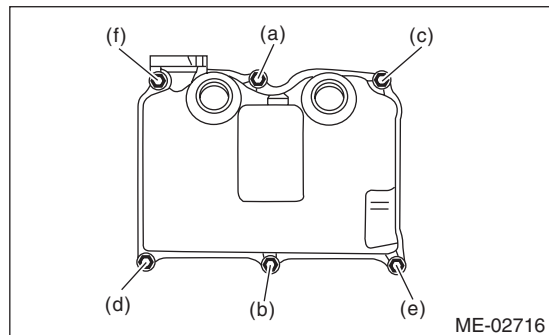
Second time (tighten only (a) and (b))

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

RH side



LH side



6) Install the timing belt cover. <Ref. to ME(H4SO)-43, INSTALLATION, Timing Belt Cover.>

7) Install the crank pulley. <Ref. to ME(H4SO)-42, INSTALLATION, Crank Pulley.>

8) Install the V-belts. <Ref. to ME(H4SO)-40, INSTALLATION, V-belt.>

C: DISASSEMBLY

NOTE:

Intake valve rocker assembly cannot be disassembled.

1) Remove the exhaust valve rocker arm from the rocker shaft.

NOTE:

Keep all the removed parts in order for re-installing in their original positions.

2) Remove the nut and adjusting screw from exhaust valve rocker.

D: ASSEMBLY

NOTE:

Intake valve rocker assembly cannot be disassembled.

- 1) Install the adjusting screw and nut to the exhaust valve rocker.
- 2) Insert the exhaust valve rocker arm to rocker shaft.

NOTE:

Valve rocker arms, and rocker shaft have identification marks. Make sure the parts with same markings are properly assembled.

E: INSPECTION

1. INTAKE VALVE ROCKER ASSEMBLY

- 1) If the roller or valve contact surface of valve rocker arm is worn or dented excessively, replace the valve rocker assembly.
- 2) Check that the valve rocker arm roller rotates smoothly. If not, replace the valve rocker assembly.

2. EXHAUST VALVE ROCKER ASSEMBLY

- 1) Measure the inner diameter of valve rocker arm and outer diameter of valve rocker shaft, and confirm the difference (oil clearance) between the two values.

Clearance between arm and shaft:

Standard:

0.020 — 0.054 mm (0.0008 — 0.0021 in)

Service limit:

0.10 mm (0.0039 in)

- 2) If the oil clearance exceeds the limit, replace the valve rocker arm or shaft, whichever shows greater amount of wear.

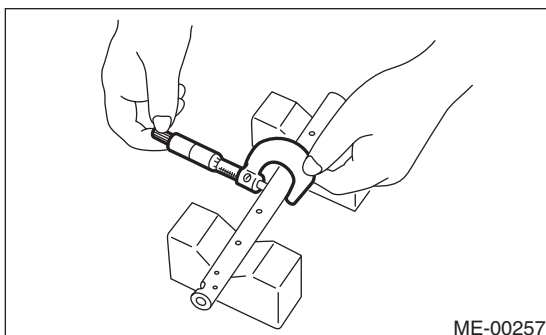
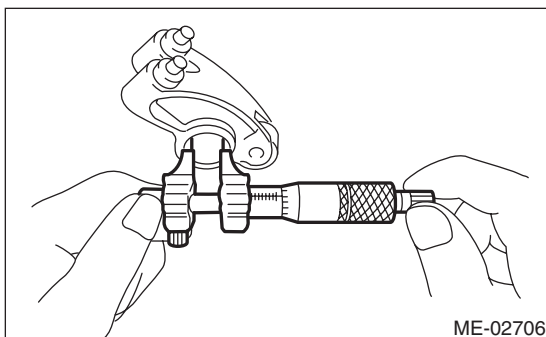
Rocker arm inside diameter:

22.020 — 22.041 mm (0.8669 — 0.8678 in)

Rocker shaft diameter:

21.987 — 22.000 mm (0.8656 — 0.8661 in)

- 3) If the roller or valve contact surface of valve rocker arm is worn or dented excessively, replace the valve rocker arm.
- 4) Check that the valve rocker arm roller rotates smoothly. If not, replace the valve rocker arm.



19. Camshaft

A: REMOVAL

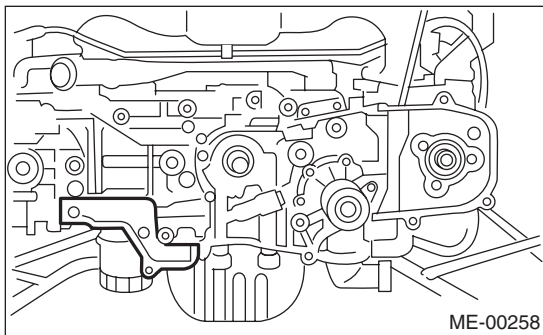
NOTE:

Perform the work with the engine installed to body when replacing a single part. Refer to "Valve Clearance" for preparation. <Ref. to ME(H4SO)-30, Valve Clearance.>

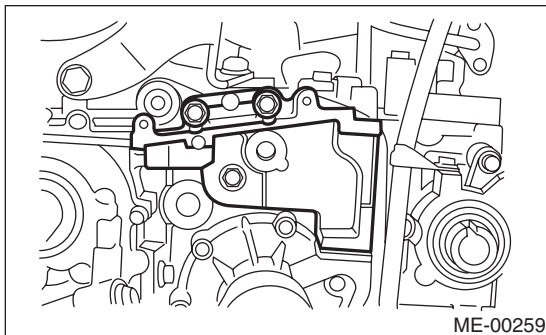
- 1) Remove the V-belts. <Ref. to ME(H4SO)-40, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4SO)-42, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(H4SO)-43, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt. <Ref. to ME(H4SO)-44, REMOVAL, Timing Belt.>
- 5) Remove the cam sprocket. <Ref. to ME(H4SO)-49, REMOVAL, Cam Sprocket.>
- 6) Remove the timing belt cover No. 2 (LH).
- 7) Remove the timing belt cover No. 2 (RH).

NOTE:

Do not damage or lose the seal rubber when removing the timing belt covers.



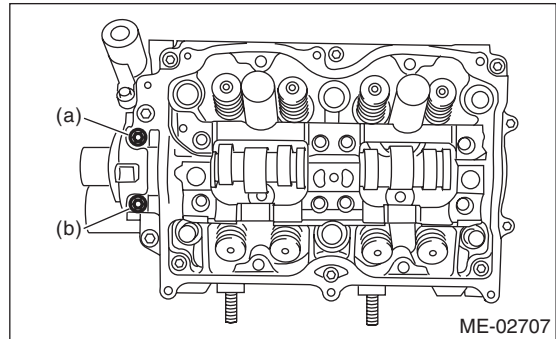
- 8) Remove the tensioner bracket.



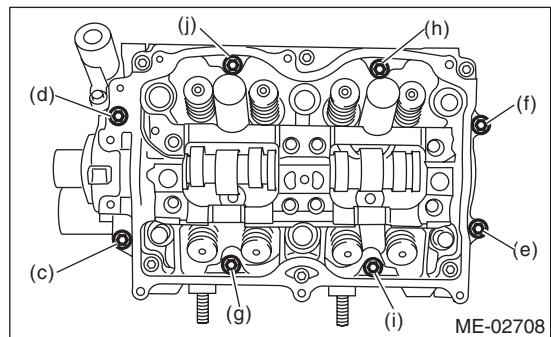
- 9) Remove the camshaft position sensor support. (LH side only)
- 10) Remove the oil level gauge guide. (LH side only)
- 11) Remove the valve rocker assembly. <Ref. to ME(H4SO)-51, REMOVAL, Valve Rocker Assembly.>

- 12) Remove the camshaft cap.

- (1) Remove the bolts (a) and (b) in alphabetical sequence.

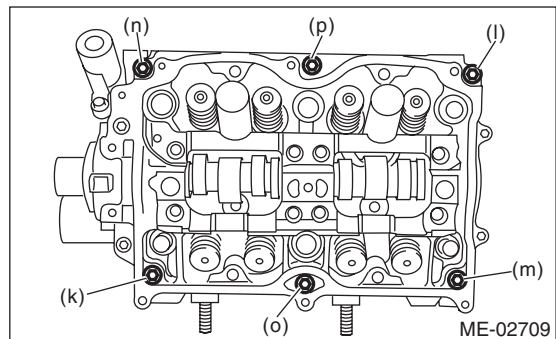


- (2) Equally loosen the bolts (c) through (j) all the way in alphabetical sequence.



- (3) Remove the bolts (k) through (p) in alphabetical sequence using ST.

ST 499497000 TORX® PLUS



- (4) Remove the camshaft cap.

- 13) Remove the camshaft.

- 14) Remove the oil seal.

- 15) Remove the plug from rear side of camshaft.

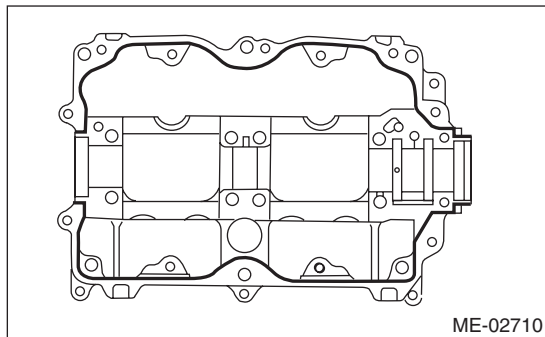
CAUTION:

- Do not remove the oil seal unless necessary.
- Do not scratch the journal surface when removing the oil seal.

B: INSTALLATION

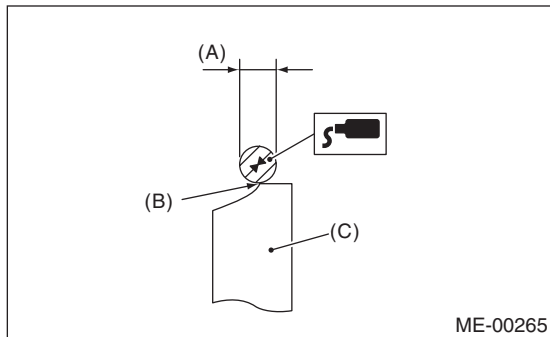
- 1) Apply a thin coat of engine oil to camshaft journals, and install the camshaft.
- 2) Install the camshaft cap.
 - (1) Apply liquid gasket to the mating surfaces of camshaft cap.

Liquid gasket:
THREE BOND 1280B
 (Part No. K0877YA018)

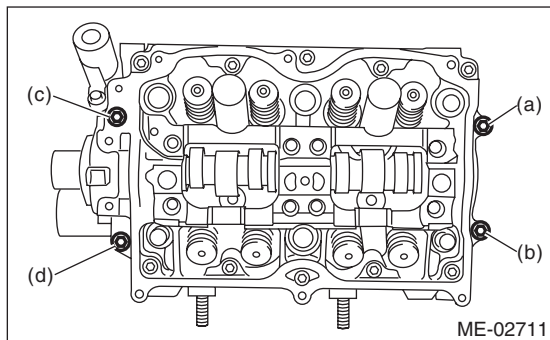


NOTE:

- Apply a coat of liquid gasket of 3 mm (0.12 in) in diameter (A) along the edge (B) of camshaft cap (C) mating surface.
- Install within 5 min. after applying liquid gasket.



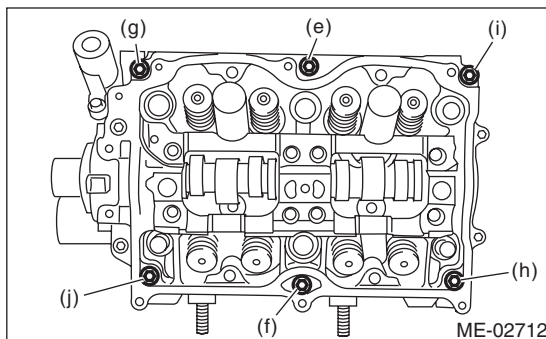
- (2) Temporarily tighten the bolts (a) through (d) in alphabetical sequence.



- (3) Install the valve rocker assembly.
 <Ref. to ME(H4SO)-51, INSTALLATION, Valve Rocker Assembly.>

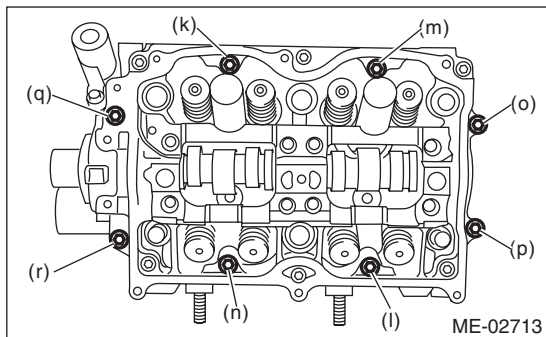
- (4) Tighten the TORX® bolts (e) through (j) in alphabetical sequence using ST.
 ST 499497000 TORX® PLUS

Tightening torque:
18 N·m (1.8 kgf-m, 13.0 ft-lb)



- (5) Tighten the bolts (k) through (r) in alphabetical sequence.

Tightening torque:
9.75 N·m (1.0 kgf-m, 7.2 ft-lb)

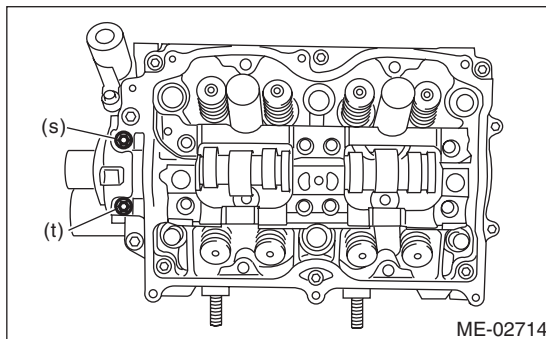


- (6) Tighten the bolts (s) and (t) in alphabetical sequence.

NOTE:

- Use new seal washer.
- Install and tighten the seal washer.

Tightening torque:
9.75 N·m (1.0 kgf-m, 7.2 ft-lb)



Camshaft

MECHANICAL

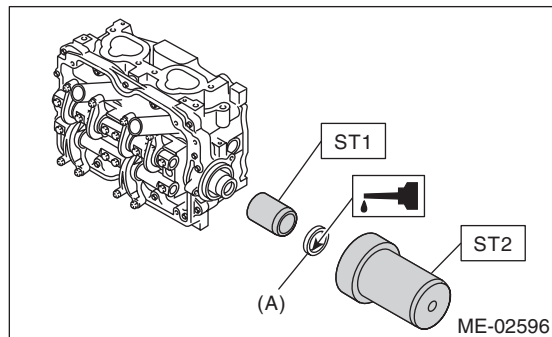
3) Apply a coat of engine oil to the oil seal periphery and oil seal lip, then install the oil seal (A) on camshaft using ST1 and ST2.

NOTE:

Use a new oil seal.

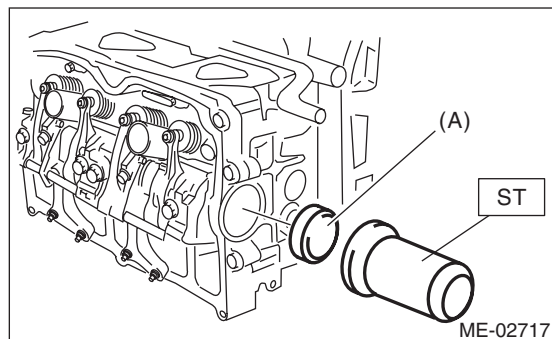
ST1 499597000 OIL SEAL GUIDE

ST2 499587500 OIL SEAL INSTALLER



4) Install the plug (A) using ST.

ST 499587700 CAMSHAFT OIL SEAL INSTALLER



5) Adjust the valve clearance. <Ref. to ME(H4SO)-31, ADJUSTMENT, Valve Clearance.>

6) Install the rocker cover and rocker cover gasket, and then connect PCV hose.

NOTE:

- Use a new rocker cover gasket.
- Tighten the bolts in two stages in alphabetical sequence as shown in figure.

Tightening torque:

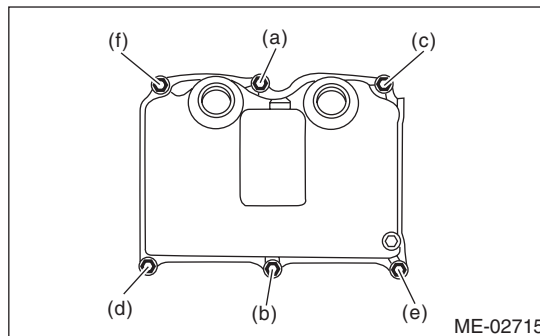
First time

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

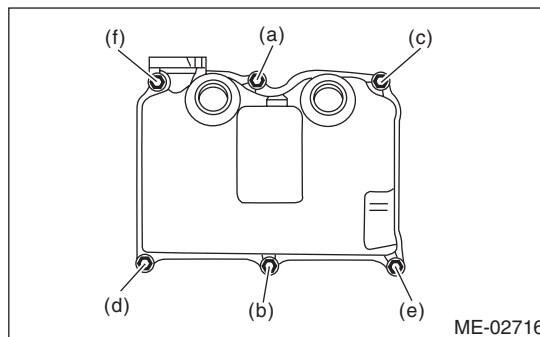
Second time (tighten only (a) and (b))

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

RH side



LH side



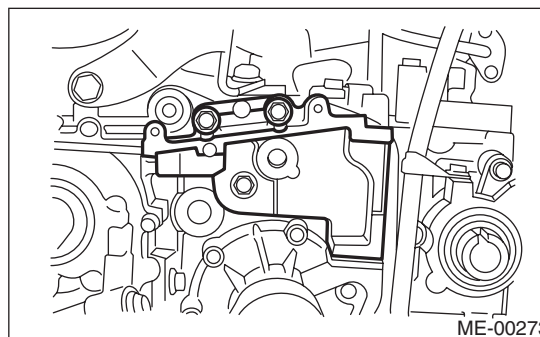
7) Install the oil level gauge guide. (LH side only)

8) Install the camshaft position sensor support. (LH side only)

9) Install the tensioner bracket.

Tightening torque:

24.5 N·m (2.5 kgf-m, 18.1 ft-lb)



10) Install the timing belt cover No. 2 (RH).

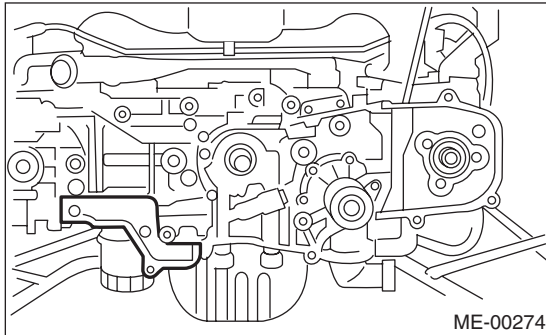
Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)

11) Install the timing belt cover No. 2 (LH).

Tightening torque:

5 N·m (0.5 kgf·m, 3.6 ft·lb)



12) Install the cam sprocket. <Ref. to ME(H4SO)-49, INSTALLATION, Cam Sprocket.>

13) Install the timing belt. <Ref. to ME(H4SO)-45, INSTALLATION, Timing Belt.>

14) Install the timing belt cover.

<Ref. to ME(H4SO)-43, INSTALLATION, Timing Belt Cover.>

15) Install the crank pulley. <Ref. to ME(H4SO)-42, INSTALLATION, Crank Pulley.>

16) Install the V-belts. <Ref. to ME(H4SO)-40, INSTALLATION, V-belt.>

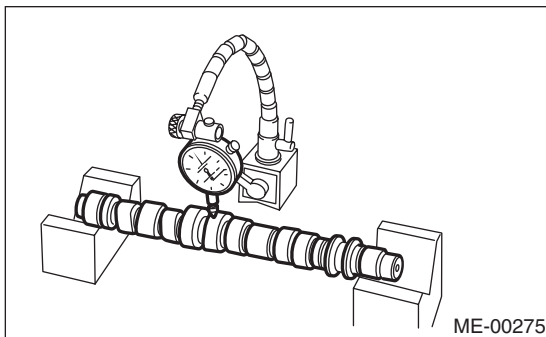
C: INSPECTION

1. CAMSHAFT

1) Measure the bend, and repair or replace if necessary.

Service limit:

0.025 mm (0.00098 in)



2) Check the journal for damage and wear. Replace if faulty.

3) Measure the outer diameter of camshaft journal and inner diameter of cylinder head journal, and confirm the difference (oil clearance) between the two values. If the oil clearance exceeds standard, replace the camshaft or cylinder head as necessary.

Unit: mm (in)		
Oil clearance	Standard	0.055 — 0.090 (0.0022 — 0.0035)
	Limit	0.10 (0.0039)
Camshaft journal O.D.		31.928 — 31.945 (1.2570 — 1.2577)
Journal hole I.D.		32.000 — 32.018 (1.2598 — 1.2605)

4) Check the cam face condition, and remove the minor faults by grinding with oil stone. Measure the cam height H. If it exceeds the limit, replace it.

Cam height H:

Part			Unit: mm (in)
Intake	Constant	Standard	40.075 — 40.175 (1.5778 — 1.5817)
		Limit	39.975 (1.5738)
	Low speed	Standard	35.182 — 35.282 (1.3851 — 1.3891)
		Limit	35.082 (1.3812)
	High speed	Standard	40.315 — 40.415 (1.5872 — 1.5911)
		Limit	40.215 (1.5833)
Exhaust	Standard	40.149 — 40.249 (1.5807 — 1.5846)	
	Limit	40.049 (1.5767)	

Cam base circle diameter A:

Intake

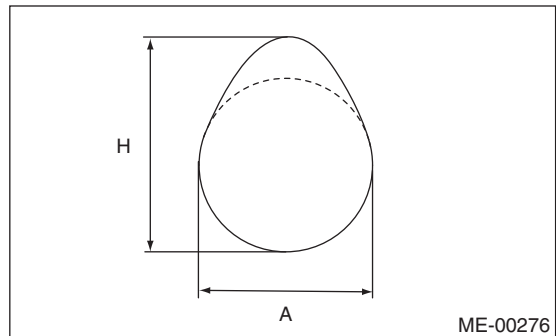
34.00 mm (1.3386 in)

Exhaust

34.00 mm (1.3386 in)

Base circle step of adjacent intake cams (low speed and high speed):

0.03 mm (0.001 in) or less



5) Measure the thrust clearance of camshaft with setting the dial gauge at end of camshaft. If the thrust clearance exceeds the limit, replace the camshaft caps and cylinder head as a set. If necessary, replace the camshaft.

Standard:

0.030 — 0.090 mm (0.0012 — 0.0035 in)

Service limit:

0.10 mm (0.0039 in)

Cylinder Head

MECHANICAL

20. Cylinder Head

A: REMOVAL

NOTE:

Perform the work with the engine installed to body when replacing a single part. Refer to "Valve Clearance" for preparation. <Ref. to ME(H4SO)-30, Valve Clearance.>

1) Remove the V-belts. <Ref. to ME(H4SO)-40, REMOVAL, V-belt.>

2) Remove the crank pulley. <Ref. to ME(H4SO)-42, REMOVAL, Crank Pulley.>

3) Remove the timing belt cover. <Ref. to ME(H4SO)-43, REMOVAL, Timing Belt Cover.>

4) Remove the timing belt. <Ref. to ME(H4SO)-44, REMOVAL, Timing Belt.>

5) Remove the cam sprocket. <Ref. to ME(H4SO)-49, REMOVAL, Cam Sprocket.>

6) Remove the intake manifold. <Ref. to FU(H4SO)-13, REMOVAL, Intake Manifold.>

7) Remove the bolt which installs the A/C compressor bracket on cylinder head.

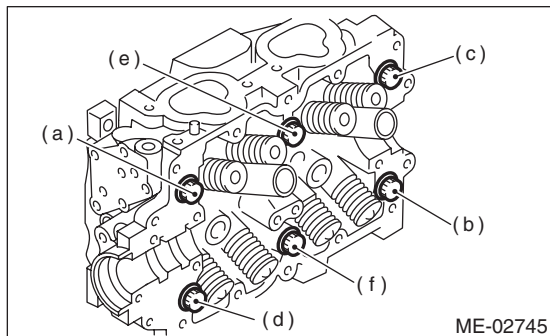
8) Remove the valve rocker assembly. <Ref. to ME(H4SO)-51, REMOVAL, Valve Rocker Assembly.>

9) Remove the camshaft. <Ref. to ME(H4SO)-54, REMOVAL, Camshaft.>

10) Remove the cylinder head bolts in alphabetical sequence as shown in the figure.

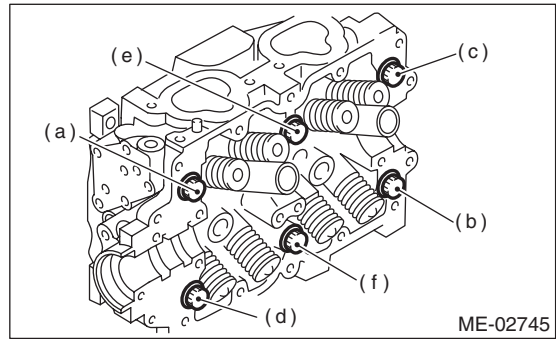
NOTE:

Leave bolts (a) and (c) engaged by three or four threads to prevent the cylinder head from falling.



11) While tapping the cylinder head with a plastic hammer, separate it from cylinder block.

12) Remove the bolts (a) and (c) to remove cylinder head.



13) Remove the cylinder head gasket.

CAUTION:

Be careful not to scratch the mating surface of cylinder block and cylinder head.

14) Similarly, remove the right side cylinder head.

B: INSTALLATION

1) Install the cylinder head and gaskets on cylinder block.

CAUTION:

Be careful not to scratch the mating surface of cylinder block and cylinder head.

NOTE:

Use new cylinder head gaskets.

2) Tighten the cylinder head bolts.

(1) Apply a thin coat of engine oil to washer and bolt thread.

(2) Tighten all bolts to 29 N·m (3.0 kgf·m, 22 ft·lb) in alphabetical sequence. Then tighten all bolts to 69 N·m (7.0 kgf·m, 51 ft·lb) in alphabetical sequence.

(3) Loosen all the bolts by 180° in reverse order of installation, and loosen again by 180° in the same order.

(4) Tighten all bolts to 42 N·m (3.9 kgf·m, 31 ft·lb) in alphabetical sequence.

(5) Tighten all bolts by 80 to 90° in alphabetical sequence.

(6) Tighten all bolts by 40 to 45° in alphabetical sequence.

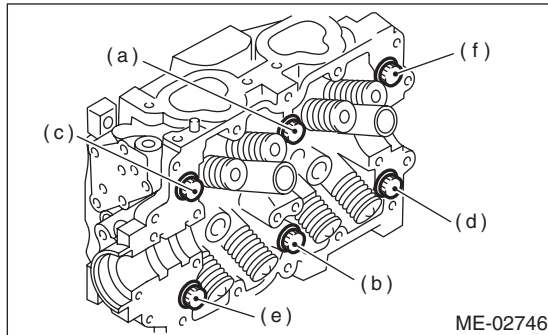
CAUTION:

The tightening angle of the bolt should not exceed 45°.

(7) Further tighten the bolts (a) and (b) by 40 — 45°.

CAUTION:

Make sure the total “re-tightening angle” of the step (6) and (7) does not exceed 90°.



3) Install the camshaft. <Ref. to ME(H4SO)-55, INSTALLATION, Camshaft.>

4) Install the valve rocker assembly. <Ref. to ME(H4SO)-51, INSTALLATION, Valve Rocker Assembly.>

5) Install the A/C compressor bracket on cylinder head.

6) Install the intake manifold.

<Ref. to FU(H4SO)-15, INSTALLATION, Intake Manifold.>

7) Install the cam sprocket. <Ref. to ME(H4SO)-49, INSTALLATION, Cam Sprocket.>

8) Install the timing belt. <Ref. to ME(H4SO)-45, INSTALLATION, Timing Belt.>

9) Adjust the valve clearance. <Ref. to ME(H4SO)-31, ADJUSTMENT, Valve Clearance.>

10) Install the rocker cover and rocker cover gasket, and then connect PCV hose.

NOTE:

Use a new gasket.

11) Install the timing belt cover.

<Ref. to ME(H4SO)-43, INSTALLATION, Timing Belt Cover.>

12) Install the crank pulley. <Ref. to ME(H4SO)-42, INSTALLATION, Crank Pulley.>

13) Install the V-belts. <Ref. to ME(H4SO)-40, INSTALLATION, V-belt.>

C: DISASSEMBLY

1) Place the cylinder head on the ST.

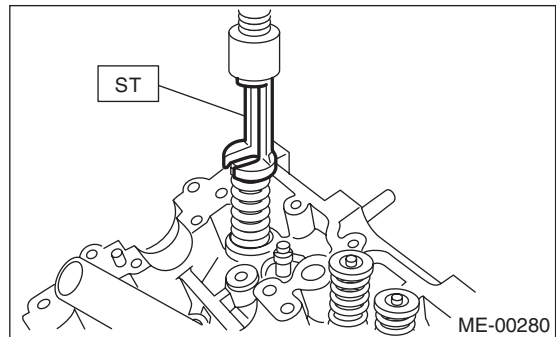
ST 498267800 CYLINDER HEAD TABLE

2) Set the ST on valve spring. Compress the valve spring and remove the valve spring retainer key. Remove each valve and valve spring.

ST 499718000 VALVE SPRING REMOVER

NOTE:

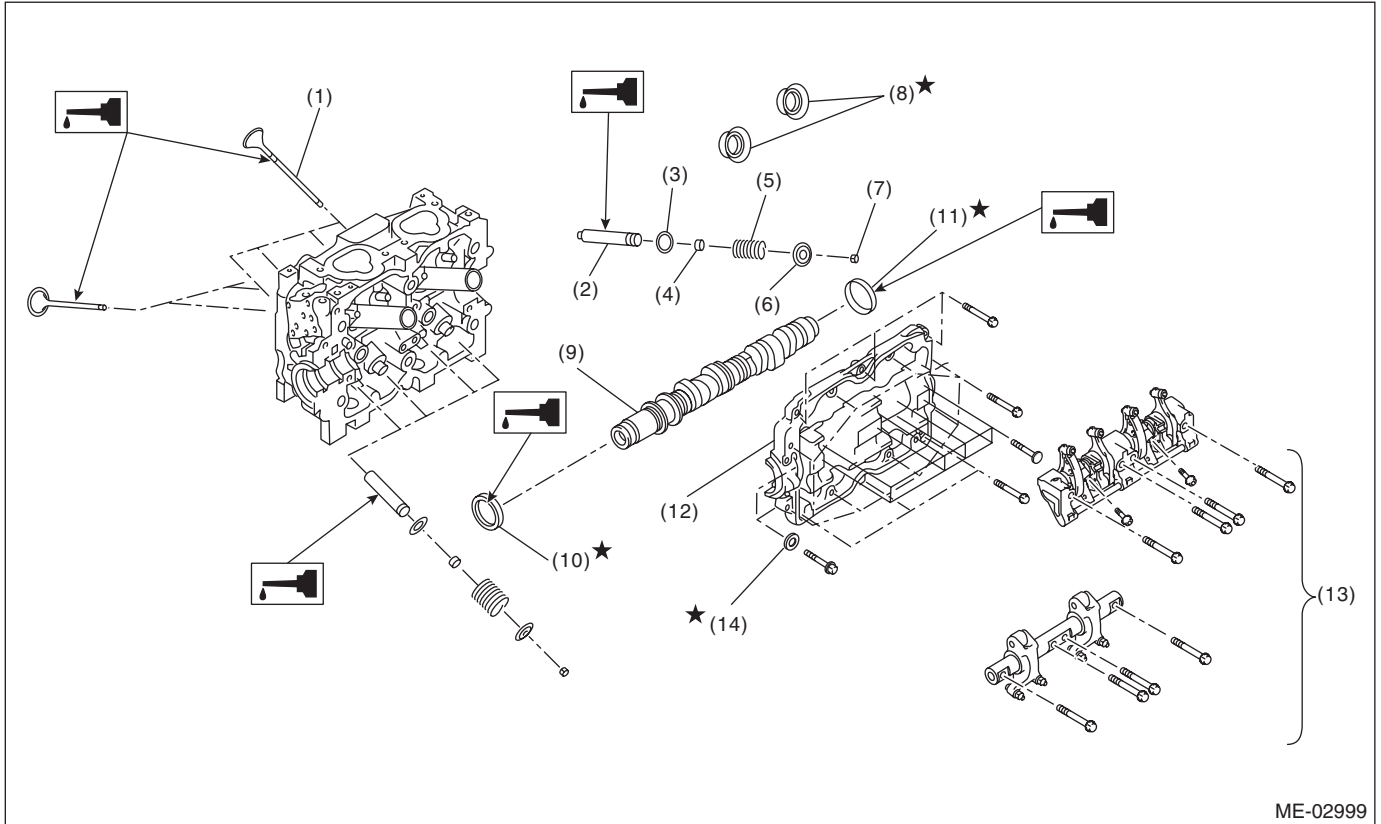
- Mark each valve to prevent confusion.
- Pay careful attention not to damage the lips of intake valve oil seals and exhaust valve oil seals.
- Keep all the removed parts in order for re-installing in their original positions.



Cylinder Head

MECHANICAL

D: ASSEMBLY



- | | | |
|-----------------------|-----------------------|------------------------|
| (1) Valve | (6) Retainer | (11) Plug |
| (2) Valve guide | (7) Retainer key | (12) Camshaft cap |
| (3) Valve spring seat | (8) Spark plug gasket | (13) Valve rocker ASSY |
| (4) Oil seal | (9) Camshaft | (14) Seal washer |
| (5) Valve spring | (10) Oil seal | |

- 1) Installation of valve spring and valve:
 (1) Place the cylinder head on the ST.
 ST 498267800 CYLINDER HEAD TABLE
 (2) Coat the stem of each valve with engine oil and insert the valve into valve guide.

NOTE:

When inserting the valve into valve guide, use special care not to damage the oil seal lip.

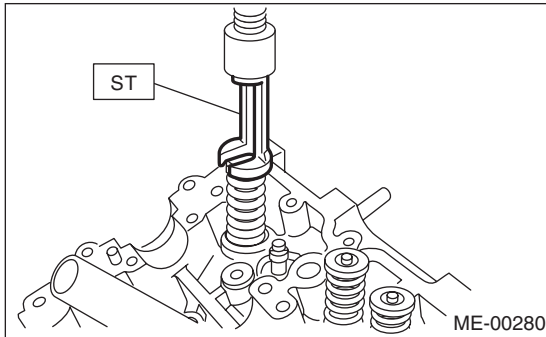
- (3) Install the valve spring and retainer.

NOTE:

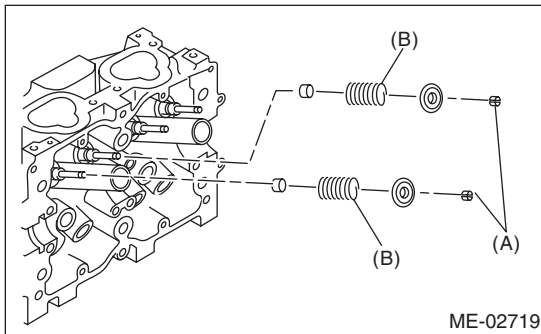
Be sure to install the valve spring with its close-coiled end facing the seat on cylinder head.

- (4) Set the ST on valve spring.

ST 499718000 VALVE SPRING REMOVER



- (5) Compress the valve spring and fit the valve spring retainer key.



- (A) Retainer key
- (B) Valve spring
- (C) Retainer

- (6) After installing, tap the valve spring retainers lightly with a plastic hammer for better seating.

E: INSPECTION

1. CYLINDER HEAD

- 1) Make sure that no crack or other damage do not exists. In addition to visual inspection, inspect important areas using liquid penetrant tester.

Also make sure the gasket installing surface shows no trace of gas and water leaks.

- 2) Place the cylinder head on the ST.

ST 498267800 CYLINDER HEAD TABLE

- 3) Measure the warping of the cylinder head surface that mates with crankcase using a straight edge and thickness gauge.

If the warping exceeds the limit, regrind the surface with a surface grinder.

Warping limit:

0.035 mm (0.0012 in)

Grinding limit:

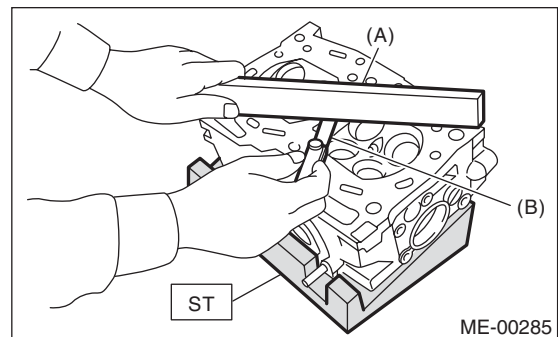
0.1 mm (0.004 in)

Standard height of cylinder head:

97.5 mm (3.839 in)

NOTE:

Uneven torque for the cylinder head bolts can cause warping. When reassembling, pay special attention to the torque so as to tighten evenly.



- (A) Straight edge
- (B) Thickness gauge

Cylinder Head

MECHANICAL

2. VALVE SEAT

Inspect the intake and exhaust valve seats, and correct the contact surfaces with a valve seat cutter if they are defective or when valve guides are replaced.

Valve seat width *W*:

Standard:

Intake (A)

0.8 — 1.4 mm (0.03 — 0.055 in)

Exhaust (B)

1.2 — 1.8 mm (0.047 — 0.071 in)

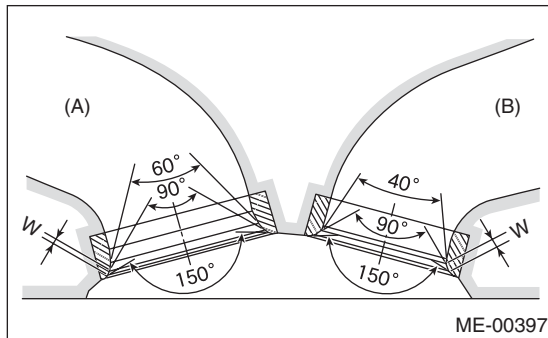
Service limit:

Intake (A)

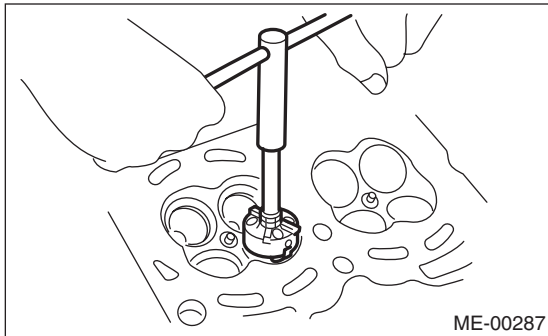
1.7 mm (0.067 in)

Exhaust (B)

2.2 mm (0.087 in)



ME-00397



ME-00287

3. VALVE GUIDE

1) Check the clearance between valve guide and stem. The clearance can be checked by measuring respectively the outer diameter of valve stem with a micrometer and the inner diameter of valve guide with a caliper gauge.

Clearance between the valve guide and valve stem:

Standard:

Intake

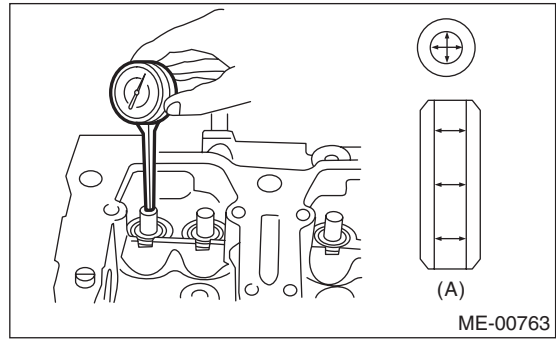
0.035 — 0.062 mm (0.0014 — 0.0024 in)

Exhaust

0.040 — 0.067 mm (0.0016 — 0.0026 in)

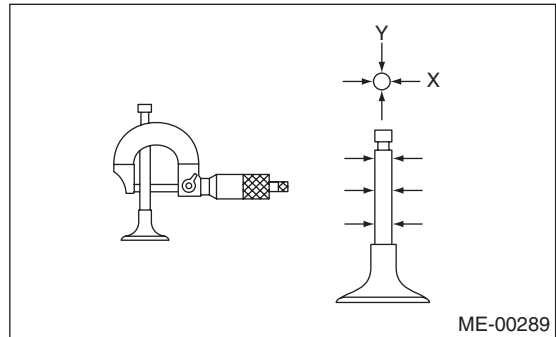
Service limit:

0.15 mm (0.0059 in)



ME-00763

(A) Valve guide



ME-00289

2) If the clearance between valve guide and stem exceeds the limit, replace the valve guide or valve itself whichever shows greater amount of wear. See the following procedure for valve guide replacement.

Valve guide inner diameter:

6.000 — 6.012 mm (0.2362 — 0.2367 in)

Valve stem outer diameters:

Intake

5.950 — 5.965 mm (0.2343 — 0.2348 in)

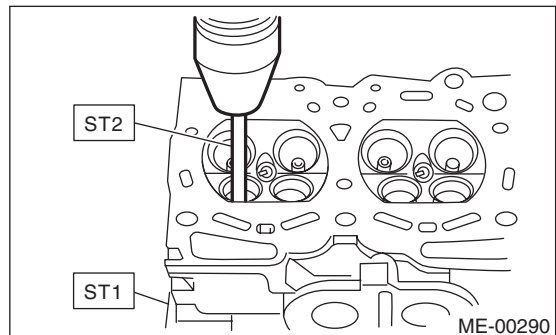
Exhaust

5.945 — 5.960 mm (0.2341 — 0.2346 in)

(1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides fit the holes in ST1.

(2) Insert the ST2 into valve guide and press it down to remove the valve guide.

ST1 498267800 CYLINDER HEAD TABLE
ST2 499767200 VALVE GUIDE REMOVER



ME-00290

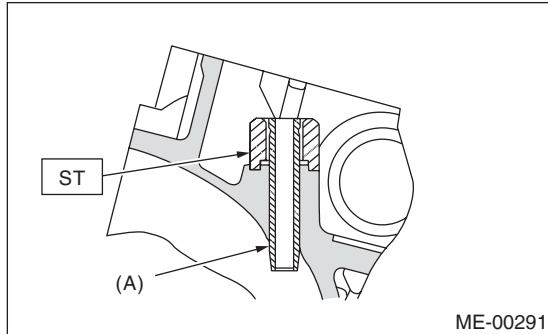
(3) Turn the cylinder head upside down and place the ST as shown in the figure.

Intake side

ST 499767700 VALVE GUIDE ADJUSTER

Exhaust side

ST 499767800 VALVE GUIDE ADJUSTER



(A) Valve guide

(4) Before installing a new valve guide, make sure that neither scratches nor damages exist on the inner surface of valve guide holes in cylinder head.

(5) Put a new valve guide, coated with sufficient oil, in cylinder, and insert the ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

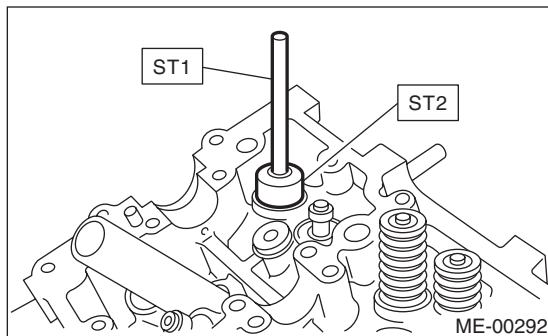
ST1 499767200 VALVE GUIDE REMOVER

Intake side

ST2 499767700 VALVE GUIDE ADJUSTER

Exhaust side

ST2 499767800 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

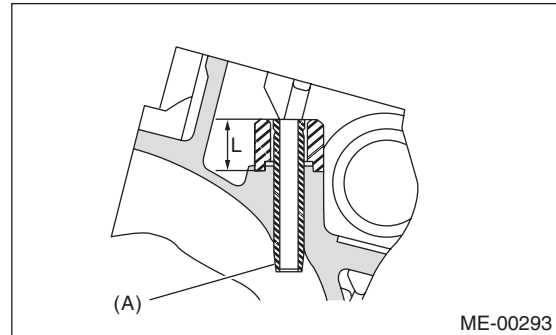
Valve guide protrusion L:

Intake

20.0 — 21.0 mm (0.787 — 0.827 in)

Exhaust

16.5 — 17.5 mm (0.650 — 0.689 in)



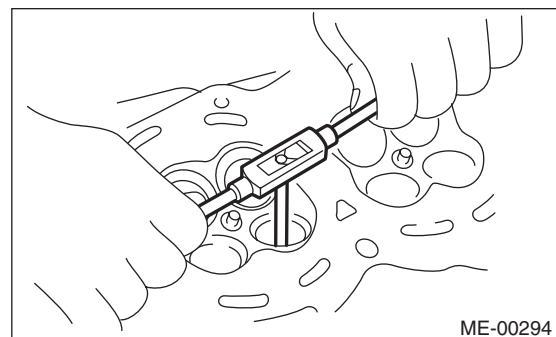
(A) Valve guide

(7) Ream the inside of valve guide using ST. Put the reamer in valve guide, and rotate the reamer slowly clockwise while pushing it lightly. Bring the reamer back while rotating it clockwise. After reaming, clean the valve guide to remove chips.

NOTE:

- Apply engine oil to the reamer when reaming.
- If the inner surface of the valve guide is torn, slightly grind the edge of the reamer with an oil stone.
- If the inner surface of valve guide becomes lustrous and the reamer does not chip, use a new reamer or remedy the reamer.

ST 499767400 VALVE GUIDE REAMER



(8) Recheck the contact condition between valve and valve seat after replacing the valve guide.

Cylinder Head

MECHANICAL

4. INTAKE AND EXHAUST VALVE

1) Inspect the flange and stem of valve, and replace if damaged, worn, or deformed, or if H is outside of the specified limit.

H:

Intake

Standard:

0.8 — 1.2 mm (0.03 — 0.047 in)

Limit:

0.6 mm (0.024 in)

Exhaust

Standard:

1.0 — 1.4 mm (0.039 — 0.055 in)

Limit:

0.6 mm (0.024 in)

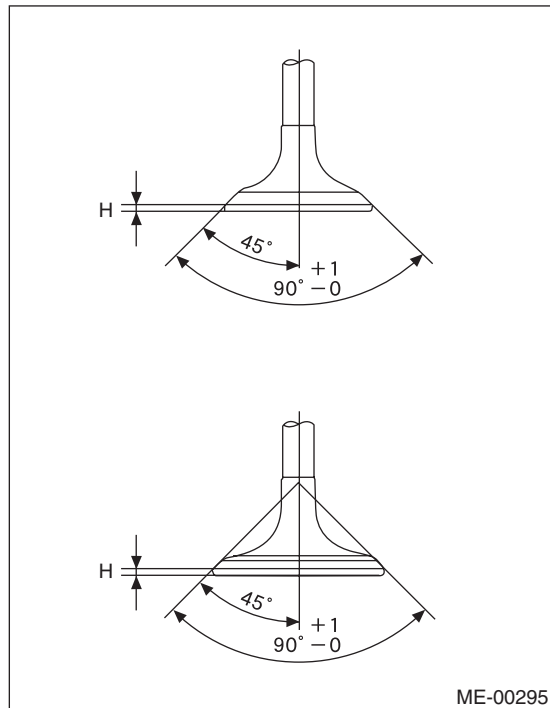
Valve overall length:

Intake

120.6 mm (4.75 in)

Exhaust

121.7 mm (4.79 in)



2) Put a small amount of grinding compound on the seat surface, and lap the valve and seat surface. Replace with a new valve oil seal after lapping.

NOTE:

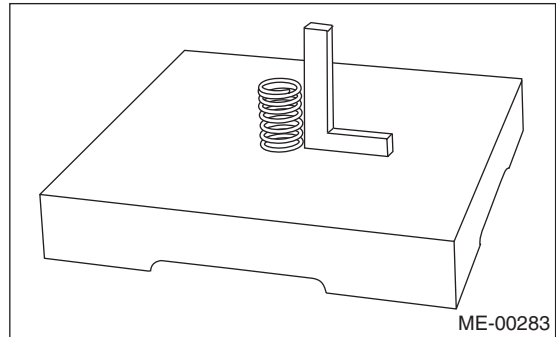
It is possible to differentiate between the intake valve and the exhaust valve by their overall length.

5. VALVE SPRING

1) Check the valve springs for damage, free length, and tension. Replace the valve spring if it is not within the standard value presented in the table.

2) To measure the squareness of the valve spring, stand the spring on a surface plate and measure its deflection at the top of spring using a try square.

Free length mm (in)		55.2 (2.173)
Tension/spring height N (kgf, lb)/ mm (in)	Set	235.3 — 270.7 (24 — 27.6, 52.9 — 60.8)/45.0 (1.772)
	Lift	578.9 — 639.9 (59.1 — 65.3, 130.3 — 143.9)/ 34.7 (1.366)
Squareness		2.5°, 2.4 mm (0.094 in) or less



6. INTAKE AND EXHAUST VALVE OIL SEAL

In the following case, remove the oil seal from the valve guide and replace it with a new part.

- When the lip is damaged.
- When the spring is out of the specified position.
- When readjusting the surfaces of intake valve and valve sheet.
- When replacing the intake valve guide.

1) Place the cylinder head on ST1.

2) Using the ST2, press-fit the oil seal.

ST1 498267800 CYLINDER HEAD TABLE

ST2 498857100 VALVE OIL SEAL GUIDE

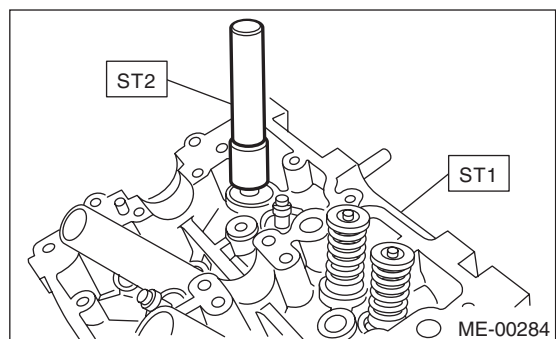
NOTE:

- Apply engine oil to oil seal before press-fitting.
- When press-fitting the oil seal, do not use a hammer or strike in.
- The intake valve oil seal and exhaust valve oil seal can be differentiated by colors.

Color of rubber part:

Intake [Gray]

Exhaust [Green]



21. Cylinder Block

A: REMOVAL

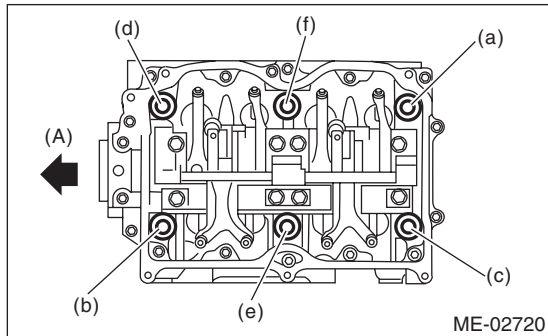
NOTE:

Before conducting this procedure, drain the engine oil completely.

- 1) Remove the intake manifold. <Ref. to FU(H4SO)-13, REMOVAL, Intake Manifold.>
- 2) Remove the V-belts. <Ref. to ME(H4SO)-40, REMOVAL, V-belt.>
- 3) Remove the crank pulley. <Ref. to ME(H4SO)-42, REMOVAL, Crank Pulley.>
- 4) Remove the timing belt cover. <Ref. to ME(H4SO)-43, REMOVAL, Timing Belt Cover.>
- 5) Remove the timing belt. <Ref. to ME(H4SO)-44, REMOVAL, Timing Belt.>
- 6) Remove the cam sprocket. <Ref. to ME(H4SO)-49, REMOVAL, Cam Sprocket.>
- 7) Remove the crank sprocket. <Ref. to ME(H4SO)-50, REMOVAL, Crank Sprocket.>
- 8) Remove the generator and A/C compressor with their brackets.
- 9) Remove the rocker cover.
- 10) Remove the cylinder head bolts in alphabetical sequence shown in the figure.

NOTE:

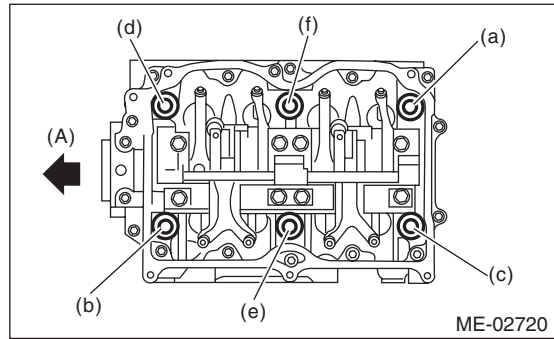
Leave bolts (a) and (d) engaged by three or four threads to prevent the cylinder head from falling.



(A) Front side

- 11) While tapping the cylinder head with a plastic hammer, separate it from cylinder block.

- 12) Remove the bolts (a) and (d) to remove cylinder head.



(A) Front side

- 13) Remove the cylinder head gasket.

CAUTION:

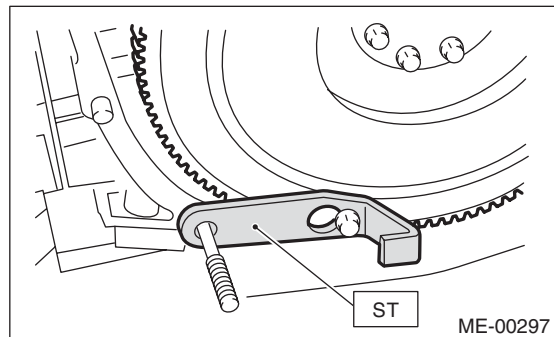
Be careful not to scratch the mating surface of cylinder block and cylinder head.

- 14) Similarly, remove the right side cylinder head.
- 15) Remove the clutch housing cover. (MT model)
- 16) Remove the flywheel (MT model) or drive plate (AT model).

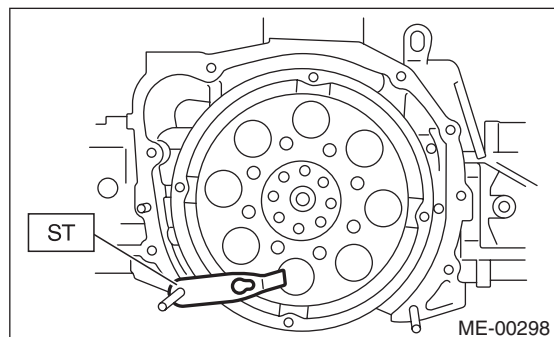
Using the ST, lock the crankshaft.

ST 498497100 CRANKSHAFT STOPPER

- MT model



- AT model

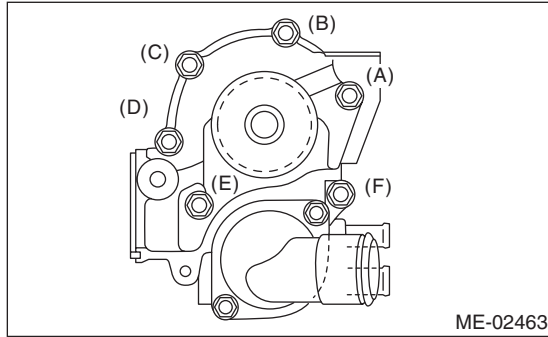


- 17) Remove the oil separator cover.
- 18) Remove the water by-pass pipe for heater.

Cylinder Block

MECHANICAL

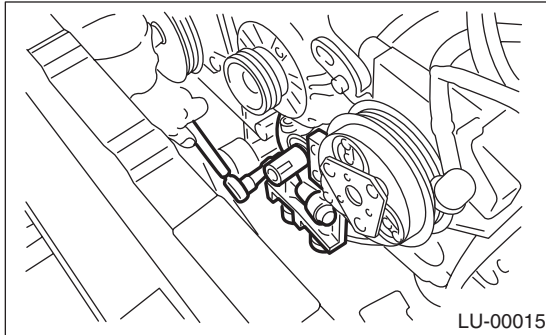
19) Remove the water pump after loosening the bolts in alphabetical sequence as shown in the figure.



20) Remove the bolts which install oil pump onto cylinder block.

NOTE:

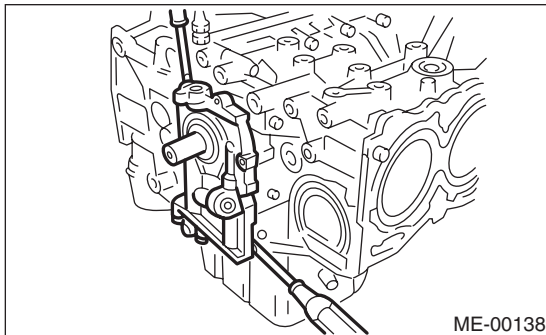
When disassembling and checking the oil pump, loosen the relief valve plug before removing the oil pump.



21) Remove the oil pump from cylinder block using a flat tip screwdriver.

CAUTION:

Be careful not to scratch the mating surface of cylinder block and oil pump.



22) Remove the oil pan.

(1) Place the cylinder block to face the #2 and #4 piston side upward.

(2) Remove the bolts which secure oil pan to cylinder block.

(3) Insert an oil pan cutter blade between cylinder block-to-oil pan clearance and remove the oil pan.

CAUTION:

Do not use a screwdriver or similar tool in place of oil pan cutter.

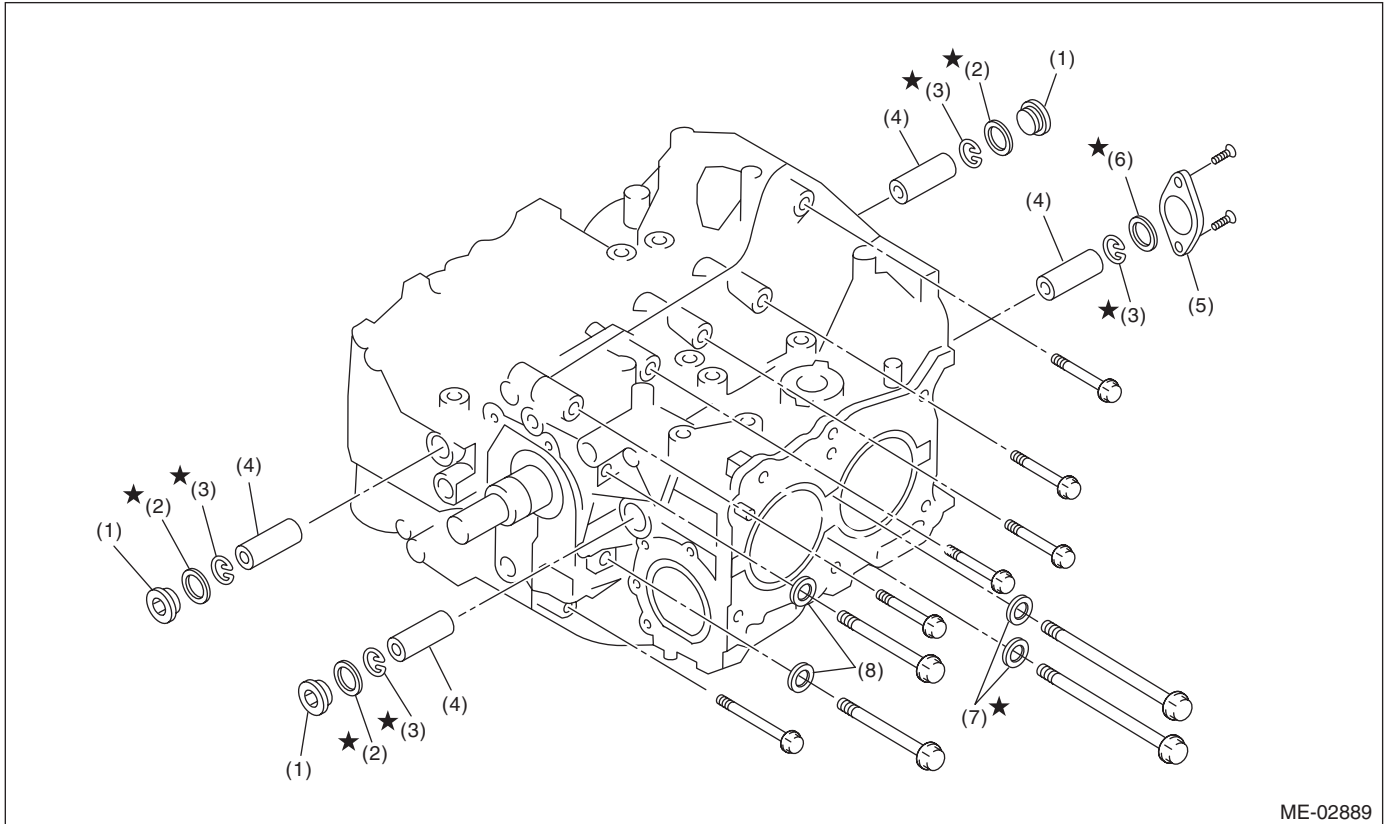
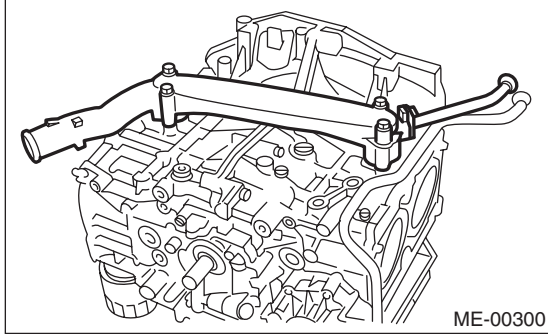
23) Remove the oil strainer stay.

24) Remove the oil strainer.

25) Remove the baffle plate.

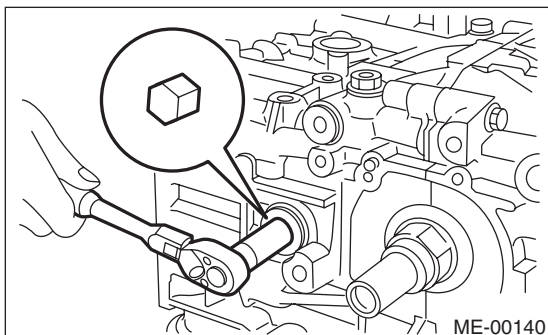
26) Remove the oil filter. <Ref. to LU (H4SO)-24, REMOVAL, Engine Oil Filter.>

27) Remove the water pipe.

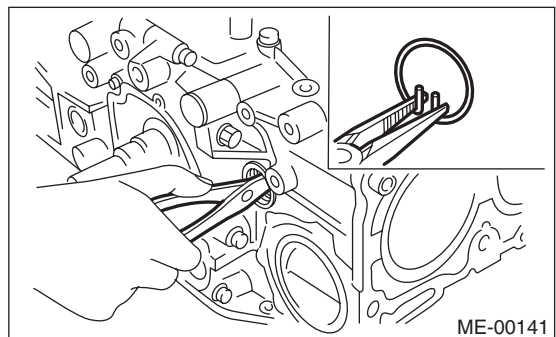


- | | | |
|-----------------------|------------------------|-----------------|
| (1) Service hole plug | (4) Piston pin | (7) Seal washer |
| (2) Gasket | (5) Service hole cover | (8) Washer |
| (3) Snap ring | (6) O-ring | |

28) Remove the service hole cover and service hole plugs using a hexagon wrench [14 mm].



29) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, then remove the piston snap ring through service hole of #1 and #2 cylinders.



Cylinder Block

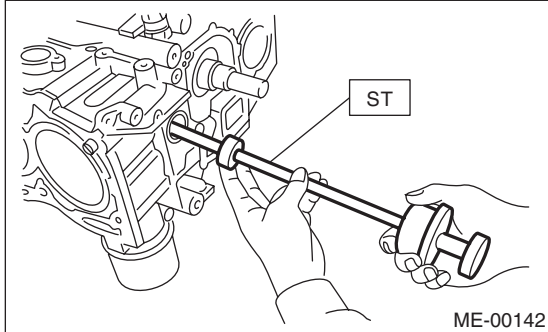
MECHANICAL

30) Draw out the piston pin from #1 and #2 pistons using ST.

ST 499097700 PISTON PIN REMOVER

NOTE:

Be careful not to confuse the original combination of piston, piston pin and cylinder.



31) Similarly remove the piston pins from #3 and #4 pistons.

32) Remove the bolts which connect cylinder block on the side of #1 and #3 cylinders (RH).

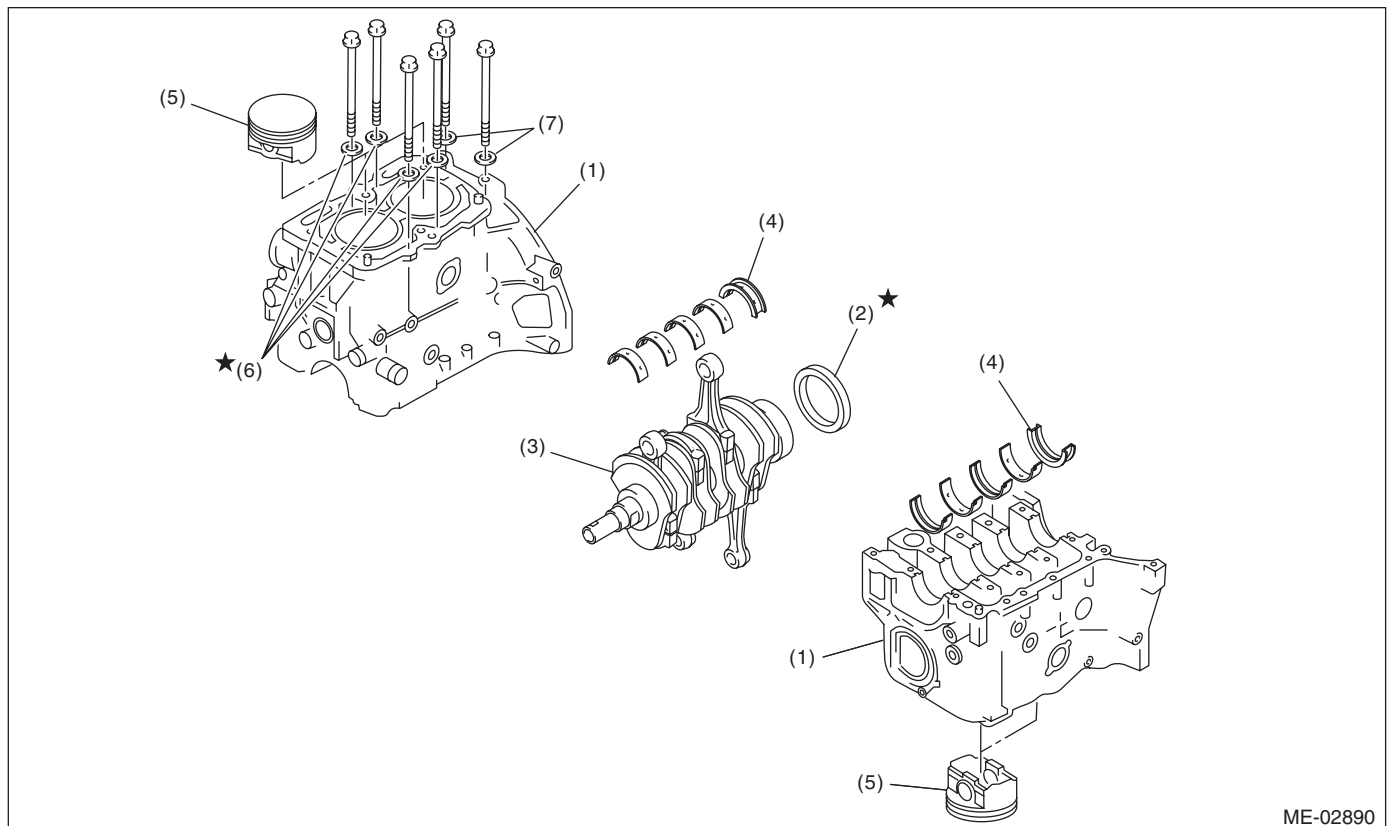
33) Loosen the bolts which connect cylinder block on the side of #2 and #4 cylinders (LH) two or three turns.

34) Set up the cylinder block so that #2 and #4 cylinders (LH) are on the upper side, then remove bolts connecting the cylinder block.

35) Separate the cylinder block (RH) and (LH).

NOTE:

When separating the cylinder block, do not allow the connecting rod to fall or damage the cylinder block.



(1) Cylinder block

(2) Rear oil seal

(3) Crankshaft

(4) Crankshaft bearing

(5) Piston

(6) Seal washer

(7) Washer

36) Remove the rear oil seal.

37) Remove the crankshaft together with connecting rod.

38) Remove the crankshaft bearings from cylinder block using a hammer handle.

NOTE:

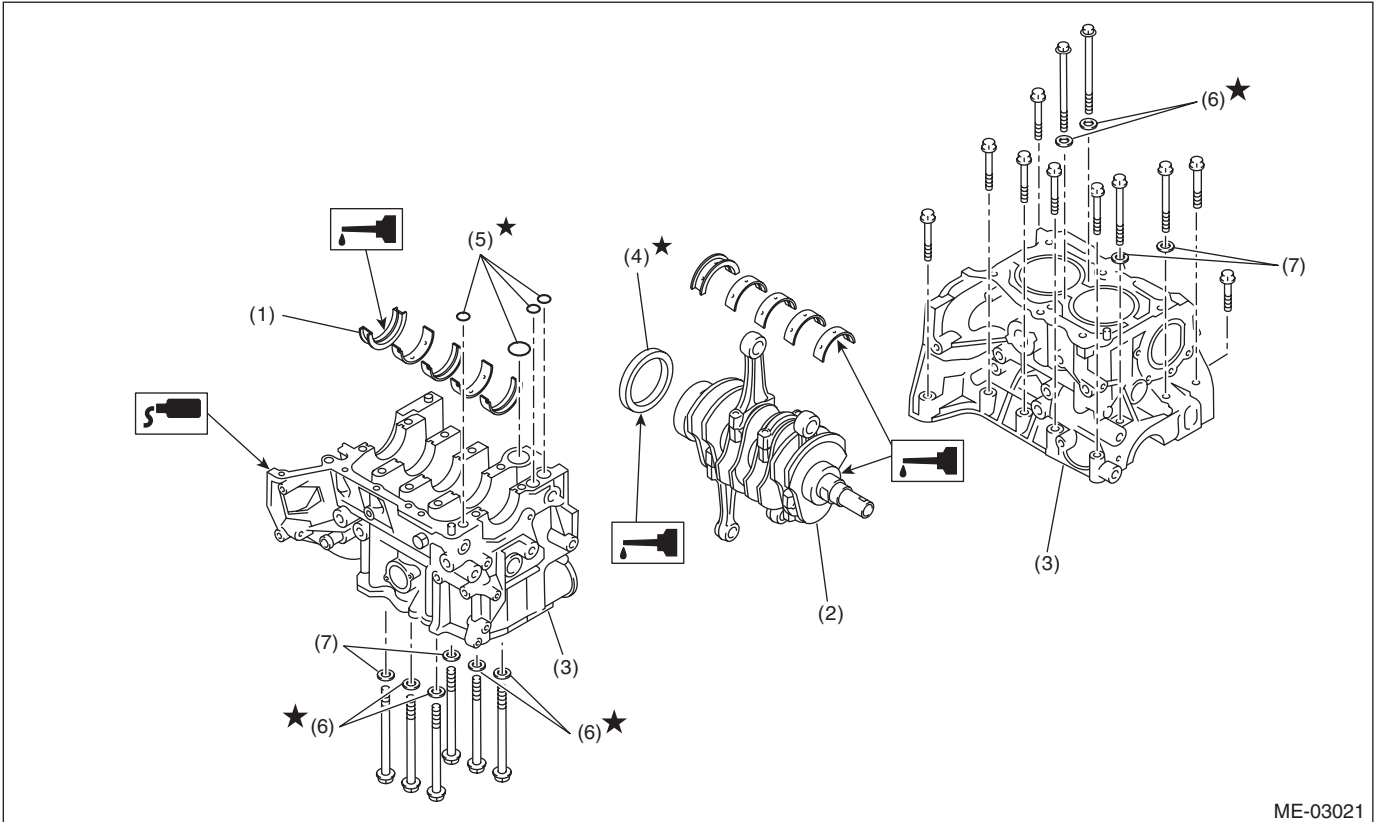
Be careful not to confuse the crankshaft bearing combination. Press the bearing at the end opposite to locking lip.

39) Draw out each piston from cylinder block using wooden bar or hammer handle.

NOTE:

Be careful not to confuse the piston and cylinder combination.

B: INSTALLATION



ME-03021

- | | | |
|------------------------|-------------------|-----------------|
| (1) Crankshaft bearing | (4) Rear oil seal | (6) Seal washer |
| (2) Crankshaft | (5) O-ring | (7) Washer |
| (3) Cylinder block | | |

1) Remove oil on the mating surface of cylinder block before installation. Apply a coat of engine oil to the bearing and crankshaft journal.

2) Position the crankshaft and the O-ring on the #1 and #3 cylinder block.

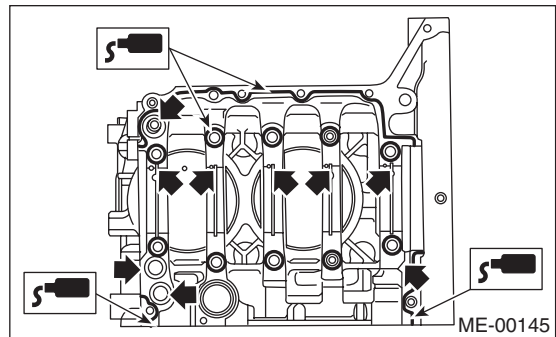
3) Apply liquid gasket to the mating surface of #1 and #3 cylinder blocks (RH), and install #2 and #4 cylinder blocks (LH) to above and position them.

Liquid gasket:

THREE BOND 1215 (Part No. 004403007) or equivalent

NOTE:

Do not allow liquid gasket to jut into O-ring grooves, oil passages, bearing grooves, etc.



ME-00145

4) Apply a coat of engine oil to the washer and bolt thread.

NOTE:

Use new seal washer.

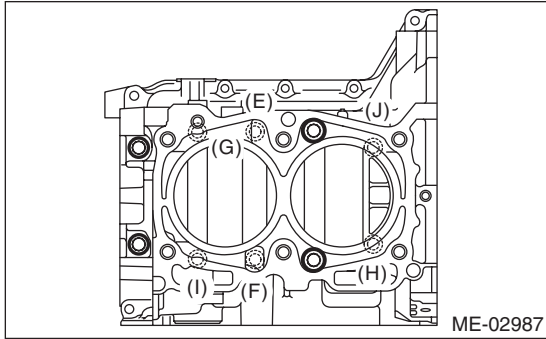
Cylinder Block

MECHANICAL

5) Tighten the 10 mm cylinder block connecting bolts on the LH side (A — D) in alphabetical order.

Tightening torque:

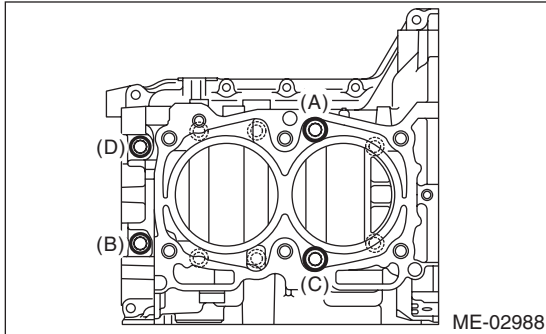
10 N·m (1.0 kgf·m, 7.2 ft·lb)



6) Tighten the 10 mm cylinder block connecting bolts on the RH side (E — J) in alphabetical order.

Tightening torque:

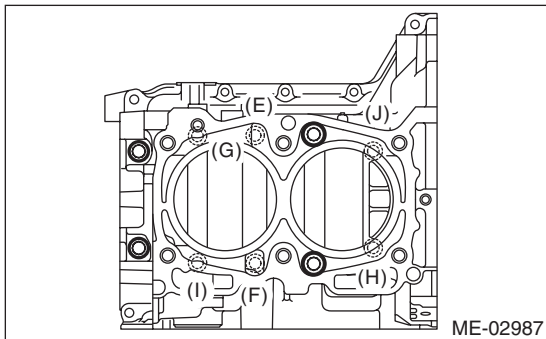
10 N·m (1.0 kgf·m, 7.2 ft·lb)



7) Further tighten the cylinder block connecting bolts on the LH side (A — D) in alphabetical sequence.

Tightening torque:

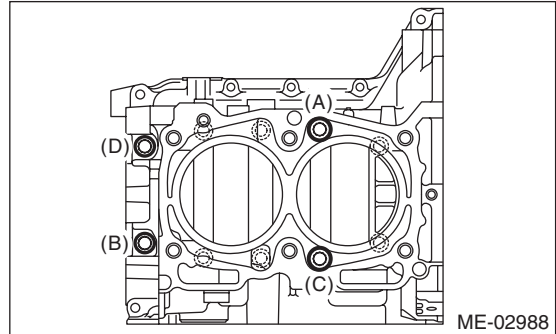
18 N·m (1.8 kgf·m, 13 ft·lb)



8) Further tighten the cylinder block connecting bolts on the RH side (E — J) in alphabetical sequence.

Tightening torque:

18 N·m (1.8 kgf·m, 13 ft·lb)



9) Further tighten the cylinder block connecting bolts on the LH side (A — D) in alphabetical sequence.

- (A), (C): Angle tightening

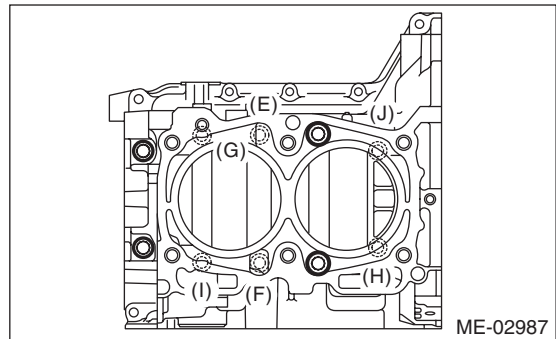
Tightening angle:

90°

- (B), (D): Torque tightening

Tightening torque:

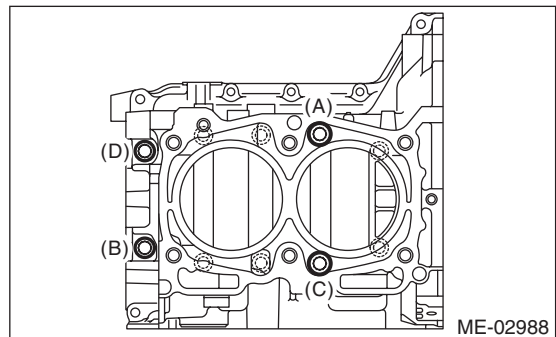
40 N·m (4.1 kgf·m, 29.6 ft·lb)



10) Tighten the cylinder block connecting bolts on the RH side (E — J) in alphabetical sequence.

Tightening angle:

90°

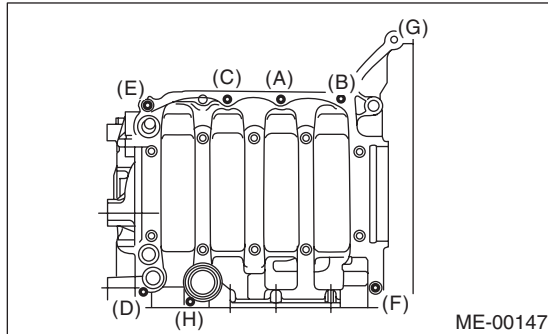


11) Tighten the 8 mm and 6 mm cylinder block connecting bolts on LH side (A — H) in alphabetical sequence.

Tightening torque:

(A) — (G): 25 N·m (2.5 kgf·m, 18.1 ft·lb)

(H): 6.4 N·m (0.65 kgf·m, 4.7 ft·lb)



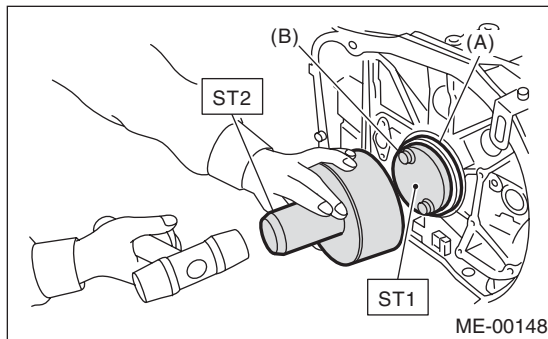
12) Apply a coat of engine oil to the oil seal periphery, then install the rear oil seal using ST1 and ST2.

NOTE:

Use a new rear oil seal.

ST1 499597100 OIL SEAL GUIDE

ST2 499587200 OIL SEAL INSTALLER



(A) Rear oil seal

(B) Flywheel attaching bolt

13) Position the top ring gap at (A) or (B) in the figure.

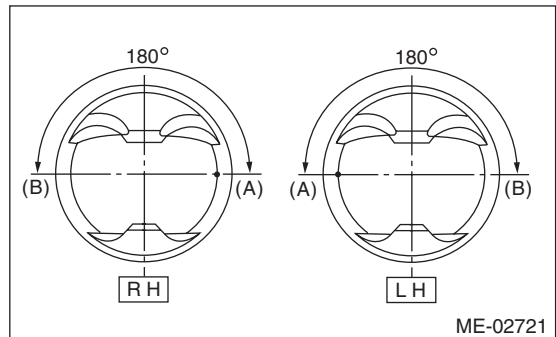
NOTE:

Assemble so that the piston ring mark “R” faces the upper side of the piston.

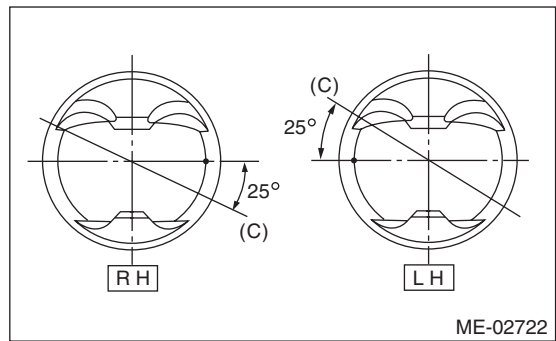
14) Position the second ring gap at 180° on the reverse side the top ring gap.

NOTE:

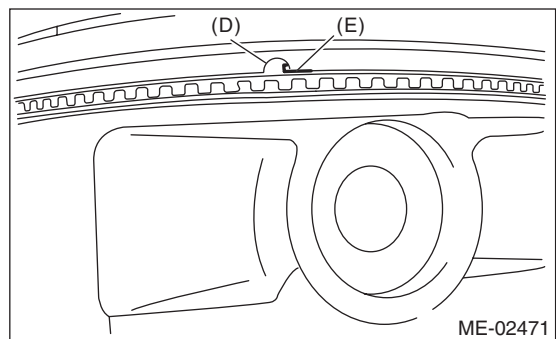
Assemble so that the piston ring mark “R” faces the upper side of the piston.



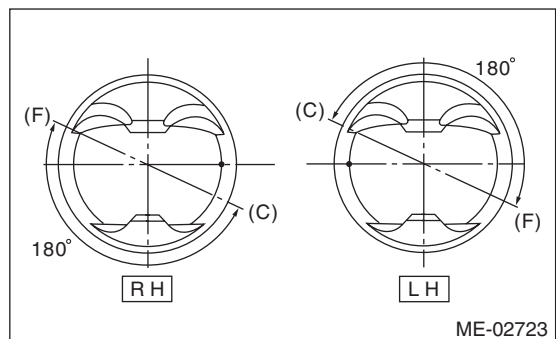
15) Position the upper rail gap at (C) in the figure.



16) Align the upper rail spin stopper (E) to the side hole (D) on the piston.



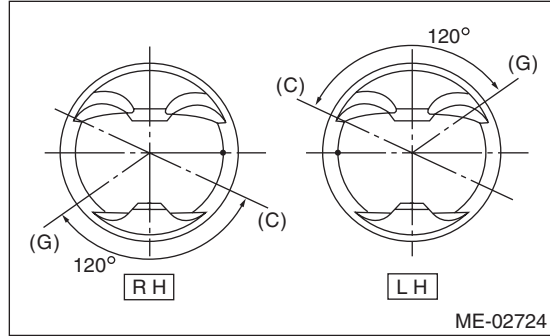
17) Position the expander gap at (F) in the figure.



Cylinder Block

MECHANICAL

18) Position the lower rail gap at (G) in the figure.



NOTE:

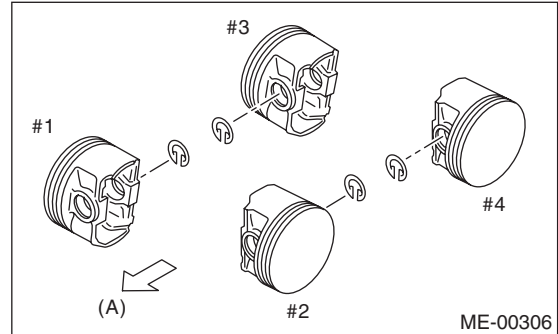
- Make sure the ring gaps do not face the same direction.
- Make sure ring gaps are not within the piston skirt area.

19) Install the snap ring.

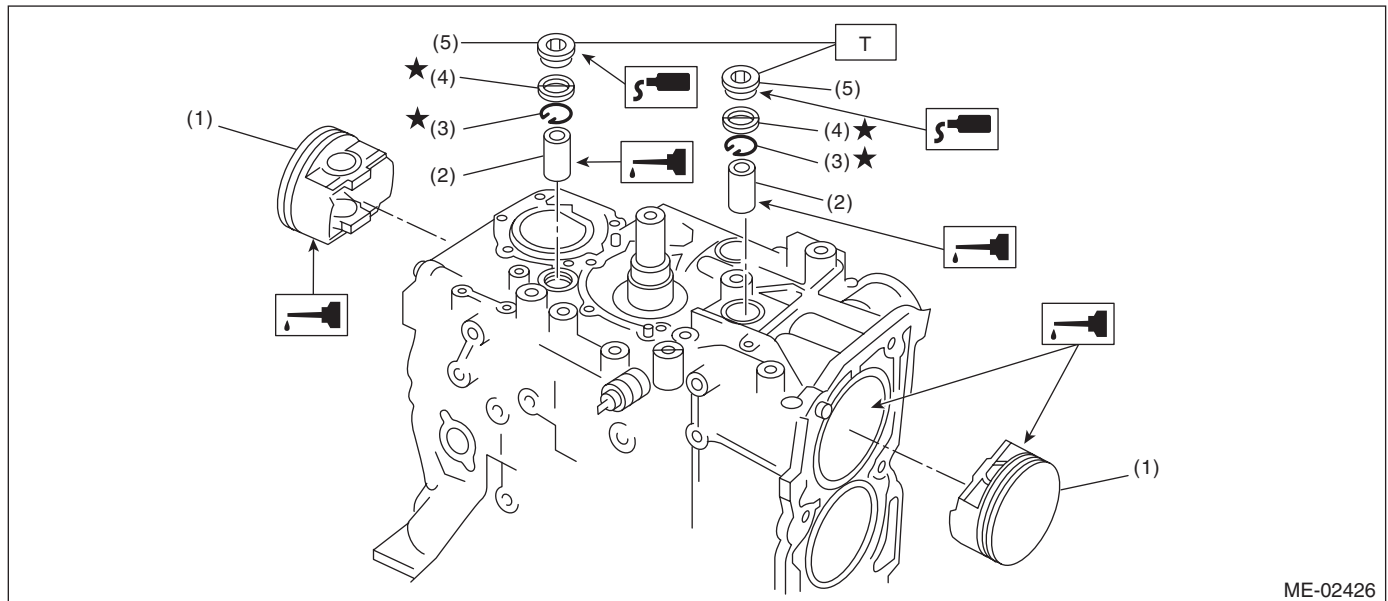
Install the snap rings in the piston holes located opposite to the service holes in cylinder block before assembling pistons to the cylinder.

NOTE:

Use new snap rings.



(A) Front side



- | | |
|----------------|-----------------------|
| (1) Piston | (4) Gasket |
| (2) Piston pin | (5) Service hole plug |
| (3) Snap ring | |

Tightening torque: N·m (kgf·m, ft·lb)

T: 70 (7.1, 50.6)

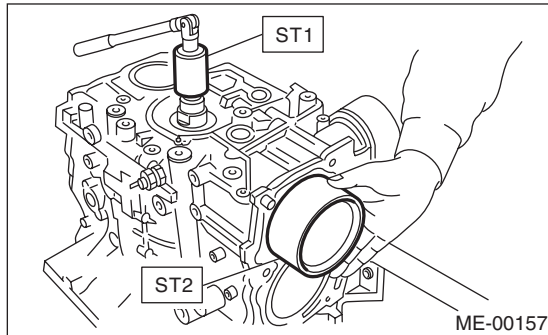
20) Install the piston.

- (1) Place the cylinder block to face the #1 and #2 cylinder side upward.
- (2) Using the ST1, turn the crankshaft so that #1 and #2 connecting rods are set at bottom dead center.

ST1 499987500 CRANKSHAFT SOCKET

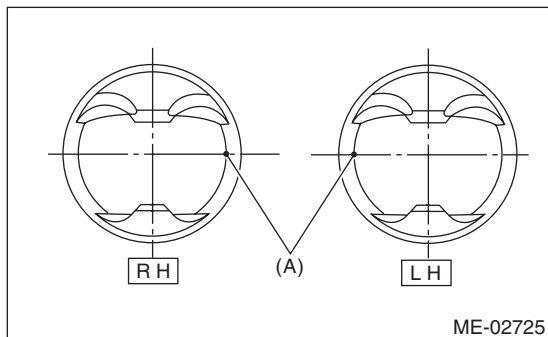
- (3) Apply a coat of engine oil to the pistons and cylinders and insert pistons in their cylinders using ST2.

ST2 498747300 PISTON GUIDE



NOTE:

Face the piston front mark towards the front of the engine.

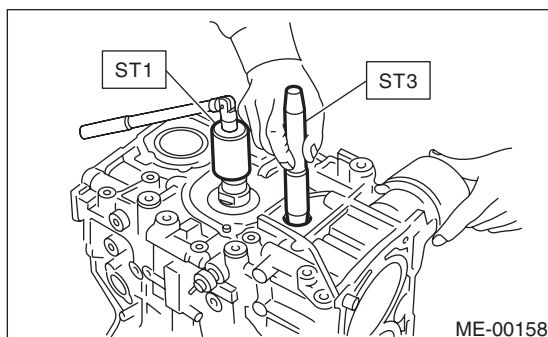


(A) Front mark

21) Install the piston pin.

- (1) Apply a coat of engine oil to ST3.
- (2) Insert ST3 into the service hole to align piston pin hole with connecting rod small end.

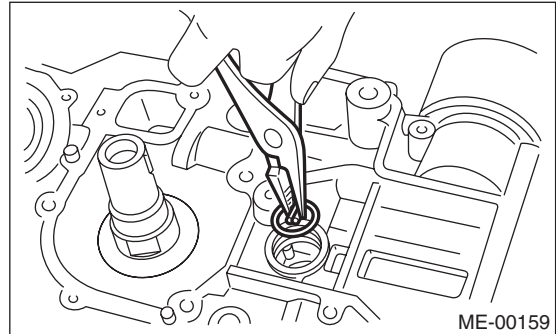
ST3 499017100 PISTON PIN GUIDE



- (3) Apply a coat of engine oil to piston pin, and insert the piston pin into piston and connecting rod through service hole.
- (4) Install the snap ring.

NOTE:

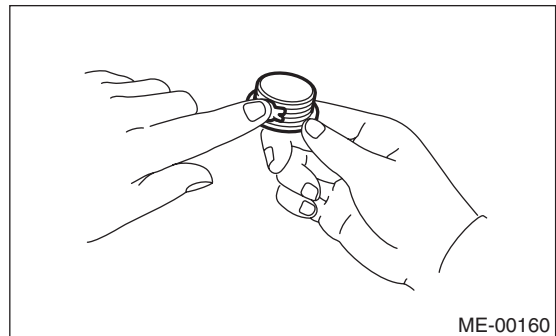
Use new snap rings.



- (5) Apply liquid gasket to the bolt threads of service plug.

Liquid gasket:

THREE BOND 1105 (Part No. 004403010) or equivalent



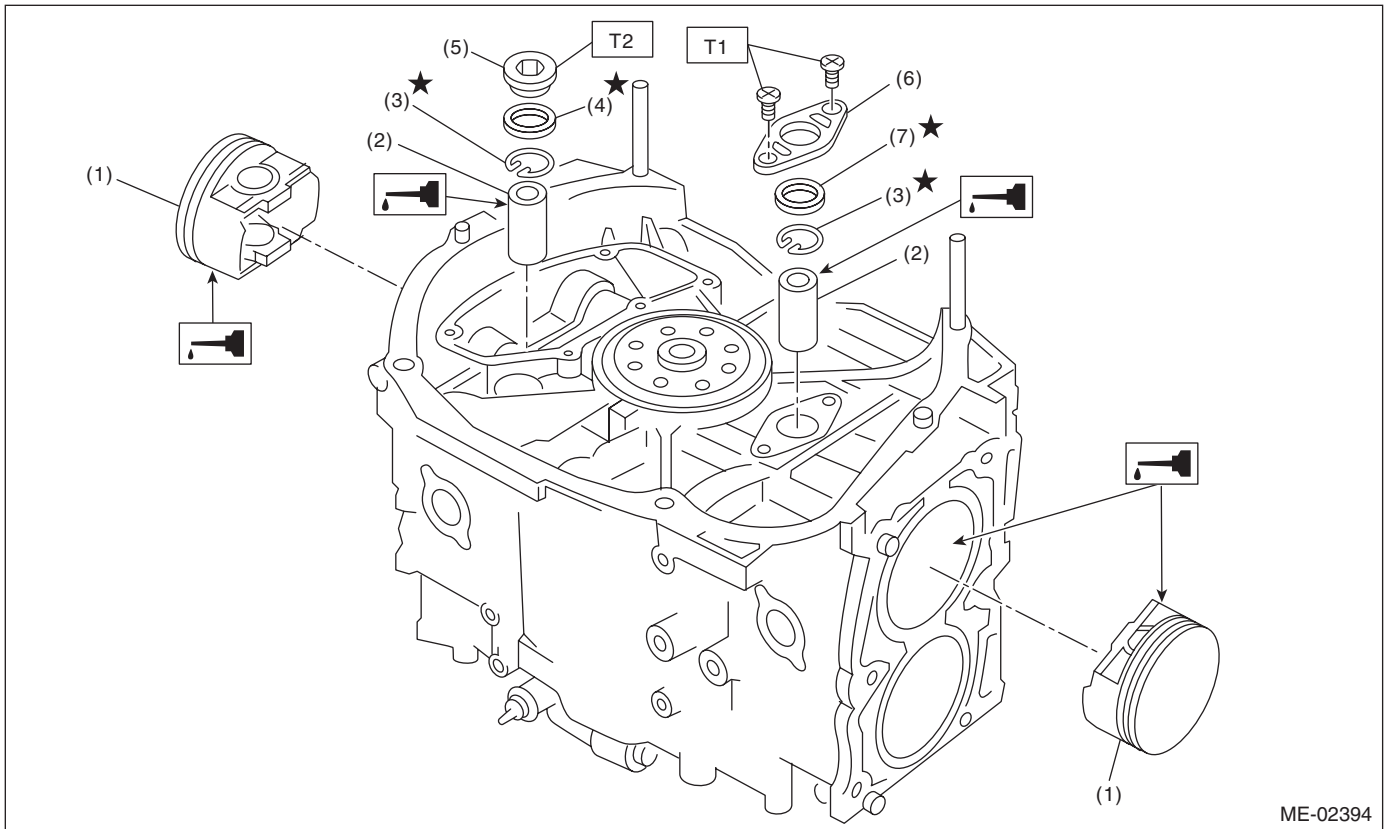
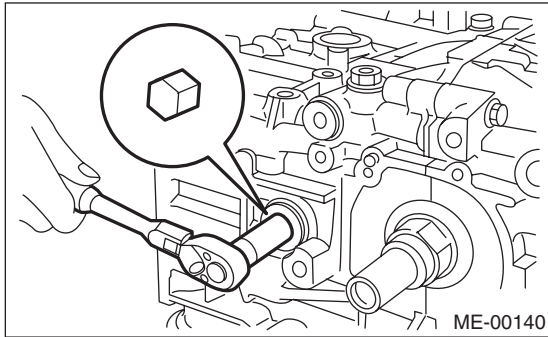
Cylinder Block

MECHANICAL

(6) Install the service hole plug and gasket.

NOTE:

Use a new gasket.



- | | |
|----------------|------------------------|
| (1) Piston | (5) Service hole plug |
| (2) Piston pin | (6) Service hole cover |
| (3) Snap ring | (7) O-ring |
| (4) Gasket | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 6.4 (0.65, 4.7)

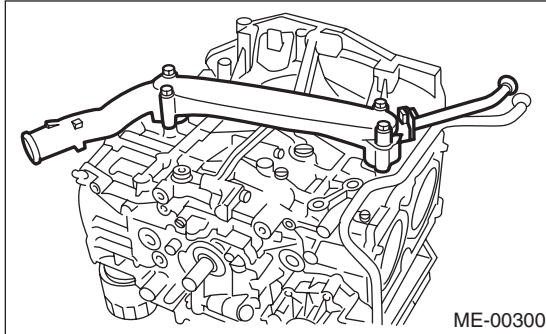
T2: 70 (7.1, 50.6)

(7) Place the cylinder block to face the #3 and #4 cylinder side upward. Following the same procedures as used for #1 and #2 cylinders, install the pistons and piston pins.

22) Install the water pipe.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



23) Install the baffle plate.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

24) Install the oil strainer and O-ring.

Tightening torque:

10 N·m (1.0 kgf-m, 7.2 ft-lb)

25) Install the oil strainer stay.

NOTE:

Tighten the oil strainer stay together with the baffle plate.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

26) Apply liquid gasket to the mating surfaces, and install the oil pan.

NOTE:

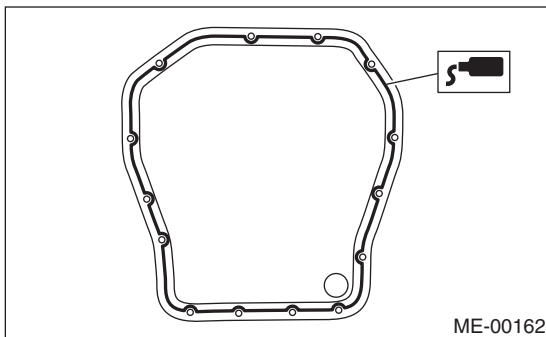
Install within 5 min. after applying liquid gasket.

Liquid gasket:

THREE BOND 1207C (Part No. 004403012) or equivalent

Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)



27) Apply liquid gasket to the mating surfaces and the threaded portion of bolt (A) shown in the figure (when reusing the bolt), and then install the oil separator cover.

NOTE:

Install within 5 min. after applying liquid gasket.

Liquid gasket:

- **Mating surface**

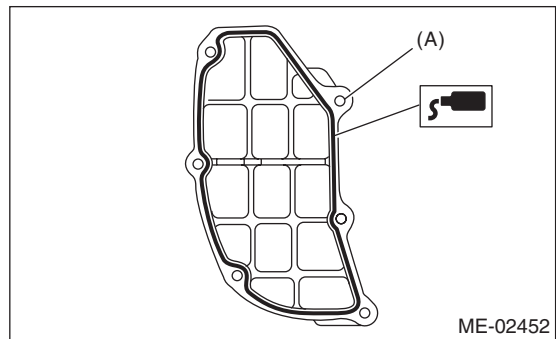
THREE BOND 1217G or equivalent

- **Bolt (A) thread (when reusing the bolt)**

THREE BOND 1324 (Part No. 004403042) or equivalent

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



28) Install the flywheel. (MT model)

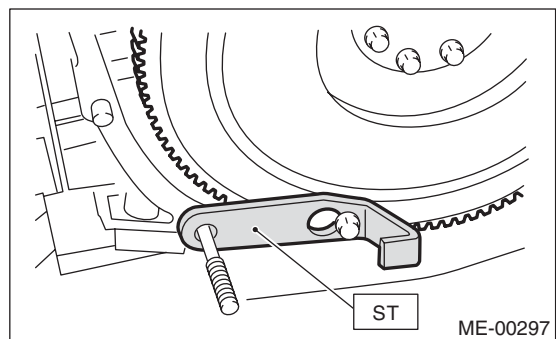
<Ref. to CL-14, INSTALLATION, Flywheel.>

To lock the crankshaft, use the ST.

ST 498497100 CRANKSHAFT STOPPER

Tightening torque:

72 N·m (7.3 kgf-m, 52.8 ft-lb)



Cylinder Block

MECHANICAL

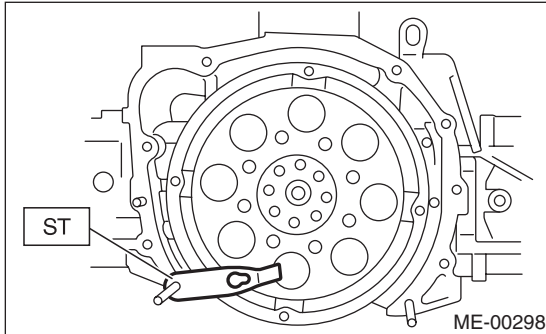
29) Install the drive plate.

To lock the crankshaft, use the ST.

ST 498497100 CRANKSHAFT STOPPER

Tightening torque:

72 N·m (7.3 kgf·m, 52.8 ft·lb)

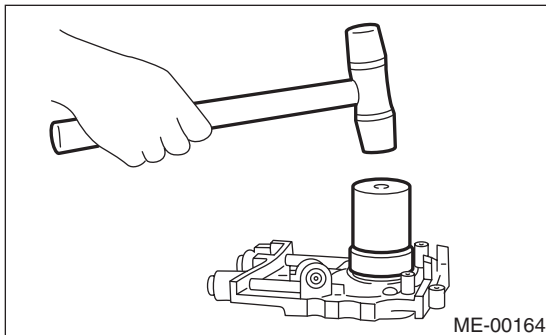


30) Install the housing cover.

31) Installation of oil pump:

(1) Replace the front oil seal with a new part using ST.

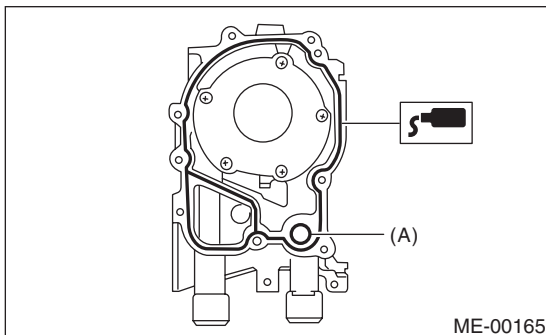
ST 499587100 OIL SEAL INSTALLER



(2) Apply liquid gasket to the matching surface of oil pump.

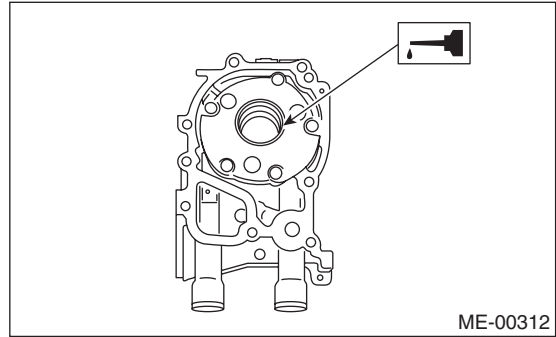
Liquid gasket:

THREE BOND 1215 (Part No. 004403007) or equivalent



(A) O-ring

(3) Apply a coat of engine oil to the inside of oil seal.



(4) Install the oil pump to cylinder block. Be careful not to damage the oil seal during installation.

NOTE:

- Make sure the oil seal lip is not folded.
- Align the flat surface of oil pump's inner rotor with crankshaft before installation.
- Use new O-rings and seals when installing the oil pump.

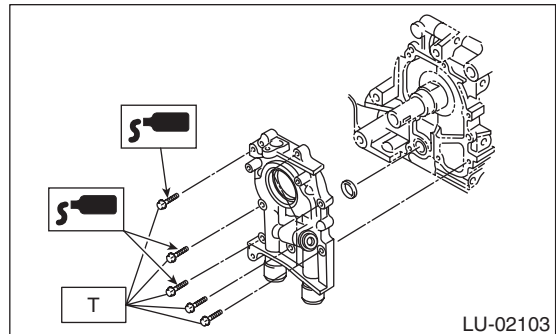
(5) Apply liquid gasket to the three bolts thread shown in figure. (when reusing the bolt)

Liquid gasket:

THREE BOND 1324 (Part No. 004403042) or equivalent

Tightening torque:

T: 6.4 N·m (0.65 kgf·m, 4.7 ft·lb)



32) Install the water pump and gasket.

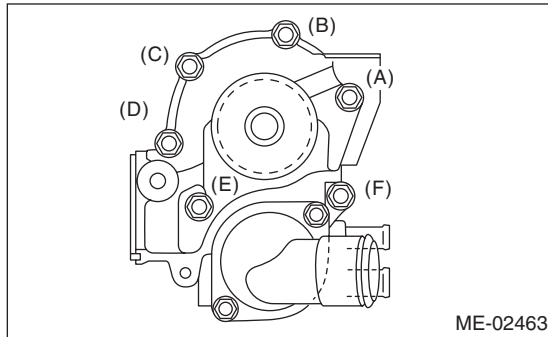
Tightening torque:

First: 12 N·m (1.2 kgf-m, 8.7 ft-lb)

Second: 12 N·m (1.2 kgf-m, 8.7 ft-lb)

NOTE:

- When installing the water pump, tighten bolts in two stages in alphabetical sequence as shown in the figure.
- Use a new gasket.



33) Install the water by-pass pipe for heater.

34) Install the oil filter.

<Ref. to LU (H4SO)-24, INSTALLATION, Engine Oil Filter.>

35) Tighten the cylinder head bolts. <Ref. to ME(H4SO)-58, INSTALLATION, Cylinder Head.>

36) Install the oil level gauge guide and tighten the bolts. (LH side only)

37) Install the crank sprocket.

<Ref. to ME(H4SO)-50, INSTALLATION, Crank Sprocket.>

38) Install the cam sprocket. <Ref. to ME(H4SO)-49, INSTALLATION, Cam Sprocket.>

39) Install the timing belt. <Ref. to ME(H4SO)-45, INSTALLATION, Timing Belt.>

40) Adjust the valve clearance. <Ref. to ME(H4SO)-31, ADJUSTMENT, Valve Clearance.>

41) After assembling the rocker cover gasket to the rocker cover, install it to the cylinder head, and then connect it to PCV hose.

NOTE:

Use a new rocker cover gasket.

42) Install the timing belt cover.

<Ref. to ME(H4SO)-43, INSTALLATION, Timing Belt Cover.>

43) Install the crank pulley. <Ref. to ME(H4SO)-42, INSTALLATION, Crank Pulley.>

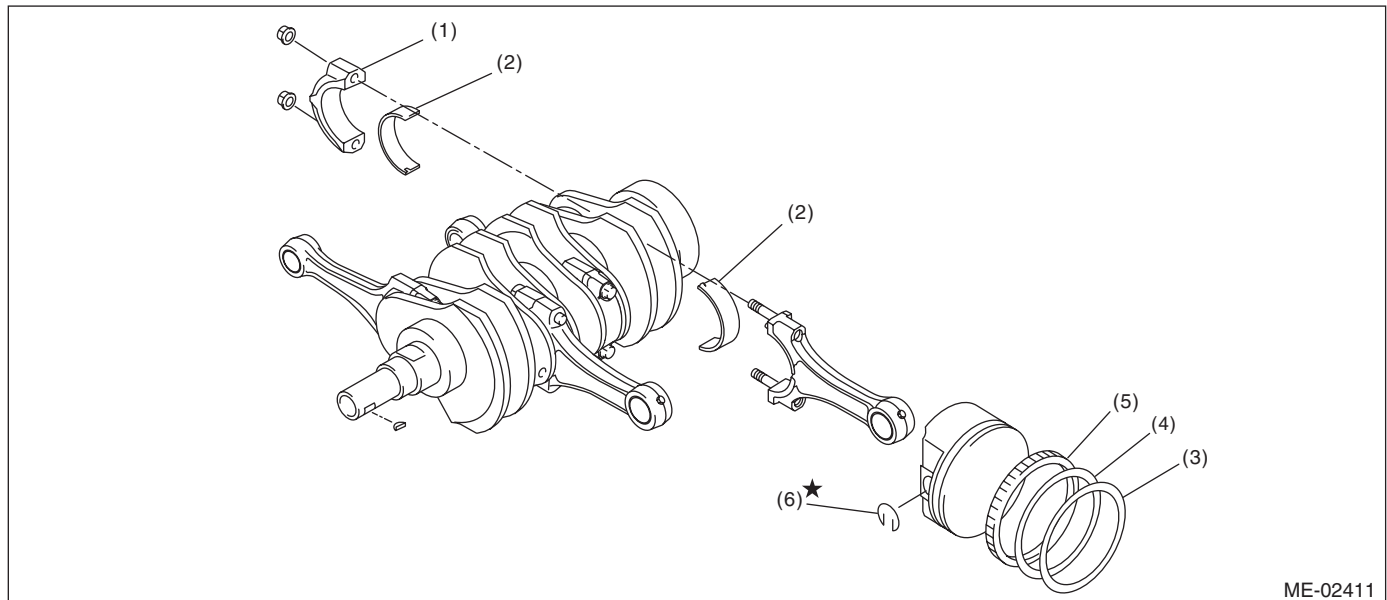
44) Install the intake manifold.

<Ref. to FU(H4SO)-15, INSTALLATION, Intake Manifold.>

45) Install the generator and A/C compressor brackets on cylinder head.

46) Install the V-belts. <Ref. to ME(H4SO)-40, INSTALLATION, V-belt.>

C: DISASSEMBLY



- (1) Connecting rod cap
- (2) Connecting rod bearing

- (3) Top ring
- (4) Second ring

- (5) Oil ring
- (6) Snap ring

Cylinder Block

MECHANICAL

- 1) Remove the connecting rod cap.
- 2) Remove the connecting rod bearing.

NOTE:

Arrange the removed connecting rod, connecting rod cap and bearing in order, to prevent confusion.

- 3) Remove the piston rings using piston ring expander.

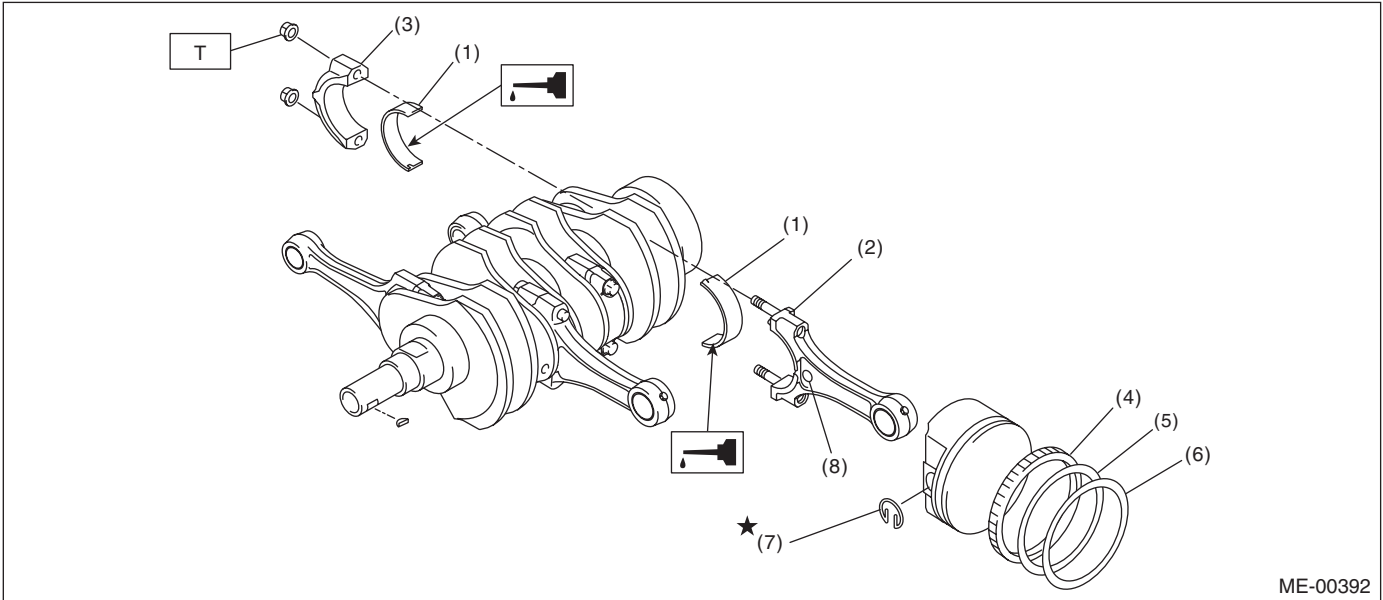
- 4) Remove the oil ring by hand.

NOTE:

Arrange the removed piston rings in proper order, to prevent confusion.

- 5) Remove the snap ring.

D: ASSEMBLY



- | | |
|----------------------------|-----------------|
| (1) Connecting rod bearing | (5) Second ring |
| (2) Connecting rod | (6) Top ring |
| (3) Connecting rod cap | (7) Snap ring |
| (4) Oil ring | (8) Side mark |

Tightening torque: N·m (kgf·m, ft·lb)
T: 45 (4.6, 33.3)

- 1) Apply oil to the surfaces of the connecting rod bearings.
- 2) Install the connecting rod bearings on connecting rods and connecting rod caps.
- 3) Position each connecting rod with a side mark facing forward, and install it.
- 4) Install the connecting rod cap with connecting rod nut.

Make sure the arrow on connecting rod cap faces toward front during installation.

NOTE:

- Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching number.
 - When tightening the connecting rod nuts, apply oil on the threads.
- 5) Install the expander, lower rail and upper rail by hand. Install the second ring and top ring using piston ring expander.

E: INSPECTION

1. CYLINDER BLOCK

- 1) Visually check for cracks and damage. Especially, inspect the important parts using liquid penetrant tester.
- 2) Check the oil passages for clogging.
- 3) Inspect the cylinder block surface that mates with cylinder head for warping by using a straight edge, and correct by grinding if necessary.

Warping limit:

0.025 mm (0.00098 in)

Grinding limit:

0.1 mm (0.004 in)

Standard height of cylinder block:

201.0 mm (7.91 in)

2. CYLINDER AND PISTON

1) The cylinder bore size is stamped on the cylinder block front upper surface.

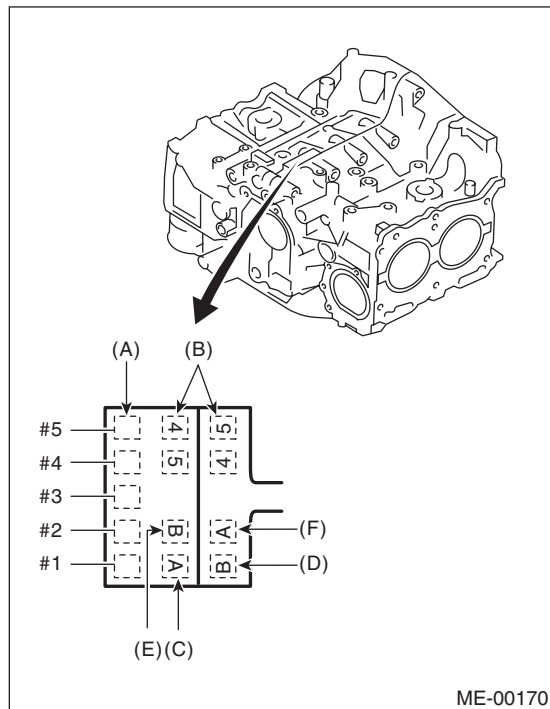
NOTE:

- Measurement should be performed at a temperature of 20°C (68°F).
- Standard sized pistons are classified into two grades, "A" and "B". These grades should be used as guide lines in selecting a standard piston.

Standard diameter:

A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)

B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)



- (A) Main journal size mark
- (B) Cylinder block (RH)-(LH) combination mark
- (C) #1 cylinder bore size mark
- (D) #2 cylinder bore size mark
- (E) #3 cylinder bore size mark
- (F) #4 cylinder bore size mark

2) How to measure the inner diameter of each cylinder

Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights as shown in the figure, using a cylinder bore gauge.

NOTE:

Measurement should be performed at a temperature of 20°C (68°F).

Taper:

Standard:

0.015 mm (0.0006 in)

Service limit:

0.050 mm (0.0020 in)

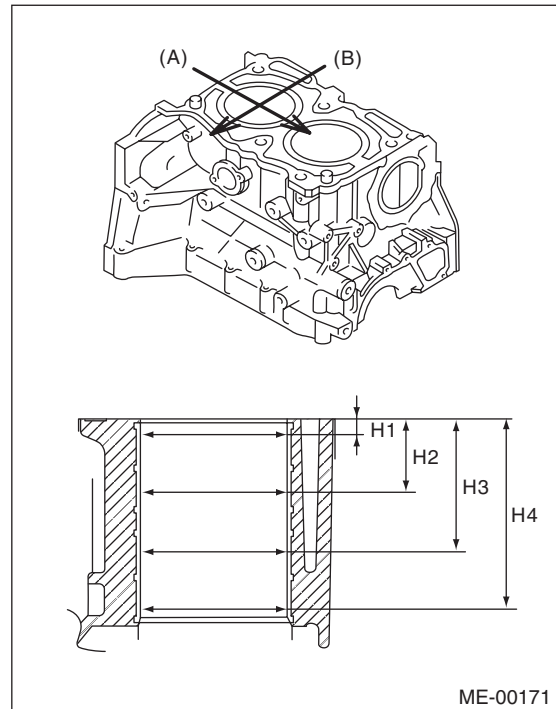
Out-of-roundness:

Standard:

0.010 mm (0.0004 in)

Service limit:

0.050 mm (0.0020 in)



- (A) Piston pin direction
- (B) Thrust direction
- H1 10 mm (0.39 in)
- H2 45 mm (1.77 in)
- H3 80 mm (3.15 in)
- H4 115 mm (4.53 in)

3) When the piston is to be replaced due to general wear or cylinder wear, select a suitable sized piston by measuring the piston clearance.

Cylinder Block

MECHANICAL

4) How to measure the outer diameter of each cylinder:

Measure the outer diameter of each piston at the height as shown in the figure. (Thrust direction)

NOTE:

Measurement should be performed at a temperature of 20°C (68°F).

Piston grade point H:
38.2 mm (1.504 in)

Standard:

A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)

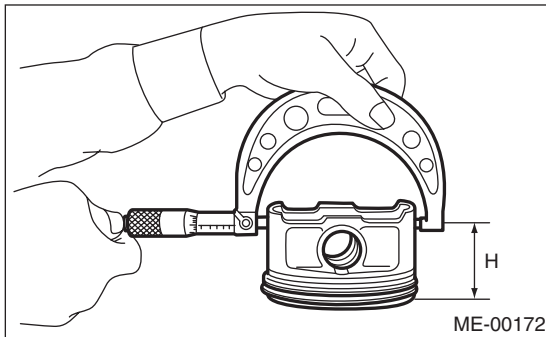
B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)

0.25 mm (0.0098 in) oversize:

99.745 — 99.765 mm (3.9270 — 3.9278 in)

0.50 mm (0.0197 in) oversize:

99.995 — 100.015 mm (3.9368 — 3.9376 in)



5) Calculate the clearance between cylinder and piston.

NOTE:

Measurement should be performed at a temperature of 20°C (68°F).

Cylinder to piston clearance at 20°C (68°F):

Standard:

-0.010 — 0.010 mm (-0.00039 — 0.00039 in)

Service limit:

0.030 mm (0.0012 in)

6) Boring and honing

(1) If any of the measured value of taper, out-of-roundness or cylinder-to-piston clearance is not within the service limit or if there is any damage on the cylinder wall, rebores it to use an oversize piston.

CAUTION:

- When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and replace to oversize pistons.
- Do not perform boring on one cylinder only. Nor replace an oversize piston for one cylinder only.

(2) If the cylinder inner diameter exceeds the limit after boring and honing, replace the cylinder block.

Cylinder inner boring limit (diameter):
To 100.005 mm (3.9372 in)

NOTE:

Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention when measuring the cylinder diameter.

3. PISTON AND PISTON PIN

1) Check the pistons and piston pins for damage, cracks and wear, and the piston ring grooves for wear and damage. Replace if faulty.

2) Measure the piston-to-cylinder clearance at each cylinder. <Ref. to ME(H4SO)-79, CYLINDER AND PISTON, INSPECTION, Cylinder Block.>If any of the clearances exceeds the limit value, replace the piston or bore the cylinder to enable use of the oversize piston.

3) Make sure that the piston pin can be inserted into the piston pin hole with fingers at 20°C (68°F). Replace if faulty.

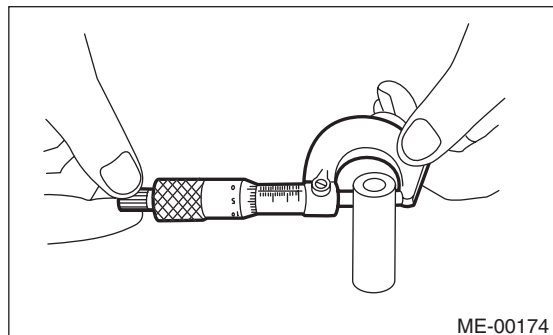
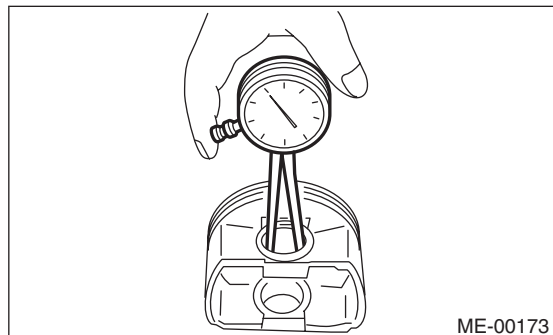
Clearance between piston hole and piston pin:

Standard:

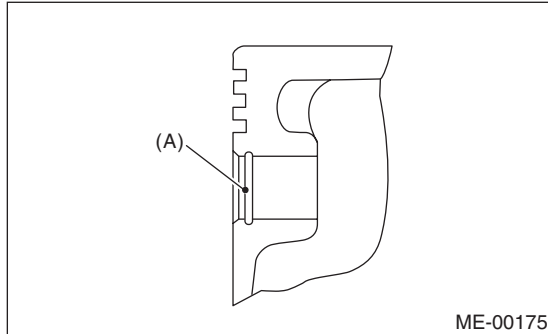
0.004 — 0.008 mm (0.0002 — 0.0003 in)

Service limit:

0.020 mm (0.0008 in)



4) Check the snap ring installation groove (A) on the piston for burr. If necessary, remove burr from the groove so that the piston pin can lightly move.



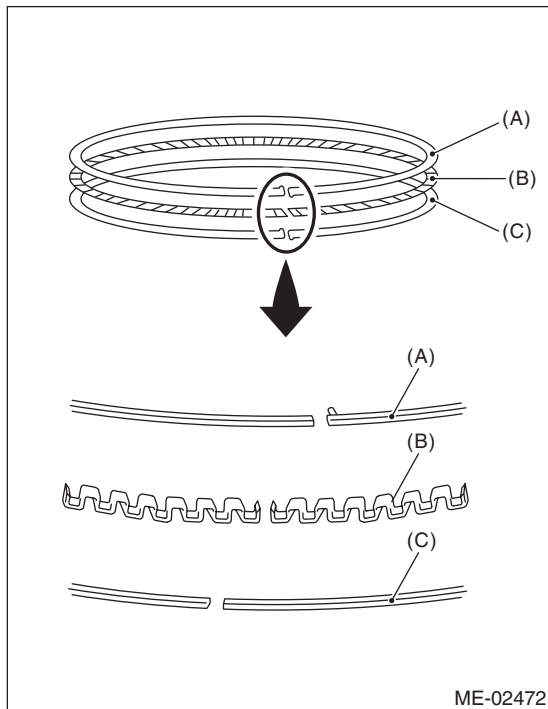
5) Check the piston pin snap ring for distortion, cracks and wear.

4. PISTON RING

1) If the piston ring is broken, damaged or worn, or if its tension is insufficient, or when the piston is replaced, replace the piston ring with a new part of the same size as piston.

NOTE:

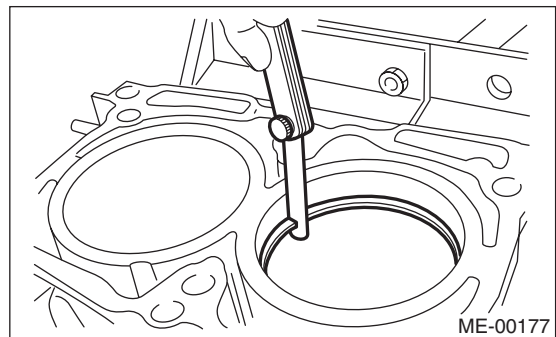
- Marks that shows the installing direction are shown on the end of top and second rings. Face these marks upward when installing the rings to piston.
- Oil ring consists of the upper rail, expander and lower rail. Be careful about the direction of rail when installing the oil ring to piston.



- (A) Upper rail
- (B) Expander
- (C) Lower rail

2) Clean the piston ring groove and piston ring.
3) Squarely place the piston ring and oil ring in cylinder, and measure the piston ring gap with a thickness gauge.

		mm (in)	
		Standard	Limit
Piston ring gap	Top ring	0.20 — 0.35 (0.0079 — 0.0138)	1.0 (0.039)
	Second ring	0.37 — 0.52 (0.0144 — 0.0203)	
	Oil ring rail	0.20 — 0.50 (0.0079 — 0.0197)	1.5 (0.059)

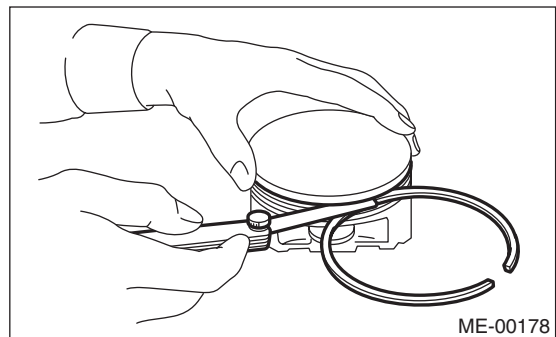


4) Measure the clearance between piston ring and piston ring groove with a thickness gauge.

NOTE:

Before measuring the clearance, clean the piston ring groove and piston ring.

		mm (in)	
		Standard	Limit
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 — 0.0031)	0.15 (0.059)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)	



Cylinder Block

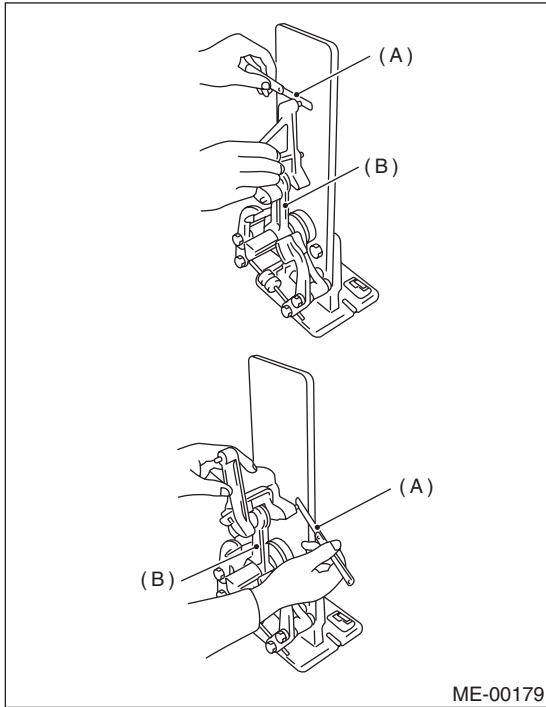
MECHANICAL

5. CONNECTING ROD

- 1) Replace the connecting rod, if the large or small end thrust surface is damaged.
- 2) Check for bend or twist using a connecting rod aligner. Replace the connecting rod if the bend or twist exceeds the limit.

Limit of bend or twist per 100 mm (3.94 in) in length:

0.10 mm (0.0039 in)



(A) Thickness gauge
(B) Connecting rod

- 3) Install the connecting rod fitted with bearing to crankshaft and measure the side clearance (thrust clearance). Replace the connecting rod if the side clearance exceeds the specified limit.

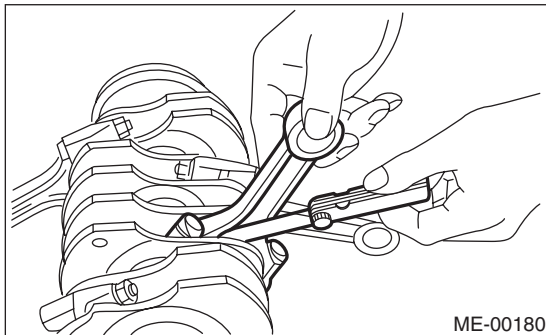
Connecting rod side clearance:

Standard:

0.070 — 0.330 mm (0.0028 — 0.0130 in)

Service limit:

0.4 mm (0.016 in)



ME-00180

- 4) Inspect the connecting rod bearing for scar, peeling, seizure, melting, wear, etc.

- 5) Measure the oil clearance on each connecting rod bearing using plastigauge. If there is an oil clearance that exceeds the service limit, replace the defective bearing with a new standard or undersized bearing as necessary. (See the table below.)

Connecting rod oil clearance:

Standard:

0.016 — 0.044 mm (0.00063 — 0.0017 in)

Service limit:

0.05 mm (0.0020 in)

Unit: mm (in)		
Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.492 — 1.501 (0.0587 — 0.0591)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) Undersize	1.510 — 1.513 (0.0594 — 0.0596)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) Undersize	1.520 — 1.523 (0.0598 — 0.0600)	51.934 — 51.950 (2.0446 — 2.0453)
0.25 (0.0098) Undersize	1.620 — 1.623 (0.0638 — 0.0639)	51.734 — 51.750 (2.0368 — 2.0374)

- 6) Inspect the bushing at connecting rod small end, and replace if worn or damaged. Also measure the piston pin clearance at connecting rod small end.

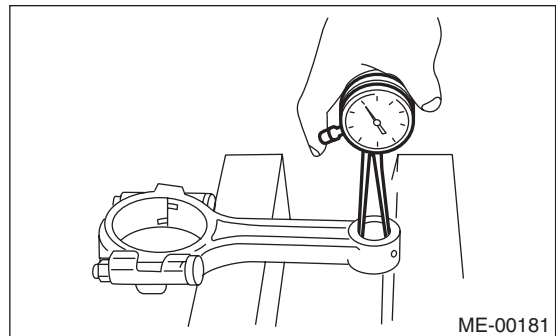
Clearance between piston pin and bushing:

Standard:

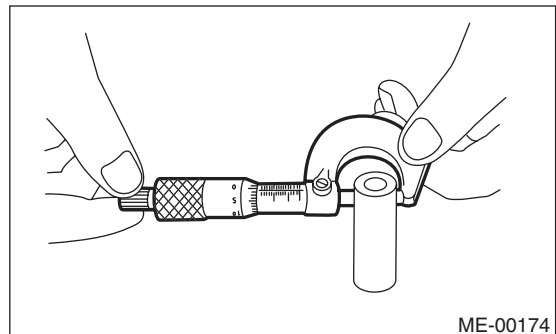
0 — 0.022 mm (0 — 0.0009 in)

Service limit:

0.030 mm (0.0012 in)

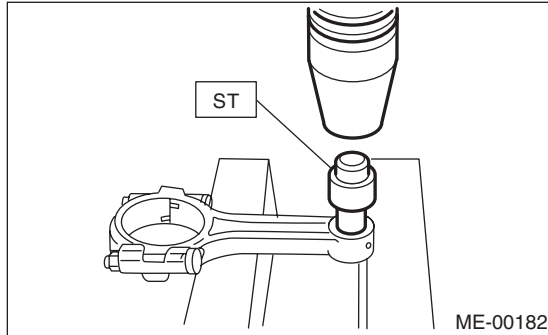


ME-00181



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- 7) Replacement procedure is as follows.
- (1) Remove the bushing from connecting rod with ST and press.
 - (2) Press the bushing with the ST after applying oil on the periphery of new bushing.
- ST 499037100 CONNECTING ROD BUSHING REMOVER AND INSTALLER



- (3) Make two 3 mm (0.12 in) holes in the pressed bushing by aligning with the pre-manufactured holes on the connecting rod. Then, ream the inside of bushing.
- (4) After completion of reaming, clean the bushing to remove chips.

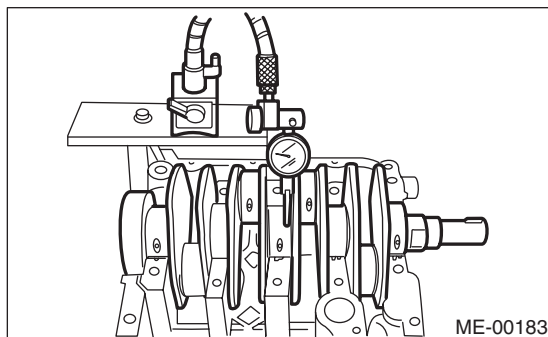
6. CRANKSHAFT AND CRANKSHAFT BEARING

- 1) Clean the crankshaft completely, and check it for cracks using liquid penetrant tester. Replace if faulty.
- 2) Measure the bend of crankshaft. If it exceeds the limit, repair or replace it.

NOTE:

If a suitable V-block is not available, install #1 and #5 crankshaft bearing on cylinder block, position the crankshaft on these bearings, and then measure the crankshaft bend using a dial gauge.

Crankshaft bend limit:
0.035 mm (0.0014 in)



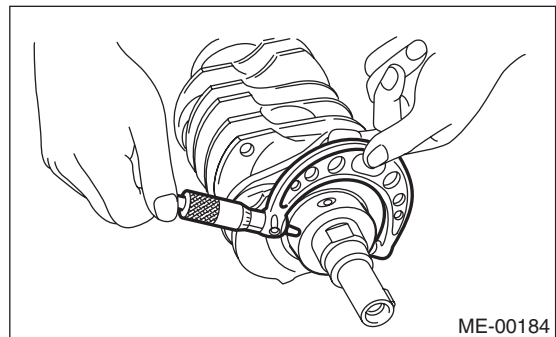
- 3) Inspect the crank journal and crank pin for wear. If they are not within the standard, replace the bearing with a suitable (undersize) one, and replace or readjust the crankshaft if necessary. When grinding the crank journal or crank pin, finish them to the specified dimensions according to the undersize bearing to be used.

Crank pin

Out-of-roundness:
0.003 mm (0.0001 in)
Cylindricity:
0.004 mm (0.0002 in)
Grinding limit:
To 51.750 mm (2.0374 in) dia.

Crank journal

Out-of-roundness:
0.005 mm (0.0002 in)
Cylindricity:
0.006 mm (0.0002 in)
Grinding limit:
To 59.758 mm (2.3527 in) dia.



Cylinder Block

MECHANICAL

		Crank journal outer diameter		Unit: mm (in)
		#1, #3	#2, #4, #5	Crank pin outer diameter
Standard	Journal O.D.	59.992 — 60.008 (2.3619 — 2.3625)	59.992 — 60.008 (2.3619 — 2.3625)	51.984 — 52.000 (2.0466 — 2.0472)
	Bearing size (Thickness at center)	1.998 — 2.011 (0.0787 — 0.0792)	2.000 — 2.013 (0.0787 — 0.0793)	1.492 — 1.501 (0.0587 — 0.0591)
0.03 (0.0012) Undersize	Journal O.D.	59.962 — 59.978 (2.3607 — 2.3613)	59.962 — 59.978 (2.3607 — 2.3613)	51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.017 — 2.020 (0.0794 — 0.0795)	2.019 — 2.022 (0.0795 — 0.0796)	1.510 — 1.513 (0.0594 — 0.0596)
0.05 (0.0020) Undersize	Journal O.D.	59.942 — 59.958 (2.3599 — 2.3605)	59.942 — 59.958 (2.3599 — 2.3605)	51.934 — 51.950 (2.0446 — 2.0453)
	Bearing size (Thickness at center)	2.027 — 2.030 (0.0798 — 0.0799)	2.029 — 2.032 (0.0799 — 0.0800)	1.520 — 1.523 (0.0598 — 0.0600)
0.25 (0.0098) Undersize	Journal O.D.	59.742 — 59.758 (2.3520 — 2.3527)	59.742 — 59.758 (2.3520 — 2.3527)	51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.127 — 2.130 (0.0837 — 0.0839)	2.129 — 2.132 (0.0838 — 0.0839)	1.620 — 1.623 (0.0638 — 0.0639)

4) Use a thickness gauge to measure the thrust clearance of crankshaft at center bearing. If the clearance exceeds the limit, replace the bearing.

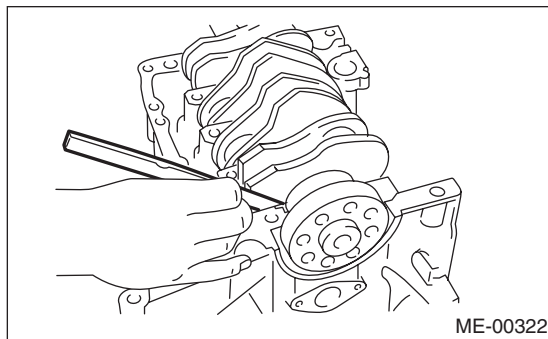
Crankshaft thrust clearance:

Standard:

0.030 — 0.115 mm (0.0012 — 0.0045 in)

Service limit:

0.25 mm (0.0098 in)



5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting and wear.

6) Measure the oil clearance on each crankshaft bearing using plastigauge. If the measured value exceeds the limit, replace the defective bearing with an undersize one, and replace or readjust the crankshaft if necessary.

Crankshaft oil clearance:

Standard:

0.010 — 0.030 mm (0.0004 — 0.0012 in)

Service limit:

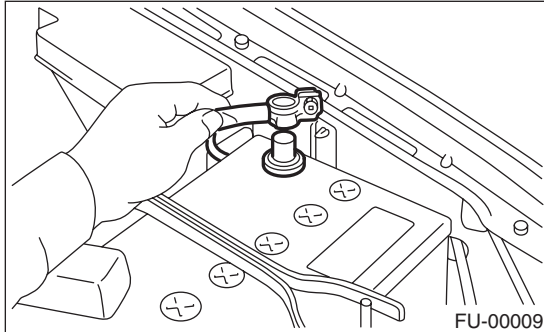
0.040 mm (0.0016 in)

22. Oil Switching Solenoid Valve

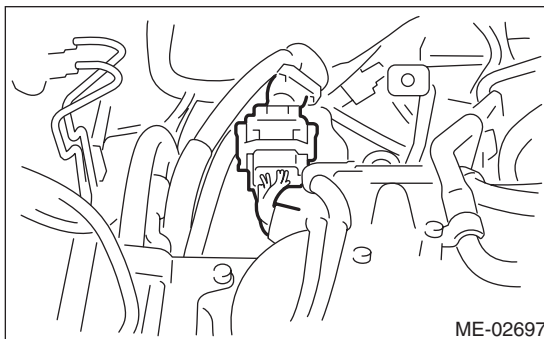
A: REMOVAL

1. RH SIDE

1) Disconnect the ground cable from the battery.

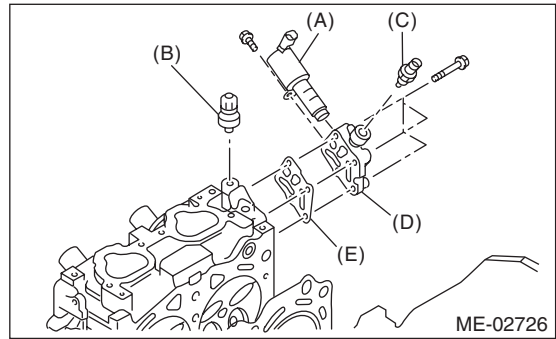


- 2) Remove the air intake chamber.
<Ref. to IN (H4SO)-6, REMOVAL, Air Intake Chamber.>
3) Remove the engine harness connector from the bracket.



- 4) Disconnect the connector from the oil switching solenoid valve.
5) Remove the oil switching solenoid valve.
6) Remove the variable valve lift diagnosis oil pressure switch.
<Ref. to FU(H4SO)-34, REMOVAL, Variable Valve Lift Diagnosis Oil Pressure Switch.>
7) Remove the oil temperature sensor.
<Ref. to FU(H4SO)-35, REMOVAL, Oil Temperature Sensor.>

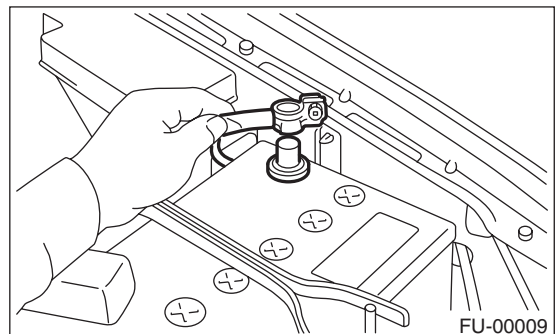
8) Remove the oil switching solenoid valve holder from the cylinder head.



- (A) Oil switching solenoid valve
(B) Variable valve lift diagnosis oil pressure switch
(C) Oil temperature sensor
(D) Oil switching solenoid valve holder
(E) Gasket

2. LH SIDE

1) Disconnect the ground cable from the battery.

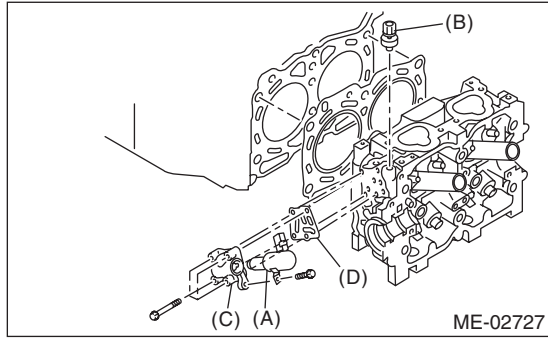


- 2) Remove the V-belts.
<Ref. to ME(H4SO)-40, REMOVAL, V-belt.>
3) Remove the crank pulley.
<Ref. to ME(H4SO)-42, REMOVAL, Crank Pulley.>
4) Remove the timing belt cover.
<Ref. to ME(H4SO)-43, REMOVAL, Timing Belt Cover.>
5) Remove the timing belt.
<Ref. to ME(H4SO)-44, REMOVAL, Timing Belt.>
6) Remove the cam sprocket.
<Ref. to ME(H4SO)-49, REMOVAL, Cam Sprocket.>
7) Remove the timing belt cover No. 2 (LH).
8) Disconnect the connector from the oil switching solenoid valve.
9) Remove the oil switching solenoid valve.
10) Remove the variable valve lift diagnosis oil pressure switch.
<Ref. to FU(H4SO)-34, REMOVAL, Variable Valve Lift Diagnosis Oil Pressure Switch.>

Oil Switching Solenoid Valve

MECHANICAL

11) Remove the oil switching solenoid valve holder from the cylinder head.



- (A) Oil switching solenoid valve
- (B) Variable valve lift diagnosis oil pressure switch
- (C) Oil switching solenoid valve holder
- (D) Gasket

B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

NOTE:

- Use a new gasket.
- Apply liquid gasket to the bolt threads of oil temperature sensor.

Liquid gasket:

THREE BOND 1324 (Part No. 004403042) or equivalent

Tightening torque:

T1

8 N·m (0.8 kgf·m, 5.9 ft·lb)

T2

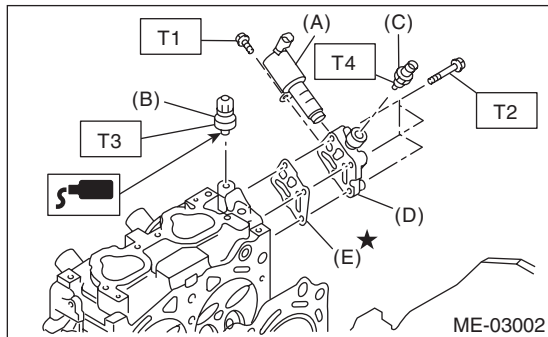
10 N·m (1.0 kgf·m, 7.4 ft·lb)

T3

17 N·m (1.7 kgf·m, 12.5 ft·lb)

T4

18 N·m (1.8 kgf·m, 13.3 ft·lb)



- (A) Oil switching solenoid valve
- (B) Variable valve lift diagnosis oil pressure switch
- (C) Oil temperature sensor
- (D) Oil switching solenoid valve holder
- (E) Gasket

2. LH SIDE

Install in the reverse order of removal.

NOTE:

- Use a new gasket.
- Apply liquid gasket to the bolt threads of oil temperature sensor.

Liquid gasket:

THREE BOND 1324 (Part No. 004403042) or equivalent

Tightening torque:

T1

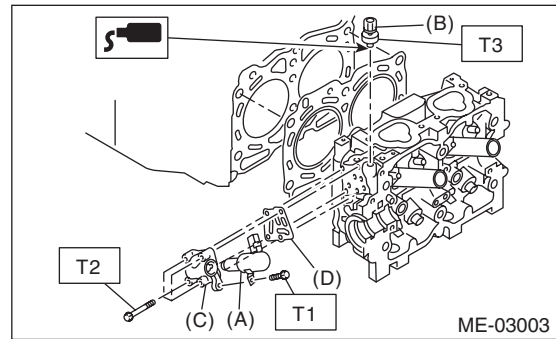
8 N·m (0.8 kgf·m, 5.9 ft·lb)

T2

10 N·m (1.0 kgf·m, 7.4 ft·lb)

T3

17 N·m (1.7 kgf·m, 12.5 ft·lb)



- (A) Oil switching solenoid valve
- (B) Variable valve lift diagnosis oil pressure switch
- (C) Oil switching solenoid valve holder
- (D) Gasket

23. Intake and Exhaust Valve

A: SPECIFICATION

Refer to "Cylinder Head" for removal and installation procedures of intake and exhaust valves. <Ref. to ME(H4SO)-58, REMOVAL, Cylinder Head.>
<Ref. to ME(H4SO)-58, INSTALLATION, Cylinder Head.>

24.Piston

A: SPECIFICATION

Refer to "Cylinder Block" for removal and installation procedures of pistons. <Ref. to ME(H4SO)-65, REMOVAL, Cylinder Block.> <Ref. to ME(H4SO)-69, INSTALLATION, Cylinder Block.>

25.Connecting Rod

A: SPECIFICATION

Refer to "Cylinder Block" for removal and installation procedures of connecting rod.

<Ref. to ME(H4SO)-65, REMOVAL, Cylinder Block.> <Ref. to ME(H4SO)-69, INSTALLATION, Cylinder Block.>

26.Crankshaft

A: SPECIFICATION

Refer to "Cylinder Block" for removal and installation procedures of the crankshaft. <Ref. to ME(H4SO)-65, REMOVAL, Cylinder Block.> <Ref. to ME(H4SO)-69, INSTALLATION, Cylinder Block.>

27.Engine Trouble in General

A: INSPECTION

NOTE:

“RANK” shown in the chart refers to the possibility of the cause of trouble in order “Very often” to “Rarely”

A — Very often

B — Sometimes

C — Rarely

Symptoms	Problem parts etc.	Possible cause	RANK
1. Engine does not start.			
1) Starter does not turn.	Starter	Defective battery-to-starter harness	B
		Defective starter switch	C
		Defective inhibitor switch	C
		Defective starter	B
	Battery	Improper connection of terminal	A
		Run-down battery	A
		Defective charging system	B
	Friction	Seizure of crankshaft and connecting rod bearing	C
		Seized camshaft	C
Seized or stuck piston and cylinder		C	
2) Initial combustion does not occur.	Starter	Defective starter	C
	Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A
	Fuel line	Defective fuel pump and relay	A
		Clogged fuel line	C
		Lack of or insufficient fuel	B
	Timing belt	Degradation, etc.	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	B
Worn or stuck piston rings, cylinder and piston		C	
Incorrect valve timing		B	
Improper engine oil (low viscosity)	B		

Engine Trouble in General

MECHANICAL

Symptoms	Problem parts etc.	Possible cause	RANK
3) Initial combustion occurs.	Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Defective intake manifold gasket	B
		Defective throttle body gasket	B
	Fuel line	Defective fuel pump and relay	C
		Clogged fuel line	C
		Lack of or insufficient fuel	B
	Timing belt	Degradation, etc.	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	B
Worn or stuck piston rings, cylinder and piston		C	
Incorrect valve timing		B	
Improper engine oil (low viscosity)	B		
4) Engine stalls after initial combustion.	Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	B
		Loosened or cracked PCV hose	C
		Loosened or cracked vacuum hose	C
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Dirty air cleaner element	C
	Fuel line	Clogged fuel line	C
		Lack of or insufficient fuel	B
	Timing belt	Degradation, etc.	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
Incorrect valve timing		B	
Improper engine oil (low viscosity)	B		

Engine Trouble in General

MECHANICAL

Symptoms	Problem parts etc.	Possible cause	RANK
2. Rough idle and engine stall	Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	A
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	C
		Loosened oil filler cap	B
		Dirty air cleaner element	C
	Fuel line	Defective fuel pump and relay	C
		Clogged fuel line	C
		Lack of or insufficient fuel	B
	Timing belt	Defective timing	C
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	B
		Loosened cylinder head bolt or defective gasket	B
		Improper valve sealing	B
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	B
		Incorrect valve timing	A
	Lubrication system	Improper engine oil (low viscosity)	B
		Incorrect oil pressure	B
Cooling system	Defective rocker cover gasket	C	
	Overheating	C	
Others	Evaporative emission control system malfunction	A	
	Stuck or damaged throttle valve	B	

Engine Trouble in General

MECHANICAL

Symptoms	Problem parts etc.	Possible cause	RANK
3. Low output, hesitation and poor acceleration	Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	B
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	B
		Loosened oil filler cap	B
		Dirty air cleaner element	A
	Fuel line	Defective fuel pump and relay	B
		Clogged fuel line	B
		Lack of or insufficient fuel	C
	Timing belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	B
		Loosened cylinder head bolt or defective gasket	B
		Improper valve sealing	B
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
	Improper engine oil (low viscosity)	B	
	Lubrication system	Incorrect oil pressure	B
	Cooling system	Overheating	C
		Over-cooling	C
	Others	Evaporative emission control system malfunction	A
	4. Surging	Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>	
Intake system		Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	A
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	B
		Loosened oil filler cap	B
		Dirty air cleaner element	B
Fuel line		Defective fuel pump and relay	B
		Clogged fuel line	B
		Lack of or insufficient fuel	C
Timing belt		Defective timing	B
Compression		Incorrect valve clearance	B
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
Improper engine oil (low viscosity)		B	
Cooling system		Overheating	B
Others		Evaporative emission control system malfunction	C

Engine Trouble in General

MECHANICAL

Symptoms	Problem parts etc.	Possible cause	RANK
5. Engine does not return to idle.	Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked vacuum hose	A
	Others	Stuck or damaged throttle valve	A
6. Dieseling (Run-on)	Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A
	Cooling system	Overheating	B
	Others	Evaporative emission control system malfunction	B
7. After burning in exhaust system	Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	C
		Loosened or cracked PCV hose	C
		Loosened or cracked vacuum hose	B
		Defective PCV valve	B
		Loosened oil filler cap	C
	Timing belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective gasket	C
		Improper valve sealing	B
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
Lubrication system	Incorrect oil pressure	C	
Cooling system	Over-cooling	C	
Others	Evaporative emission control system malfunction	C	
8. Knocking	Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened oil filler cap	B
	Timing belt	Defective timing	B
	Compression	Incorrect valve clearance	C
		Incorrect valve timing	B
	Cooling system	Overheating	A
9. Excessive engine oil consumption	Intake system	Loosened or cracked PCV hose	A
		Defective PCV valve	B
		Loosened oil filler cap	C
	Compression	Defective valve stem	A
		Worn or stuck piston rings, cylinder and piston	A
	Lubrication system	Loosened oil pump attaching bolts and defective gasket	B
		Defective oil filter seal	B
		Defective crankshaft oil seal	B
		Defective rocker cover gasket	B
		Loosened oil drain plug or defective gasket	B
	Loosened oil pan fitting bolts or defective oil pan	B	

Engine Trouble in General

MECHANICAL

Symptoms	Problem parts etc.	Possible cause	RANK	
10. Excessive fuel consumption	Engine control system <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.>		A	
	Intake system	Dirty air cleaner element	A	
	Timing belt	Defective timing	B	
	Compression	Incorrect valve clearance		B
		Loosened spark plug or defective gasket		C
		Loosened cylinder head bolt or defective gasket		C
		Improper valve sealing		B
		Defective valve stem		C
		Worn or broken valve spring		C
		Worn or stuck piston rings, cylinder and piston		B
		Incorrect valve timing		B
	Lubrication system	Incorrect oil pressure	C	
	Cooling system	Over-cooling	C	

28.Engine Noise

A: INSPECTION

Type of sound	Condition	Possible cause
Regular clicking sound	Sound increases as engine speed increases.	<ul style="list-style-type: none"> • Valve mechanism is defective. • Incorrect valve clearance • Worn valve rocker • Worn camshaft • Broken valve spring
Heavy and dull clank	Oil pressure is low.	<ul style="list-style-type: none"> • Camshaft journal wear • Worn connecting rod bearing (large end)
	Oil pressure is normal.	Damaged engine mounting
High-pitched clank (Spark knock)	Sound is noticeable when accelerating with an overload condition.	<ul style="list-style-type: none"> • Ignition timing advanced • Accumulation of carbon inside combustion chamber • Wrong spark plug • Improper gasoline
Clank when engine speed is 1,000 to 2,000 rpm	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	<ul style="list-style-type: none"> • Camshaft journal wear • Worn connecting rod bearing (large end)
Knocking sound when engine is operating under idling speed and engine is warm	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	<ul style="list-style-type: none"> • Worn cylinder liner and piston ring • Broken or stuck piston ring • Worn piston pin and hole at piston end of connecting rod
	Sound is not reduced if each fuel injector connector is disconnected in turn. (NOTE*)	<ul style="list-style-type: none"> • Worn cam sprocket • Worn camshaft journal bore in cylinder head assembly
Squeaky sound	—	Insufficient generator lubrication
Rubbing sound	—	Poor contact of generator brush and rotor
Gear scream when starting engine	—	<ul style="list-style-type: none"> • Defective ignition starter switch • Worn gear and starter pinion
Sound like polishing glass with a dry cloth	—	<ul style="list-style-type: none"> • Loose drive belt • Defective water pump shaft
Hissing sound	—	<ul style="list-style-type: none"> • Insufficient compression • Air leakage in air intake system, hose, connection or manifold
Timing belt noise	—	<ul style="list-style-type: none"> • Loose timing belt • Belt contacting with case/adjacent part
Valve noise	—	Incorrect valve clearance

NOTE*)

When disconnecting the fuel injector connector, the malfunction indicator light illuminates and DTC is stored in ECM memory. Therefore, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.> after connecting the fuel injector connector.

Engine Noise

MECHANICAL

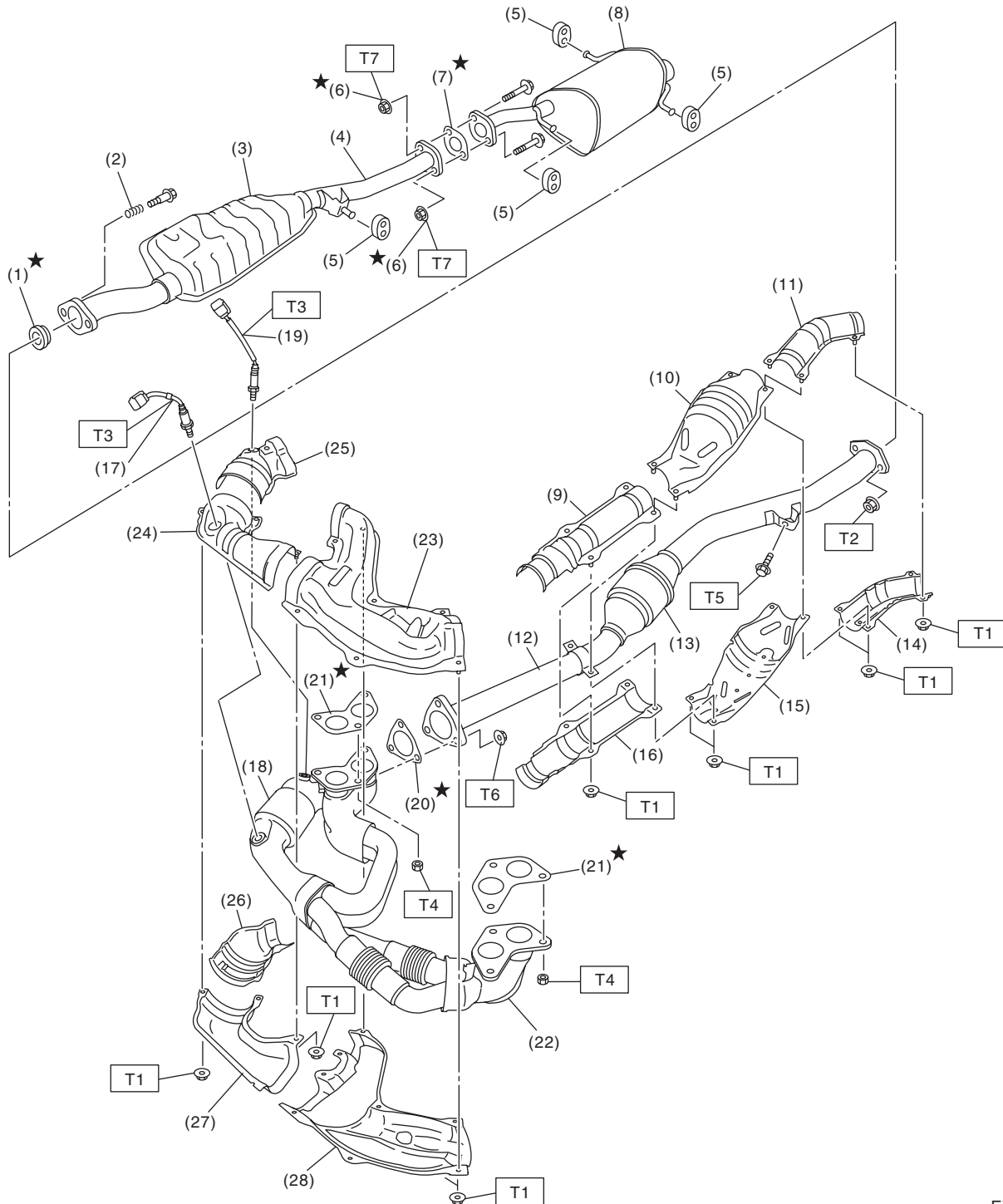
ME(H4SO)-98

General Description

EXHAUST

1. General Description

A: COMPONENT



EX-02133

General Description

EXHAUST

(1) Gasket	(14) Center exhaust pipe rear lower cover	(25) Front catalytic converter upper cover
(2) Spring	(15) Rear catalytic converter lower cover	(26) Front catalytic converter lower cover
(3) Chamber	(16) Center exhaust pipe front lower cover	(27) Front exhaust pipe lower cover RH
(4) Rear exhaust pipe	(17) Front oxygen (A/F) sensor	(28) Front exhaust pipe lower cover LH
(5) Cushion rubber	(18) Front catalytic converter	
(6) Self-locking nut	(19) Rear oxygen sensor	
(7) Gasket	(20) Gasket	
(8) Muffler	(21) Gasket	
(9) Center exhaust pipe front upper cover	(22) Front exhaust pipe	
(10) Rear catalytic converter upper cover	(23) Front exhaust pipe upper cover LH	
(11) Center exhaust pipe rear upper cover	(24) Front exhaust pipe upper cover RH	
(12) Center exhaust pipe		
(13) Rear catalytic converter		

Tightening torque: N·m (kgf·m, ft·lb)

T1: 13 (1.3, 9.4)

T2: 18 (1.8, 13.0)

T3: 21 (2.1, 15.2)

T4: 30 (3.1, 22.4)

T5: 35 (3.6, 26.0)

T6: 40 (4.1, 29.5)

T7: 48 (4.9, 35.4)

B: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from the battery.

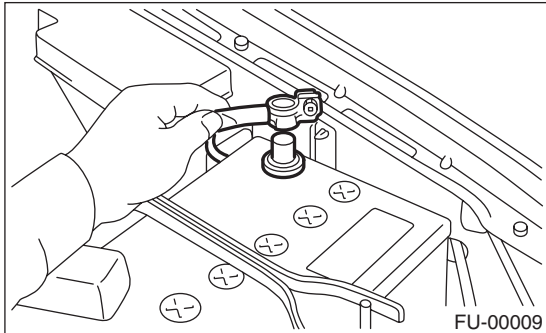
Front Exhaust Pipe

EXHAUST

2. Front Exhaust Pipe

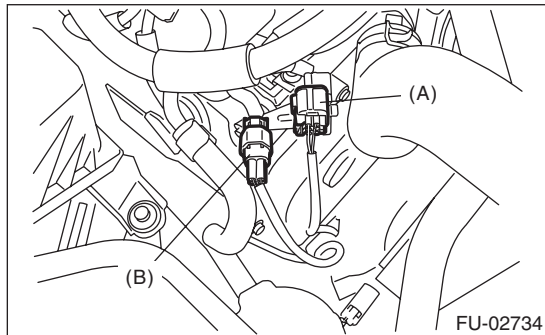
A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.



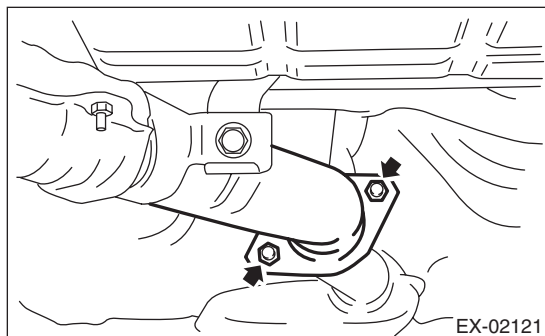
- 3) Unclip the clip fastening the harness and disconnect the following connectors.

- (1) Front oxygen (A/F) sensor connector
- (2) Rear oxygen sensor connector



- (A) Front oxygen (A/F) sensor connector
(B) Rear oxygen sensor connector

- 4) Lift-up the vehicle.
- 5) Separate the center exhaust pipe from rear exhaust pipe.

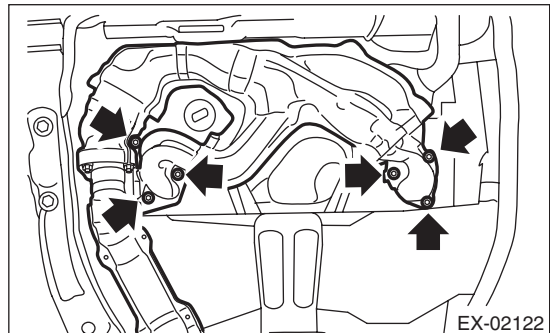


- 6) Remove the under cover.

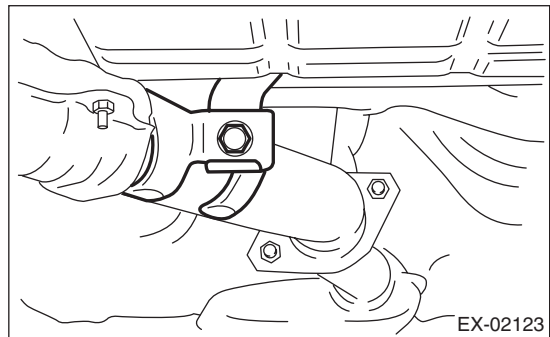
- 7) Remove the nuts which hold front exhaust pipe onto cylinder heads.

CAUTION:

Be careful not to pull down the front and center exhaust pipe assembly.



- 8) Remove the bolt which holds center exhaust pipe to hanger bracket.



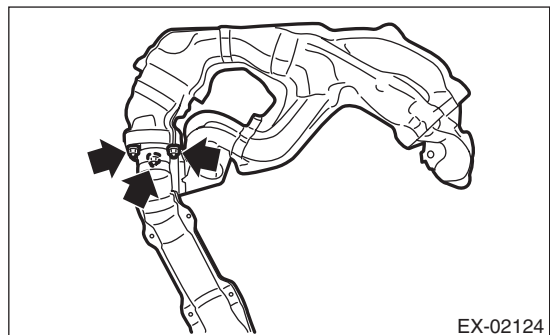
- 9) Remove the front and center exhaust pipe assembly from the vehicle.

CAUTION:

Be careful not to let the front and center exhaust pipe assembly fall off when removing as it is quite heavy.

After removing the front and center exhaust pipe assembly, do not apply excessive pulling force on the rear exhaust pipe.

- 10) Separate the front exhaust pipe from center exhaust pipe.



- 11) Remove the front oxygen (A/F) sensor and rear oxygen sensor. <Ref. to FU(H4SO)-36, REMOVAL, Front Oxygen (A/F) Sensor.> <Ref. to FU(H4SO)-38, REMOVAL, Rear Oxygen Sensor.>

B: INSTALLATION

1) Install the front oxygen (A/F) sensor and rear oxygen sensor to the front exhaust pipe. <Ref. to FU(H4SO)-36, INSTALLATION, Front Oxygen (A/F) Sensor.> <Ref. to FU(H4SO)-38, INSTALLATION, Rear Oxygen Sensor.>

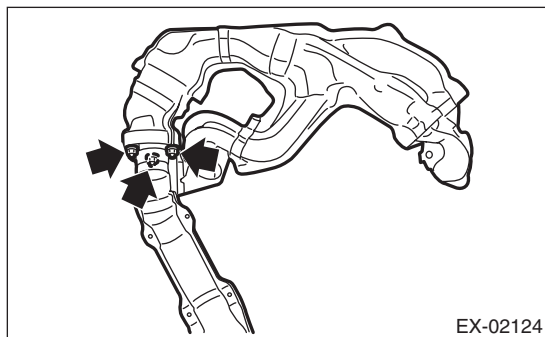
2) Install the front exhaust pipe to center exhaust pipe.

NOTE:

Use a new gasket.

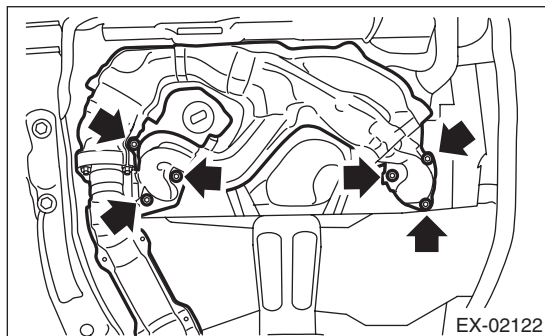
Tightening torque:

40 N·m (4.1 kgf·m, 29.5 ft-lb)



3) Install the front and center exhaust pipe assembly to the vehicle.

4) Temporarily tighten the nuts which hold front exhaust pipe to cylinder heads.



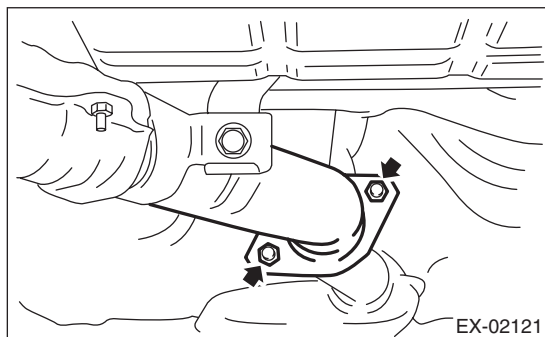
5) Tighten the bolt which holds the center exhaust pipe to exhaust pipe.

NOTE:

Use a new gasket.

Tightening torque:

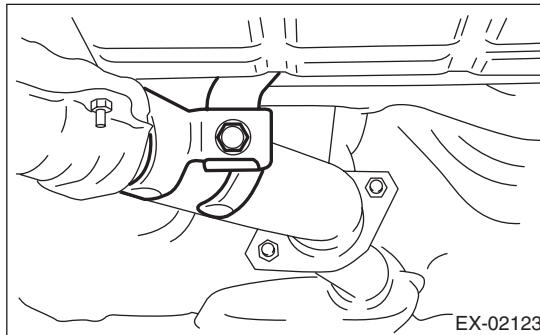
18 N·m (1.8 kgf·m, 13.0 ft-lb)



6) Tighten the bolt which holds center exhaust pipe to hanger bracket.

Tightening torque:

35 N·m (3.6 kgf·m, 26.0 ft-lb)



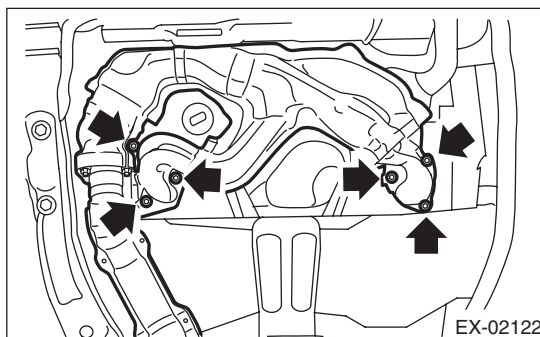
7) Tighten the nuts which hold front exhaust pipe to cylinder heads.

NOTE:

Use a new gasket.

Tightening torque:

30 N·m (3.1 kgf·m, 22.4 ft-lb)



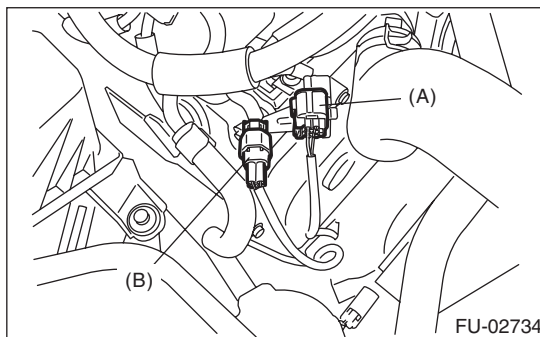
8) Install the under cover.

9) Lower the vehicle.

10) Connect the following connectors.

(1) Front oxygen (A/F) sensor connector

(2) Rear oxygen sensor connector



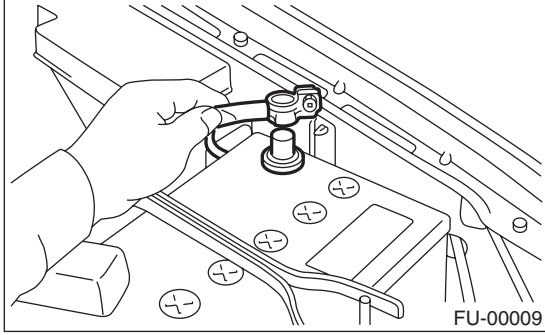
(A) Front oxygen (A/F) sensor connector

(B) Rear oxygen sensor connector

Front Exhaust Pipe

EXHAUST

11) Connect the ground cable to the battery.



C: INSPECTION

- 1) Check the connections and welds for exhaust leaks.
- 2) Check for hole or rust.

3. Center Exhaust Pipe

A: REMOVAL

After removing the center and front exhaust pipes as one unit, separate them. Refer to "Front Exhaust Pipe" for removal procedure. <Ref. to EX (H4SO)-4, REMOVAL, Front Exhaust Pipe.>

B: INSTALLATION

Install the center exhaust pipe and front exhaust pipe as one unit. Refer to "Front Exhaust Pipe" for installation procedure. <Ref. to EX (H4SO)-5, INSTALLATION, Front Exhaust Pipe.>

C: INSPECTION

- 1) Check the connections and welds for exhaust leaks.
- 2) Check for hole or rust.

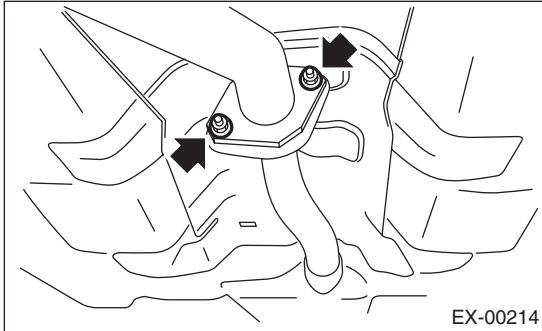
Rear Exhaust Pipe

EXHAUST

4. Rear Exhaust Pipe

A: REMOVAL

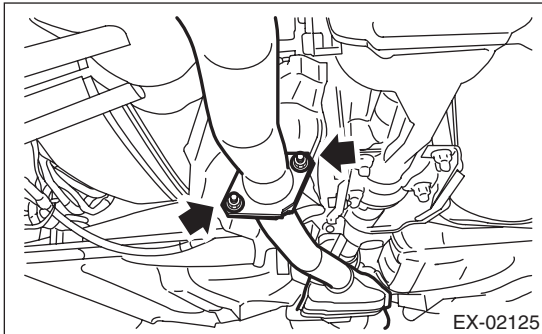
- 1) Set the vehicle on a lift.
- 2) Lift-up the vehicle.
- 3) Separate the rear exhaust pipe from center exhaust pipe.



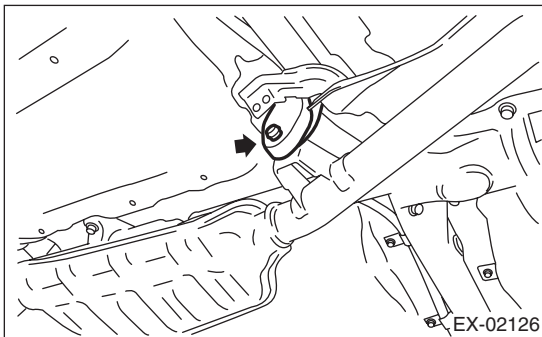
- 4) Separate the rear exhaust pipe from muffler.

CAUTION:

Be careful not to pull down the rear exhaust pipe.

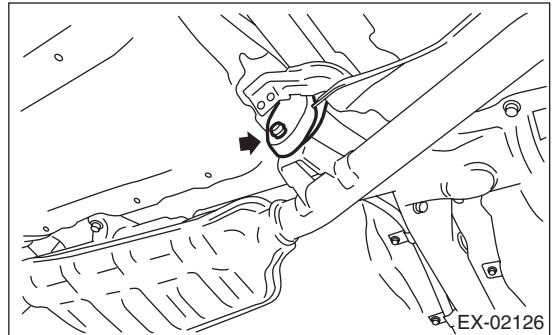


- 5) Apply a coat of spray type lubricant to the mating area of cushion rubber.
- 6) Remove the rear exhaust pipe bracket from cushion rubber.



B: INSTALLATION

- 1) Install the rear exhaust pipe bracket to cushion rubber.



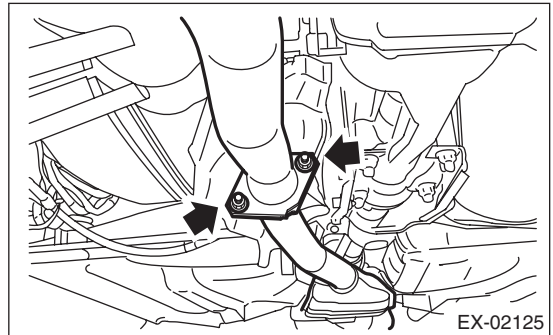
- 2) Install the rear exhaust pipe to muffler.

NOTE:

- Use a new gasket and self-locking nut.
- When the lubricant was applied to the cushion rubber during the removal/installation, degrease it after reassembling.

Tightening torque:

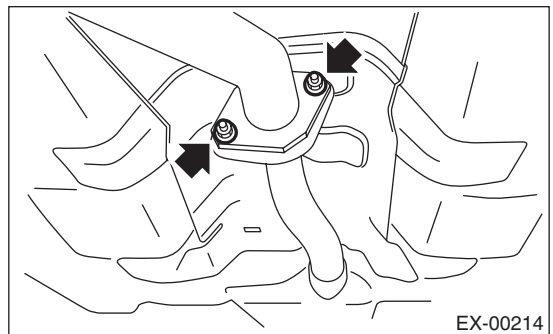
48 N·m (4.9 kgf-m, 35.4 ft-lb)



- 3) Install the rear exhaust pipe to center exhaust pipe.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)



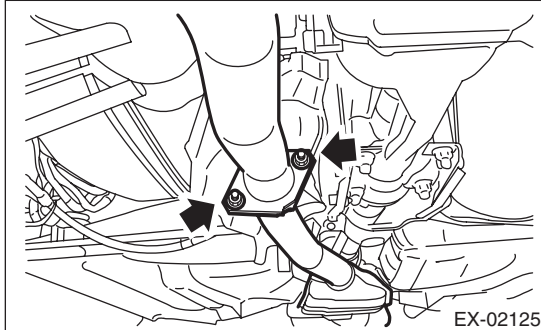
C: INSPECTION

- 1) Check the connections and welds for exhaust leaks.
- 2) Check for hole or rust.
- 3) Check the cushion rubber for wear or crack.

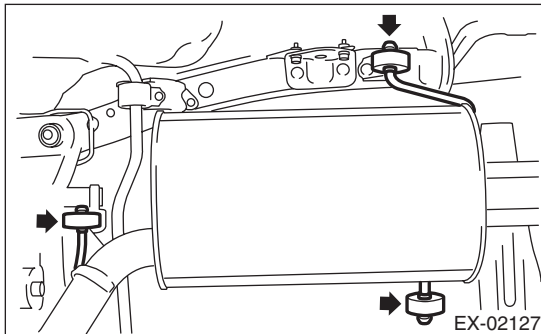
5. Muffler

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Lift-up the vehicle.
- 3) Separate the muffler from rear exhaust pipe.



- 4) Apply a coat of spray type lubricant to the mating area of cushion rubber.



- 5) Remove the front and rear cushion rubber, and then remove the muffler.

B: INSTALLATION

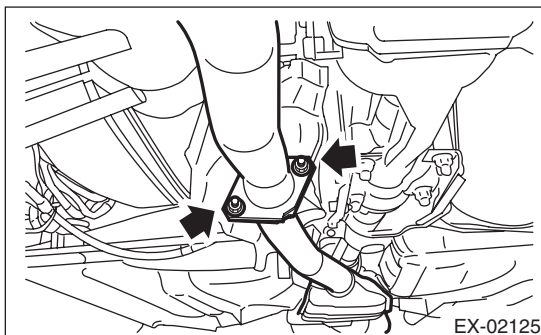
Install in the reverse order of removal.

NOTE:

- Use a new gasket and self-locking nut.
- When the lubricant was applied to the cushion rubber during the removal/installation, degrease it after reassembling.

Tightening torque:

48 N·m (4.9 kgf-m, 35.4 ft-lb)



C: INSPECTION

- 1) Check the connections and welds for exhaust leaks.
- 2) Check for hole or rust.
- 3) Check the cushion rubber for wear or crack.

Muffler

EXHAUST

EX (H4SO)-10

General Description

COOLING

1. General Description

A: SPECIFICATION

- Non-turbo model

Engine		Non-turbo	
Cooling system		Electric fan + Forced engine coolant circulation system	
Total engine coolant capacity		\varnothing (US qt, Imp qt) AT: approx. 6.5 (6.87, 5.72) MT: approx. 6.6 (6.98, 5.81)	
Water pump	Type		Centrifugal impeller type
	Discharge performance I	Discharge rate	20 \varnothing (5.3 US gal, 4.4 Imp gal)/min.
		Pump speed — Discharge pressure	760 rpm — 2.9 kPa (0.3 mAq)
		Engine coolant temperature	80°C (176°F)
	Discharge performance II	Discharge rate	100 \varnothing (26.4 US gal, 22.0 Imp gal)/min.
		Pump speed — Discharge pressure	3,000 rpm — 49.0 kPa (5.0 mAq)
		Engine coolant temperature	80°C (176°F)
	Discharge performance III	Discharge rate	200 \varnothing (52.8 US gal, 44.0 Imp gal)/min.
		Pump speed — Discharge pressure	6,000 rpm — 225.4 kPa (23.0 mAq)
		Engine coolant temperature	80°C (176°F)
Impeller diameter		76 mm (2.99 in)	
Number of impeller vanes		8	
Pump pulley diameter		60 mm (2.36 in)	
Clearance between impeller and case		0.5 — 1.5 mm (0.020 — 0.059 in)	
Thermostat	Type		Wax pellet type
	Starts to open		80 — 84°C (176 — 183°F)
	Fully opens		95°C (203°F)
	Valve lift		9.0 mm (0.354 in) or more
	Valve bore		35 mm (1.38 in)
Radiator fan	Motor input	Main fan	120 W
		Sub fan	120 W
Fan diameter / Blade		320 mm (12.60 in) / 5 (main fan) 320 mm (12.60 in) / 7 (sub fan)	
Radiator	Type		Down flow
	Core dimensions	Width × Height × Thickness	691.5 × 360 × 16 mm (27.22 × 14.17 × 0.63 in)
	Pressure range in which cap valve is open		Above: 108±15 kPa (1.1±0.15 kg/cm ² , 16±2 psi) Below: -1.0 to -4.9 kPa (-0.01 to -0.05 kg/cm ² , -0.1 to -0.7 psi)
	Fins		Corrugated fin type
Reservoir tank	Capacity		0.5 \varnothing (0.5 US qt, 0.4 Imp qt)

General Description

COOLING

Coolant	Recommended materials	Item number	Alternative
Coolant	SUBARU coolant	000016218	Phosphoric acid (non-amine) type
Water for dilution	Distilled water	—	Soft water or tap water
Cooling system protecting agent	Cooling system conditioner	SOA345001	None

General Description

COOLING

- Turbo model

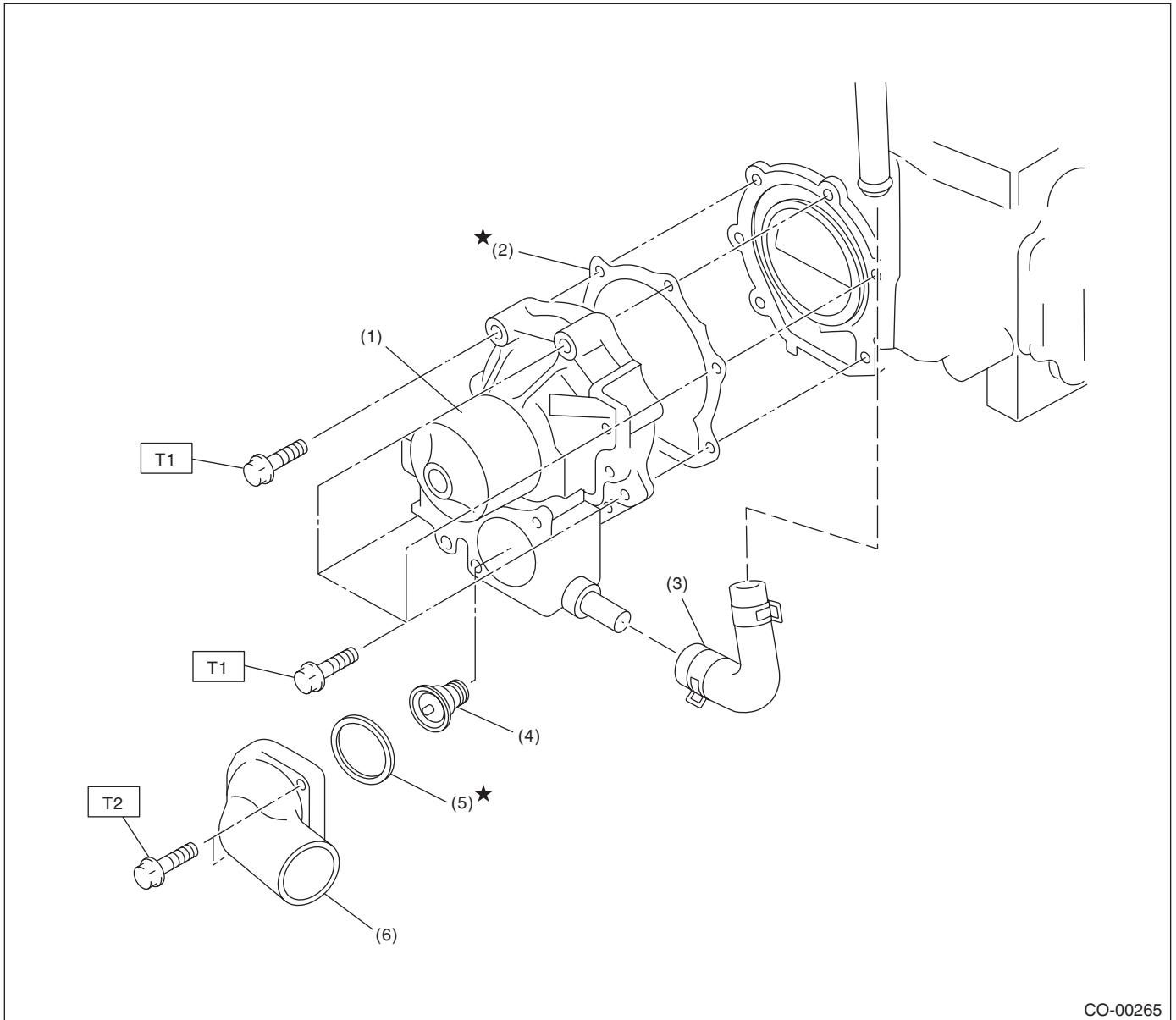
Engine		DOHC Turbo	
Cooling system		Electric fan + Forced engine coolant circulation system	
Total engine coolant capacity		\varnothing (US qt, Imp qt) AT: 7.3 (7.71, 6.42) MT: 7.4 (7.82, 6.51)	
Water pump	Type		Centrifugal impeller type
	Discharge performance I	Discharge rate	20 \varnothing (5.3 US gal, 4.4 Imp gal)/min.
		Pump speed — Discharge pressure	760 rpm — 2.9 kPa (0.3 mAq)
		Engine coolant temperature	80°C (176°F)
	Discharge performance II	Discharge rate	100 \varnothing (26.4 US gal, 22.0 Imp gal)/min.
		Pump speed — Discharge pressure	3,000 rpm — 49.0 kPa (5.0 mAq)
		Engine coolant temperature	80°C (176°F)
	Discharge performance III	Discharge rate	200 \varnothing (52.8 US gal, 44.0 Imp gal)/min.
		Pump speed — Discharge pressure	6,000 rpm — 225.4 kPa (23.0 mAq)
		Engine coolant temperature	80°C (176°F)
	Impeller diameter		76 mm (2.99 in)
Number of impeller vanes		8	
Pump pulley diameter		60 mm (2.36 in)	
Clearance between impeller and case		0.5 — 1.5 mm (0.020 — 0.059 in)	
Thermostat	Type		Wax pellet type
	Starts to open		76 — 80°C (169 — 176°F)
	Fully opens		91°C (196°F)
	Valve lift		9.0 mm (0.354 in) or more
	Valve bore		35 mm (1.38 in)
Radiator fan	Motor input	Main fan	120 W
		Sub fan	120 W
	Fan diameter / Blade		320 mm (12.60 in) / 5 (main fan) 320 mm (12.60 in) / 7 (sub fan)
Radiator	Type		Down flow
	Core dimensions	Width × Height × Thickness	691.5 × 360 × 16 mm (27.22 × 14.17 × 0.63 in)
	Pressure range in which cap valve is open	Coolant filler tank side	Above: 108±15 kPa (1.1±0.15 kg/cm ² , 16±2 psi) Below: -1.0 to -4.9 kPa (-0.01 to -0.05 kg/cm ² , -0.1 to -0.7 psi)
		Radiator side	Above only: 137±14.7 kPa (1.40±0.15 kgf/cm ² , 20±2.1 psi)
Fins		Corrugated fin type	
Reservoir tank	Capacity		0.5 \varnothing (0.5 US qt, 0.4 Imp qt)

Coolant	Recommended materials	Item number	Alternative
Coolant	SUBARU coolant	000016218	Phosphoric acid (non-amine) type
Water for dilution	Distilled water	—	Soft water or tap water
Cooling system protecting agent	Cooling system conditioner	SOA345001	None

B: COMPONENT

1. WATER PUMP

Non-turbo model



CO-00265

- | | |
|-------------------------|----------------------|
| (1) Water pump ASSY | (4) Thermostat |
| (2) Gasket | (5) Gasket |
| (3) Heater by-pass hose | (6) Thermostat cover |

Tightening torque:N·m (kgf-m, ft-lb)

T1: First 12 (1.2, 8.9)

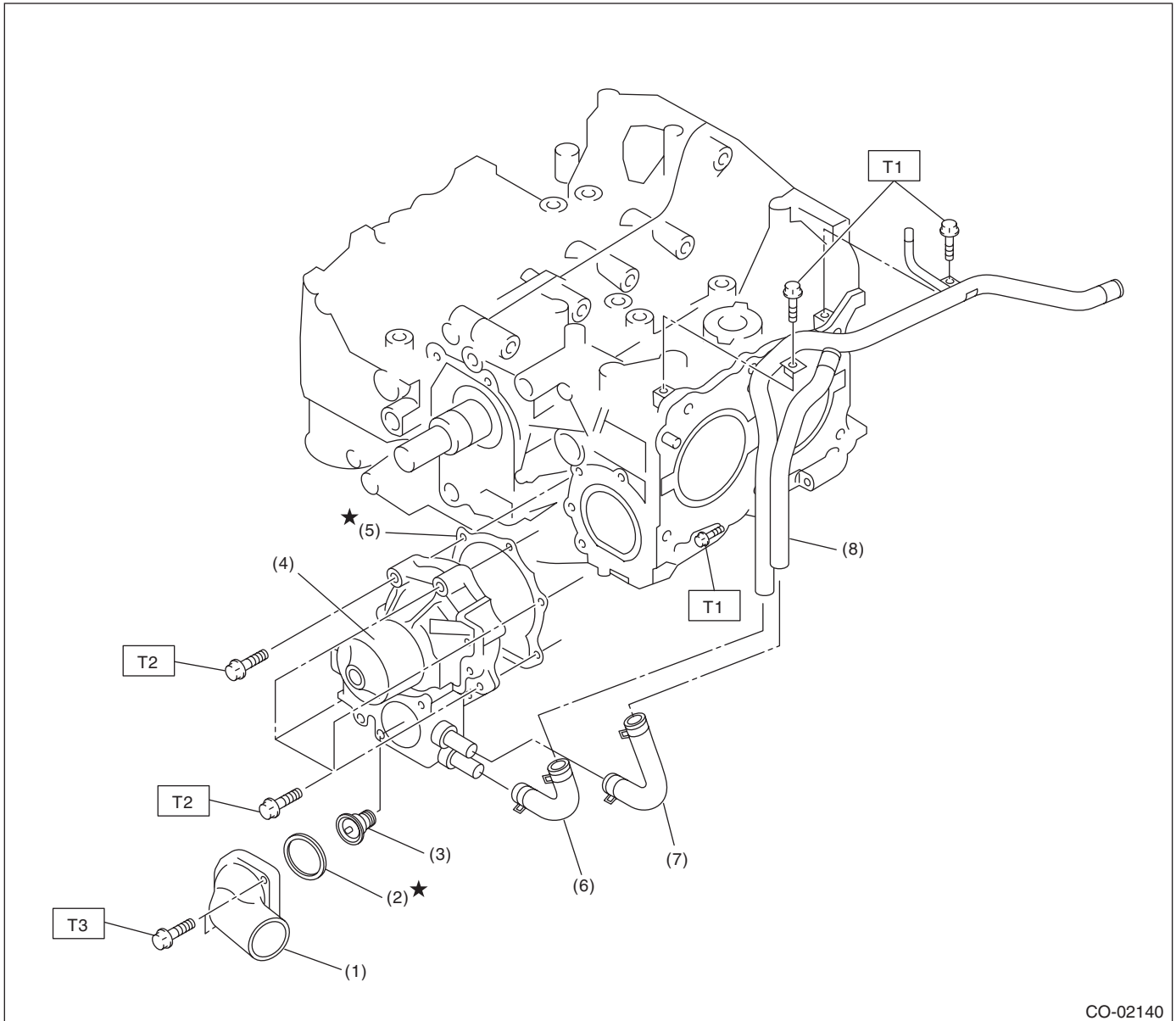
Second 12 (1.2, 8.9)

T2: 12 (1.2, 8.9)

General Description

COOLING

Turbo model



CO-02140

- | | |
|----------------------|---------------------------------|
| (1) Thermostat cover | (5) Gasket |
| (2) Gasket | (6) Heater by-pass hose |
| (3) Thermostat | (7) Coolant filler by-pass hose |
| (4) Water pump ASSY | (8) Water by-pass pipe |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 6.4 (0.65, 4.7)

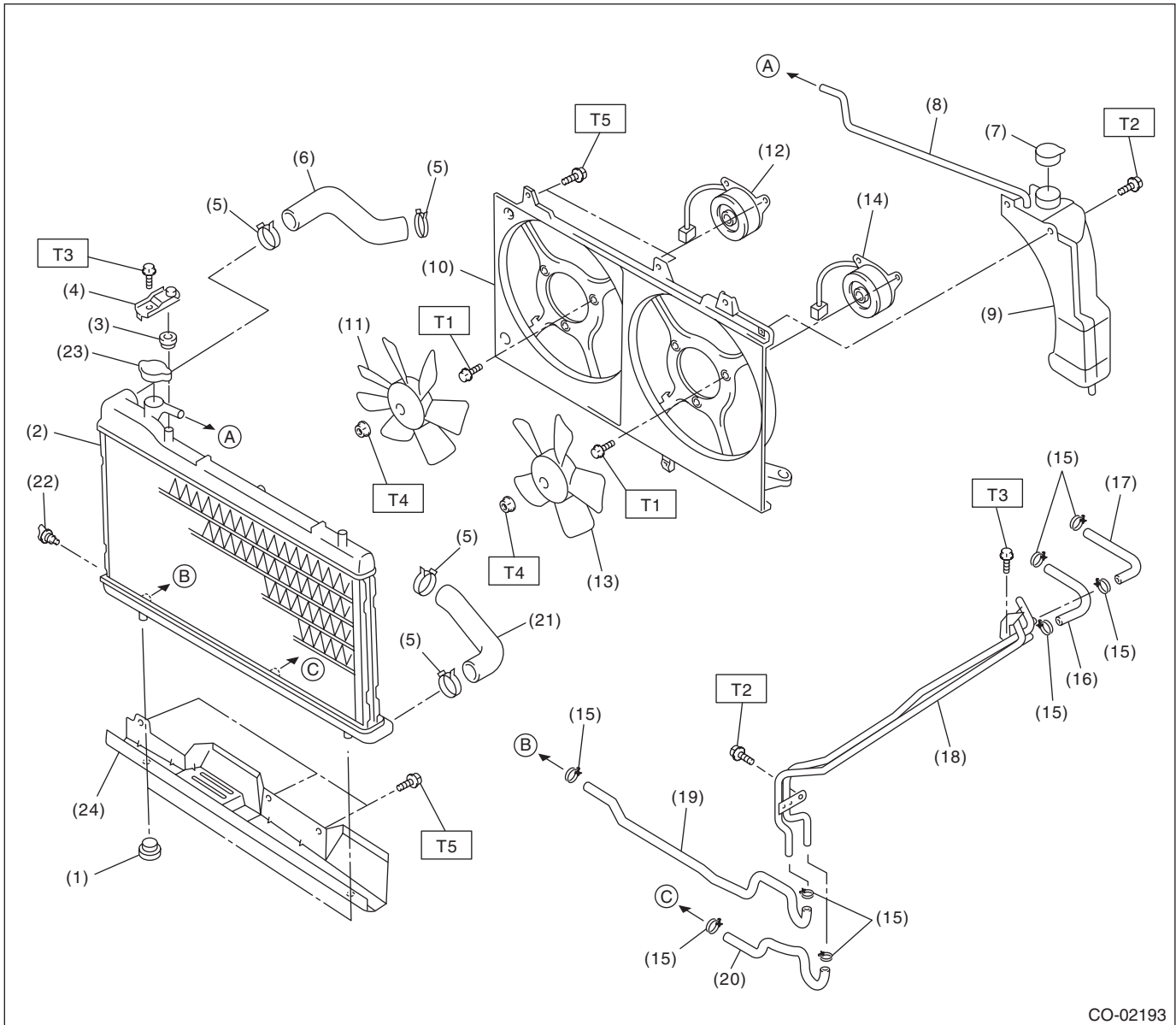
T2: First 12 (1.2, 8.9)

Second 12 (1.2, 8.9)

T3: 12 (1.2, 8.9)

2. RADIATOR AND ELECTRIC FAN

Non-turbo model



CO-02193

- | | | |
|---------------------------------------|--------------------------------|--------------------------------------|
| (1) Radiator lower cushion | (12) Radiator sub fan motor | (22) Radiator drain plug |
| (2) Radiator | (13) Radiator main fan | (23) Radiator cap |
| (3) Radiator upper cushion | (14) Radiator main fan motor | (24) Radiator under cover (AT model) |
| (4) Radiator upper bracket | (15) ATF hose clamp (AT model) | |
| (5) Clamp | (16) ATF hose A (AT model) | |
| (6) Radiator inlet hose | (17) ATF hose B (AT model) | |
| (7) Engine coolant reservoir tank cap | (18) ATF pipe (AT model) | |
| (8) Over flow hose | (19) ATF hose C (AT model) | |
| (9) Engine coolant reservoir tank | (20) ATF hose D (AT model) | |
| (10) Radiator fan shroud | (21) Radiator outlet hose | |
| (11) Radiator sub fan | | |

Tightening torque: N-m (kgf-m, ft-lb)

T1: 4.4 (0.45, 3.3)

T2: 7.5 (0.76, 5.5)

T3: 18 (1.8, 13.0)

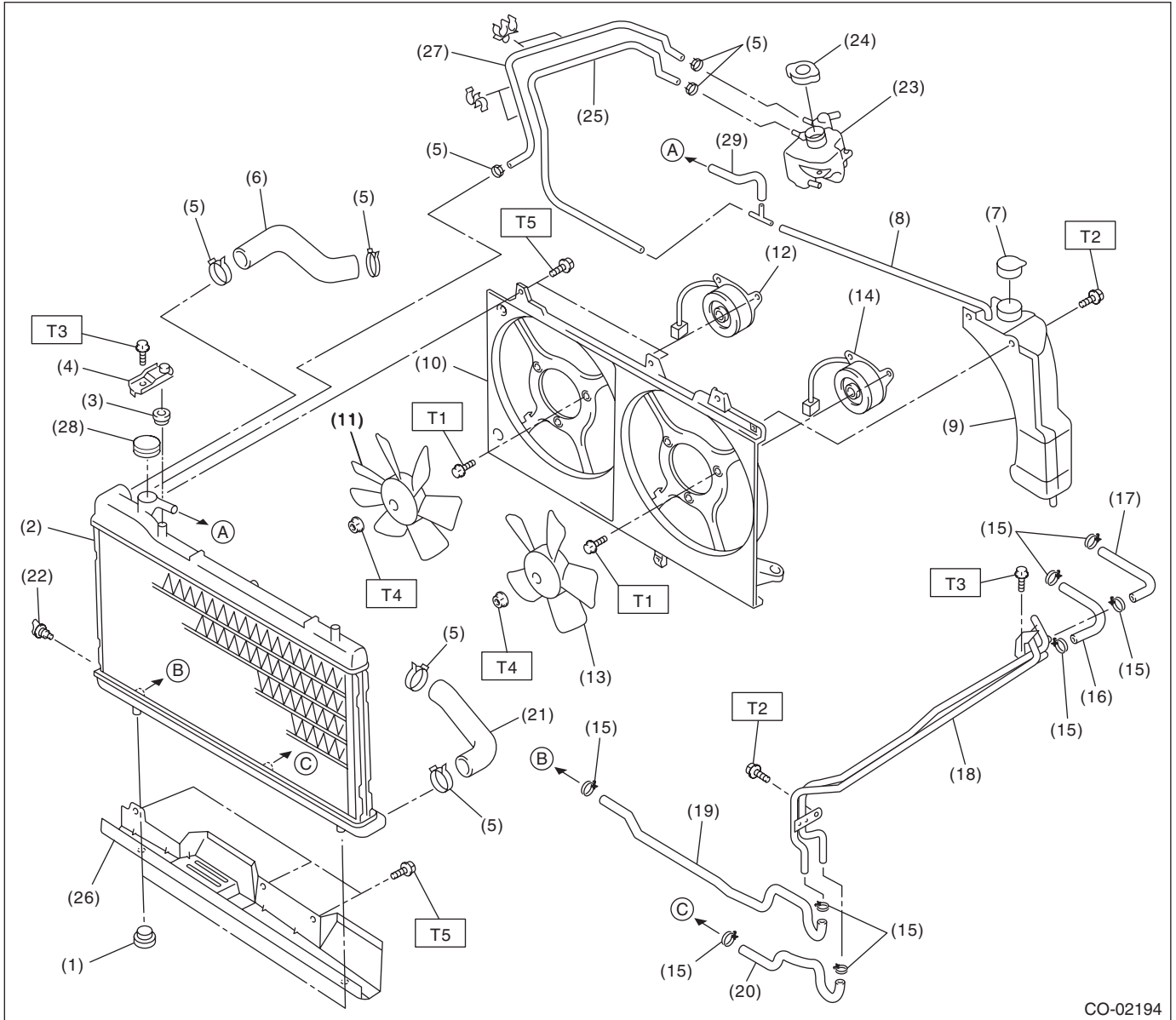
T4: 3.4 (0.35, 2.5)

T5: 4.9 (0.50, 3.6)

General Description

COOLING

Turbo model



CO-02194

(1) Radiator lower cushion	(13) Radiator main fan	(25) Overflow hose B
(2) Radiator	(14) Radiator main fan motor	(26) Radiator under cover (AT model)
(3) Radiator upper cushion	(15) ATF hose clamp (AT model)	(27) Air breather hose
(4) Radiator upper bracket	(16) ATF hose A (AT model)	(28) Radiator cap
(5) Clamp	(17) ATF hose B (AT model)	(29) Overflow hose C
(6) Radiator inlet hose	(18) ATF pipe (AT model)	
(7) Engine coolant reservoir tank cap	(19) ATF hose C (AT model)	
(8) Overflow hose A	(20) ATF hose D (AT model)	
(9) Engine coolant reservoir tank	(21) Radiator outlet hose	
(10) Radiator fan shroud	(22) Radiator drain plug	
(11) Radiator sub fan	(23) Engine coolant filler tank	
(12) Radiator sub fan motor	(24) Engine coolant filler tank cap	

Tightening torque: N·m (kgf·m, ft·lb)

T1: 4.4 (0.45, 3.3)

T2: 7.5 (0.76, 5.5)

T3: 18 (1.8, 13.0)

T4: 3.4 (0.35, 2.5)

T5: 4.9 (0.50, 3.6)

C: CAUTION

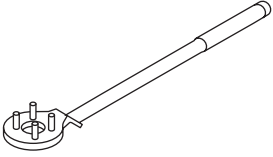
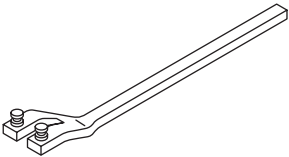
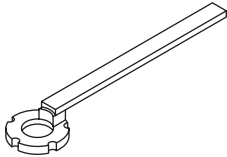
- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from the battery.

General Description

COOLING

D: PREPARATION TOOL

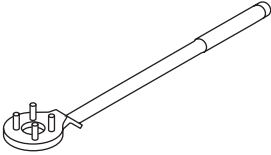
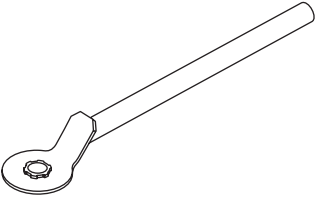
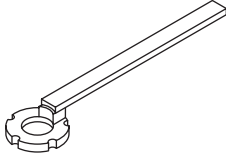
1. NON-TURBO MODEL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST-499977100</p>	499977100	CRANK PULLEY WRENCH	Used for stopping crank pulley when loosening and tightening crank pulley bolts.
 <p>ST18231AA010</p>	18231AA010	CAM SPROCKET WRENCH (For LH)	<ul style="list-style-type: none"> Used for removing and installing cam sprocket (LH). CAM SPROCKET WRENCH (499207100) can also be used.
 <p>ST-499207400</p>	499207400	CAM SPROCKET WRENCH (For RH)	Used for removing and installing cam sprocket (RH).

General Description

COOLING

2. TURBO MODEL

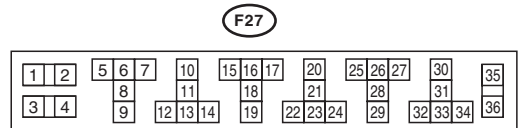
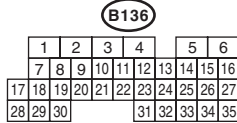
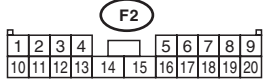
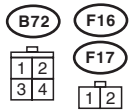
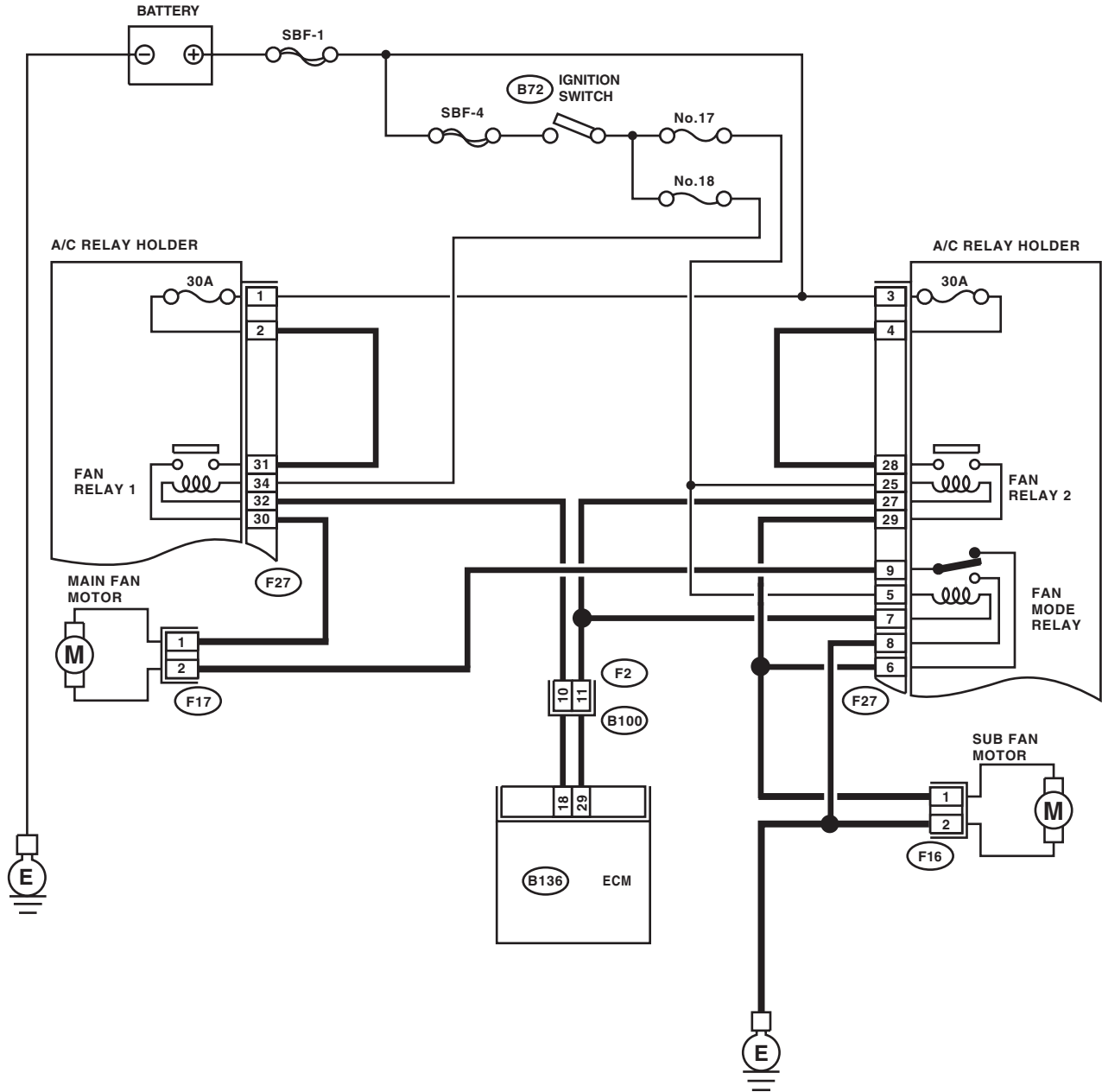
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST-499977100</p>	499977100	CRANK PULLEY WRENCH	Used for stopping crank pulley when loosening and tightening crank pulley bolts.
 <p>ST-499977500</p>	499977500	CAM SPROCKET WRENCH	Used for removing and installing cam sprocket. (Intake)
 <p>ST-499207400</p>	499207400	CAM SPROCKET WRENCH	Used for removing and installing cam sprocket. (Exhaust)

Radiator Fan System

COOLING

2. Radiator Fan System

A: WIRING DIAGRAM



CO-02223

B: INSPECTION

DETECTING CONDITION:

- Engine coolant temperature is above 95°C (203°F).
- Vehicle speed is below 19 km/h (12 MPH).

TROUBLE SYMPTOM:

- Radiator main and sub fans do not rotate under the above conditions.

Step	Check	Yes	No
1 CHECK OPERATION OF RADIATOR FAN. 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Using Subaru Select Monitor, check the compulsory operation of radiator fan. NOTE: • When performing the compulsory operation check for the radiator fan using Subaru Select Monitor, the radiator main fan and sub fan will repeat such a operation as low speed revolution → high speed revolution → OFF in this order. • Subaru Select Monitor Refer to Compulsory Valve Operation Check Mode for detail procedures. <Ref. to EN(H4SO)(diag)-45, Compulsory Valve Operation Check Mode.>	Do the radiator main and sub fans rotate at low speed?	Go to step 2.	Go to step 3.
2 CHECK OPERATION OF RADIATOR FAN. 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Using Subaru Select Monitor, check the compulsory operation of radiator fan. NOTE: • When performing the compulsory operation check for the radiator fan using Subaru Select Monitor, the radiator main fan and sub fan will repeat such a operation as low speed revolution → high speed revolution → OFF in this order. • Subaru Select Monitor Refer to Compulsory Valve Operation Check Mode for detail procedures. <Ref. to EN(H4SO)(diag)-45, Compulsory Valve Operation Check Mode.>	Do the radiator main and sub fans rotate at high speed?	Radiator main fan system is normal.	Go to step 32.
3 CHECK POWER SUPPLY TO FAN RELAY 1. 1) Turn the ignition switch to OFF. 2) Remove the fan relay 1 from A/C relay holder. 3) Measure the voltage between fan relay 1 terminal and chassis ground. <i>Connector & terminal</i> <i>(F27) No. 31 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Go to step 4.	Go to step 5.
4 CHECK POWER SUPPLY TO FAN RELAY 1. 1) Turn the ignition switch to ON. 2) Measure the voltage between fan relay 1 terminal and chassis ground. <i>Connector & terminal</i> <i>(F27) No. 34 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Go to step 8.	Go to step 7.
5 CHECK FUSE. 1) Remove the 30 A fuse from A/C relay holder. 2) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Go to step 6.

Radiator Fan System

COOLING

Step	Check	Yes	No
6 CHECK HARNESS OF 30 A FUSE TERMINAL AND FAN RELAY 1 TERMINAL. 1) Turn the ignition switch to OFF. 2) Measure the resistance between 30 A fuse terminal and fan relay 1 terminal. Terminals No. 2 — No. 31:	Is the resistance less than 1 Ω ?	Repair the power supply line.	Repair the open circuit of harness.
7 CHECK FUSE. 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 18. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Repair the power supply line.
8 CHECK FAN RELAY 1. 1) Turn the ignition switch to OFF. 2) Measure the resistance between fan relay 1 terminals. Terminals No. 30 — No. 31:	Is the resistance 1 M Ω or more?	Go to step 9.	Replace the fan relay 1.
9 CHECK FAN RELAY 1. 1) Connect the battery to fan relay 1 terminals No. 32 and No. 34. 2) Measure the resistance between fan relay 1 terminals. Terminals No. 30 — No. 31:	Is the resistance less than 1 Ω ?	Go to step 10.	Replace the fan relay 1.
10 CHECK HARNESS BETWEEN FAN RELAY 1 TERMINAL AND MAIN FAN MOTOR CONNECTOR. 1) Disconnect the connector from the main fan motor. 2) Measure the resistance of the harness between fan relay 1 terminal and main fan motor connector. Connector & terminal (F17) No. 1 — (F27) No. 30:	Is the resistance less than 1 Ω ?	Go to step 11.	Repair the open circuit of the harness between fan relay 1 terminal and main fan motor connector.
11 CHECK THE HARNESS BETWEEN MAIN FAN MOTOR CONNECTOR AND FAN MODE RELAY CONNECTOR. 1) Remove the fan mode relay from A/C relay holder. 2) Measure the resistance of harness between main fan motor connector and fan mode relay connector. Connector & terminal (F17) No. 2 — (F27) No. 9:	Is the resistance less than 1 Ω ?	Go to step 12.	Repair the open circuit of the harness between the main fan motor connector and fan mode relay connector.
12 CHECK POOR CONTACT. Check poor contact of main fan motor connector.	Is there poor contact in main fan motor connector?	Repair the poor contact of main fan motor connector.	Go to step 13.
13 CHECK MAIN FAN MOTOR. Connect the battery positive (+) terminal to terminal No. 1, and the ground (-) terminal to terminal No. 2 of main fan motor.	Does the main fan rotate?	Go to step 14.	Replace the main fan motor with a new part.
14 CHECK FAN MODE RELAY. Measure the resistance of fan mode relay. Terminals No. 6 — No. 9:	Is the resistance less than 1 Ω ?	Go to step 15.	Replace the fan mode relay.

Radiator Fan System

COOLING

Step	Check	Yes	No
15 CHECK HARNESS BETWEEN FAN MODE RELAY TERMINAL AND SUB FAN MOTOR CONNECTOR. 1) Disconnect the connector from the sub fan motor. 2) Measure the resistance of harness between fan mode relay terminal and sub fan motor connector. <i>Connector & terminal (F16) No. 1 — (F27) No. 6:</i>	Is the resistance less than 1 Ω ?	Go to step 16.	Repair the open circuit of the harness between fan mode relay terminal and sub fan motor connector.
16 CHECK SUB FAN MOTOR AND GROUND CIRCUIT. Measure the resistance between sub fan motor connector and chassis ground. <i>Connector & terminal (F16) No. 2 — Chassis ground:</i>	Is the resistance less than 5 Ω ?	Go to step 17.	Repair the open circuit of harness between sub fan motor connector and chassis ground.
17 CHECK POOR CONTACT. Check the poor contact of sub fan motor connector.	Is there poor contact in sub fan motor connector?	Repair the poor contact of sub fan motor connector.	Go to step 18.
18 CHECK SUB FAN MOTOR. Connect the battery positive (+) terminal to terminal No. 1, and the ground (-) terminal to terminal No. 2 of sub fan motor.	Does the sub fan rotate?	Go to step 19.	Replace the sub fan motor with a new part.
19 CHECK HARNESS BETWEEN FAN RELAY 1 AND ECM. 1) Disconnect the connectors from ECM. 2) Measure the resistance between fan relay 1 terminal and ECM connector. <i>Connector & terminal (B136) No. 18 — (F27) No. 32:</i>	Is the resistance less than 1 Ω ?	Go to step 20.	Repair the open circuit of the harness between fan relay 1 terminal and ECM.
20 CHECK POOR CONTACT. Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact your SOA Service Center. NOTE: Multiple parts may be deteriorated.
21 CHECK POWER SUPPLY TO FAN RELAY 2. 1) Turn the ignition switch to OFF. 2) Remove the fan relay 2 from A/C relay holder. 3) Measure the voltage between fan relay 2 terminal and chassis ground. <i>Connector & terminal (F27) No. 28 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Go to step 22.	Go to step 23.
22 CHECK POWER SUPPLY TO FAN RELAY 2. 1) Turn the ignition switch to ON. 2) Measure the voltage between fan relay 2 terminal and chassis ground. <i>Connector & terminal (F27) No. 25 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Go to step 26.	Go to step 25.
23 CHECK FUSE. 1) Remove the 30 A fuse from A/C relay holder. 2) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Go to step 24.

Radiator Fan System

COOLING

Step	Check	Yes	No
24 CHECK HARNESS OF 30 A FUSE TERMINAL AND FAN RELAY 2 TERMINAL. 1) Turn the ignition switch to OFF. 2) Measure the resistance between 30 A fuse terminal and fan relay 2 terminal. Terminals No. 4 — No. 28:	Is the resistance less than 1 Ω ?	Repair the power supply line.	Repair the open circuit of harness.
25 CHECK FUSE. 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 17. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Repair the power supply line.
26 CHECK FAN RELAY 2. 1) Turn the ignition switch to OFF. 2) Remove the fan relay 2 from A/C relay holder. 3) Measure the resistance of fan relay 2. Terminals No. 28 — No. 29:	Is the resistance 1 M Ω or more?	Go to step 27.	Replace the fan relay 2.
27 CHECK FAN RELAY 2. 1) Connect the battery to fan relay 2 terminals No. 25 and No. 27. 2) Measure the resistance between fan relay 2 terminals. Terminals No. 28 — No. 29:	Is the resistance less than 1 Ω ?	Go to step 28.	Replace the fan relay 2.
28 CHECK HARNESS BETWEEN FAN RELAY 2 TERMINAL AND SUB FAN MOTOR CONNECTOR. 1) Disconnect the connector from the sub fan motor. 2) Measure the resistance of harness between fan relay 2 terminal and sub fan motor connector. Connector & terminal (F16) No. 1 — (F27) No. 29:	Is the resistance less than 1 Ω ?	Go to step 29.	Repair the open circuit of the harness between fan relay 2 terminal and sub fan motor connector.
29 CHECK HARNESS BETWEEN FAN RELAY 2 AND ECM. 1) Disconnect the connectors from ECM. 2) Measure the resistance between fan relay 2 terminal and ECM connector. Connector & terminal (B136) No. 29 — (F27) No. 27:	Is the resistance less than 1 Ω ?	Go to step 30.	Repair the open circuit of the harness between fan relay 2 terminal and ECM.
30 CHECK HARNESS BETWEEN FAN MODE RELAY AND ECM. Measure the resistance between fan mode relay terminal and ECM connector. Connector & terminal (B136) No. 29 — (F27) No. 7:	Is the resistance less than 1 Ω ?	Go to step 31.	Repair the open circuit of the harness between fan mode relay terminal and ECM.
31 CHECK POOR CONTACT. Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Contact your SOA Service Center. NOTE: Multiple parts may be deteriorated.
32 CHECK OPERATION OF RADIATOR FAN.	Does the radiator main fan rotate when the radiator main and sub fans do not rotate at high speed?	Go to step 21.	Go to step 33.

Radiator Fan System

COOLING

Step	Check	Yes	No
33 CHECK GROUND CIRCUIT OF FAN MODE RELAY. 1) Remove the fan mode relay from A/C relay holder. 2) Measure the resistance between fan mode relay terminal and chassis ground. <i>Connector & terminal</i> <i>(F27) No. 8 — Chassis ground:</i>	Is the resistance less than 1 Ω?	Go to step 34.	Repair the open circuit of harness between fan mode relay and chassis ground.
34 CHECK POWER SUPPLY TO FAN MODE RELAY. 1) Turn the ignition switch to ON. 2) Measure the voltage between fan mode relay terminal and chassis ground. <i>Connector & terminal</i> <i>(F27) No. 5 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Go to step 35.	Repair the power supply line.
35 CHECK FAN MODE RELAY. 1) Turn the ignition switch to OFF. 2) Remove the fan mode relay. 3) Measure the resistance of fan mode relay. <i>Terminals</i> <i>(F27) No. 8 — (F27) No. 9:</i>	Is the resistance 1 MΩ or more?	Go to step 36.	Replace the fan mode relay.
36 CHECK FAN MODE RELAY. 1) Connect the battery to terminals No. 5 and No. 7 of fan mode relay. 2) Measure the resistance of fan mode relay. <i>Terminals</i> <i>(F27) No. 8 — (F27) No. 9:</i>	Is the resistance less than 1 Ω?	Go to step 29.	Replace the fan mode relay.

3. Engine Coolant

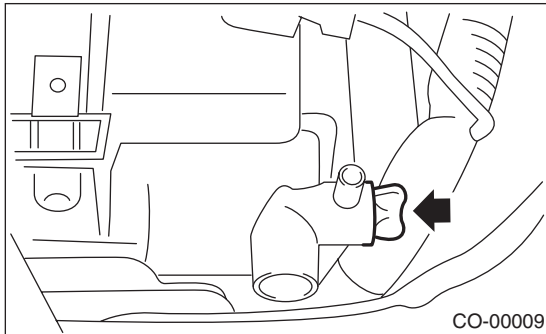
A: REPLACEMENT

1. DRAINING OF ENGINE COOLANT

- 1) Set the vehicle on a lift.
- 2) Lift-up the vehicle.
- 3) Remove the under cover.
- 4) Remove the drain cock to drain engine coolant into container.

NOTE:

Remove the radiator cap so that engine coolant will drain faster.



- 5) Install the drain cock.

2. FILLING OF ENGINE COOLANT

- 1) Fill cooling system conditioner into the filler neck of the radiator (the filler neck of the coolant filler tank on turbo models).

Cooling system protecting agent:

<Ref. to CO(H4SO)-2, SPECIFICATION, General Description.>

- 2) Fill engine coolant into the filler neck of the radiator (the filler neck of the coolant filler tank on turbo models) up to the filler neck position.

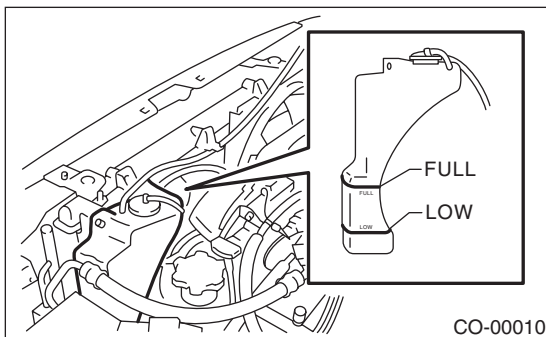
Recommended engine coolant:

<Ref. to CO(H4SO)-2, SPECIFICATION, General Description.>

Coolant level:

<Ref. to CO(H4SO)-2, SPECIFICATION, General Description.>

- 3) Fill engine coolant into the reservoir tank up to "FULL" level.



- 4) Close the radiator cap (on Non-turbo models) or the coolant filler tank cap (on turbo models), start the engine and race 5 to 6 times at less than 3,000 rpm, then stop the engine. (Complete this operation within 40 seconds.)

- 5) Wait for one minute after the engine stops, then open the radiator cap (on non-turbo models) or the coolant filler tank cap (on turbo models). If the engine coolant level drops, add engine coolant into the radiator filler neck (on non-turbo models) or the coolant filler tank filler neck (on turbo models) up to the filler neck position.

- 6) Perform the procedures 4) and 5) again.

- 7) Close the radiator cap (on non-turbo models) or the coolant filler tank cap (on turbo models), and the reservoir tank cap.

- 8) Start the engine and operate the heater at maximum hot position and the blower speed setting to "LO".

- 9) Run the engine at 2,000 rpm or less until radiator fan starts and stops.

NOTE:

Be careful with the engine coolant temperature gauge to prevent overheating.

- 10) Stop the engine and wait until the engine coolant temperature lowers to 30°C (86°F).

- 11) Open the radiator cap (on non-turbo models) or the coolant filler tank cap (on turbo models). If the engine coolant level drops, add engine coolant into the radiator filler neck (on non-turbo models) or the coolant filler tank filler neck (on turbo models) up to the filler neck position.

Then, pour the coolant into reservoir tank up to "FULL" level.

- 12) Close the radiator cap (on non-turbo models) or the coolant filler tank cap (on turbo models), and the reservoir tank cap.

- 13) Set the heater setting to maximum hot position and the blower speed setting to "LO" and start the engine. Perform racing at less than 3,000 rpm. If the flowing sound is heard at this time, perform the procedures from 9) again.

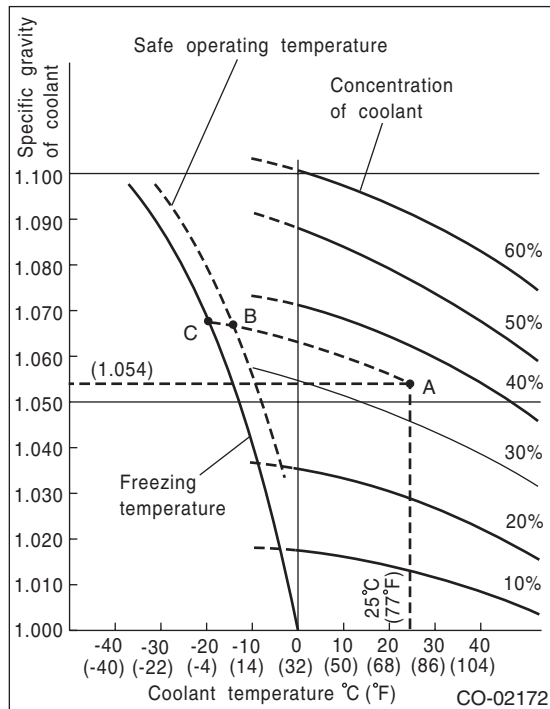
B: INSPECTION

1. RELATIONSHIP OF SUBARU COOLANT CONCENTRATION AND FREEZING TEMPERATURE

The concentration and safe operating temperature of SUBARU coolant is shown in the diagram. Measuring the temperature and specific gravity of the coolant will provide this information.

[Example]

If the coolant temperature is 25°C (77°F) and its specific gravity is 1.054, the concentration is 35% (point A), the safe operating temperature is -14°C (7°F) (point B), and the freezing temperature is -20°C (-4°F) (point C).



2. PROCEDURE TO ADJUST THE CONCENTRATION OF THE COOLANT

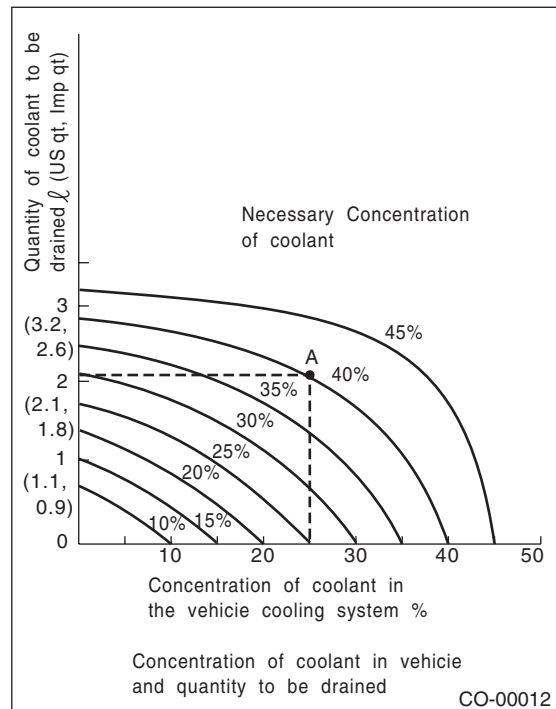
To adjust the concentration of coolant according to temperature, find the proper fluid concentration in the above diagram and replace the necessary amount of coolant with an undiluted solution of SUBARU genuine coolant (concentration 50%).

The amount of engine coolant that should be replaced can be determined using the diagram.

[Example]

Assume that the engine coolant concentration must be increased from 25% to 40%. Find point A, where the 25% line of engine coolant concentration intersects with the 40% curve of the necessary engine coolant concentration, and read the scale on the vertical axis of the graph at height A. The quantity of coolant to be drained is 2.1 ℓ (2.2 US qt, 1.8 Imp qt). Drain 2.1 ℓ (2.2 US qt, 1.8 Imp qt) of coolant from the cooling system and add 2.1 ℓ (2.2 US qt, 1.8 Imp qt) of the undiluted solution of SUBARU coolant.

If a coolant concentration of 50% is needed, drain all the coolant and refill with the undiluted solution only.



Water Pump

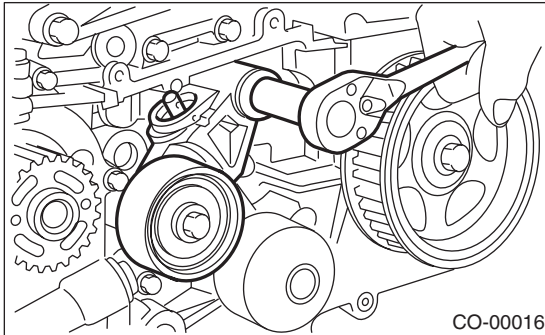
COOLING

4. Water Pump

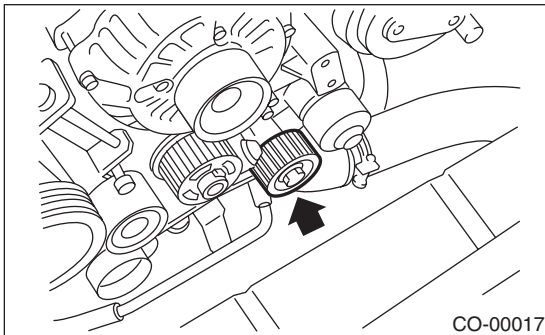
A: REMOVAL

1. NON-TURBO MODEL

- 1) Remove the radiator. <Ref. to CO(H4SO)-27, REMOVAL, Radiator.>
- 2) Remove the V-belts.
<Ref. to ME(H4SO)-40, REMOVAL, V-belt.>
- 3) Remove the timing belt.
<Ref. to ME(H4SO)-44, TIMING BELT, REMOVAL, Timing Belt.>
- 4) Remove the automatic belt tension adjuster.

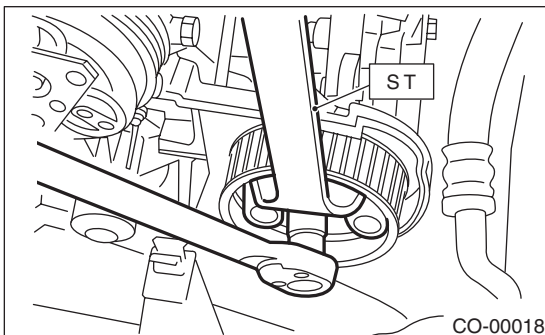


- 5) Remove the belt idler No. 2.

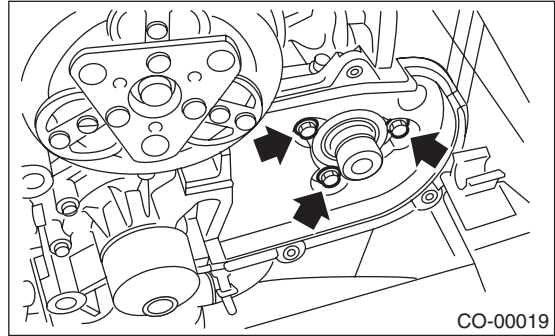


- 6) Remove the cam sprocket (LH) using ST.
ST 18231AA010 CAM SPROCKET WRENCH

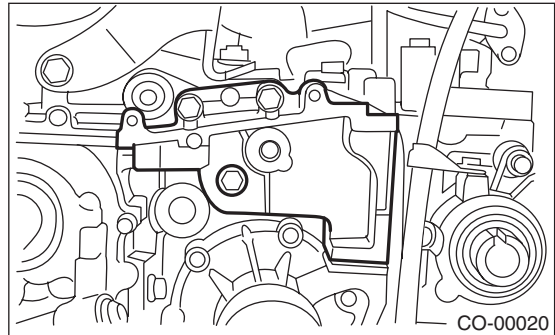
NOTE:
CAMSHAFT SPROCKET WRENCH (499207100)
can also be used.



- 7) Remove the belt cover (LH) No. 2.

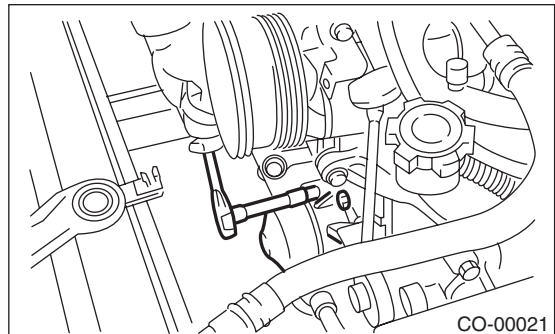


- 8) Remove the tensioner bracket.



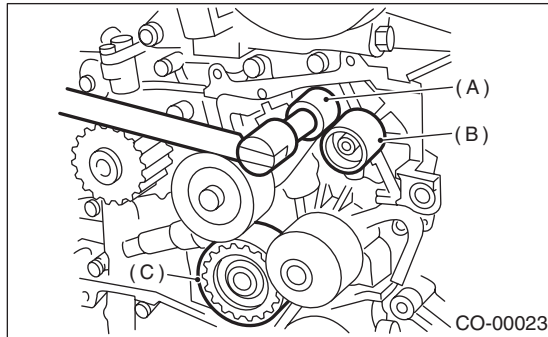
- 9) Disconnect the hose from water pump.

- 10) Remove the water pump.



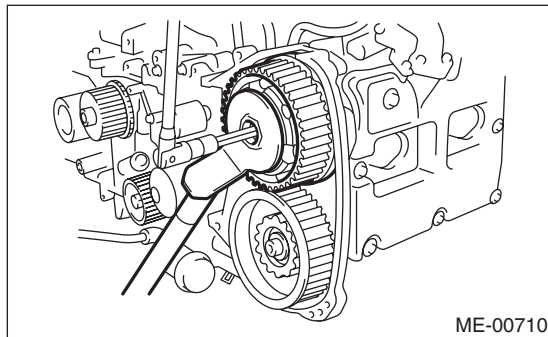
2. TURBO MODEL

- 1) Remove the radiator. <Ref. to CO(H4SO)-27, REMOVAL, Radiator.>
- 2) Remove the V-belts. <Ref. to ME(H4DOTC)-40, REMOVAL, V-belt.>
- 3) Remove the timing belt. <Ref. to ME(H4DOTC)-44, REMOVAL, Timing Belt.>
- 4) Remove the automatic belt tension adjuster (A).
- 5) Remove the belt idler (B).
- 6) Remove the belt idler No. 2 (C).

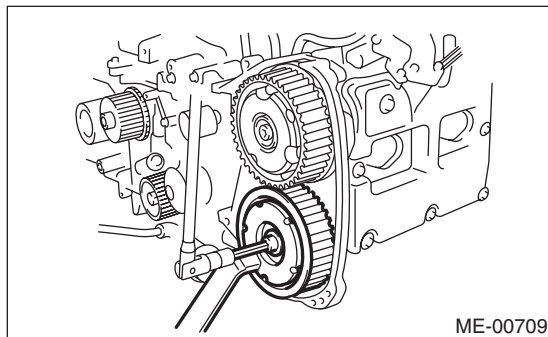


- 7) Remove the camshaft position sensor. <Ref. to FU(H4DOTC)-28, REMOVAL, Camshaft Position Sensor.>

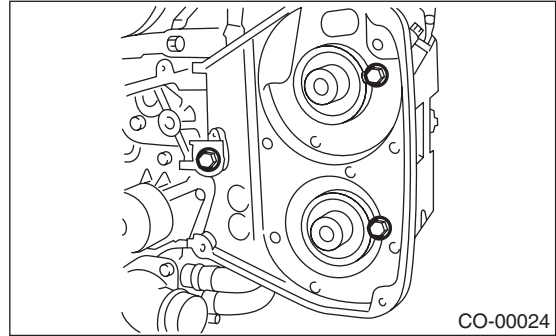
- 8) Remove the cam sprocket (LH) using ST.
ST 499977500 CAM SPROCKET WRENCH (INTAKE)



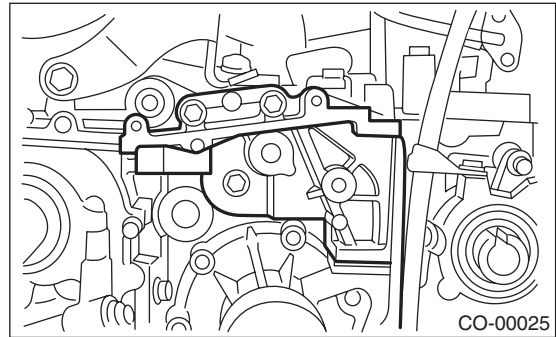
- ST 499207400 CAM SPROCKET WRENCH (EXHAUST)



- 9) Remove the belt cover (LH) No. 2.

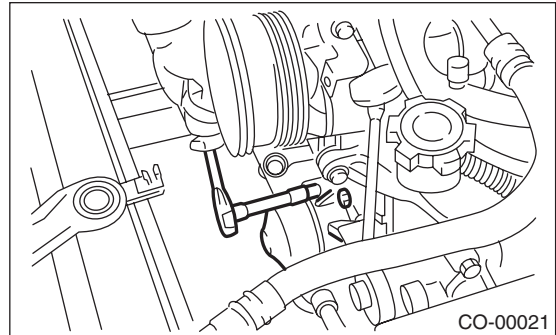


- 10) Remove the tensioner bracket.



- 11) Disconnect the hose from water pump.

- 12) Remove the water pump.



Water Pump

COOLING

B: INSTALLATION

1. NON-TURBO MODEL

1) Install the water pump onto cylinder block (LH).

NOTE:

- Replace with a new gasket.
- When installing the water pump, tighten the bolts in two stages in alphabetical sequence as shown in figure.

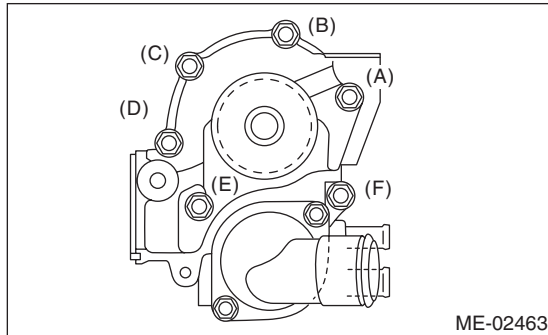
Tightening torque:

First:

12 N·m (1.2 kgf·m, 8.9 ft·lb)

Second:

12 N·m (1.2 kgf·m, 8.9 ft·lb)

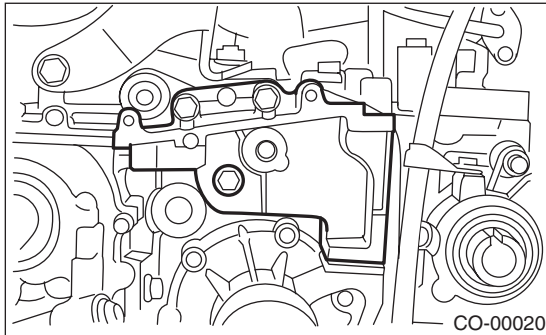


2) Install the hose to water pump.

3) Install the tensioner bracket.

Tightening torque:

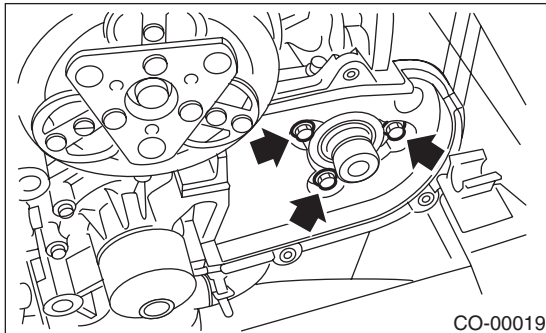
24.5 N·m (2.5 kgf·m, 18.1 ft·lb)



4) Install the belt cover No. 2 (LH).

Tightening torque:

5 N·m (0.5 kgf·m, 3.6 ft·lb)



5) Install the cam sprocket (LH) using ST.

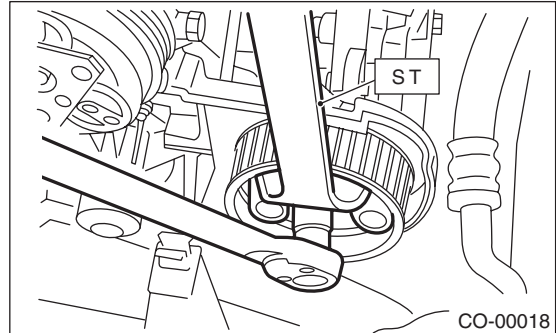
ST 18231AA010 CAM SPROCKET WRENCH

NOTE:

CAMSHAFT SPROCKET WRENCH (499207100) can also be used.

Tightening torque:

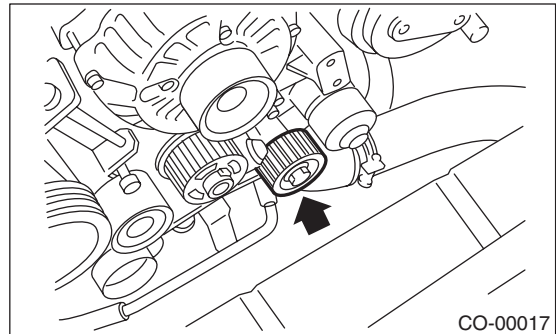
78 N·m (8.0 kgf·m, 57.9 ft·lb)



6) Install the belt idler No. 2.

Tightening torque:

39 N·m (4.0 kgf·m, 28.9 ft·lb)



7) Install an automatic belt tension adjuster with the tension rod held by a pin. <Ref. to ME(H4SO)-45, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt.>

8) Install the timing belt. <Ref. to ME(H4SO)-46, TIMING BELT, INSTALLATION, Timing Belt.>

9) Install the V-belts. <Ref. to ME(H4SO)-40, INSTALLATION, V-belt.>

10) Install the radiator. <Ref. to CO(H4SO)-29, INSTALLATION, Radiator.>

2. TURBO MODEL

1) Install the water pump onto cylinder block (LH).

NOTE:

- Replace with a new gasket.
- When installing the water pump, tighten the bolts in two stages in alphabetical sequence as shown in figure.

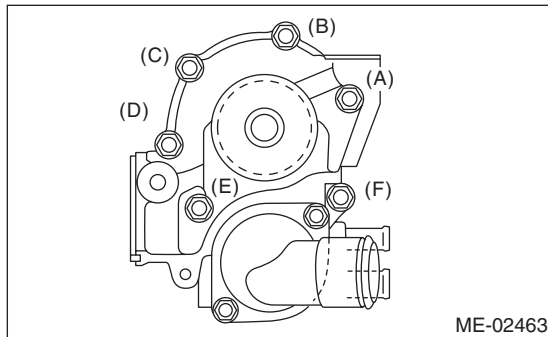
Tightening torque:

First:

12 N·m (1.2 kgf·m, 8.9 ft·lb)

Second:

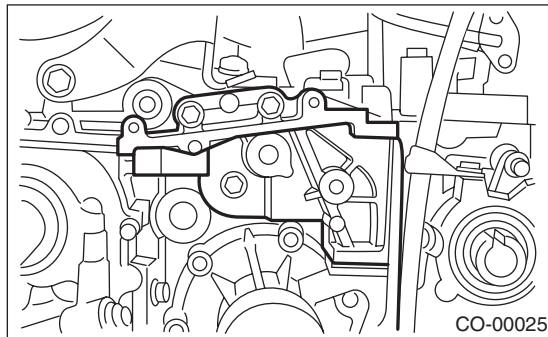
12 N·m (1.2 kgf·m, 8.9 ft·lb)



- 2) Install the hose to water pump.
- 3) Install the tensioner bracket.

Tightening torque:

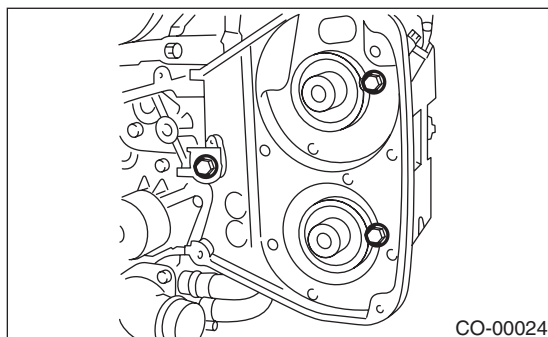
24.5 N·m (2.5 kgf·m, 18.1 ft·lb)



4) Install the belt cover No. 2 (LH).

Tightening torque:

5 N·m (0.5 kgf·m, 3.6 ft·lb)

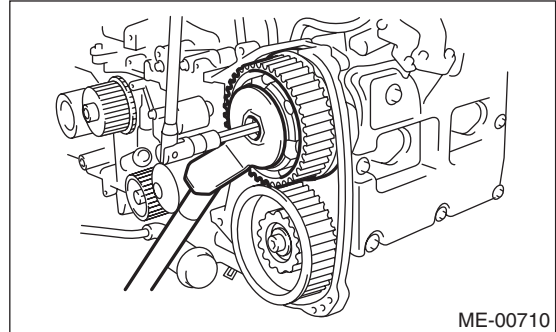


5) Install the cam sprocket (LH) using ST.

ST 499977500 CAM SPROCKET WRENCH (INTAKE)

Tightening torque:

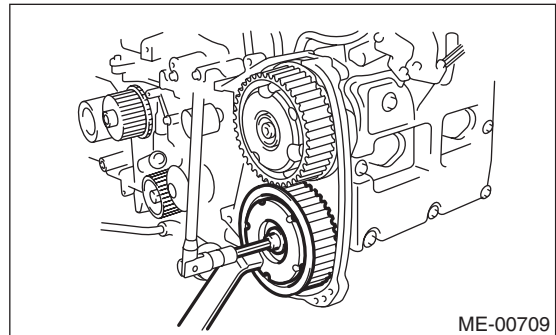
Tighten to 30 N·m (3.0 kgf·m, 21.8 ft·lb), and then tighten further by 45°.



ST 499207400 CAM SPROCKET WRENCH (EXHAUST)

Tightening torque:

Tighten to 30 N·m (3.0 kgf·m, 21.8 ft·lb), and then tighten further by 45°.



6) Install the camshaft position sensor. <Ref. to FU(H4DOTC)-28, INSTALLATION, Camshaft Position Sensor.>

7) Install the belt idler No. 2 (C).

8) Install the belt idler (B).

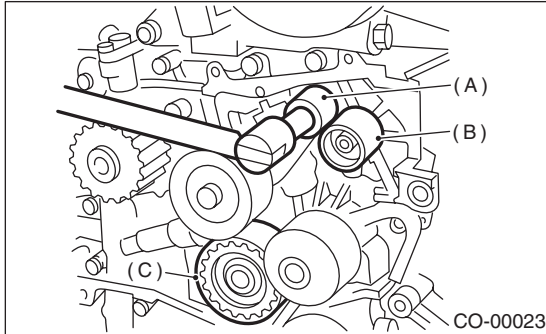
Water Pump

COOLING

9) Install the automatic belt tension adjuster (A) with the tension rod held by a pin. <Ref. to ME(H4DOTC)-46, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt.>

Tightening torque:

39 N·m (4.0 kgf-m, 28.9 ft-lb)



10) Install the timing belt. <Ref. to ME(H4DOTC)-47, TIMING BELT, INSTALLATION, Timing Belt.>

11) Install the V-belts. <Ref. to ME(H4DOTC)-40, INSTALLATION, V-belt.>

12) Install the radiator. <Ref. to CO(H4SO)-29, INSTALLATION, Radiator.>

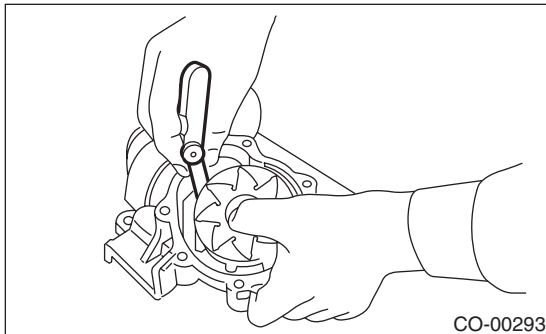
C: INSPECTION

- 1) Check the water pump bearing for smooth rotation.
- 2) Check the water pump pulley for abnormalities.
- 3) Make sure the impeller is not deformed or damaged.
- 4) Inspect the clearance between impeller and pump case.

Clearance between impeller and pump case:

Specification

0.5 — 1.5 mm (0.020 — 0.060 in)

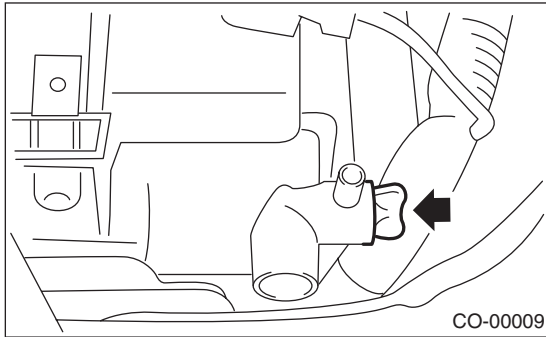


5) After water pump installation, check pulley shaft for engine coolant leaks. If leaks are noted, replace the water pump assembly.

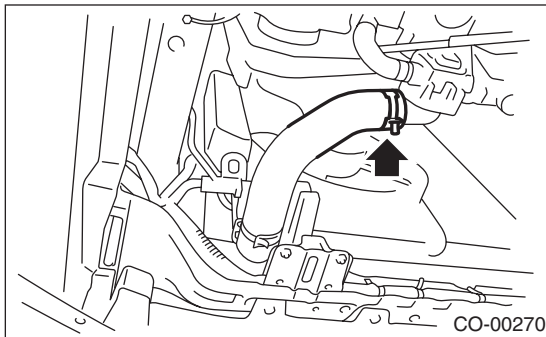
5. Thermostat

A: REMOVAL

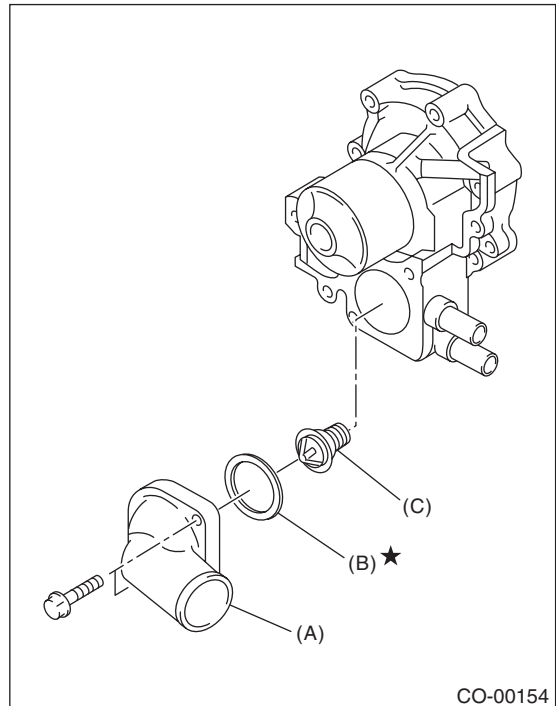
- 1) Set the vehicle on a lift.
- 2) Lift-up the vehicle.
- 3) Remove the under cover.
- 4) Drain engine coolant completely. <Ref. to CO(H4SO)-18, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>



- 5) Disconnect the radiator outlet hose from thermostat cover.



- 6) Remove the thermostat cover, and then remove the gasket and thermostat.



- (A) Thermostat cover
- (B) Gasket
- (C) Thermostat

Thermostat

COOLING

B: INSTALLATION

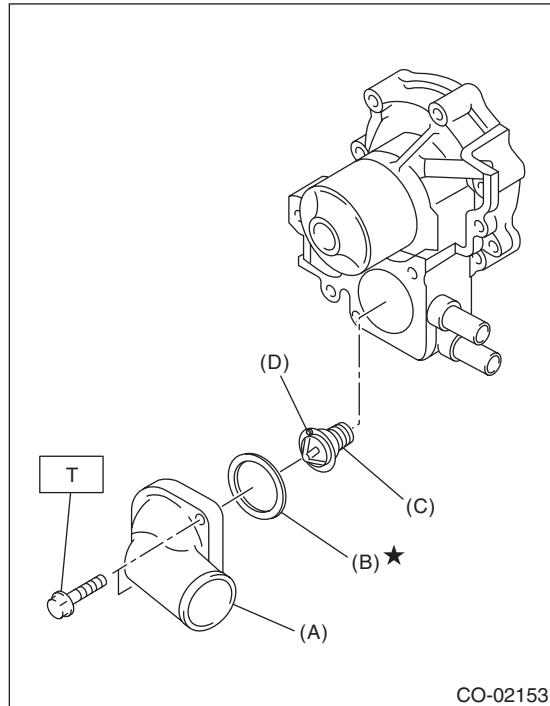
1) Install a gasket to thermostat, and install the thermostat and gasket to water pump as a unit. Then, install the thermostat cover.

NOTE:

- When reinstalling the thermostat, use a new gasket.
- The thermostat must be installed with the jiggle pin facing upward.

Tightening torque:

12 N·m (1.2 kgf-m, 8.9 ft-lb)



- (A) Thermostat cover
- (B) Gasket
- (C) Thermostat
- (D) Jiggle pin

2) Connect the radiator outlet hose to thermostat cover.

3) Install the under cover.

4) Lower the vehicle.

5) Fill engine coolant. <Ref. to CO(H4SO)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: INSPECTION

Replace the thermostat if the valve does not close completely at an ambient temperature or if the following test shows unsatisfactory results.

• Inspection method

Immerse the thermostat and a thermometer in water. Raise water temperature gradually, and measure the temperature and valve lift when the valve begins to open and when the valve is fully opened. During the test, agitate the water for even temperature distribution. The measured value should meet the specification.

NOTE:

- Leave the thermostat in the boiling water for more than five minutes before measuring valve lift.
- Hold the thermostat with a wire or the like to avoid contacting with container bottom.

Starting temperature to open:

Non-turbo model

80 — 84°C (176 — 183°F)

Turbo model

76 — 80°C (169 — 176°F)

Fully opens:

Non-turbo model

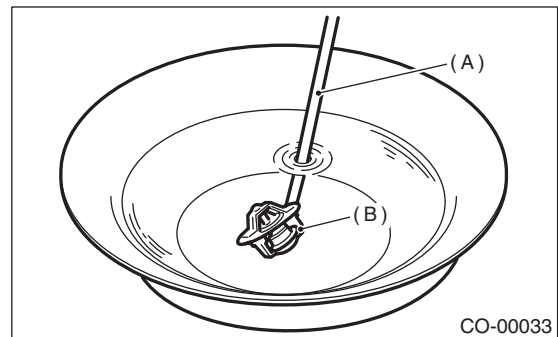
95°C (203°F)

Turbo model

91°C (196°F)

Valve lift:

9.0 mm (0.354 in) or more



- (A) Thermometer
- (B) Thermostat

6. Radiator

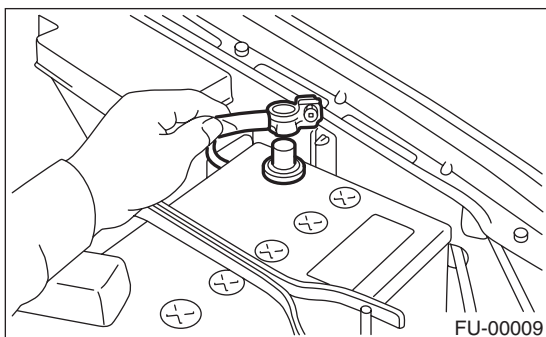
A: REMOVAL

1. NON-TURBO MODEL

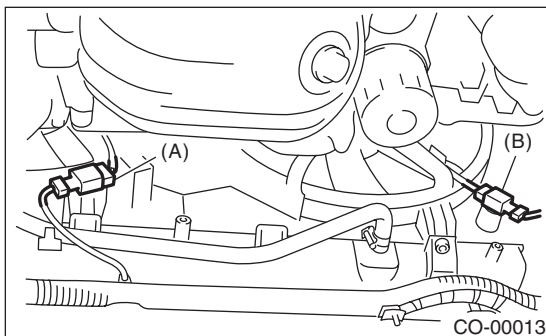
WARNING:

The radiator is pressurized. Wait until engine cools down before working on the radiator.

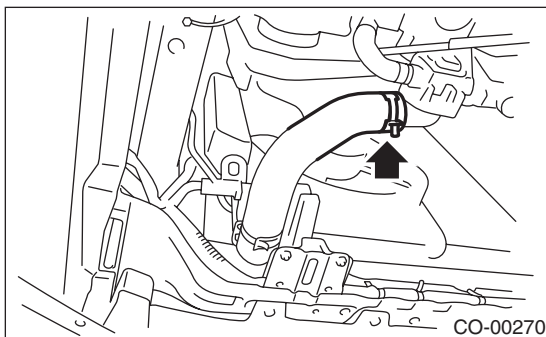
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.



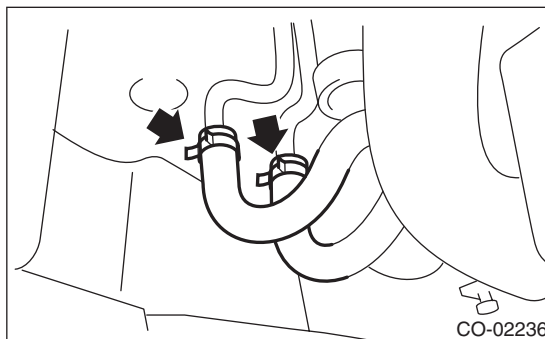
- 3) Lift-up the vehicle.
- 4) Remove the under cover.
- 5) Drain engine coolant completely. <Ref. to CO(H4SO)-18, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 6) Disconnect the connectors of radiator main fan (A) and sub fan motor (B).



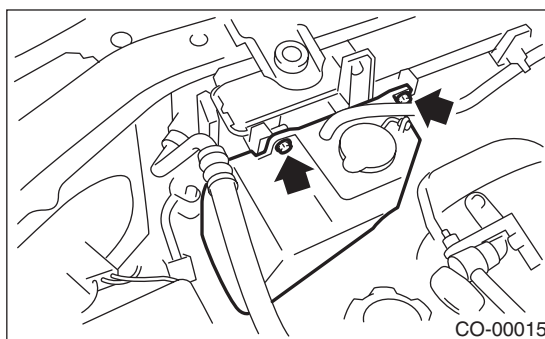
- 7) Disconnect the radiator outlet hose from thermostat cover.



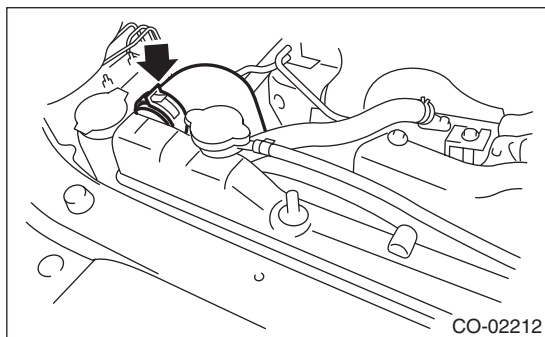
- 8) Disconnect the ATF cooler hoses from ATF pipes. (AT model) Apply the cap to prevent ATF leaks.



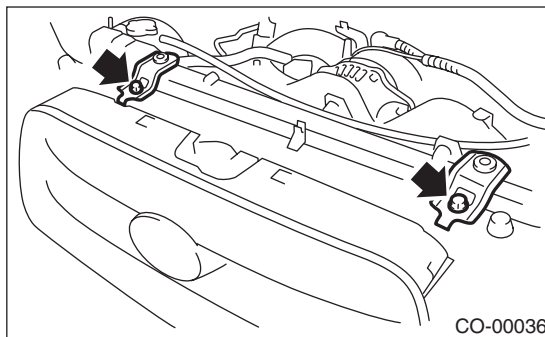
- 9) Lower the vehicle.
- 10) Disconnect the over flow hose.
- 11) Remove the reservoir tank.



- 12) Disconnect the radiator inlet hose from radiator.



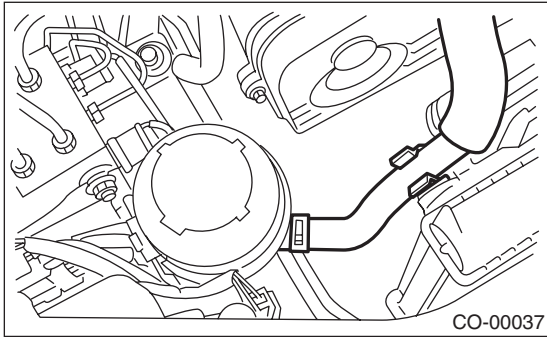
- 13) Remove the radiator upper brackets.



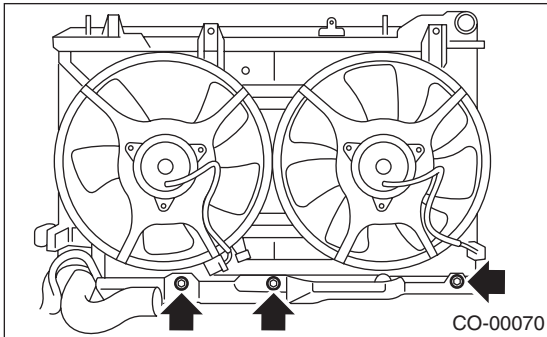
Radiator

COOLING

14) Detach the power steering hose from the clip on the radiator.



15) Lift the radiator up and away from vehicle.
16) Remove the radiator under cover. (AT model)

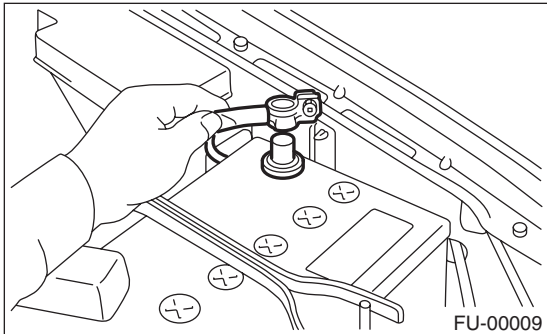


2. TURBO MODEL

WARNING:

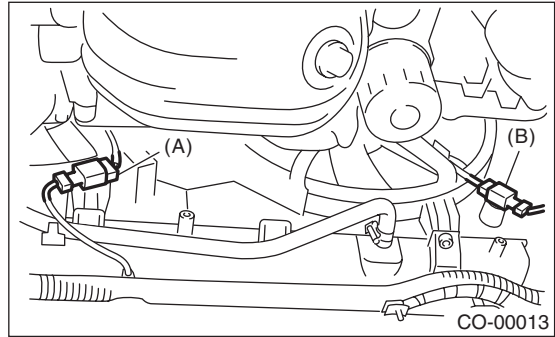
The radiator is pressurized. Wait until engine cools down before working on the radiator.

- 1) Set the vehicle on a lift.
- 2) Remove the collector cover.
- 3) Disconnect the ground cable from the battery.

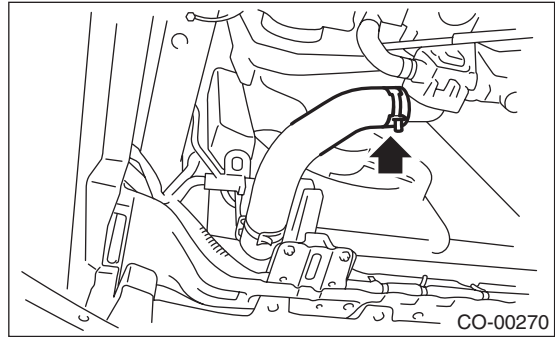


- 4) Lift-up the vehicle.
- 5) Remove the under cover.
- 6) Drain engine coolant completely. <Ref. to CO(H4SO)-18, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

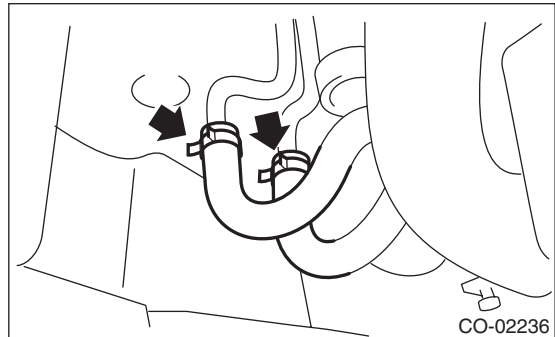
7) Disconnect the connectors of radiator main fan (A) and sub fan motor (B).



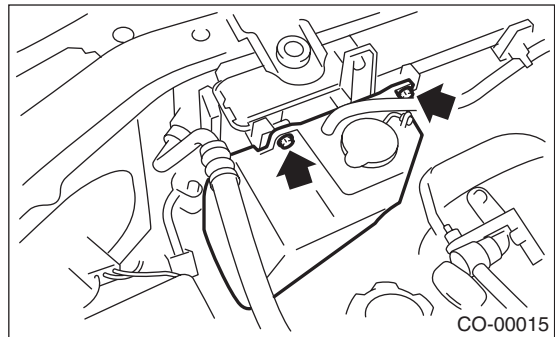
8) Disconnect the radiator outlet hose from thermostat cover.



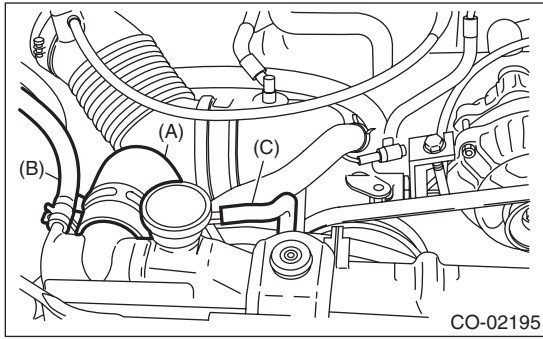
9) Disconnect the ATF cooler hoses from ATF pipes. (AT model)
Apply the cap to prevent ATF leaks.



- 10) Lower the vehicle.
- 11) Remove the reservoir tank.

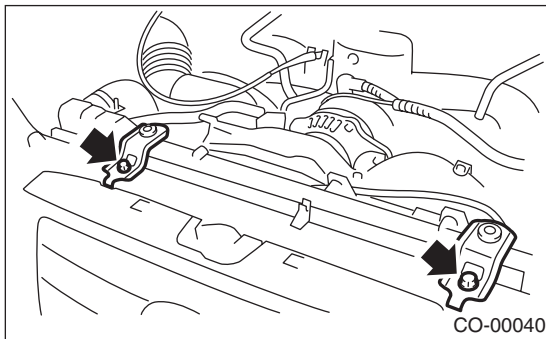


12) Disconnect the radiator inlet hose, air breather hose and the overflow hose from radiator.

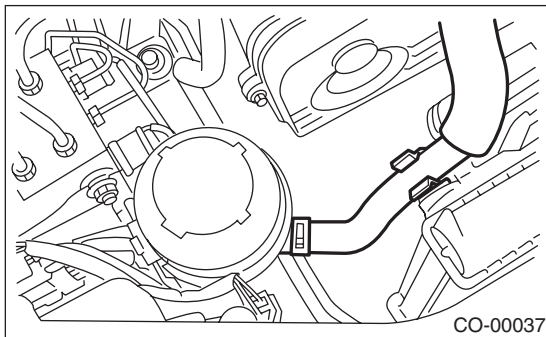


- (A) Radiator inlet hose
- (B) Air breather hose
- (C) Over flow hose

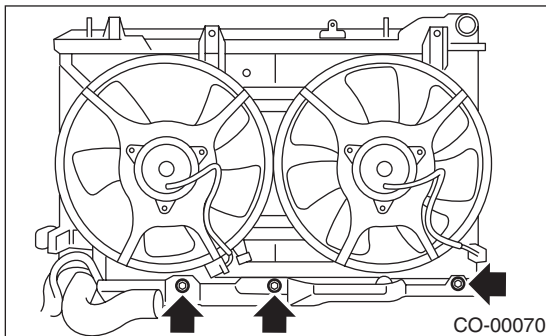
13) Remove the radiator upper brackets.



14) Disconnect the power steering hose from the clip on the radiator.



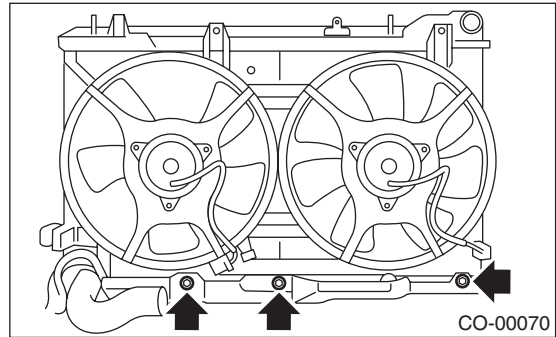
15) Lift the radiator up and away from vehicle.
 16) Remove the radiator under cover. (AT model)



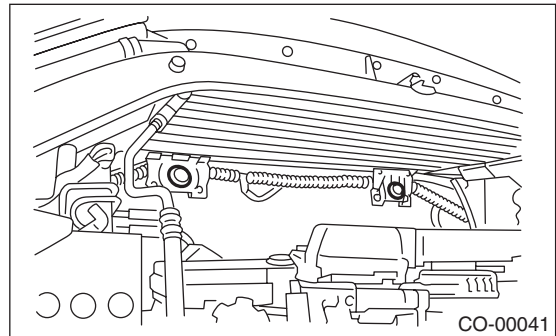
B: INSTALLATION

1. NON-TURBO MODEL

1) Attach the radiator under cover to the radiator. (AT model)



2) Attach the radiator lower cushions to holes on the vehicle.



3) Install the radiator to vehicle.

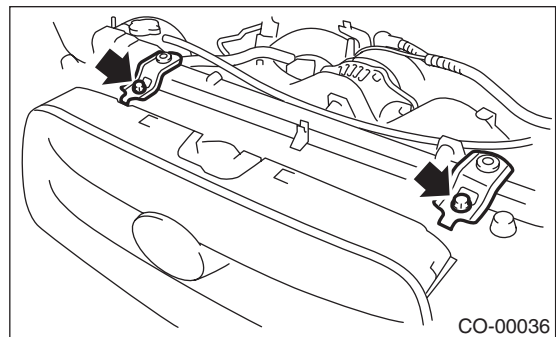
NOTE:

Make pins on the lower side of radiator be fitted into the radiator lower cushions on body side.

4) Install the radiator upper brackets and tighten the bolts.

Tightening torque:

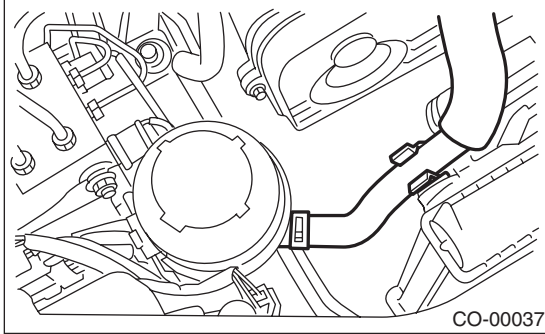
18 N·m (1.8 kgf-m, 13.0 ft-lb)



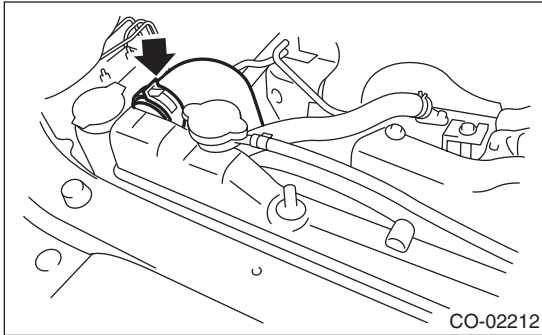
Radiator

COOLING

5) Attach the power steering hose to the radiator.



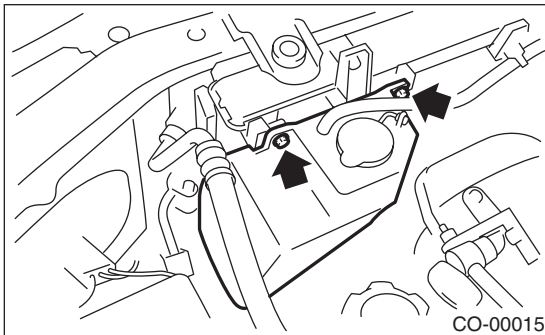
6) Connect the radiator inlet hose.



7) Install the reservoir tank.

Tightening torque:

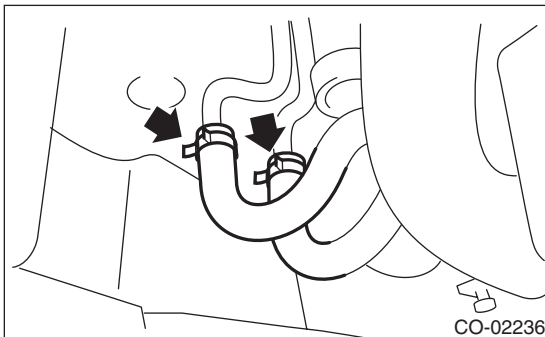
7.5 N·m (0.76 kgf·m, 5.5 ft·lb)



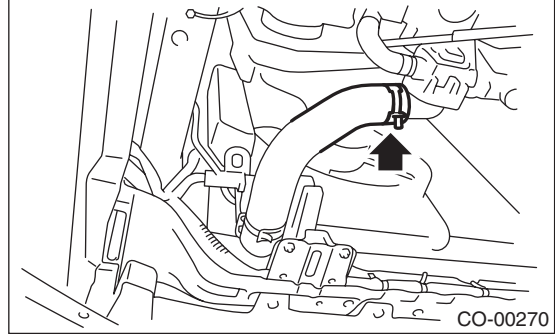
8) Connect the over flow hose.

9) Lift-up the vehicle.

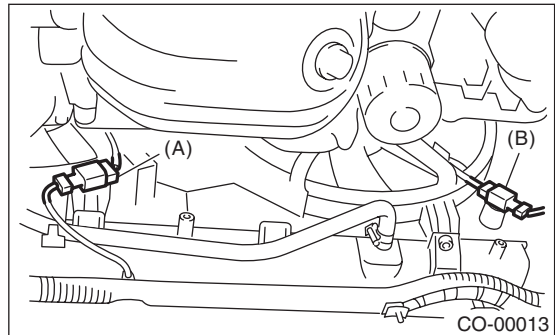
10) Connect the ATF cooler hoses. (AT model)



11) Connect the radiator outlet hose.



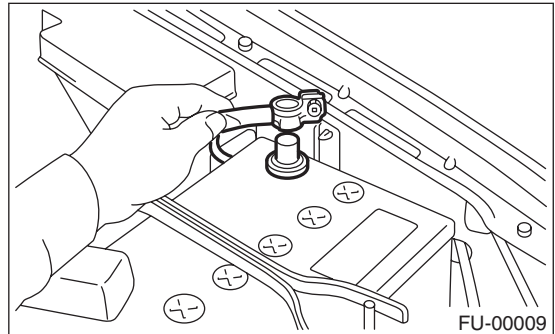
12) Connect the connectors to the radiator main fan motor (A) and sub fan motor (B).



13) Install the under cover.

14) Lower the vehicle.

15) Connect the ground cable to the battery.

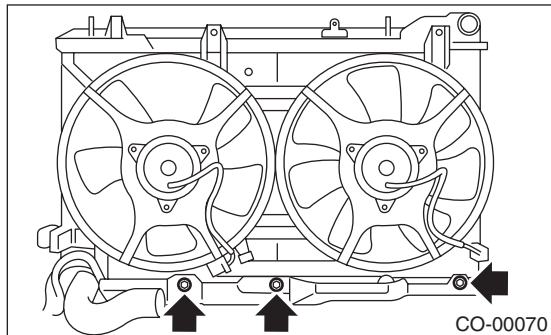


16) Fill engine coolant. <Ref. to CO(H4SO)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

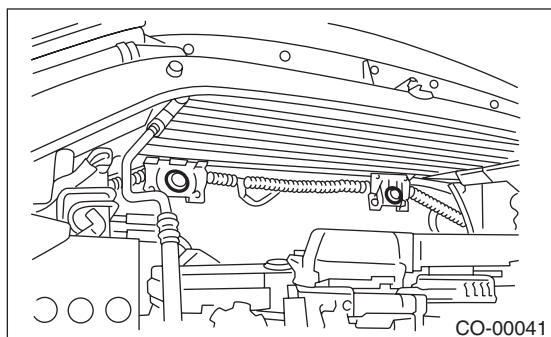
17) Check the ATF level. <Ref. to 4AT-28, INSPECTION, Automatic Transmission Fluid.>

2. TURBO MODEL

1) Attach the radiator under cover to the radiator. (AT model)



2) Attach the radiator lower cushions to holes on the vehicle.



3) Install the radiator to vehicle.

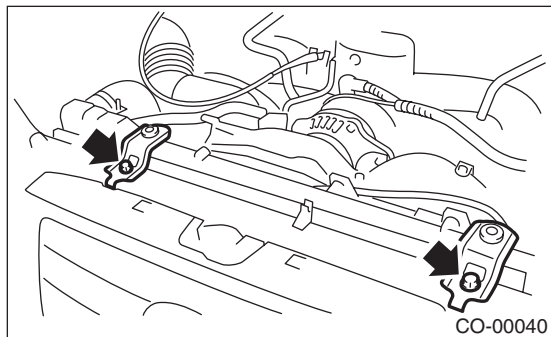
NOTE:

Make pins on the lower side of radiator be fitted into the radiator lower cushions on body side.

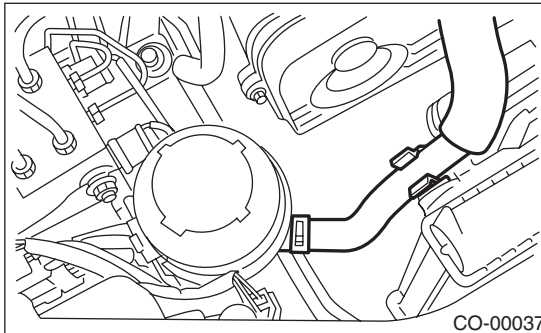
4) Install the radiator upper brackets and tighten the bolts.

Tightening torque:

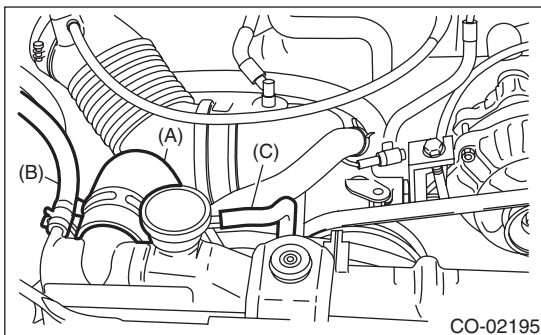
18 N·m (1.8 kgf-m, 13.0 ft-lb)



5) Attach the power steering hose to the radiator.



6) Connect the radiator inlet hose, air breather hose and the overflow hose (B).



(A) Radiator inlet hose

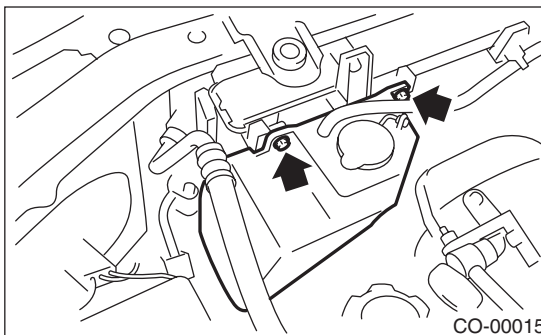
(B) Air breather hose

(C) Over flow hose

7) Install the reservoir tank.

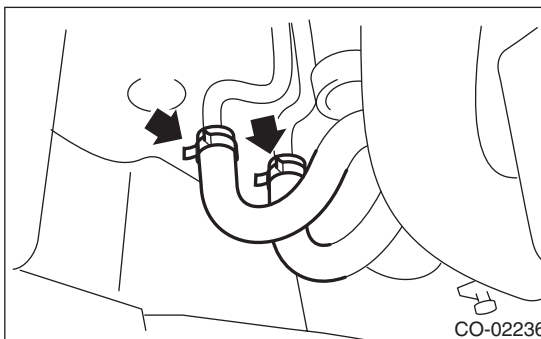
Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



8) Lift-up the vehicle.

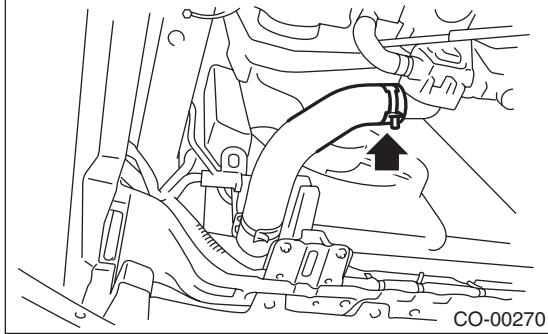
9) Connect the ATF cooler hoses. (AT model)



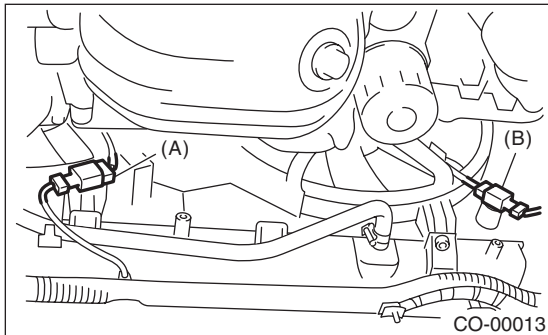
Radiator

COOLING

10) Connect the radiator outlet hose.



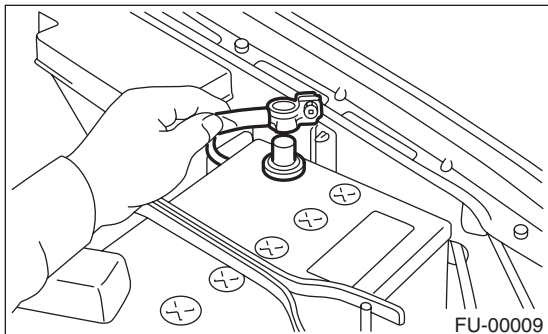
11) Connect the connectors to the radiator main fan motor (A) and sub fan motor (B).



12) Install the under cover.

13) Lower the vehicle.

14) Connect the ground cable to the battery.



15) Fill engine coolant. <Ref. to CO(H4SO)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

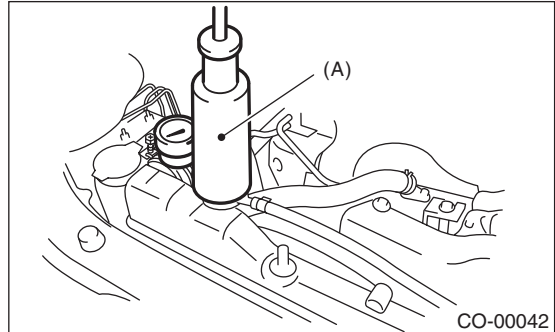
16) Check the ATF level. <Ref. to 4AT-28, INSPECTION, Automatic Transmission Fluid.>

17) Install the collector cover.

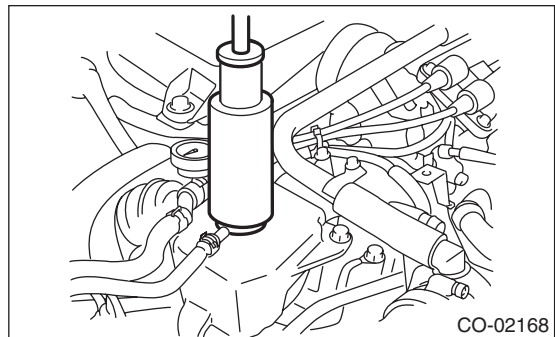
C: INSPECTION

1) Remove the radiator cap (for Non-turbo model) or the coolant filler tank cap (for turbo model), and fill the engine coolant, and then install the tester (A) to the installation position of cap.

- Non-turbo model



- Turbo model



2) When engine coolant leaks at/around radiator, apply the following pressure.

Non-turbo model

157 kPa (1.6 kg/cm², 23 psi)

Turbo model

122 kPa (1.2 kg/cm², 18 psi)

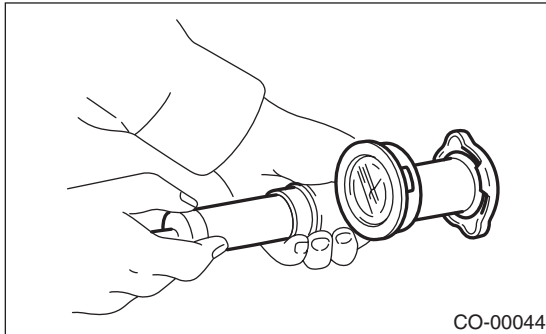
CAUTION:

- Inspection must be carried out at the side of coolant filler tank, not at the side of radiator. (Turbo model)
- Engine should be turned off.
- Wipe engine coolant from check points in advance.
- Be careful to prevent engine coolant from spurting out when removing tester.
- Be careful not to deform the filler neck of radiator when installing and removing the tester.

7. Radiator Cap

A: INSPECTION

1) Attach the radiator cap to tester.



2) Increase pressure until the tester gauge pointer stops. Radiator cap is functioning properly if it holds the service limit pressure for 5 — 6 seconds.

Non-turbo model radiator side and turbo model coolant filler tank side

Specified pressure:

93 — 123 kPa (0.95 — 1.25 kgf/cm², 14 — 18 psi)

Service limit pressure:

83 kPa (0.85 kgf/cm², 12 psi)

Radiator side on turbo models

Specified pressure:

122 — 152 kPa (1.24 — 1.55 kgf/cm², 18 — 22 psi)

Service limit pressure:

112 kPa (1.14 kgf/cm², 16 psi)

CAUTION:

- Be sure to remove foreign matter and rust from the cap in advance. Otherwise, results of pressure test will be incorrect.
- Do not confuse the cap of coolant filler tank and cap of radiator.

Radiator Main Fan and Fan Motor

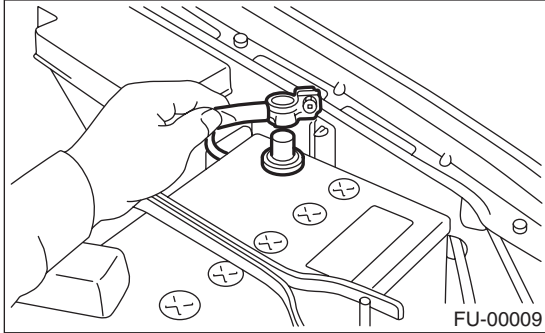
COOLING

8. Radiator Main Fan and Fan Motor

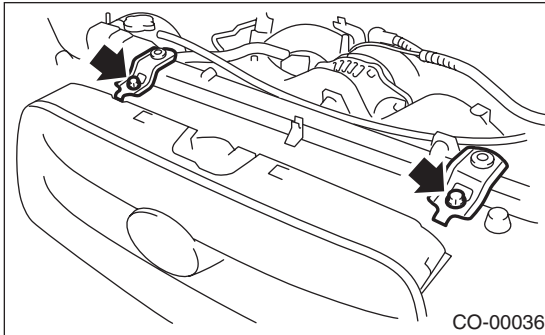
A: REMOVAL

1. NON-TURBO MODEL

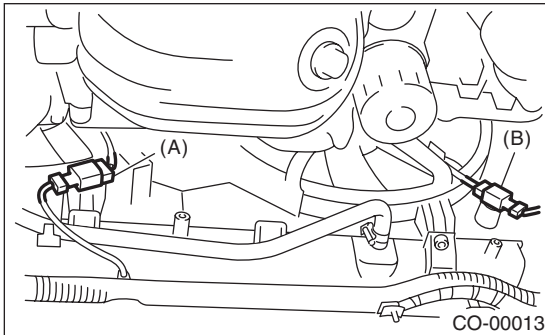
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.



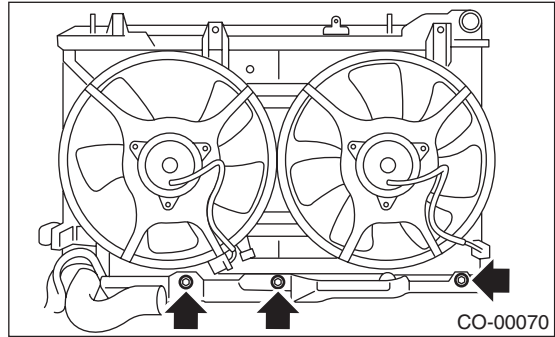
- 3) Remove the radiator upper brackets. (AT model)



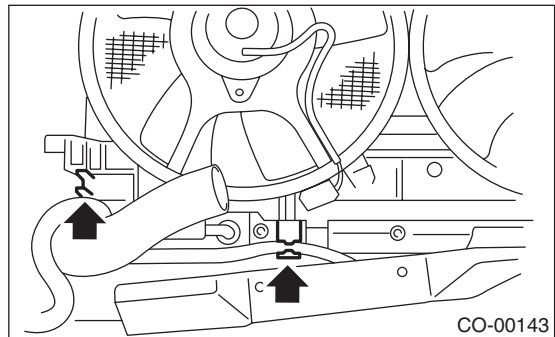
- 4) Lift-up the vehicle.
- 5) Remove the under cover.
- 6) Drain approximately 1 \varnothing (1.06 US qt, 0.88 Imp qt) of engine coolant. <Ref. to CO(H4SO)-18, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 7) Disconnect the connectors of main fan motor (A) and sub fan motor (B).



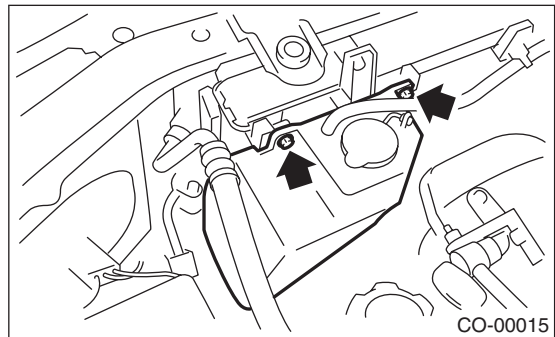
- 8) Remove the radiator under cover attaching bolts. (AT model)



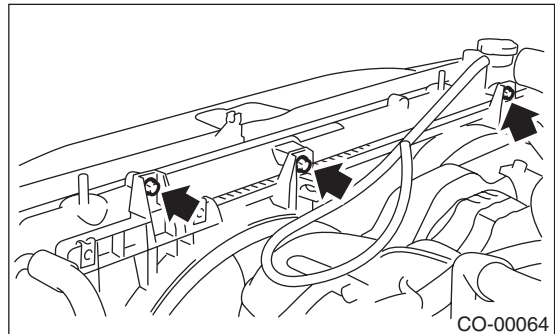
- 9) Lift the radiator outlet hose and float the radiator from the radiator under cover. Remove the ATF hose from 2 places on the clip of radiator fan motor assembly. (AT model)



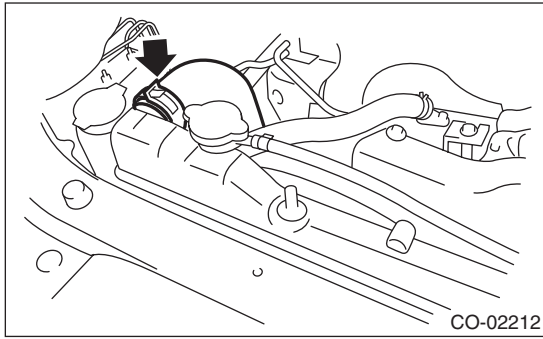
- 10) Lower the vehicle.
- 11) Remove the V-belt covers.
- 12) Disconnect the over flow hose.
- 13) Remove the reservoir tank.



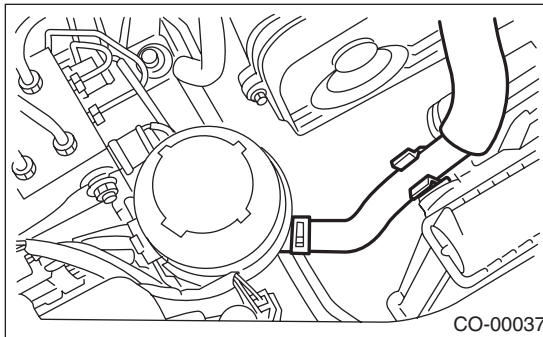
- 14) Remove the mounting bolts from the radiator fan motor assembly.



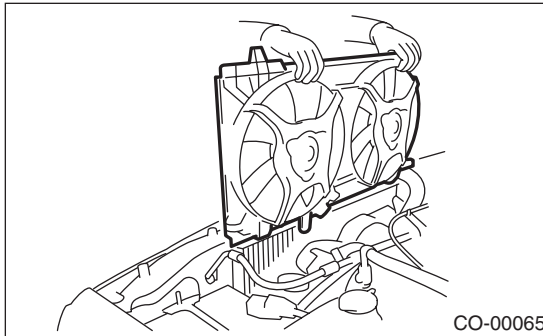
15) Disconnect the radiator inlet hose from radiator.



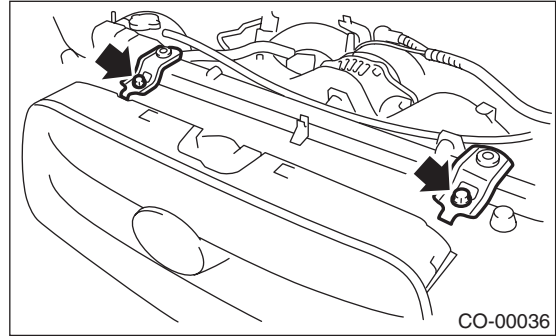
16) Detach the power steering hose from the clip on the radiator.



17) Lift the radiator fan motor assembly up and away from vehicle.



4) Remove the radiator upper brackets. (AT model)

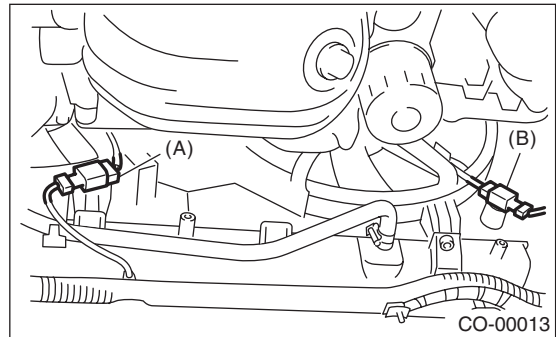


5) Lift-up the vehicle.

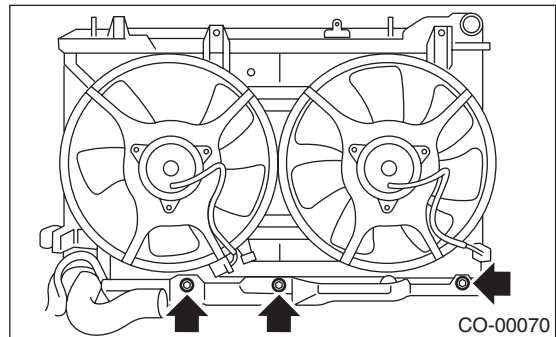
6) Remove the under cover.

7) Drain approximately 1 ℓ (1.06 US qt, 0.88 Imp qt) of engine coolant. <Ref. to CO(H4SO)-18, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

8) Disconnect the connectors of radiator main fan motor connector (A) and sub fan motor connector (B).



9) Remove the radiator under cover attaching bolts. (AT model)

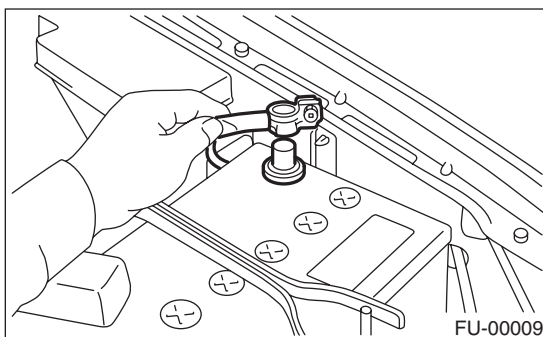


2. TURBO MODEL

1) Set the vehicle on a lift.

2) Remove the collector cover.

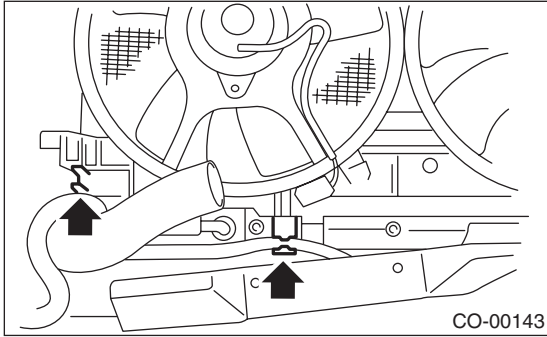
3) Disconnect the ground cable from the battery.



Radiator Main Fan and Fan Motor

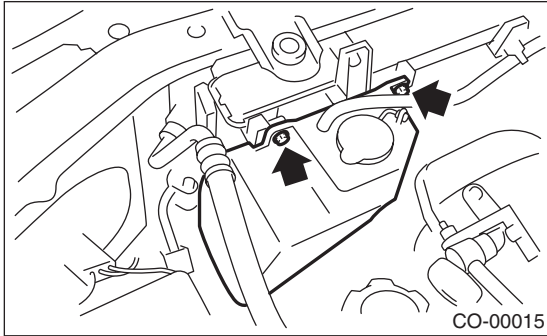
COOLING

10) Lift the radiator outlet hose and float the radiator from the radiator under cover. Remove the ATF hose from 2 places on the clip of radiator fan motor assembly. (AT model)

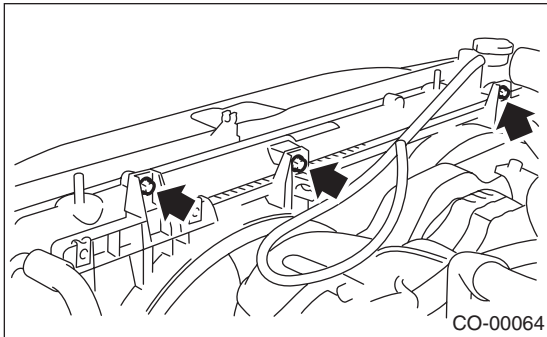


11) Lower the vehicle.

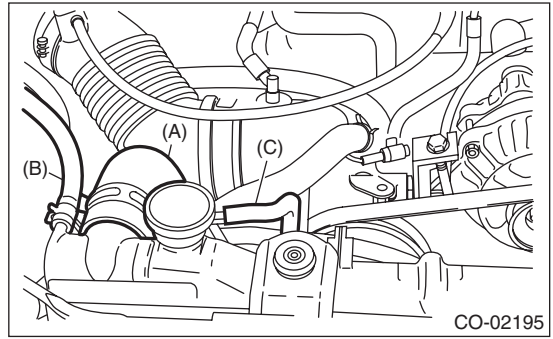
12) Remove the reservoir tank.



13) Remove the mounting bolts from radiator main fan motor assembly.



14) Disconnect the radiator inlet hose and the over flow hose.

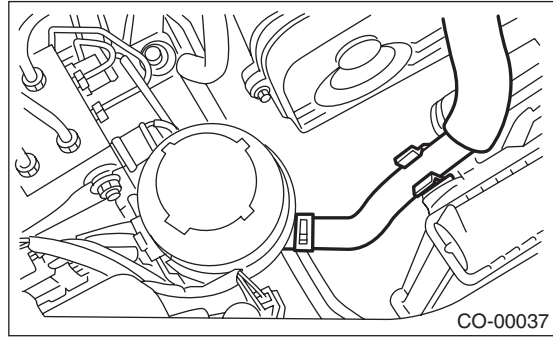


(A) Radiator inlet hose

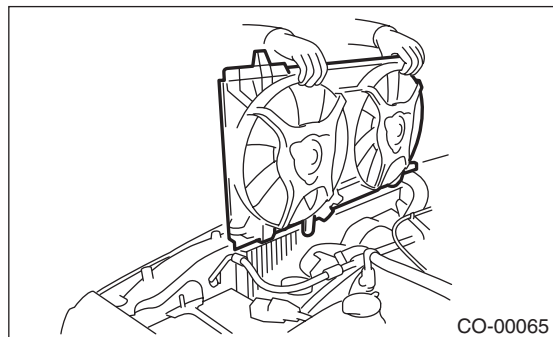
(B) Air breather hose

(C) Over flow hose

15) Disconnect the power steering hose from the clip on the radiator.



16) Remove the radiator main fan motor assembly from vehicle.



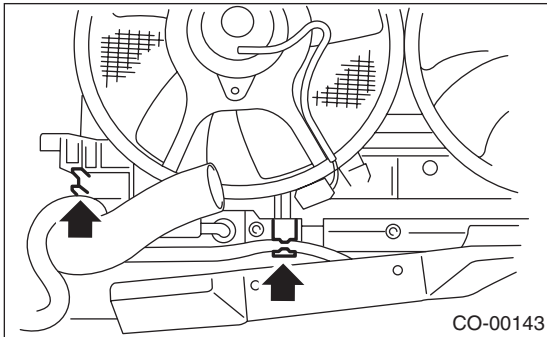
B: INSTALLATION

1. NON-TURBO MODEL

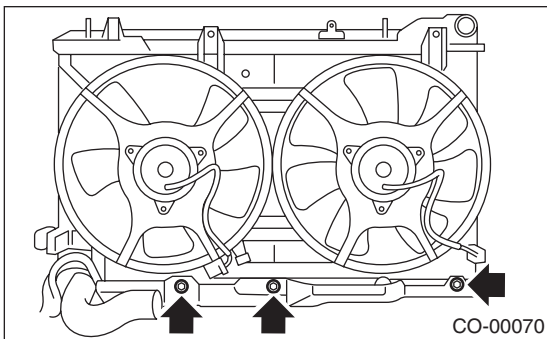
- 1) Install the radiator main fan motor assembly to the radiator.
- 2) Lift-up the vehicle.
- 3) Lift the radiator outlet hose and float the radiator from the radiator under cover. Connect the ATF hose to 2 locations on the clip of radiator main fan motor assembly. (AT model)

NOTE:

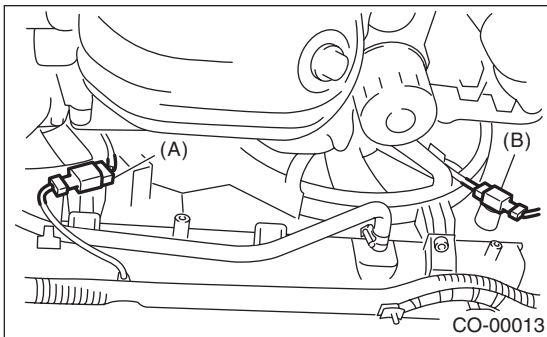
Make pins on the lower side of radiator be fitted into the vehicle side.



- 4) Tighten the attachment bolts of the radiator under cover. (AT model)

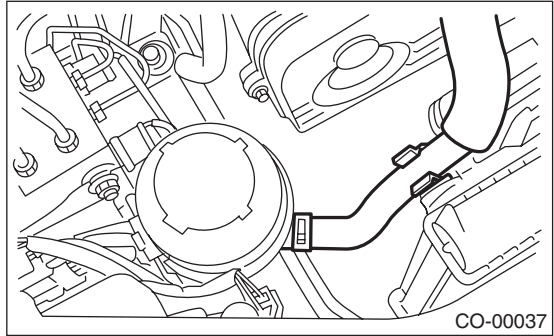


- 5) Connect the radiator main fan motor connector (A) and sub fan motor connector (B).

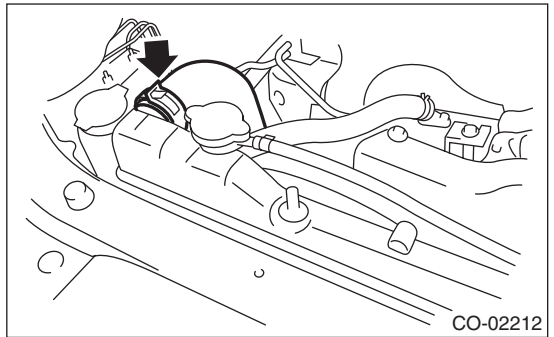


- 6) Install the under cover.
- 7) Lower the vehicle.

- 8) Attach the power steering hose to the radiator.



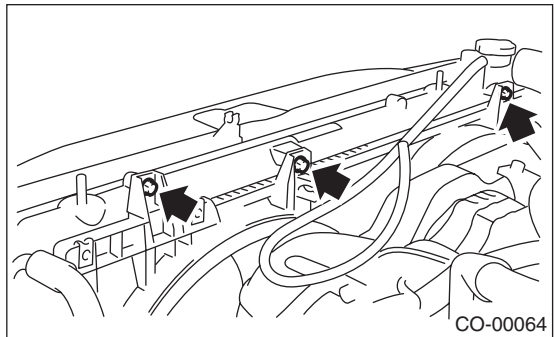
- 9) Connect the radiator inlet hose.



- 10) Install the mounting bolts to radiator main fan motor assembly.

Tightening torque:

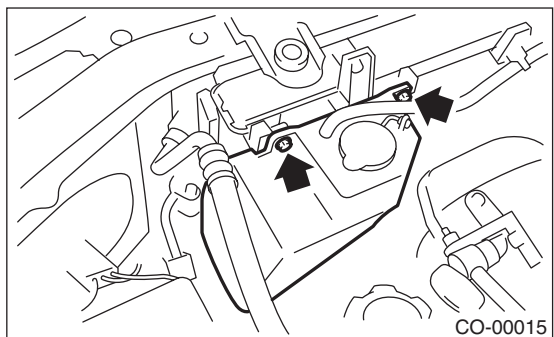
4.9 N·m (0.50 kgf·m, 3.6 ft·lb)



- 11) Install the reservoir tank.

Tightening torque:

7.5 N·m (0.76 kgf·m, 5.5 ft·lb)

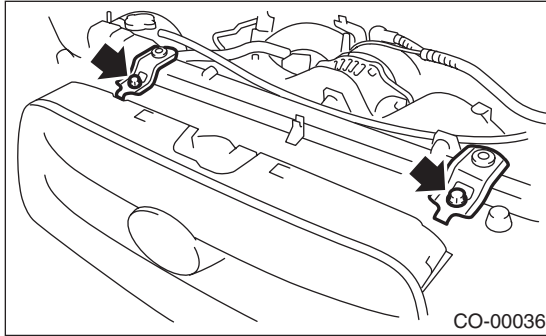


- 12) Install the over flow hose.

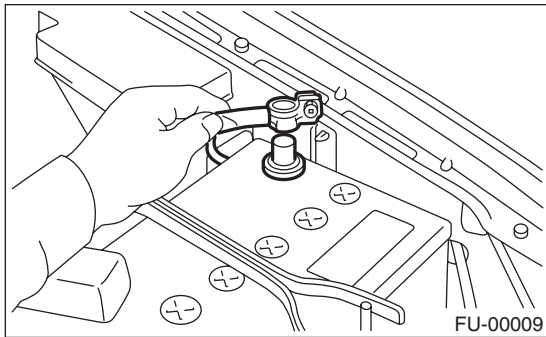
Radiator Main Fan and Fan Motor

COOLING

13) Install the radiator upper brackets. (AT model)



14) Connect the ground cable to the battery.



15) Fill engine coolant. <Ref. to CO(H4SO)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

2. TURBO MODEL

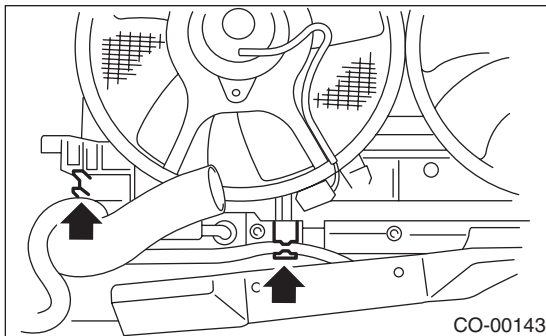
1) Install the radiator main fan motor assembly to the radiator.

2) Lift-up the vehicle.

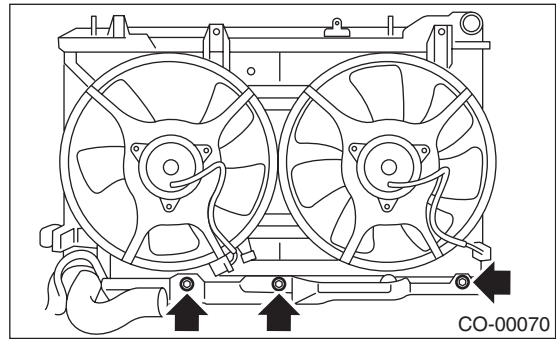
3) Lift the radiator outlet hose and float the radiator from the radiator under cover. Connect the ATF hose to 2 locations on the clip of radiator main fan motor assembly. (AT model)

NOTE:

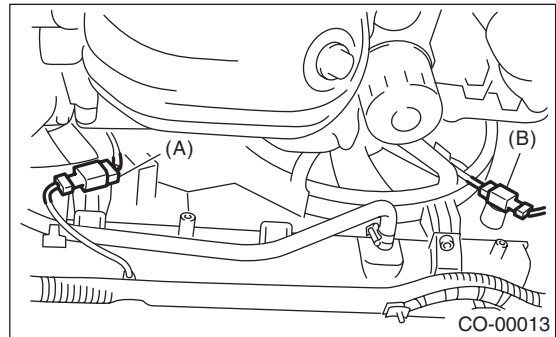
Make pins on the lower side of radiator be fitted into the vehicle side.



4) Tighten the attachment bolts of the radiator under cover. (AT model)



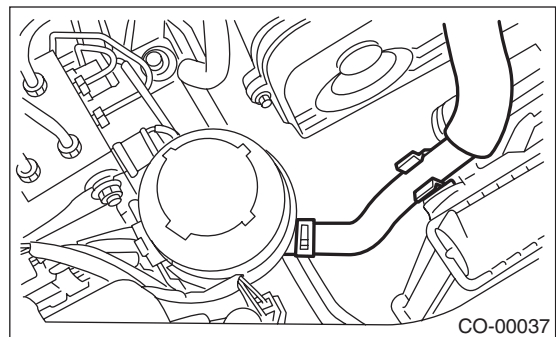
5) Connect the radiator main fan motor connector (A) and sub fan motor connector (B).



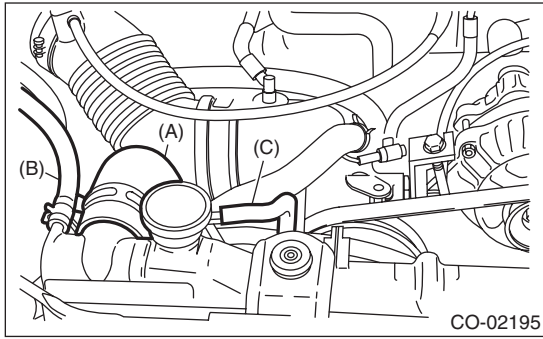
6) Install the under cover.

7) Lower the vehicle.

8) Connect the power steering hose to the clip on the radiator.



9) Connect the radiator inlet hose and the overflow hose to radiator.

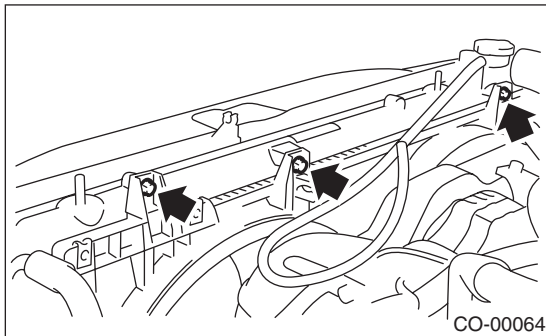


- (A) Radiator inlet hose
- (B) Air breather hose
- (C) Over flow hose

10) Install the mounting bolts to radiator main fan motor assembly.

Tightening torque:

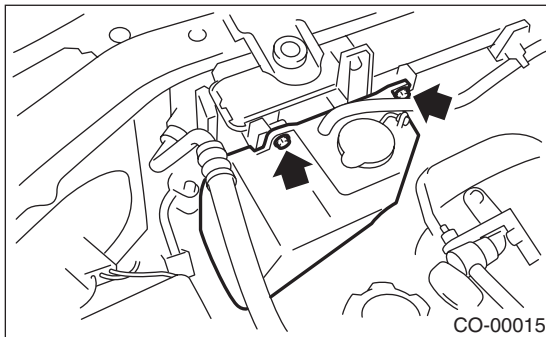
4.9 N·m (0.5 kgf-m, 3.6 ft-lb)



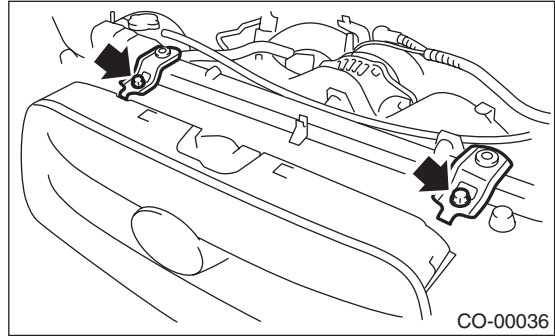
11) Install the reservoir tank.

Tighting torque:

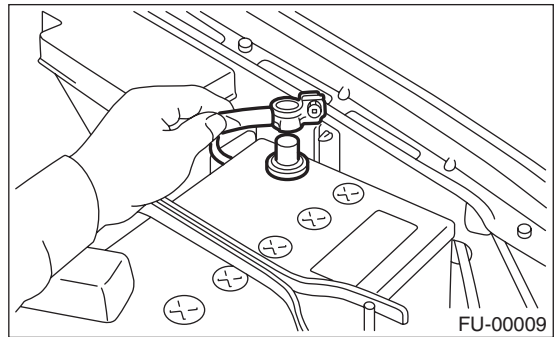
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



12) Install the radiator upper brackets. (AT model)



13) Connect the ground cable to the battery.



14) Fill engine coolant. <Ref. to CO(H4SO)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

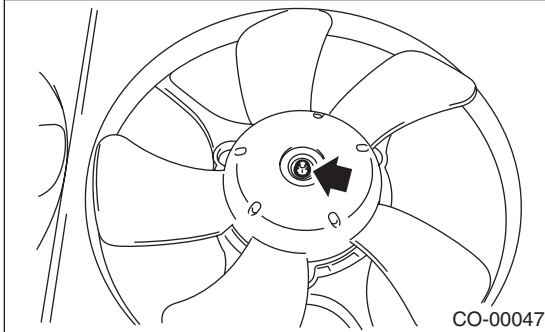
15) Install the collector cover.

Radiator Main Fan and Fan Motor

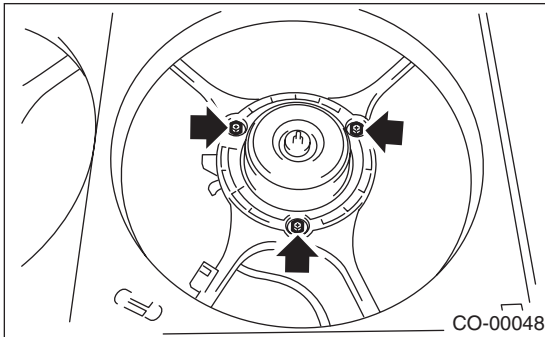
COOLING

C: DISASSEMBLY

- 1) Remove the clip which holds motor connector onto the shroud.
- 2) Remove the nuts which secure the fan to the fan motor.



- 3) Remove the bolts which hold fan motor onto shroud.

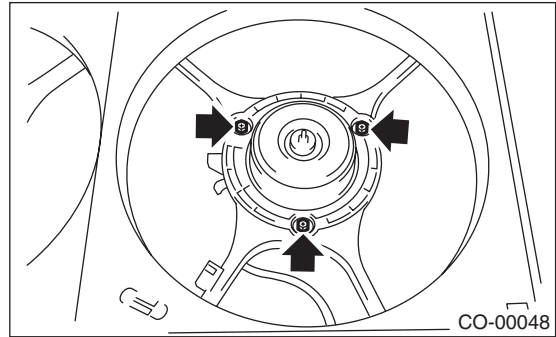


D: ASSEMBLY

Assemble in the reverse order of disassembly.

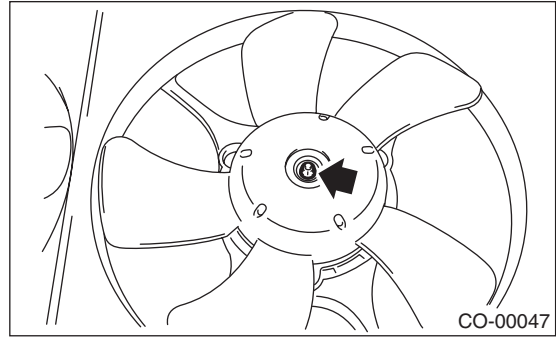
Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



Tightening torque:

3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



9. Radiator Sub Fan and Fan Motor

A: REMOVAL

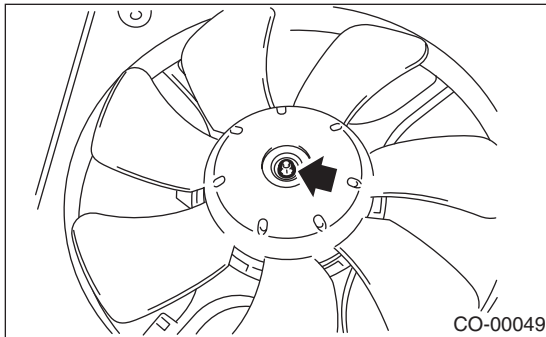
Refer to the radiator main fan and fan motor. <Ref. to CO(H4SO)-34, REMOVAL, Radiator Main Fan and Fan Motor.>

B: INSTALLATION

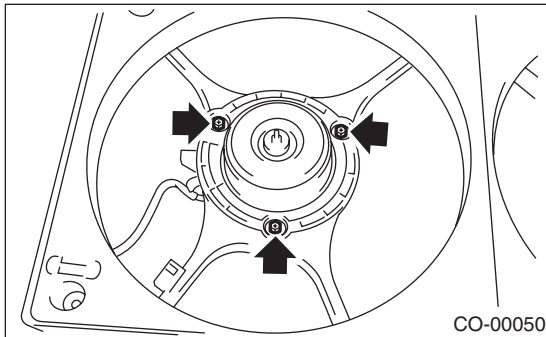
Refer to the radiator main fan and fan motor. <Ref. to CO(H4SO)-37, INSTALLATION, Radiator Main Fan and Fan Motor.>

C: DISASSEMBLY

- 1) Remove the clip which holds motor connector onto the shroud.
- 2) Remove the nuts which secure the fan to the fan motor.



- 3) Remove the bolts which hold fan motor onto shroud.

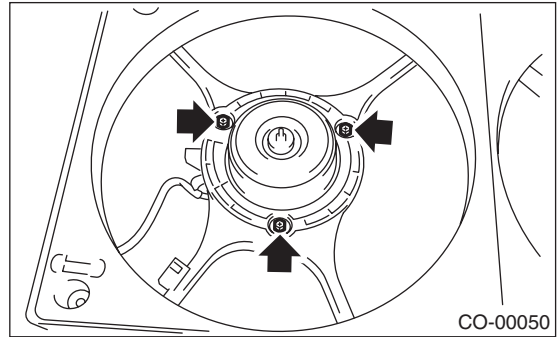


D: ASSEMBLY

Assemble in the reverse order of disassembly.

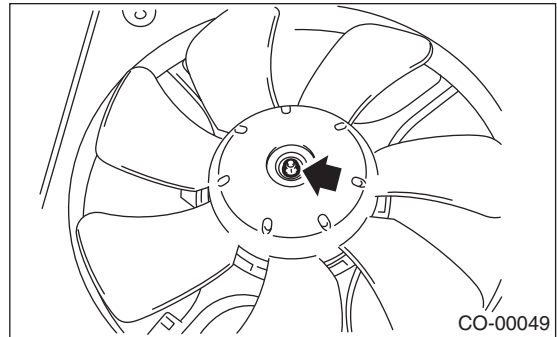
Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



Tightening torque:

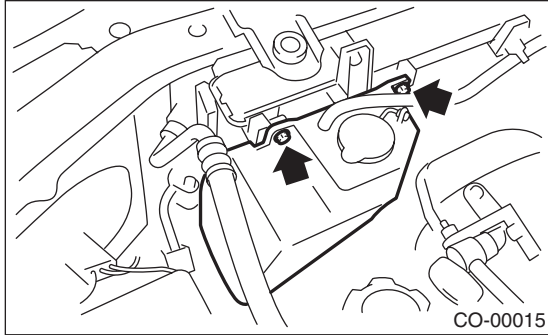
3.4 N·m (0.35 kgf-m, 2.5 ft-lb)



10. Reservoir Tank

A: REMOVAL

- 1) Disconnect the over flow hose which is connected to the radiator filler neck.
- 2) Remove the bolts which install reservoir tank onto radiator main fan shroud.
- 3) Remove the reservoir tank.

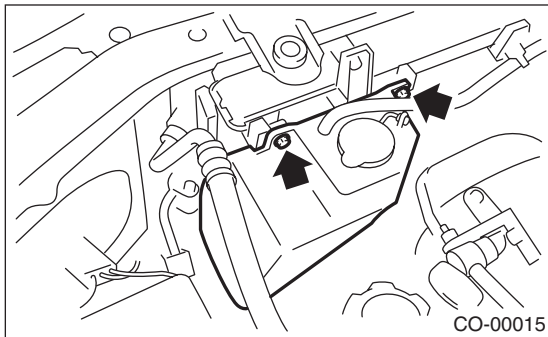


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

7.5 N·m (0.76 kgf·m, 5.5 ft·lb)



C: INSPECTION

Make sure the engine coolant level is between "FULL" and "LOW".

11. Coolant Filler Tank

A: REMOVAL

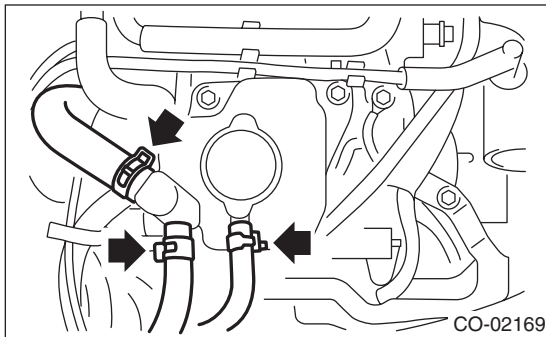
NOTE:

Mount the coolant filler tank only to the turbo model.

WARNING:

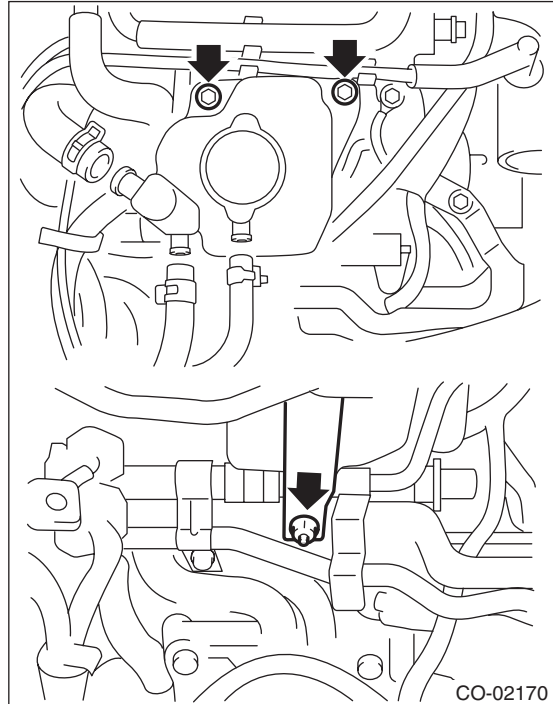
The radiator is pressurized. Wait until engine cools down before working on the radiator.

- 1) Remove the collector cover.
- 2) Drain approximately 3.0 ℓ (3.2 US qt, 2.6 Imp qt) of engine coolant. <Ref. to CO(H4SO)-18, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>
- 3) Remove the air cleaner upper cover and the air intake duct. <Ref. to IN (H4SO)-5, REMOVAL, Air Cleaner Case.>
- 4) Remove the air cleaner element.
- 5) Disconnect the engine coolant hoses from coolant filler tank.



- 6) Remove the bolts and nut which install coolant filler tank.
- 7) Disconnect the engine coolant hose which connects the under side of coolant filler tank.

- 8) Remove the coolant filler tank.



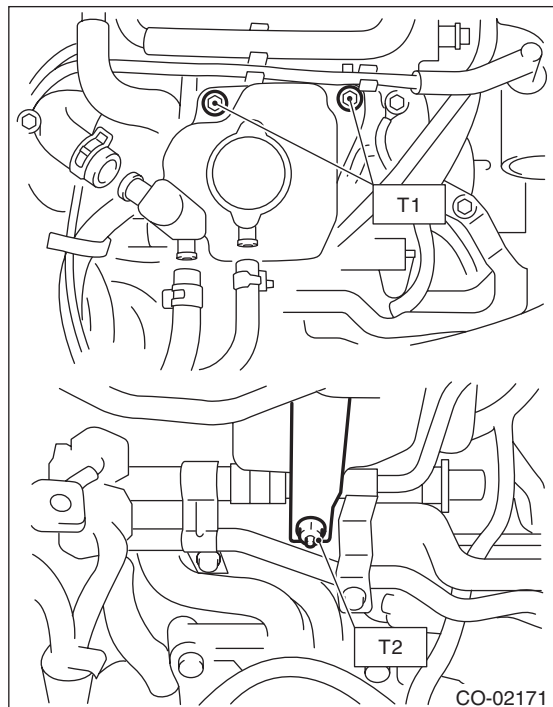
B: INSTALLATION

- 1) Install in the reverse order of removal.

Tightening torque:

T1: 16 N·m (1.6 kgf·m, 11.8 ft·lb)

T2: 13 N·m (1.3 kgf·m, 9.6 ft·lb)



- 2) Fill engine coolant. <Ref. to CO(H4SO)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

Engine Cooling System Trouble in General

COOLING

12.Engine Cooling System Trouble in General

A: INSPECTION

Trouble	Possible cause	Corrective action
Overheating	a. Insufficient engine coolant	Replenish engine coolant, inspect for leakage, and repair it if necessary.
	b. Loose timing belt	Repair or replace timing belt tensioner.
	c. Oil on timing belt	Replace.
	d. Malfunction of thermostat	Replace.
	e. Malfunction of water pump	Replace.
	f. Clogged engine coolant passage	Clean.
	g. Improper ignition timing	Inspect and repair the ignition control system. <Ref. to EN(H4SO)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.> <Ref. to EN(H4DOTC)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>
	h. Clogged or leaking radiator	Clean, repair or replace.
	i. Engine oil mixed in engine coolant	Replace the engine coolant.
	j. Air/fuel mixture ratio too lean	Inspect and repair the fuel injection system. <Ref. to EN(H4SO)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.> <Ref. to EN(H4DOTC)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>
	k. Excessive back pressure in exhaust system	Clean or replace.
	l. Insufficient clearance between piston and cylinder	Adjust or replace.
	m. Slipping clutch	Correct or replace.
	n. Dragging brake	Adjust.
o. Defective radiator fan	Inspect the radiator fan relay, engine coolant temperature sensor or fan motor and replace them.	
Over-cooling	a. Ambient temperature extremely low	Partly cover radiator front area.
	b. Defective thermostat	Replace.
Engine coolant leaks	a. Loosened or damaged connecting units on hoses	Correct or replace.
	b. Leakage from water pump	Replace.
	c. Leakage from water pipe	Correct or replace.
	d. Leakage around cylinder head gasket	Retighten cylinder head bolts or replace gasket.
	e. Damaged or cracked cylinder head and cylinder block	Correct or replace.
	f. Damaged or cracked thermostat case	Correct or replace.
	g. Leakage from radiator	Correct or replace.
Strange noise	a. Defective drive belt	Replace.
	b. Defective radiator fan	Replace.
	c. Defective water pump bearing	Replace water pump.
	d. Defective water pump mechanical seal	Replace water pump.

General Description

LUBRICATION

1. General Description

A: SPECIFICATION

Lubrication method			Forced lubrication
Oil pump	Pump type		Trochoid type
	Number of teeth	Inner rotor	9
		Outer rotor	10
	Outer rotor diameter × thickness		78 × 10 mm (3.07 × 0.39 in)
	Tip clearance between inner and outer rotors	Specification	0.04 — 0.14 mm (0.0016 — 0.0055 in)
		Limit	0.18 mm (0.0071 in)
	Side clearance between inner rotor and pump case	Specification	0.02 — 0.07 mm (0.0008 — 0.0028 in)
		Limit	0.12 mm (0.0047 in)
	Case clearance between outer rotor and pump case	Specification	0.10 — 0.175 mm (0.0039 — 0.0069 in)
		Limit	0.20 mm (0.0079 in)
	Performance (Oil temperature 80°C (176°F))	600 rpm	Discharge pressure
Discharge rate			4.6 ℓ (4.9 US qt, 4.0 Imp qt)/min.
5,000 rpm		Discharge pressure	294 kPa (3.0 kgf/cm ² , 43 psi)
		Discharge rate	47.0 ℓ (49.7 US qt, 41.4 Imp qt)/min.
Relief valve working pressure			588 kPa (6.0 kgf/cm ² , 85 psi)
Oil filter	Filter type		Full-flow filter type
	Filtration area	Outer diameter: 68 mm (2.68 in)	800 cm ² (124 sq in)
		Outer diameter: 65 mm (2.56 in)	470 cm ² (73 sq in)
	By-pass valve opening pressure		160 kPa (1.63 kgf/cm ² , 23.2 psi)
	Outer diameter × width	Outer diameter: 68 mm (2.68 in)	68 × 65 mm (2.68 × 2.56 in)
		Outer diameter: 65 mm (2.56 in)	65 × 74.4 mm (2.56 × 2.93 in)
Installation bolt specifications			M 20 × 1.5
Oil pressure switch	Type		Immersed contact point type
	Operating voltage — wattage		12 V — 3.4 W or less
	Warning light operating pressure		14.7 kPa (0.15 kgf/cm ² , 2.1 psi)
	Proof pressure		981 kPa (10 kgf/cm ² , 142 psi) or more
Engine oil	Capacity (at overhaul)	Non-turbo	5.0 ℓ (5.4 US qt, 4.5 Imp qt)
		Turbo	5.0 ℓ (5.4 US qt, 4.5 Imp qt)
	When replacing engine oil and oil filter	Non-turbo	4.2 ℓ (4.4 US qt, 3.7 Imp qt)
		Turbo	4.3 ℓ (4.5 US qt, 3.8 Imp qt)
	When replacing engine oil only	Non-turbo	4.0 ℓ (4.2 US qt, 3.5 Imp qt)
		Turbo	4.0 ℓ (4.2 US qt, 3.5 Imp qt)

Recommended oil:

Items having the API standard SM “Energy Conserving” logo

ILSAC standard GF-4 “starburst mark” displayed on container top.

SAE (1)						
(°C)	-30	-20	-15	0	15	30 40
(°F)	-22	-4	5	32	59	86 104

LU-02203

- (1) SAE viscosity No. and applicable temperature
- (2) Recommended

CAUTION:

It is acceptable to fill an engine with oil of another name when replacing oil, but use an API standard specified by Subaru or one that has SAE viscosity number.

NOTE:

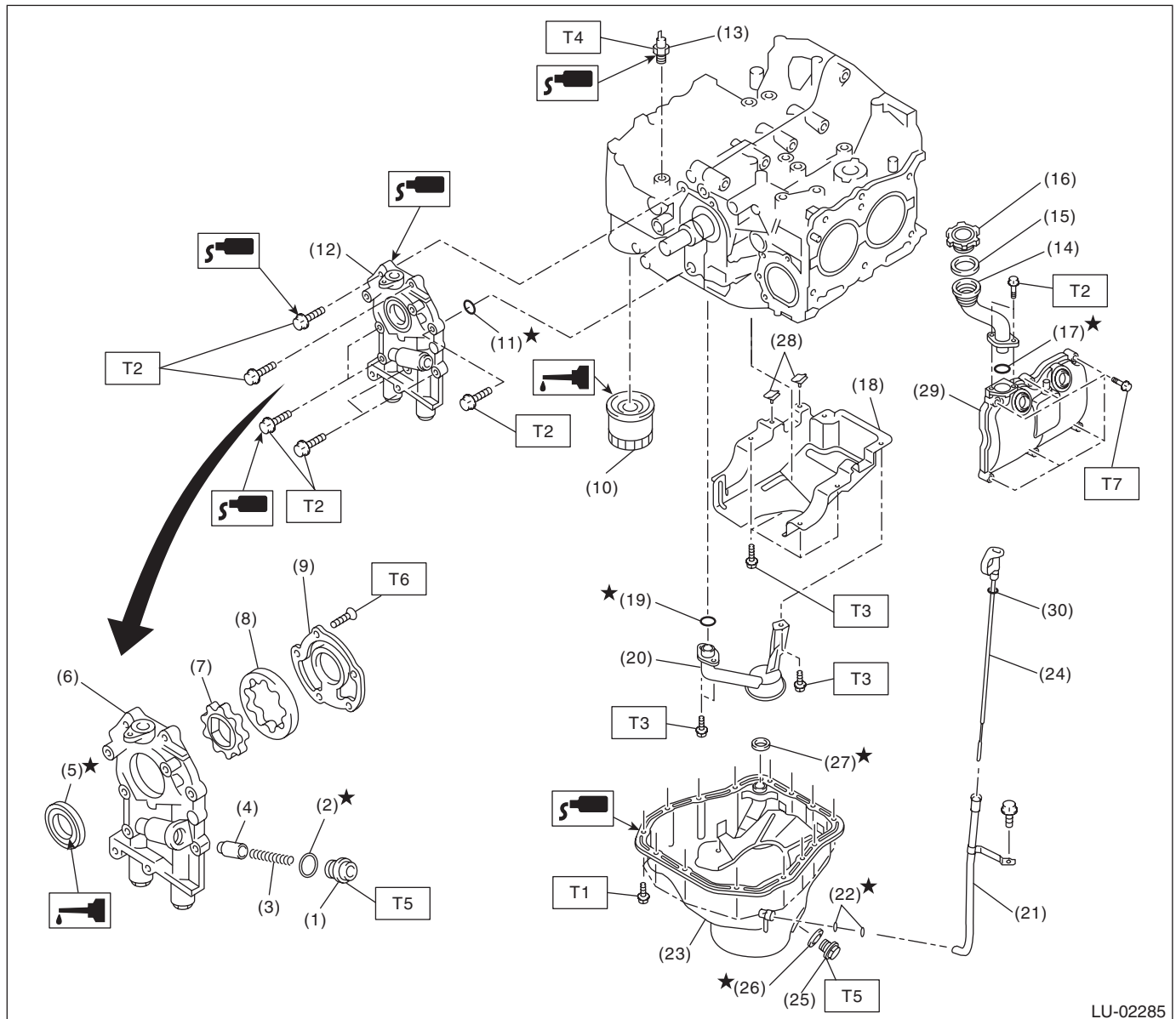
Use an oil with the viscosity shown below if the vehicle is used in regions of high temperature, or in severe environments. API standard: SM or SL
 SAE viscosity No.: 30, 40, 10W-50, 20W-40, 20W-50

General Description

LUBRICATION

B: COMPONENT

1. NON-TURBO MODEL



LU-02285

- | | |
|--------------------------|----------------------------|
| (1) Plug | (15) O-ring |
| (2) Gasket | (16) Oil filler cap |
| (3) Relief valve spring | (17) O-ring |
| (4) Relief valve | (18) Baffle plate |
| (5) Oil seal | (19) O-ring |
| (6) Oil pump case | (20) Oil strainer |
| (7) Inner rotor | (21) Oil level gauge guide |
| (8) Outer rotor | (22) O-ring |
| (9) Oil pump cover | (23) Oil pan |
| (10) Oil filter | (24) Oil level gauge |
| (11) O-ring | (25) Drain plug |
| (12) Oil pump ASSY | (26) Metal gasket |
| (13) Oil pressure switch | (27) Gasket |
| (14) Oil filler duct | |

- | |
|-------------------|
| (28) Seal |
| (29) Rocker cover |
| (30) O-ring |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 5 (0.5, 3.6)

T2: 6.4 (0.65, 4.7)

T3: 10 (1.0, 7.2)

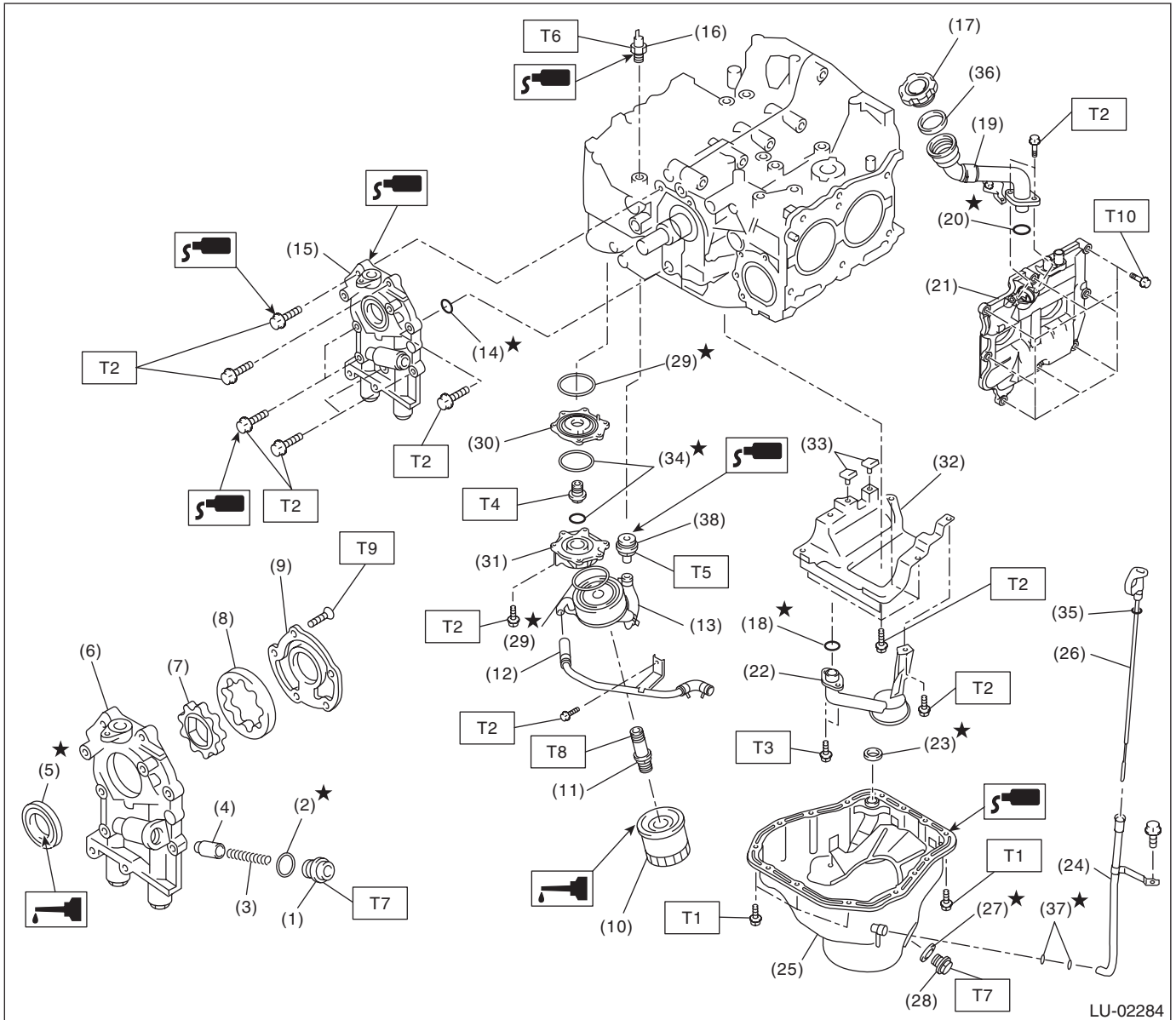
T4: 25 (2.5, 18.1)

T5: 44 (4.5, 32.5)

T6: 5.4 (0.55, 4.0)

T7: <Ref. to ME(H4SO)-55, INSTALLATION, Camshaft.>

2. TURBO MODEL



LU-02284

General Description

LUBRICATION

(1) Plug	(18) O-ring	(35) O-ring
(2) Gasket	(19) Oil filler duct	(36) O-ring
(3) Relief valve spring	(20) O-ring	(37) O-ring
(4) Relief valve	(21) Rocker cover	(38) Plug
(5) Oil seal	(22) Oil strainer	
(6) Oil pump case	(23) Gasket	
(7) Inner rotor	(24) Oil level gauge guide	
(8) Outer rotor	(25) Oil pan	
(9) Oil pump cover	(26) Oil level gauge	
(10) Oil filter	(27) Metal gasket	
(11) Oil cooler connector	(28) Drain plug	
(12) Water by-pass pipe	(29) Gasket	
(13) Oil cooler	(30) Adapter (1)	
(14) O-ring	(31) Adapter (2)	
(15) Oil pump ASSY	(32) Baffle plate	
(16) Oil pressure switch	(33) Seal	
(17) Oil filler cap	(34) O-ring	

Tightening torque: N-m (kgf-m, ft-lb)**T1: 5 (0.5, 3.6)****T2: 6.4 (0.65, 4.7)****T3: 10 (1.0, 7.2)****T4: 45 (4.6, 33.2)****T5: 69 (7.0, 51)****T6: 25 (2.5, 18.1)****T7: 44 (4.5, 32.5)****T8: 54 (5.5, 40)****T9: 5.4 (0.55, 4.0)****T10: <Ref. to ME(H4DOTC)-55,
INSTALLATION, Camshaft.>**

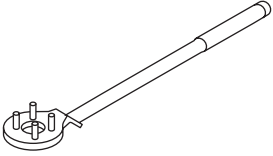
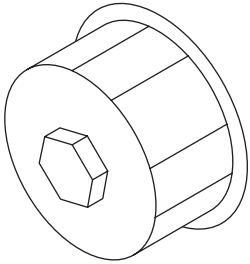
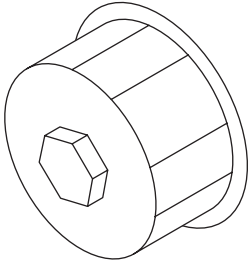
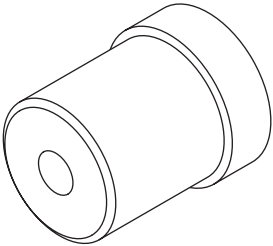
C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from the battery.

General Description

LUBRICATION

D: PREPARATION TOOL

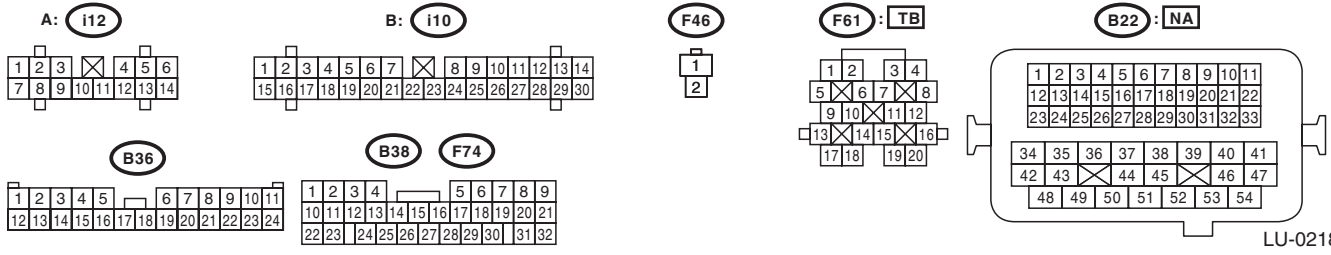
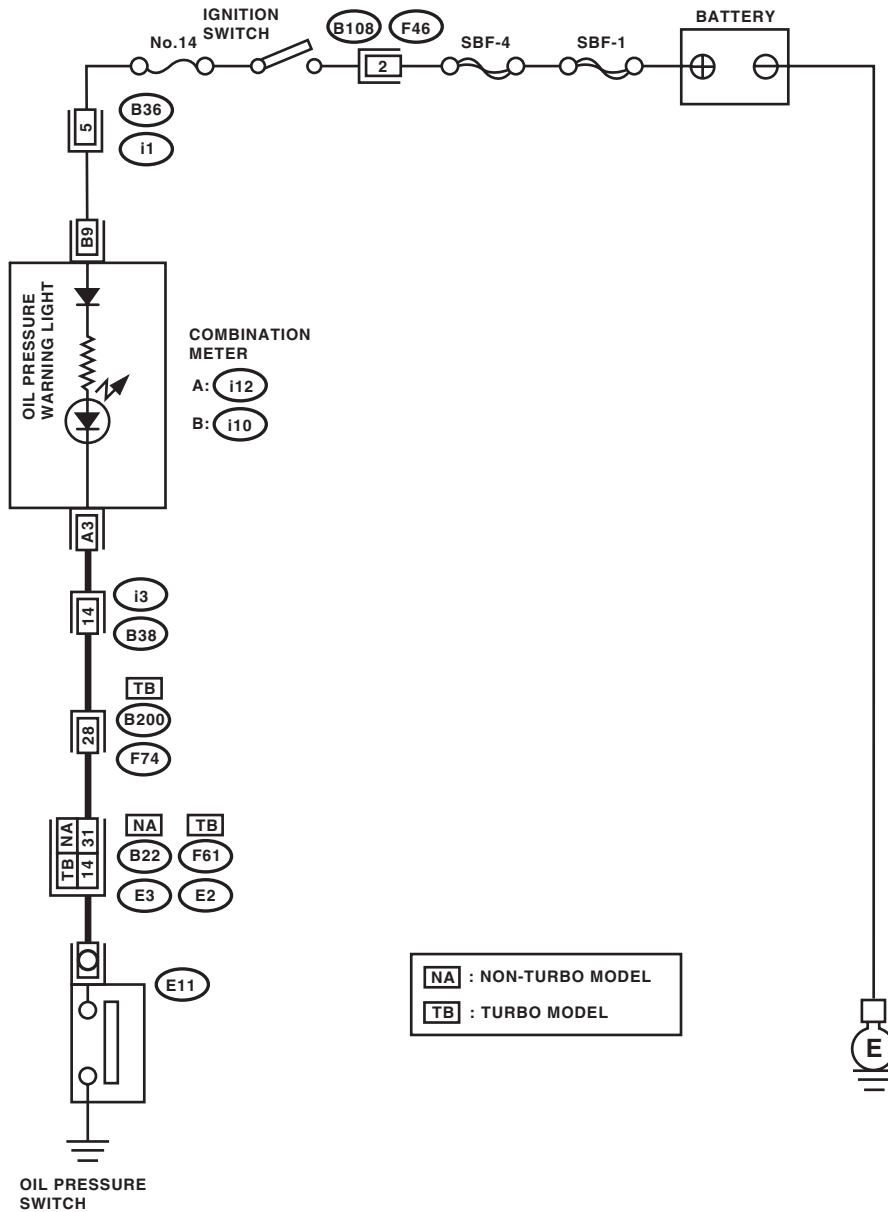
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST-499977100</p>	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crank pulley when loosening and tightening the crank pulley bolt.
 <p>ST18332AA000</p>	18332AA000	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 68 mm (2.68 in))
 <p>ST18332AA010</p>	18332AA010	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 65 mm (2.56 in))
 <p>ST-499587100</p>	499587100	OIL SEAL INSTALLER	Used for installing oil seal into oil pump.

Oil Pressure System

LUBRICATION

2. Oil Pressure System

A: WIRING DIAGRAM



LU-02181

B: INSPECTION

Step	Check	Yes	No
1 CHECK COMBINATION METER. 1) Turn the ignition switch to ON (engine OFF). 2) Check other warning lights.	Does the warning light illuminate?	Go to step 2.	Repair or replace the combination meter. <Ref. to IDI-3, INSPECTION, Combination Meter System.>
2 CHECK THE HARNESS CONNECTOR BETWEEN THE COMBINATION METER AND THE OIL PRESSURE SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from oil pressure switch. 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between oil pressure switch connector and chassis ground. Connector & terminal (E11) No. 1 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Replace the oil pressure switch.	Go to step 3.
3 CHECK COMBINATION METER. 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Measure the resistance of combination meter. Terminals (i10) No. 9 — (i12) No. 3:	Is the resistance less than 10 Ω ?	Replace the harness connector between the combination meter and the oil pressure switch.	Repair or replace the combination meter. <Ref. to IDI-3, INSPECTION, Combination Meter System.>

Engine Oil

LUBRICATION

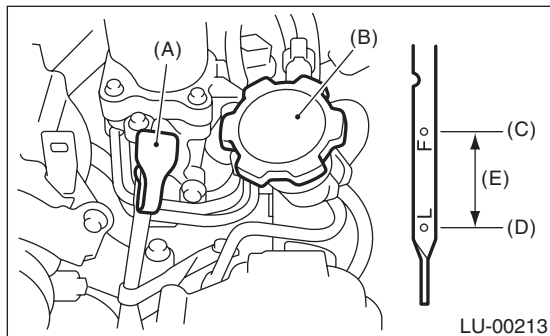
3. Engine Oil

A: INSPECTION

- 1) Park the vehicle on a level surface.
- 2) Remove the oil level gauge and wipe away the oil.
- 3) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and properly orientated.
- 4) Remove it again and note the reading. If the engine oil level is below "L" line, add oil to bring the level up to "F" line.
- 5) After turning off the engine, wait a few minutes for the oil to return to the oil pan before checking the level.
- 6) Just after driving or while the engine is warm, engine oil level shows in the range between "F" line and cutout portion. This is caused by thermal expansion of engine oil.

NOTE:

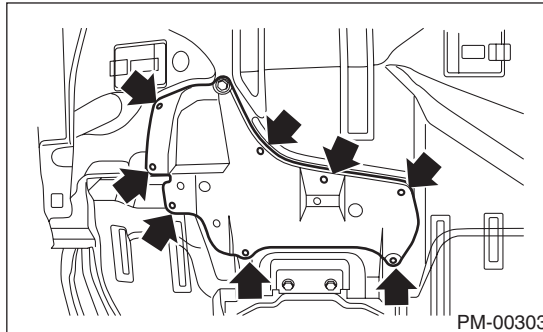
To prevent overfilling of engine oil, do not add oil above "F" line when the engine is cold.



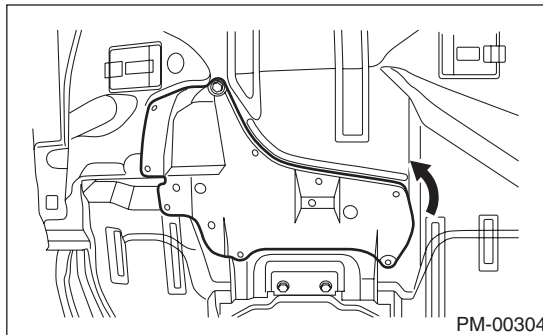
- (A) Oil level gauge
- (B) Engine oil filler cap
- (C) Upper level
- (D) Lower level
- (E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

B: REPLACEMENT

- 1) Open the engine oil filler cap for quick draining of engine oil.
- 2) Lift-up the vehicle.
- 3) Remove the service hole clip located on the under cover.



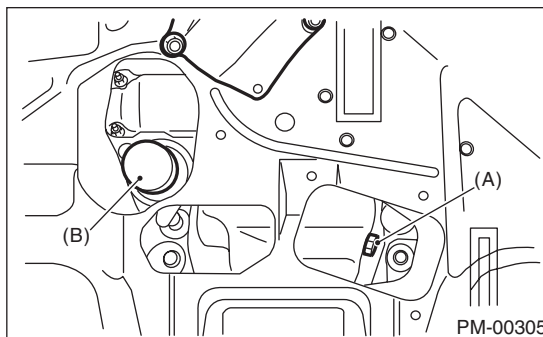
- 4) Rotate the service hole cover in the arrow direction.



- 5) Drain engine oil by loosening the engine oil drain plug.

NOTE:

Prepare the container for draining of engine oil.



- (A) Drain plug
- (B) Oil filter

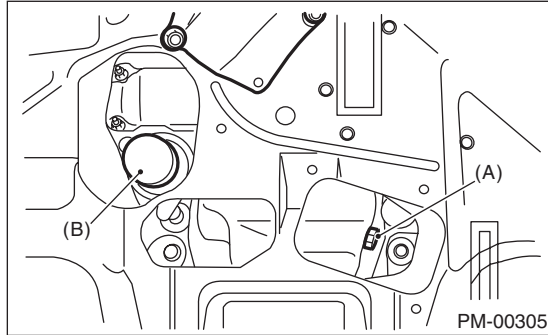
6) Tighten the engine oil drain plug after draining engine oil.

NOTE:

Use a new drain plug gasket.

Tightening torque:

44 N·m (4.5 kgf·m, 32.5 ft·lb)



- (A) Drain plug
- (B) Oil filter

7) Install the service hole cover.

8) Using engine oil of proper quality and viscosity, fill engine oil through the oil filler duct to the upper level on level gauge. Make sure that the vehicle is parked on a level surface when checking oil level.

Recommended oil

<Ref. to LU (H4SO)-2, SPECIFICATION, General Description.>

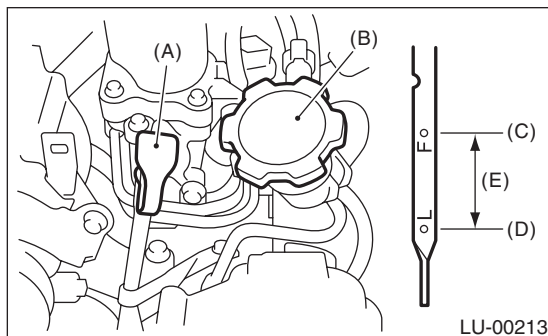
Engine oil capacity:

<Ref. to LU (H4SO)-2, SPECIFICATION, General Description.>

9) Close the engine oil filler cap.

10) Start the engine and warm it up for a time.

11) After the engine stops, recheck the oil level. If necessary, add engine oil up to the upper level on level gauge.

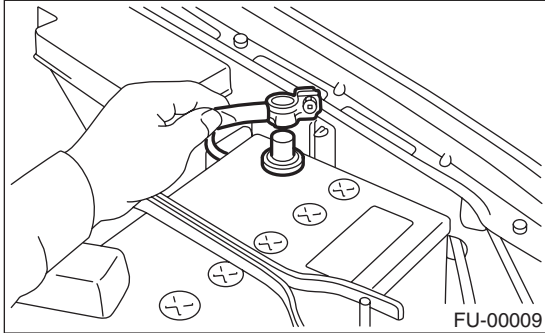


- (A) Oil level gauge
- (B) Engine oil filler cap
- (C) Upper level
- (D) Lower level
- (E) Approx. 1.0 ℓ (1.1 US qt, 0.9 Imp qt)

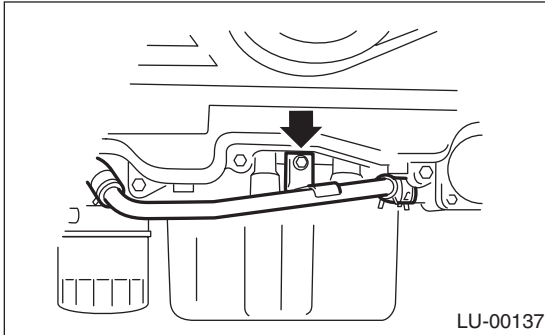
4. Oil Pump

A: REMOVAL

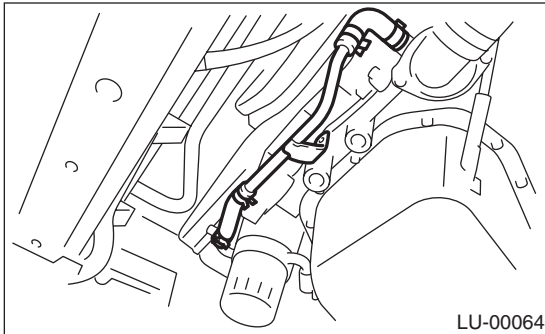
- 1) Disconnect the ground cable from the battery.



- 2) Remove the collector cover. (Turbo model)
 3) Lift-up the vehicle.
 4) Remove the under cover.
 5) Remove the bolts which install water pipe of oil cooler to oil pump. (Turbo model)

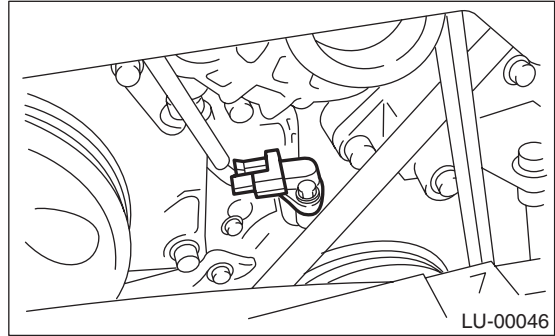


- 6) Remove the water pipe and hoses between oil cooler and water pump. (Turbo model)

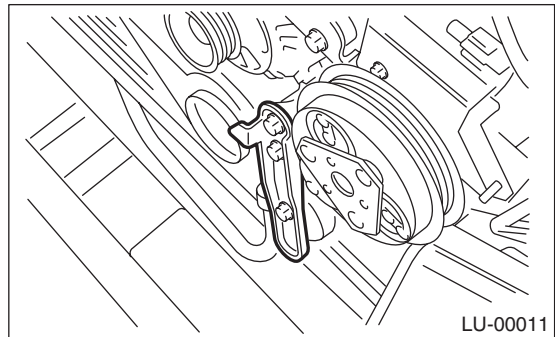


- 7) Remove the radiator. <Ref. to CO(H4SO)-27, REMOVAL, Radiator.>

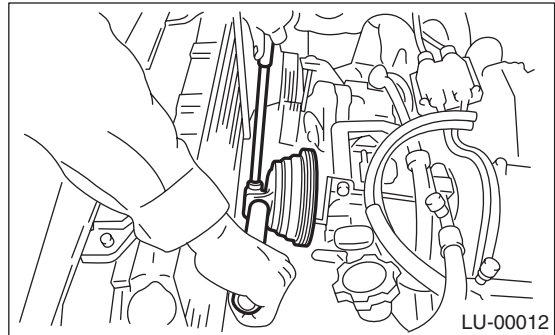
- 8) Remove the crankshaft position sensor.



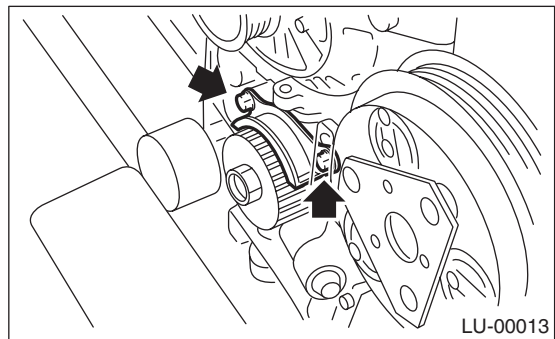
- 9) Remove the V-belts. (Non-turbo model) <Ref. to ME(H4SO)-40, REMOVAL, V-belt.> (Turbo model) <Ref. to ME(H4DOTC)-40, REMOVAL, V-belt.>
 10) Remove the V-belt tensioner.



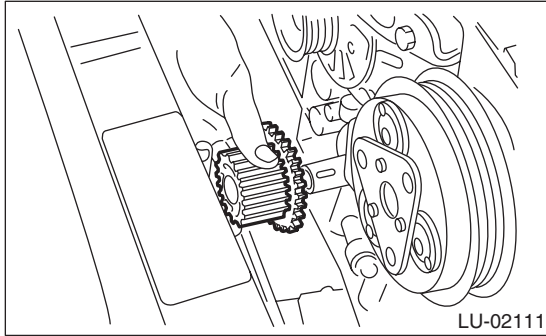
- 11) Remove the crank pulley using ST.
 ST 499977100 CRANK PULLEY WRENCH



- 12) Remove the water pump. <Ref. to CO(H4SO)-20, REMOVAL, Water Pump.>
 13) Remove the timing belt guide. (MT model)



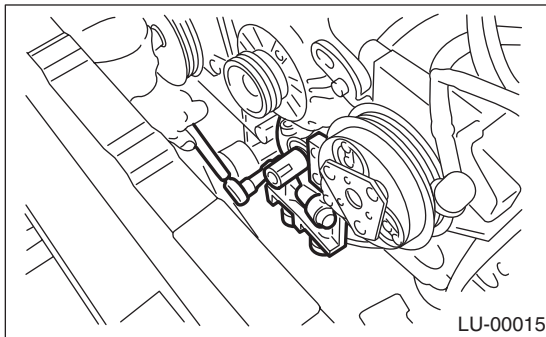
14) Remove the crank sprocket.



15) Remove the bolts which install oil pump onto cylinder block.

NOTE:

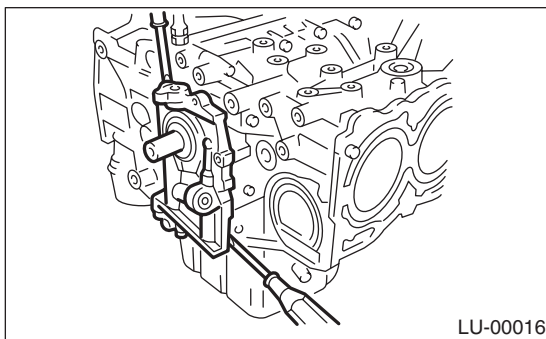
When disassembling and checking the oil pump, loosen the relief valve plug before removing the oil pump.



16) Remove the oil pump by using flat tip screwdriver.

CAUTION:

Be careful not to scratch mating surfaces of cylinder block and oil pump.



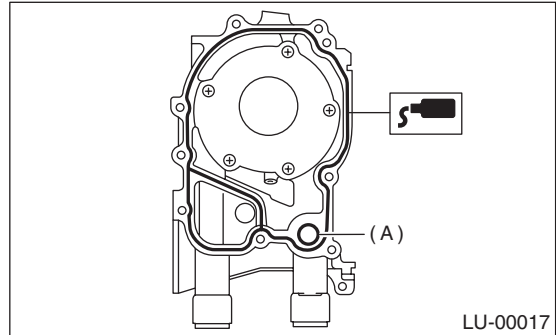
B: INSTALLATION

Install in the reverse order of removal. Perform the following.

1) Apply liquid gasket to the mating surfaces of oil pump.

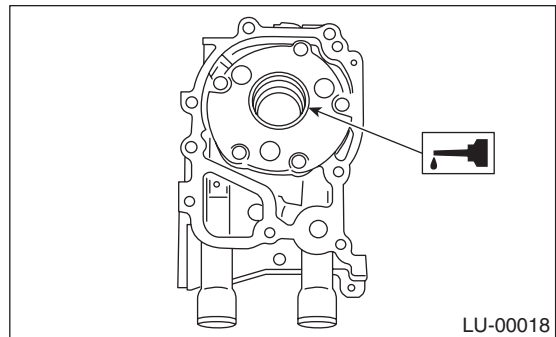
Liquid gasket:

THREE BOND 1215 (Part No. 004403007) or equivalent



2) Replace O-ring (A) with a new part.

3) Apply a coat of engine oil to the inside of oil seal.



4) Position the oil pump, aligning the notched area with crankshaft, and push the oil pump straight.

CAUTION:

- Make sure the oil seal lip is not folded.
- Be careful not to scratch the oil seal when installing oil pump on cylinder block.

5) Install the oil pump.

Oil Pump

LUBRICATION

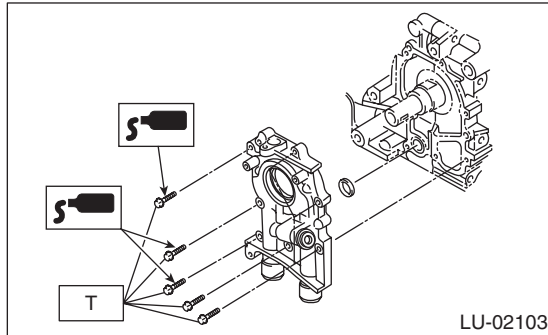
6) Apply liquid gasket to the three bolts thread shown in figure. (if the bolts are reused)

Liquid gasket:

THREE BOND 1324 (Part No. 004403042) or equivalent

Tightening torque:

6.4 N·m (0.65 kgf·m, 4.7 ft·lb)

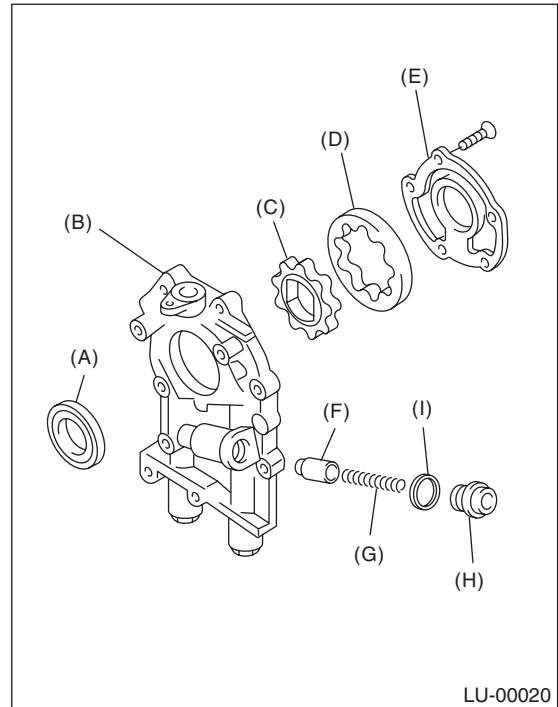


C: DISASSEMBLY

Remove the screw which secures oil pump cover and then disassemble oil pump. Inscribe alignment marks on the inner and outer rotors so that they can be replaced in their original positions during reassembly.

CAUTION:

Before disassembling the oil pump, remove the relief valve.



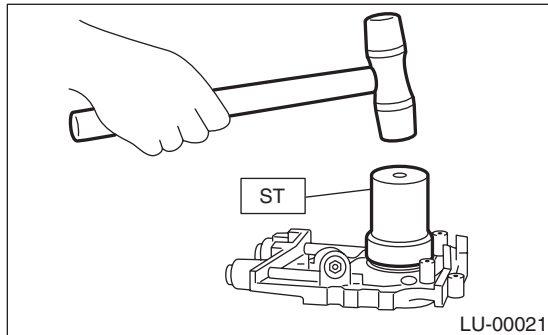
- (A) Oil seal
- (B) Oil pump case
- (C) Inner rotor
- (D) Outer rotor
- (E) Oil pump cover
- (F) Relief valve
- (G) Relief valve spring
- (H) Plug
- (I) Gasket

D: ASSEMBLY

1) Assemble the front oil seal by using ST.
ST 499587100 OIL SEAL INSTALLER

NOTE:

Use a new front oil seal.



2) Apply a coat of engine oil to inner and outer rotors.

3) Assemble the inner and outer rotors in their original positions.

4) Assemble the oil relief valve and install relief valve spring and plug.

NOTE:

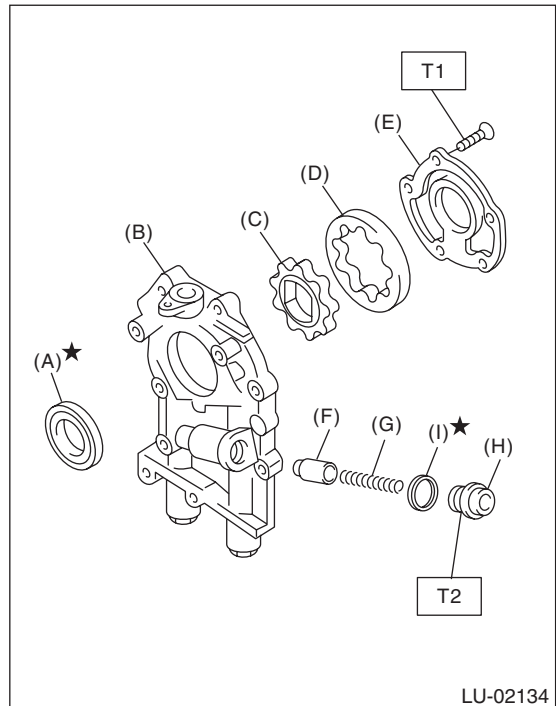
Use a new gasket.

5) Assemble the oil pump cover.

Tightening torque:

T1: 5.4 N·m (0.55 kgf-m, 4.0 ft-lb)

T2: 44 N·m (4.5 kgf-m, 32.5 ft-lb)



- (A) Oil seal
- (B) Pump case
- (C) Inner rotor
- (D) Outer rotor
- (E) Pump cover
- (F) Relief valve
- (G) Relief valve spring
- (H) Plug
- (I) Gasket

E: INSPECTION

1. TIP CLEARANCE

Measure the tip clearance of rotors. If the clearance exceeds the limit, replace rotors as a matched set.

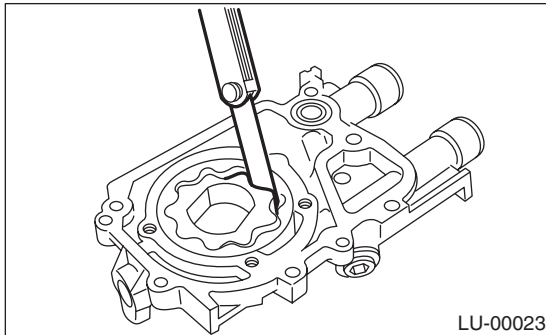
Tip clearance:

Specification:

0.04 — 0.14 mm (0.0016 — 0.0055 in)

Service limit:

0.18 mm (0.0071 in)



2. CASE CLEARANCE

Measure the clearance between outer rotor and oil pump case. If the clearance exceeds the limit, replace the rotor.

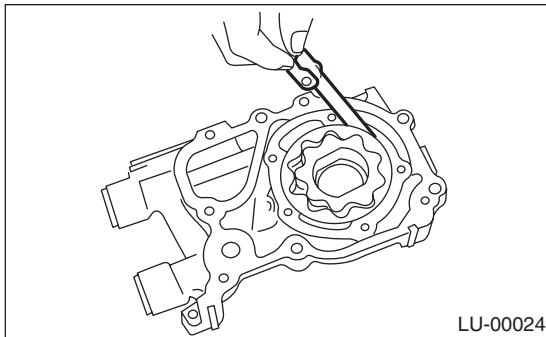
Case clearance:

Specification:

0.10 — 0.175 mm (0.0039 — 0.0069 in)

Service limit:

0.20 mm (0.0079 in)



3. SIDE CLEARANCE

Measure the clearance between oil pump inner rotor and oil pump cover. If the clearance exceeds the limit, replace rotor or oil pump case.

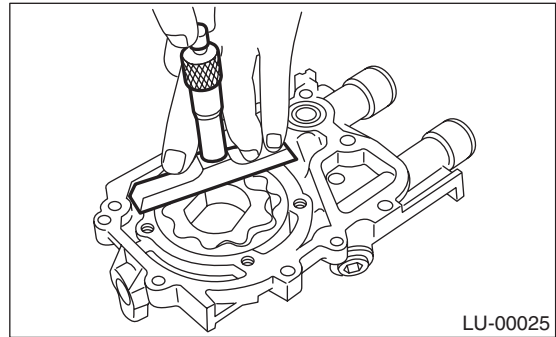
Side clearance:

Specification:

0.02 — 0.07 mm (0.0008 — 0.0028 in)

Service limit:

0.12 mm (0.0047 in)



4. OIL RELIEF VALVE

Check the valve for assembly condition and damage, and the relief valve spring for damage and deterioration. Replace the parts if defective.

Relief valve spring

Free length:

73.7 mm (2.902 in)

Installed length:

54.7 mm (2.154 in)

Load when installed:

93.1 N (9.49 kgf, 20.88 lb)

5. OIL PUMP CASE

Check the oil pump case for worn shaft hole, clogged oil passage, worn rotor chamber, cracks and other faults.

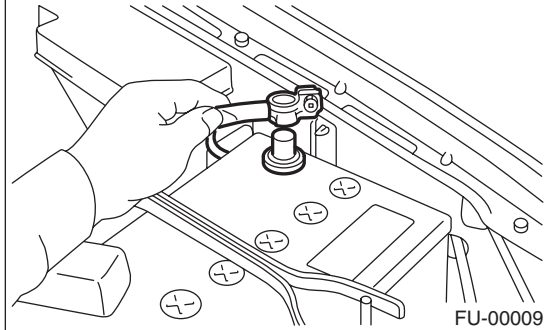
6. OIL SEAL

Check the oil seal lips for deformation, hardening, wear, etc. and replace if defective.

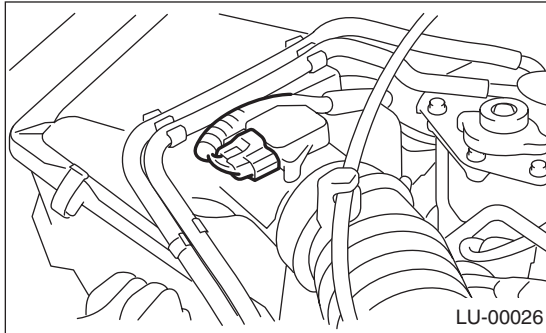
5. Oil Pan and Strainer

A: REMOVAL

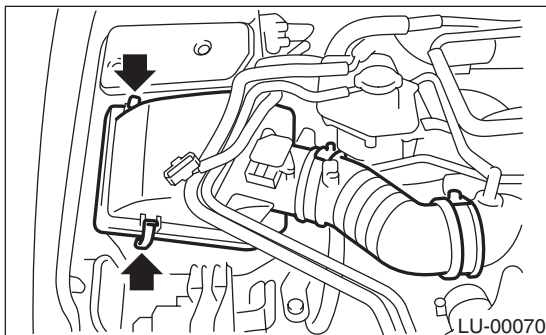
- 1) Set the vehicle on a lift.
- 2) Remove the front wheels.
- 3) Disconnect the ground cable from the battery.



- 4) Remove the collector cover. (Turbo model)
- 5) Disconnect the connector from the mass air flow and intake air temperature sensor.

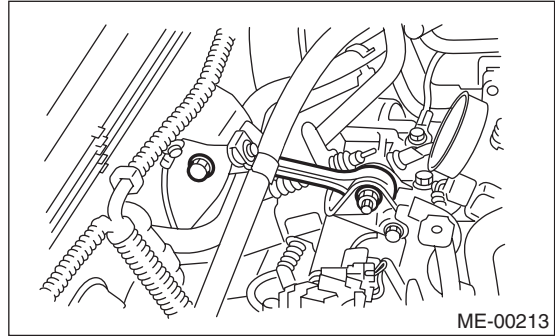


- 6) Remove the air intake duct and air cleaner case. (Non-turbo model) <Ref. to IN (H4SO)-7, REMOVAL, Air Intake Duct.> <Ref. to IN (H4SO)-5, REMOVAL, Air Cleaner Case.>
- 7) Remove the air intake boot and air cleaner upper cover. (Turbo model)

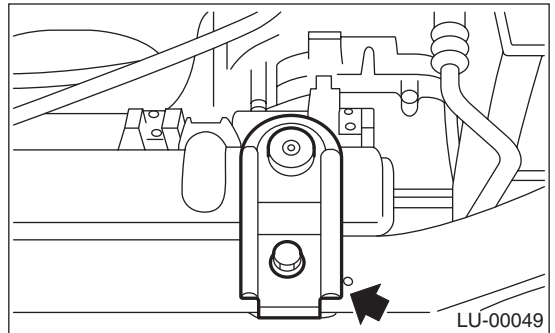


- 8) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>

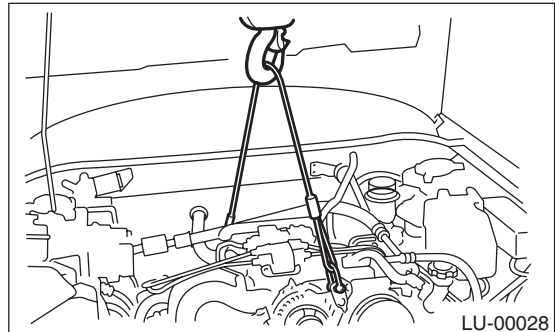
- 9) Remove the pitching stopper.



- 10) Remove the radiator upper brackets.



- 11) Support the engine with a lifting device and wire ropes.



- 12) Lift-up the vehicle.

CAUTION:

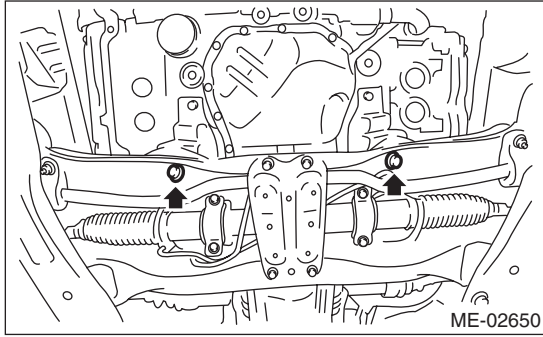
When lifting up the vehicle, raise up wire ropes at the same time.

- 13) Remove the under cover.
- 14) Drain the engine oil. <Ref. to LU (H4SO)-10, REPLACEMENT, Engine Oil.>
- 15) Remove the front and center exhaust pipes. (Non-turbo model) <Ref. to EX (H4SO)-4, REMOVAL, Front Exhaust Pipe.>

Oil Pan and Strainer

LUBRICATION

16) Remove the nuts which install front cushion rubber onto front crossmember.



17) Remove the bolts which install oil pan on cylinder block with the engine raised up.

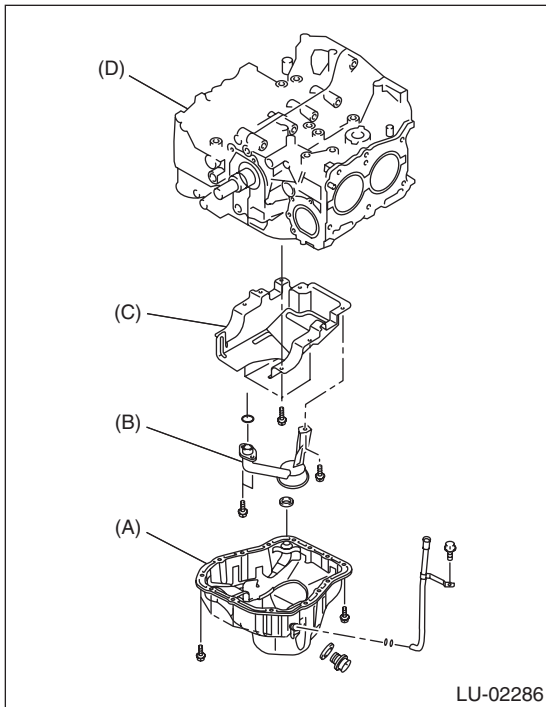
18) Insert the oil pan cutter blade into the gap between cylinder block and oil pan.

CAUTION:

Do not use a screwdriver or similar tool in place of oil pan cutter.

19) Remove the oil strainer.

20) Remove the baffle plate.



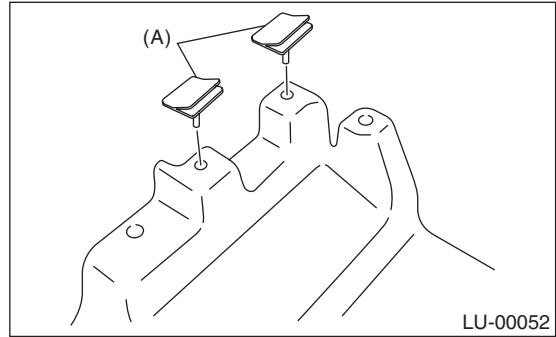
- (A) Oil pan
- (B) Oil strainer
- (C) Baffle plate
- (D) Cylinder block

B: INSTALLATION

CAUTION:

Before installing the oil pan, clean the mating surface of oil pan and engine block.

1) Make sure that the seals (A) are installed securely on the baffle plate in a direction as shown in the figure below.



2) Install the baffle plate.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

3) Install the oil strainer onto baffle plate.

NOTE:

Replace the O-ring with a new part.

Tightening torque:

10 N·m (1.0 kgf-m, 7.2 ft-lb)

4) Tighten the strainer stay together with the baffle plate.

Tightening torque:

6.4 N·m (0.65 kgf-m, 9.7 ft-lb)

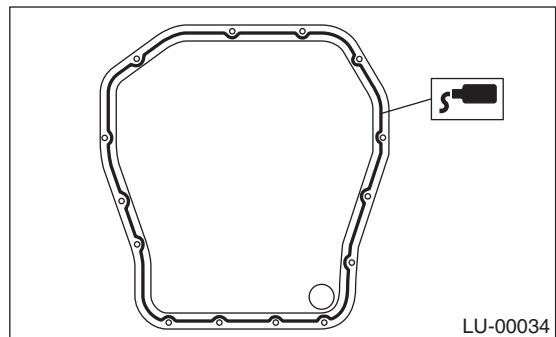
5) Apply liquid gasket to the mating surfaces, and install the oil pan.

NOTE:

Install within 5 min. after applying liquid gasket.

Liquid gasket:

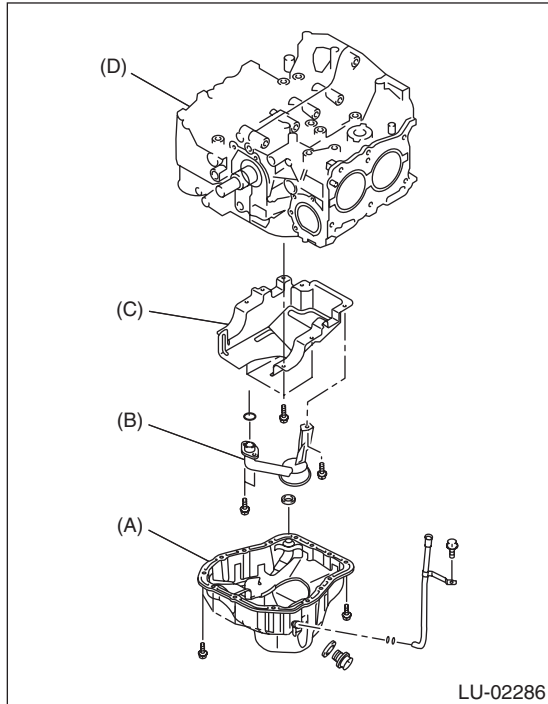
THREE BOND 1207C (Part No. 004403012) or equivalent



6) Tighten the bolt which installs oil pan to engine block.

Tightening torque:

5 N·m (0.5 kgf·m, 3.6 ft·lb)



- (A) Oil pan
- (B) Oil strainer
- (C) Baffle plate
- (D) Cylinder block

7) Lower the engine onto front crossmember.

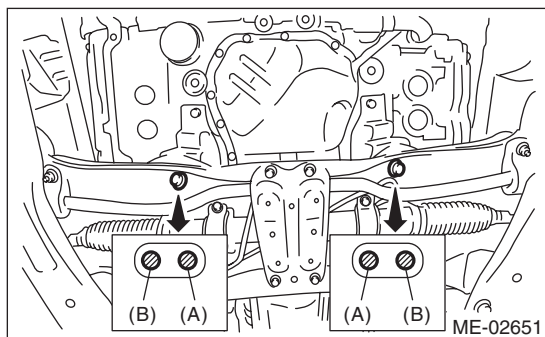
8) Install front cushion rubber onto front crossmember by tightening with nuts.

NOTE:

Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.

Tightening torque:

85 N·m (8.7 kgf·m, 63 ft·lb)



9) Install the front and center exhaust pipe. (Non-turbo model) <Ref. to EX (H4SO)-5, INSTALLATION, Front Exhaust Pipe.>

NOTE:

Use a new gasket.

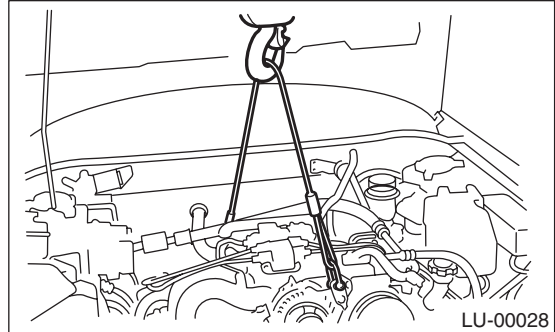
10) Install the under cover.

11) Lower the vehicle.

CAUTION:

When lowering the vehicle, lower the lift-up device and wire ropes at the same time.

12) Remove the lifting device and wire ropes.

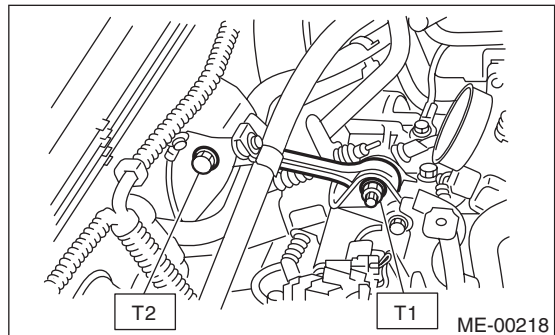


13) Install the pitching stopper.

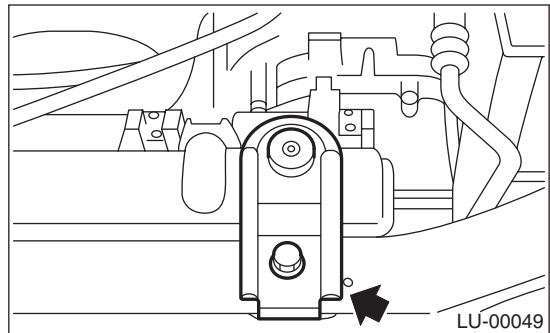
Tightening torque:

T1: 50 N·m (5.1 kgf·m, 36.9 ft·lb)

T2: 58 N·m (5.9 kgf·m, 42.8 ft·lb)



14) Install the radiator upper brackets.



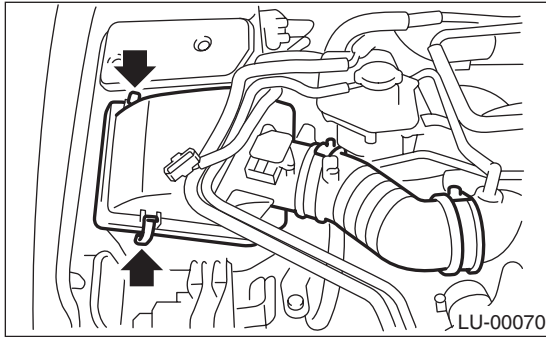
15) Install the air intake duct and air cleaner case. (Non-turbo model) <Ref. to IN (H4SO)-7, INSTALLATION, Air Intake Duct.> <Ref. to IN (H4SO)-5, INSTALLATION, Air Cleaner Case.>

16) Install the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

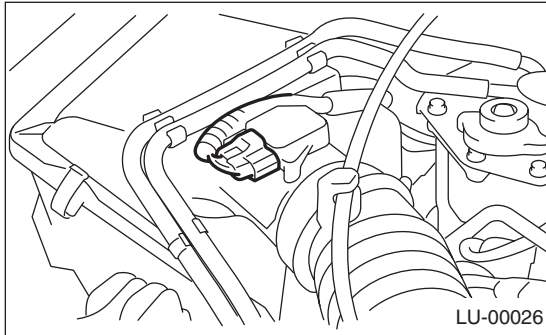
Oil Pan and Strainer

LUBRICATION

17) Install the air intake boot and air cleaner upper cover. (Turbo model)

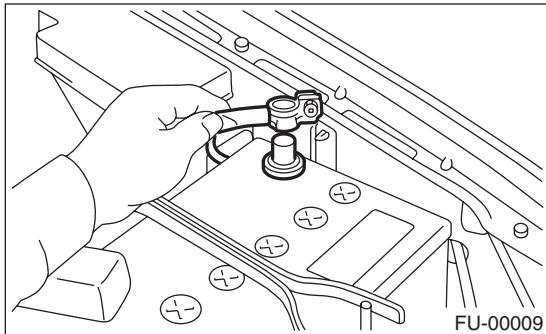


18) Connect the connector to the mass air flow and intake air temperature sensor.



19) Install the front wheels.

20) Connect the ground cable to the battery.



21) Refill the engine oil. <Ref. to LU (H4SO)-10, INSPECTION, Engine Oil.>

22) Install the collector cover. (Turbo model)

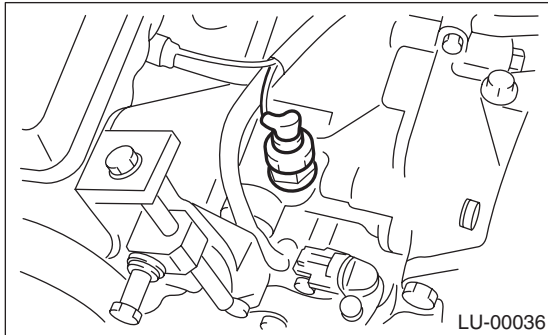
C: INSPECTION

Visually check that the oil pan, oil strainer, oil strainer stay and baffle plate are not damaged.

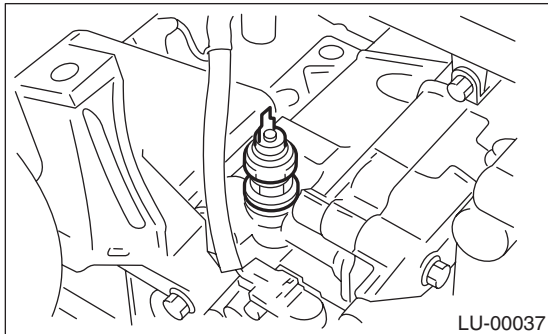
6. Oil Pressure Switch

A: REMOVAL

- 1) Remove the collector cover. (Turbo model)
- 2) Remove the generator from bracket. <Ref. to SC (H4SO)-14, REMOVAL, Generator.>
- 3) Disconnect the terminal from oil pressure switch.



- 4) Remove the oil pressure switch.

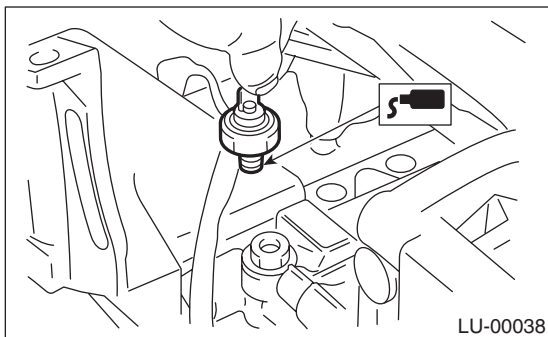


B: INSTALLATION

- 1) Apply liquid gasket to the oil pressure switch threads.

Liquid gasket:

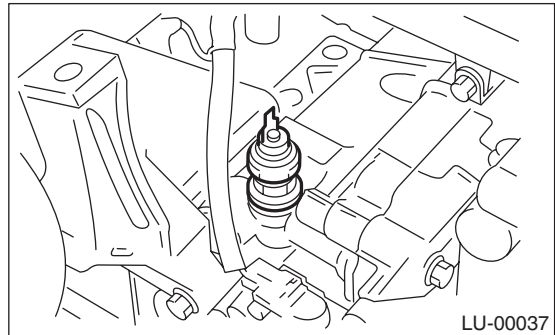
THREE BOND 1324 (Part No. 004403042) or equivalent



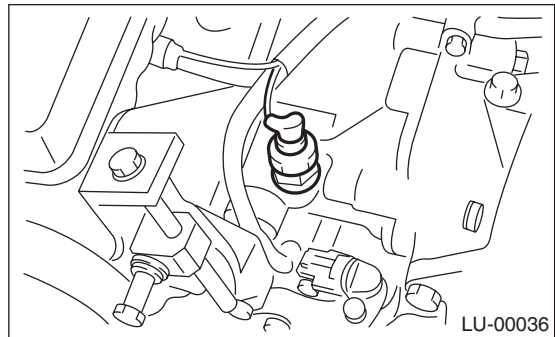
- 2) Install the oil pressure switch onto engine block.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)



- 3) Connect the terminal to the oil pressure switch.



- 4) Install the generator to bracket. <Ref. to SC (H4SO)-14, INSTALLATION, Generator.>

- 5) Install the collector cover. (Turbo model)

C: INSPECTION

Check the oil pressure switch installation portion for oil leakage and oil seepage.

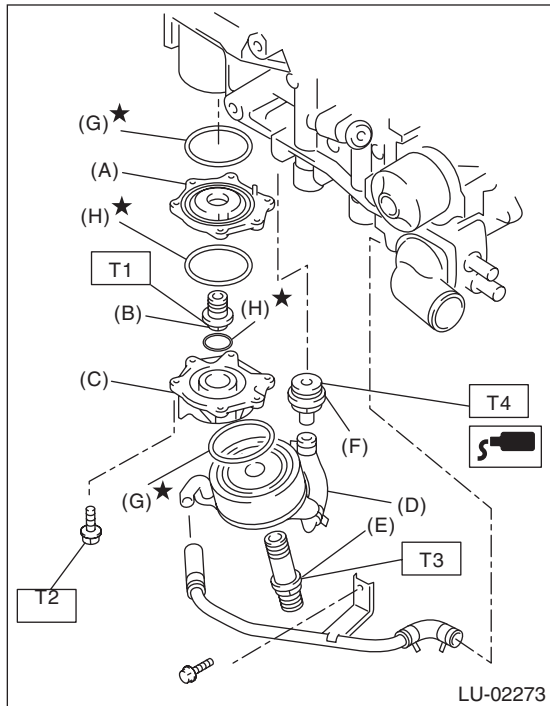
7. Engine Oil Cooler

A: REMOVAL

NOTE:

The engine oil cooler is mounted to the turbo model.

- 1) Lift-up the vehicle.
- 2) Remove the under cover.
- 3) Drain the engine oil.
<Ref. to LU (H4SO)-10, REPLACEMENT, Engine Oil.>
- 4) Drain engine coolant.
- 5) Remove the water by-pass pipe between oil cooler and water pump.
- 6) Remove the engine oil filter.
<Ref. to LU (H4SO)-24, REMOVAL, Engine Oil Filter.>
- 7) Remove the oil cooler connector and remove the oil cooler.
- 8) Remove the adapters (1) and (2).



- (A) Adapter (1)
- (B) Adapter connector
- (C) Adapter (2)
- (D) Oil cooler
- (E) Oil cooler connector
- (F) Plug
- (G) Gasket
- (H) O-ring

B: INSTALLATION

NOTE:

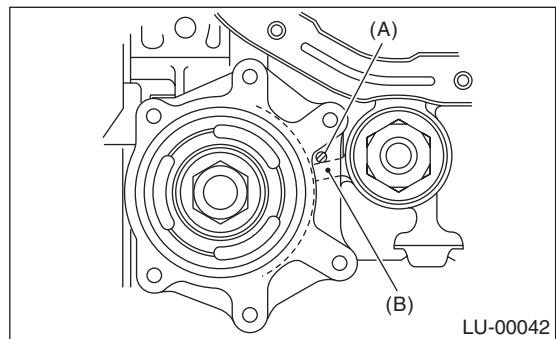
The engine oil cooler is mounted to the turbo model.

- 1) Install in the reverse order of removal.

NOTE:

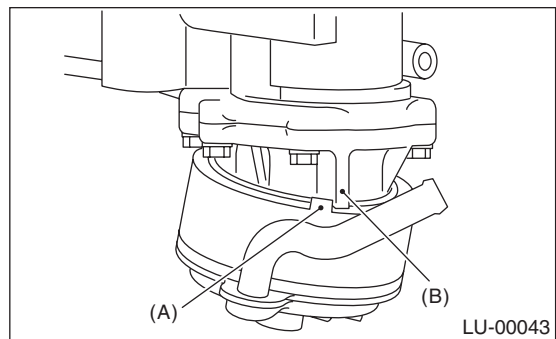
Use new O-rings and gasket.

- 2) Touch the adapter (1) knock pin (A) to the cylinder block rib (B) to install the adapter (1).



- 3) Install the adapter (2).

- 4) Touch the engine oil cooler stopper (A) to the adapter (2) rib (B) to install the engine oil cooler.



5) When installing the plug, apply liquid gasket to the plug screw.

Liquid gasket:

THREE BOND 1324 (Part No. 004403042) or equivalent

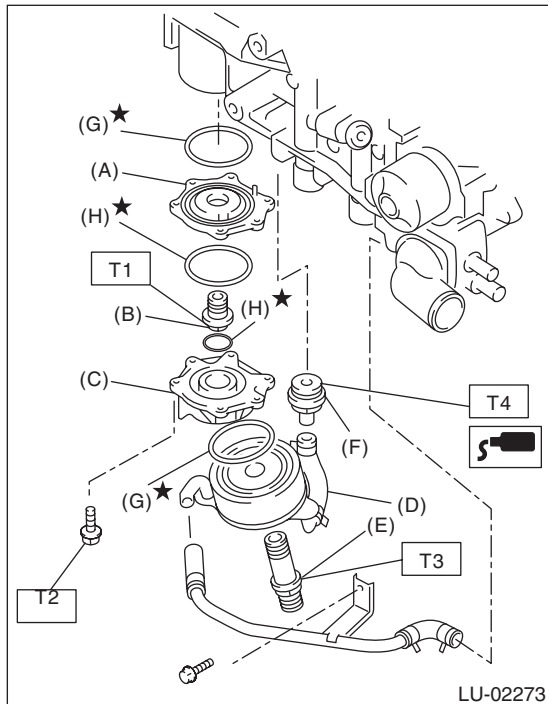
Tightening torque:

T1: 45 N·m (4.6 kgf-m, 33.2 ft-lb)

T2: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

T3: 54 N·m (5.5 kgf-m, 40 ft-lb)

T4: 69 N·m (7.0 kgf-m, 51 ft-lb)



- (A) Adapter (1)
- (B) Adapter connector
- (C) Adapter (2)
- (D) Oil cooler
- (E) Oil cooler connector
- (F) Plug
- (G) Gasket
- (H) O-ring

C: INSPECTION

- 1) Check that coolant passages are not clogged using an air blower.
- 2) Check the mating surfaces of cylinder block, O-ring and gasket groove, and oil filter for damage.

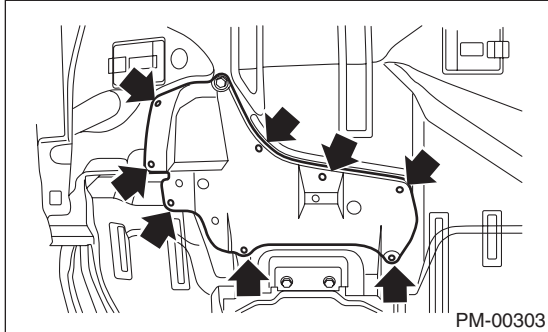
Engine Oil Filter

LUBRICATION

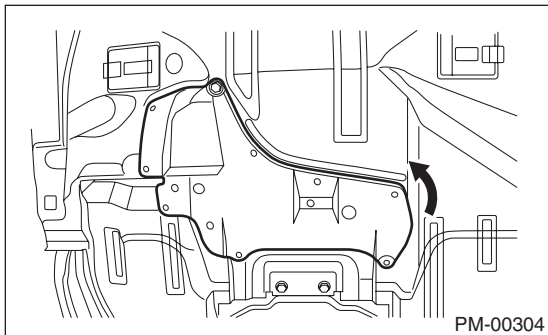
8. Engine Oil Filter

A: REMOVAL

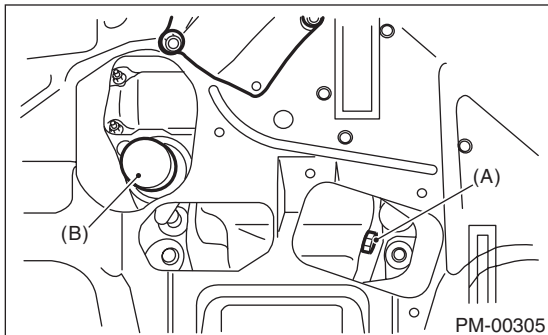
- 1) Lift-up the vehicle.
- 2) Remove the service hole clip located on the under cover.



- 3) Rotate the service hole cover in the arrow direction.



- 4) Remove the crank pulley using ST.
ST 18332AA000 OIL FILTER WRENCH (OUTER DIAMETER: 68 mm (2.68 in) FOR OIL FILTER)
ST 18332AA010 OIL FILTER WRENCH (OUTER DIAMETER: 65 mm (2.56 in) FOR OIL FILTER)



- (A) Drain plug
(B) Oil filter

B: INSTALLATION

CAUTION:

Do not tighten excessively, or oil may leak.

- 1) Clean the oil filter installation surface on cylinder block or oil cooler.
- 2) Obtain a new oil filter and apply a thin coat of engine oil to the seal rubber.
- 3) Install the oil filter turning it by hand, being careful not to damage the seal rubber.
 - Tighten the oil filter 65 mm (2.56 in) in diameter (approx. 2/3 — 3/4 rotation) after the seal rubber of the oil filter comes in contact with cylinder block or oil cooler. When using a torque wrench, tighten to 12 N·m (1.2 kgf-m, 8.7 ft-lb).
 - Tighten the oil filter 68 mm (2.68 in) in diameter (approx. 1 rotation) after the seal rubber of the oil filter comes in contact with cylinder block or oil cooler. When using a torque wrench, tighten to 14 N·m (1.4 kgf-m, 10.3 ft-lb).
- 4) Install the under cover.
- 5) Lower the vehicle.

C: INSPECTION

- 1) After installing the oil filter, run the engine and make sure that no oil is leaking around seal rubber.

NOTE:

The filter element and filter case are permanently jointed; therefore, interior cleaning is not necessary.

- 2) Check the engine oil level. <Ref. to LU (H4SO)-10, INSPECTION, Engine Oil.>

9. Engine Lubrication System Trouble in General

A: INSPECTION

Before performing diagnostics, make sure that the engine oil level is correct and no oil leakage exists.

Trouble	Possible cause		Corrective action
1. Warning light remains on.	1) Oil pressure switch failure	Cracked diaphragm or oil leakage within switch	Replace.
		Broken spring or seized contacts	Replace.
	2) Low oil pressure	Clogging of oil filter	Replace.
		Malfunction of oil by-pass valve in oil filter	Clean or replace.
		Malfunction of oil relief valve in oil pump	Clean or replace.
		Clogged oil passage	Clean.
		Excessive tip clearance and side clearance of oil pump rotor and gear	Replace.
		Clogged oil strainer or broken pipe	Clean or replace.
	3) No oil pressure	Insufficient engine oil	Replenish.
		Broken pipe of oil strainer	Replace.
Stuck oil pump rotor		Replace.	
2. Warning light does not illuminate.	1) Malfunction of combination meter		Replace.
	2) Poor contact of switch contact points		Replace.
	3) Disconnection of wiring		Repair.
3. Warning light flickers momentarily.	1) Poor contact of terminals		Repair.
	2) Defective wiring harness		Repair.
	3) Low oil pressure		Check for the same possible causes as listed 1. — 2.

Engine Lubrication System Trouble in General

LUBRICATION

General Description

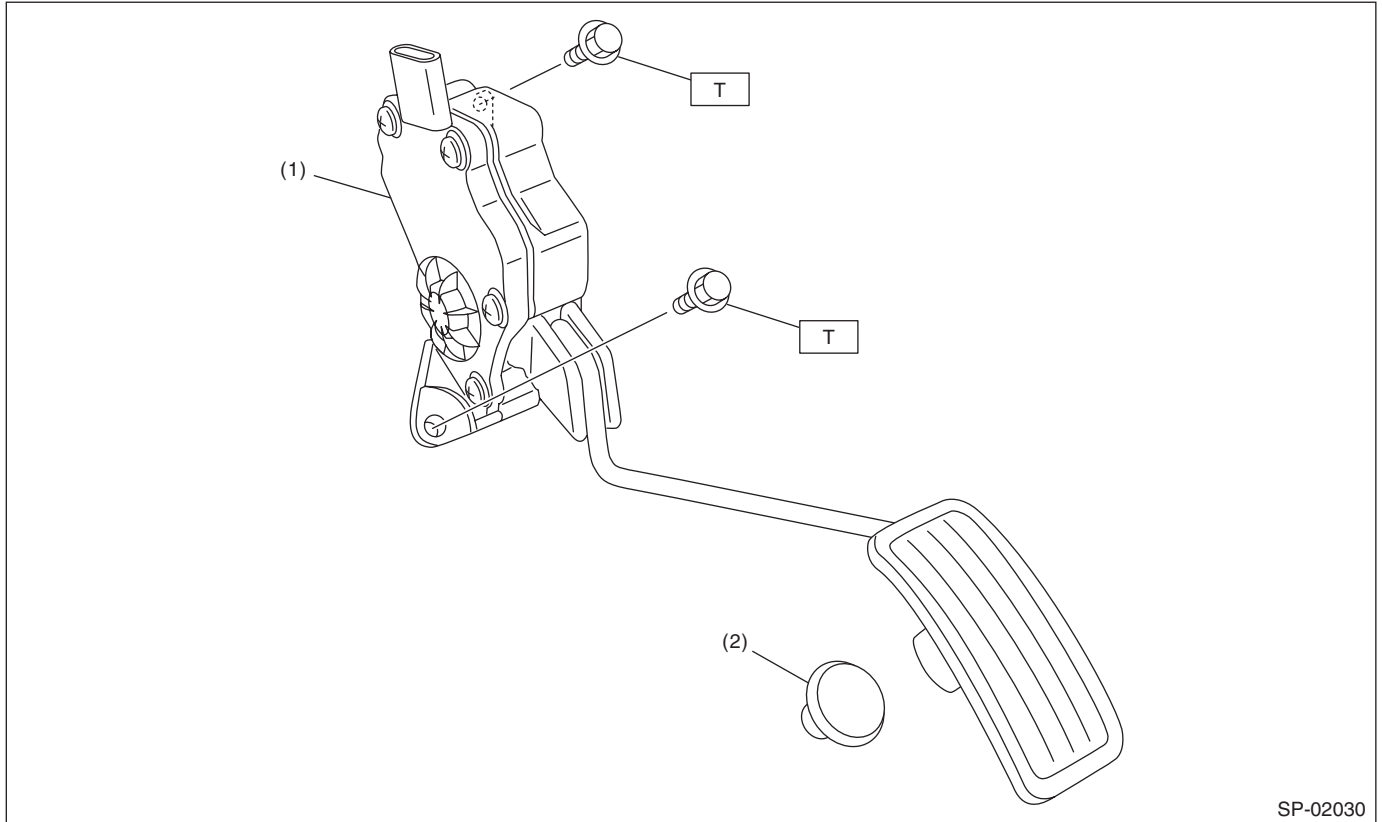
SPEED CONTROL SYSTEMS

1. General Description

A: SPECIFICATION

Accelerator pedal	Stroke	At pedal pad	52 — 57 mm (2.05 — 2.24 in)
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B: COMPONENT



(1) Accelerator pedal ASSY

(2) Stopper

Tightening torque: N·m (kgf·m, ft·lb)

T: 18 (1.8, 13.0)

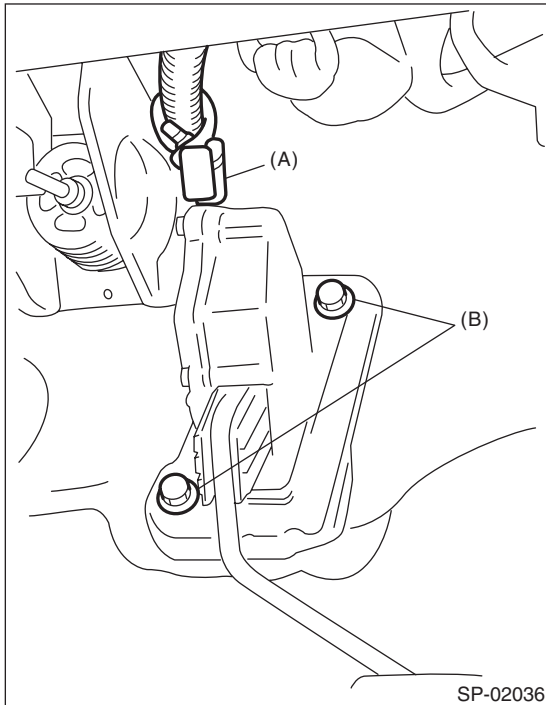
C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal or installation.
- Keep the parts in order and protect them from dust and dirt.
- Before removal or installation, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from the battery.

2. Accelerator Pedal

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Disconnect the connector (A).
- 3) Remove the nut (B) securing accelerator pedal assembly.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

C: DISASSEMBLY

NOTE:

Accelerator pedal cannot be disassembled.

Accelerator Pedal

SPEED CONTROL SYSTEMS

General Description

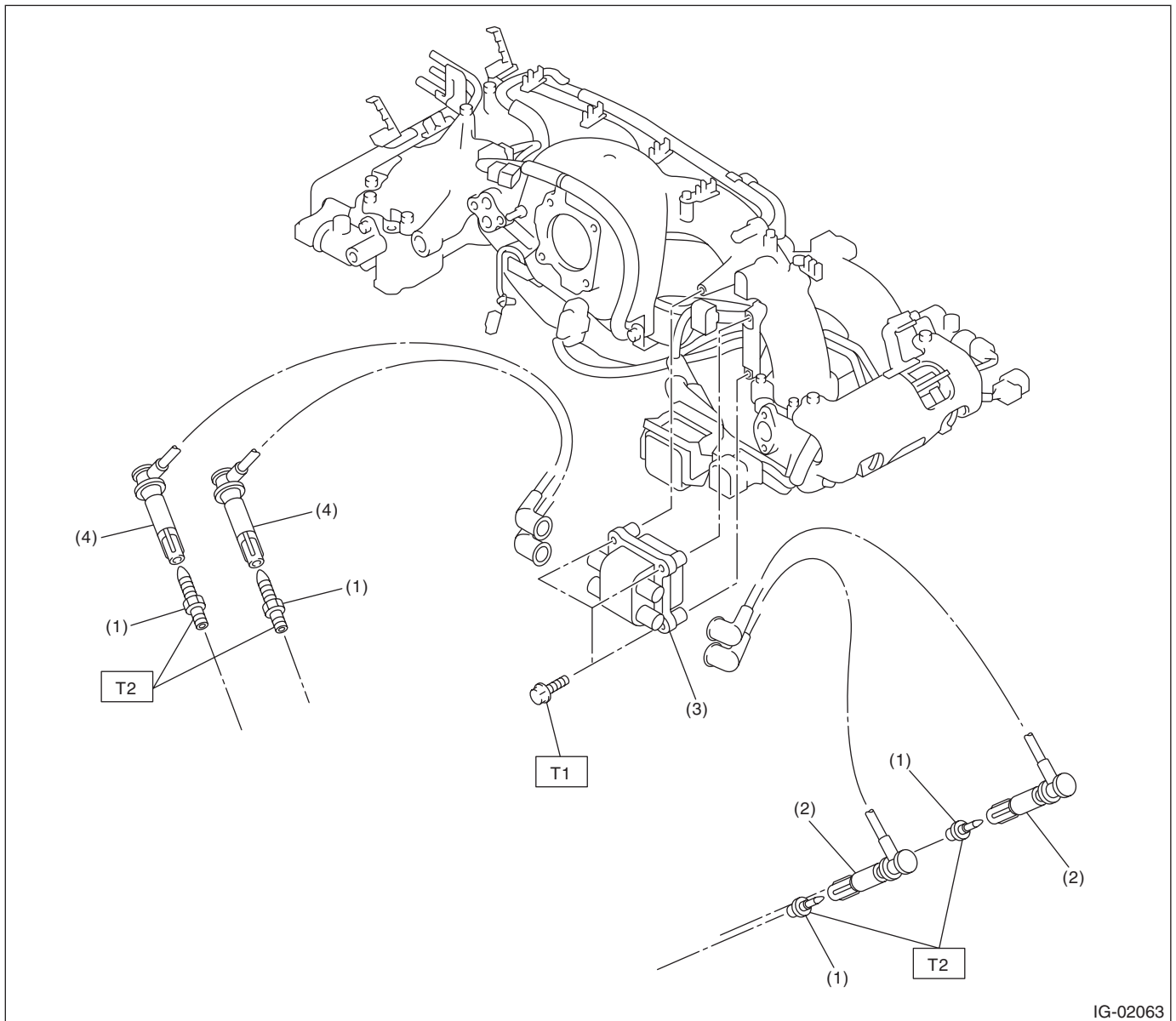
IGNITION

1. General Description

A: SPECIFICATION

Item		Specification	
Ignition coil and ignitor assembly	Type	FH 0286	
	Manufacturer	Diamond Electric	
	Secondary coil resistance	11.2 kΩ±15%	
Spark plug	Manufacturer and type	NGK: FR5AP-11	
	Thread size (diameter, pitch, length)	mm	14, 1.25, 19
	Spark plug gap	mm (in)	1.0 — 1.1 (0.039 — 0.043)
	Electrode		Platinum

B: COMPONENT



- (1) Spark plug
- (2) Spark plug cord (#1, #3)
- (3) Ignition coil and ignitor ASSY
- (4) Spark plug cord (#2, #4)

Tightening torque: N·m (kgf·m, ft·lb)
T1: 6.4 (0.65, 4.7)
T2: 21 (2.1, 15.2)

C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from the battery.

Spark Plug

IGNITION

2. Spark Plug

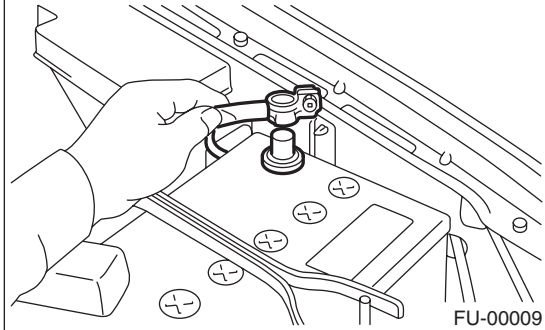
A: REMOVAL

Spark plug:

<Ref. to IG(H4SO)-2, SPECIFICATION, General Description.>

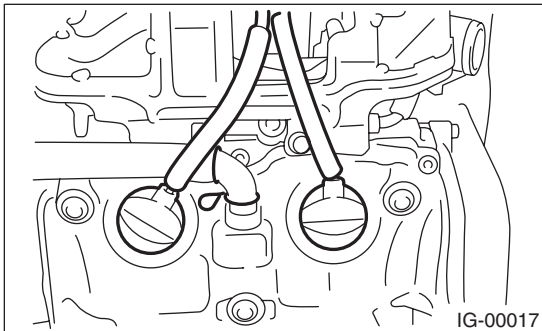
1. RH SIDE

- 1) Disconnect the ground cable from the battery.

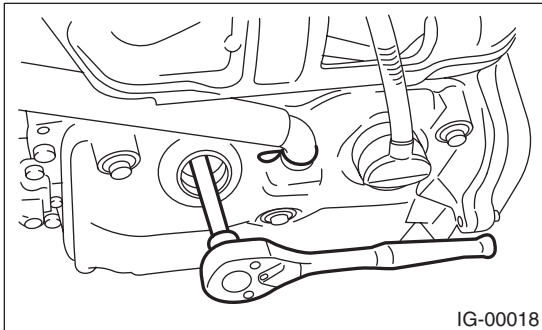


- 2) Remove the air cleaner case. <Ref. to IN (H4SO)-5, REMOVAL, Air Cleaner Case.>

- 3) Remove the spark plug cords by pulling the boot. (Do not pull the cord itself.)

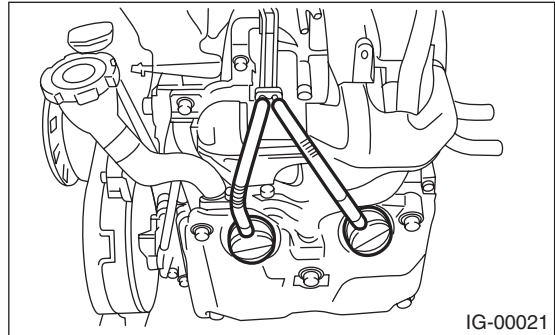


- 4) Remove the spark plug with a spark plug socket.

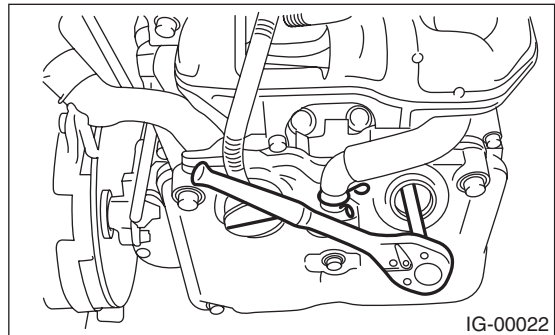


2. LH SIDE

- 1) Remove the battery.
- 2) Remove the spark plug cords by pulling the boot. (Do not pull the cord itself.)



- 3) Remove the spark plug with a spark plug socket.



B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

Tightening torque:

21 N·m (2.1 kgf-m, 15.2 ft-lb)

NOTE:

The tightening torque described above should be applied to only new spark plugs without oil on their threads.

In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

2. LH SIDE

Install in the reverse order of removal.

Tightening torque:

21 N·m (2.1 kgf-m, 15.2 ft-lb)

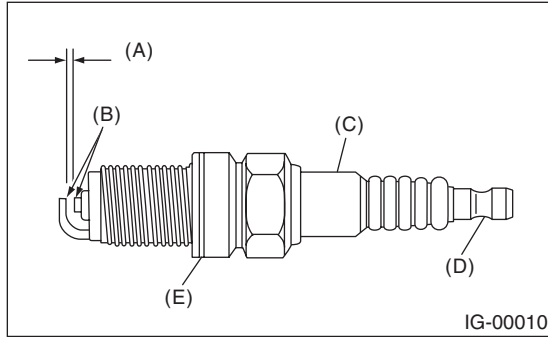
NOTE:

The tightening torque described above should be applied to only new spark plugs without oil on their threads.

In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

C: INSPECTION

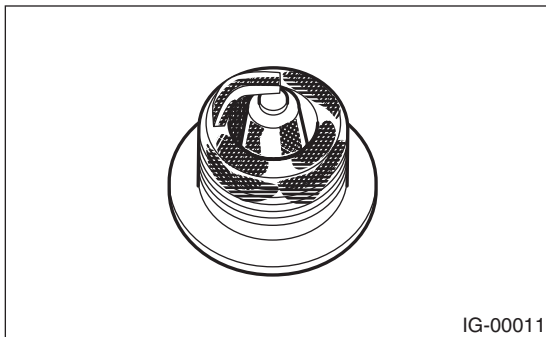
Check the electrodes and inner and outer ceramic insulator of plugs, noting the type of deposits and the degree of electrode erosion.



- (A) Spark plug gap
- (B) Carbon accumulation or wear
- (C) Crack
- (D) Damage
- (E) Damaged gasket

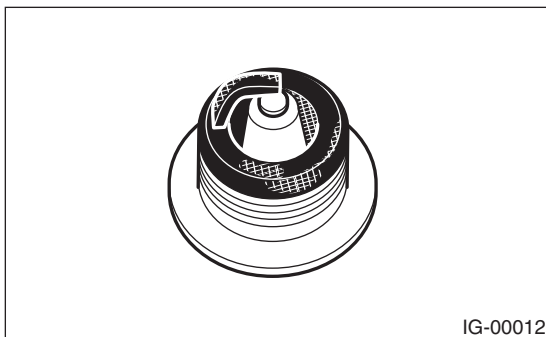
1) Normal:

Brown to grayish-tan deposits and slight electrode wear indicate correct spark plug heat range.



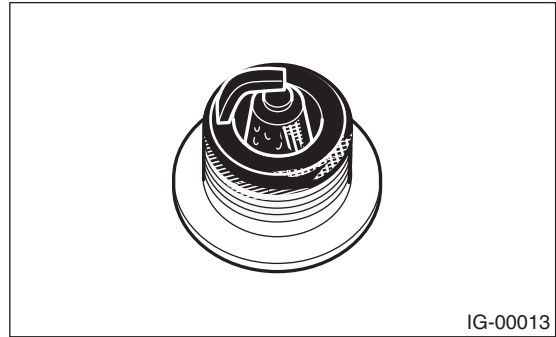
2) Carbon fouled:

Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in the city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.



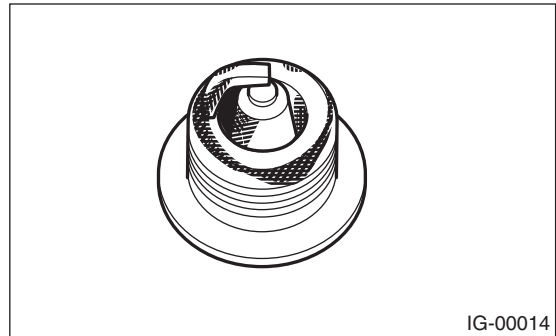
3) Oil fouled:

Wet black deposits show oil entrance into combustion chamber through worn rings or increased clearance between valve guides and stems.



4) Overheating:

White or light gray insulator with black or brown spots and bluish burnt electrodes indicates engine overheating, incorrect ignition timing, improper fuel, or loose spark plugs.



D: ADJUSTMENT

Clean the spark plugs using a wire brush. Clean and remove the carbon or oxide deposits. But do not wear away ceramic insulator at this time. If deposits are too stubborn, replace the spark plugs.

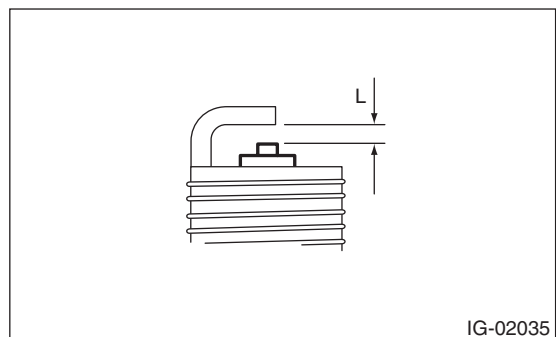
After cleaning the spark plugs, measure the spark plug gap using a gap gauge.

NOTE:

Do not use a plug cleaner because the spark plugs are applied with platinum tip.

Spark plug gap: *L*

1.0 — 1.1 mm (0.039 — 0.043 in)



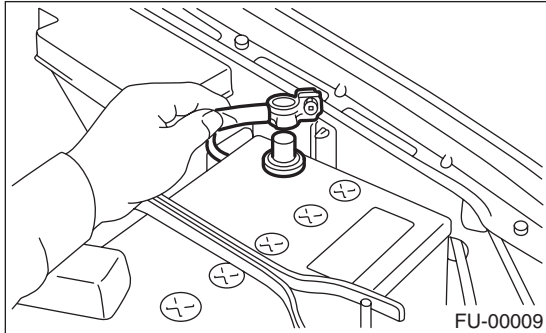
Ignition Coil and Ignitor Assembly

IGNITION

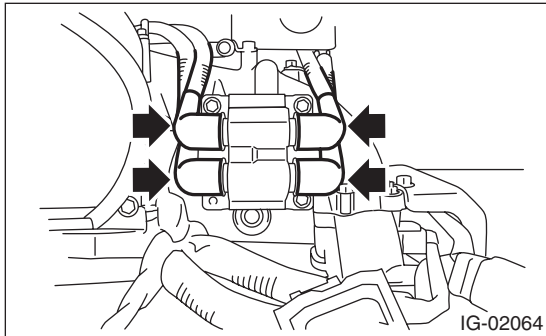
3. Ignition Coil and Ignitor Assembly

A: REMOVAL

1) Disconnect the ground cable from the battery.

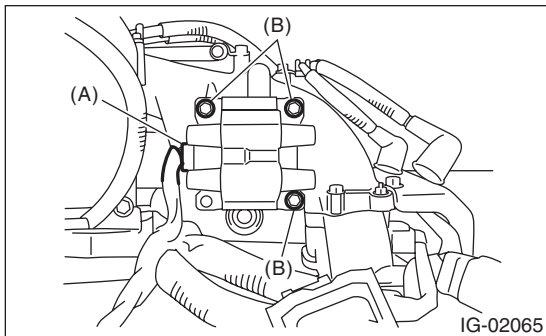


2) Disconnect the spark plug cords from ignition coil and ignitor assembly.



3) Disconnect the connector (A) from ignition coil and ignitor assembly.

4) Remove the bolt (B) which secures the ignition coil and ignitor assembly to intake manifold.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

CAUTION:

Connect the spark plug cords to correct positions. Failure to do so will damage the unit.

C: INSPECTION

Check the following items using a tester. Replace if defective.

- Secondary coil resistance

CAUTION:

- If the resistance is extremely low, it indicates the presence of a short-circuit.
- Ignitor is integrated with the coil. Therefore the resistance of primary side coil cannot be measured.

Specified resistance:

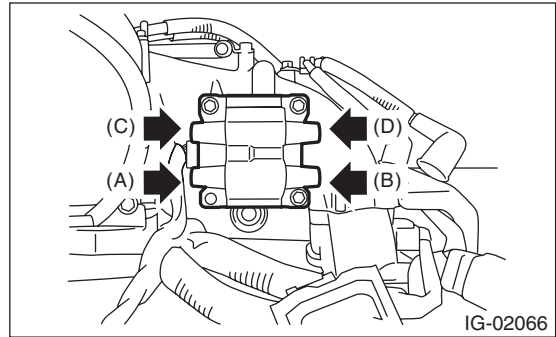
[Secondary side]

Between (A) and (B)

11.2 kΩ±15%

Between (C) and (D)

11.2 kΩ±15%



4. Spark Plug Cord

A: INSPECTION

Check the following items.

- Damage to cords, deformation, burning or rust formation of terminals
- Resistance value of cords

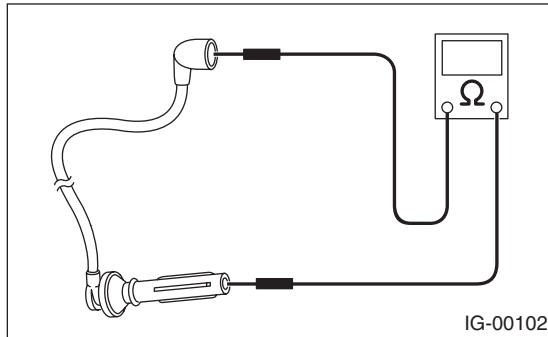
Specified resistance:

#1 cord: 7.1 — 12.1 k Ω

#2 cord: 12.1 — 19.9 k Ω

#3 cord: 7.7 — 13.0 k Ω

#4 cord: 12.3 — 20.2 k Ω



Spark Plug Cord

IGNITION

IG(H4SO)-8

General Description

STARTING/CHARGING SYSTEMS

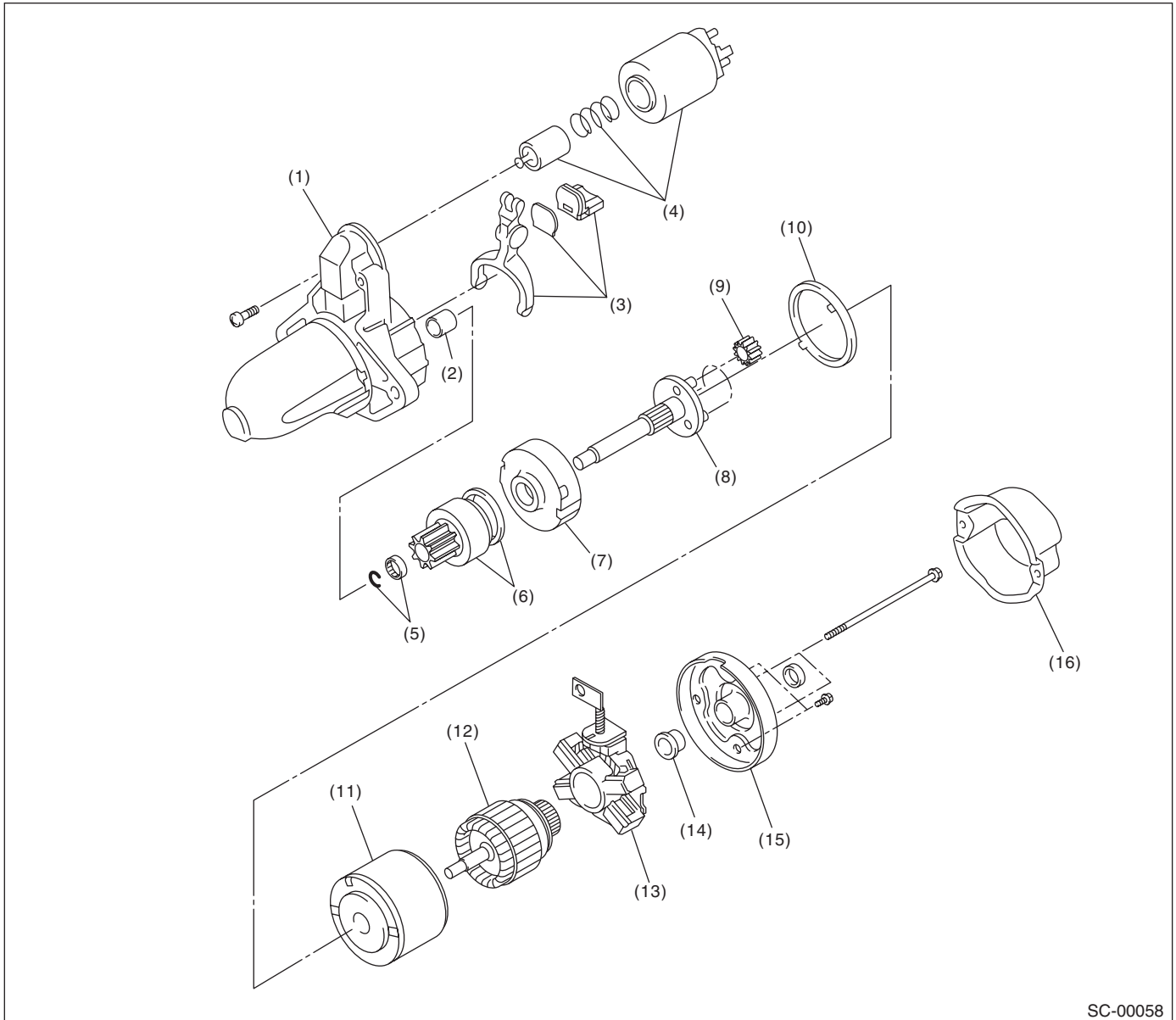
1. General Description

A: SPECIFICATION

Item		Specification		
Vehicle model		MT	AT	
Starter	Type	Reduction type		
	Model	M000T30471	M000T20171	
	Manufacturer	Mitsubishi Electric		
	Voltage and output	12 V — 1.0 kW	12 V — 1.4 kW	
	Direction of rotation	Counterclockwise (when observed from pinion)		
	Number of pinion teeth	8	9	
	No-load characteristics	Voltage	11 V	
		Current	95 A or less	90 A or less
		Rotating speed	More than 2,500 rpm	More than 2,000 rpm
	Load characteristics	Voltage	7.5 V	7.7 V
		Current	300 A	400 A
		Torque	8.84 N·m (0.90 kgf-m, 6.5 ft-lb) or more	16.7 N·m (1.70 kgf-m, 12.3 ft-lb) or more
		Rotating speed	More than 870 rpm	More than 710 rpm
	Lock characteristics	Voltage	4 V	3.5 V
		Current	680 A or less	960 A or less
Torque		17 N·m (1.73 kgf-m, 12.5 ft-lb) or more	31 N·m (3.16 kgf-m, 22.9 ft-lb) or more	
Generator	Type	Rotating-field three-phase type, voltage regulator built-in type, with load response control system		
	Model	Non-turbo	A2TG0391	
		Turbo	A3TG0491	
	Manufacturer	Mitsubishi Electric		
	Voltage and output	Non-turbo	12 V — 90 A	
		Turbo	12 V — 110 A	
	Polarity on ground side	Negative		
	Direction of rotation	Clockwise (when observed from pulley side)		
	Armature connection	3-phase Y-type		
	Output current	Non-turbo	1,500 rpm — 40 A or more 2,500 rpm — 74 A or more 5,000 rpm — 84 A or more	
Turbo		1,500 rpm — 50 A or more 2,500 rpm — 91 A or more 5,000 rpm — 105 A or more		
Regulated voltage	14.1 — 14.8 V [20°C (68°F)]			
Battery	Voltage and capacity	12V-48AH (55D23L)	12V-52AH (75D23L)	

B: COMPONENT

1. STARTER



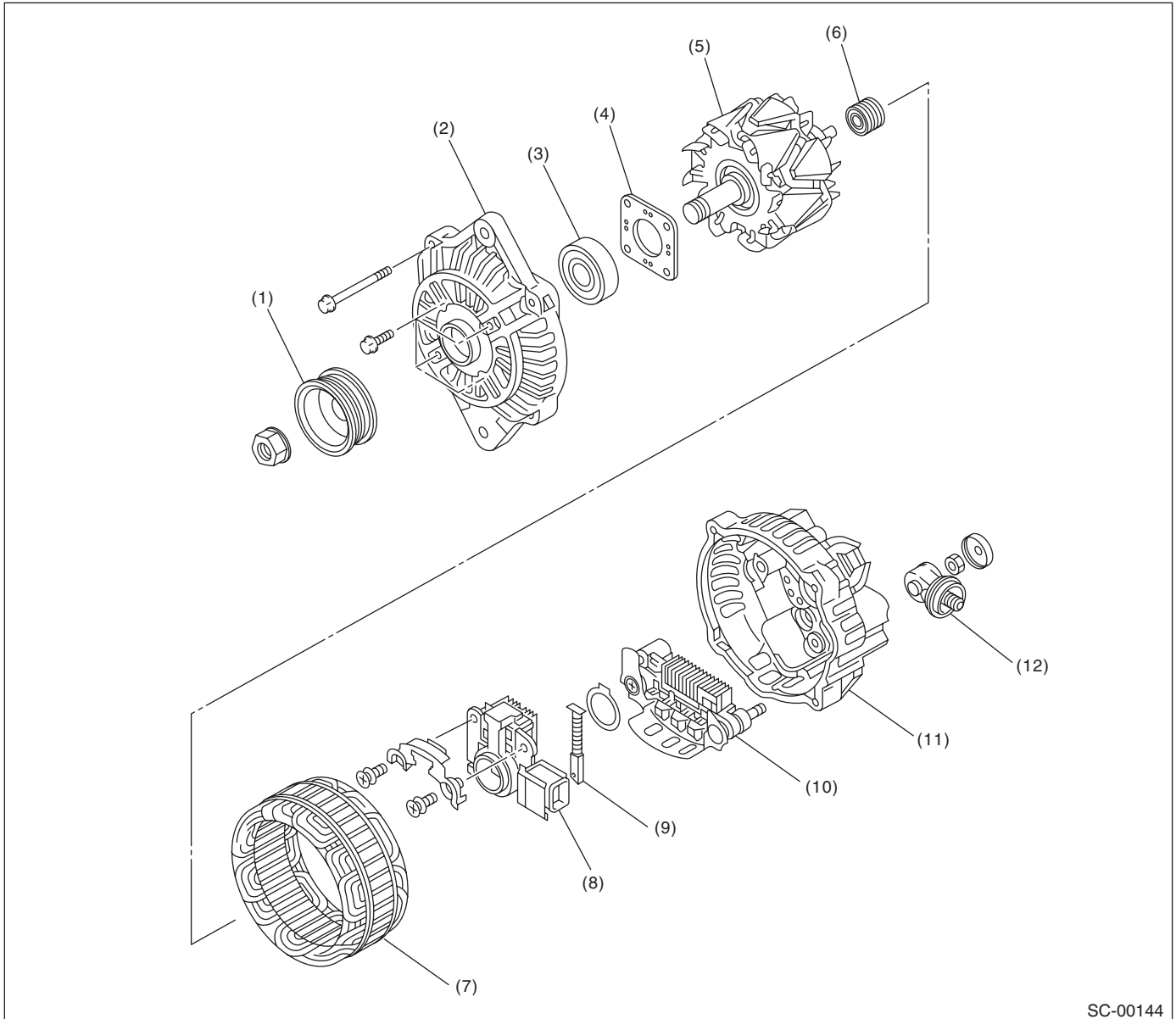
SC-00058

- | | | |
|------------------------|------------------------|------------------------|
| (1) Front bracket | (7) Internal gear ASSY | (12) Armature |
| (2) Sleeve bearing | (8) Shaft ASSY | (13) Brush holder ASSY |
| (3) Lever set | (9) Gear ASSY | (14) Sleeve bearing |
| (4) Switch ASSY | (10) Packing | (15) Rear cover |
| (5) Stopper set | (11) Yoke ASSY | (16) Rear cover set |
| (6) Overrunning clutch | | |

General Description

STARTING/CHARGING SYSTEMS

2. GENERATOR



SC-00144

- | | | |
|----------------------|-----------------------------|-----------------|
| (1) Pulley | (5) Rotor | (9) Brush |
| (2) Front cover | (6) Bearing | (10) Rectifier |
| (3) Ball bearing | (7) Starter coil | (11) Rear cover |
| (4) Bearing retainer | (8) IC regulator with brush | (12) Terminal |

C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from the battery.

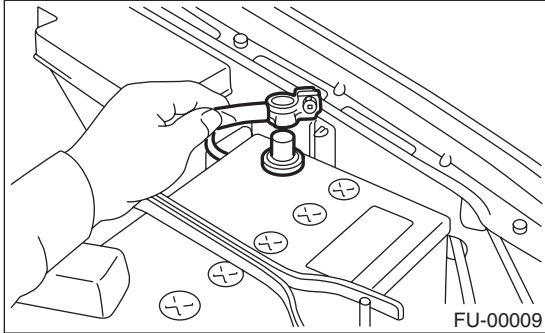
Starter

STARTING/CHARGING SYSTEMS

2. Starter

A: REMOVAL

1) Disconnect the ground cable from the battery.



2) Remove the collector cover. (Turbo model)

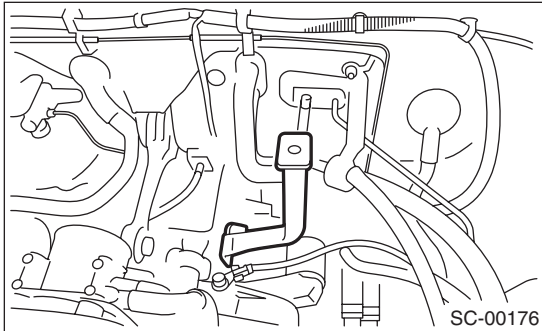
3) Remove the air intake chamber. (Non-turbo model)

<Ref. to IN (H4SO)-6, REMOVAL, Air Intake Chamber.>

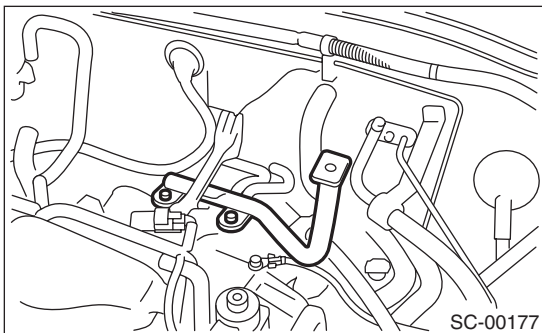
4) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>

5) Remove the air intake chamber stay LH. (Non-turbo model)

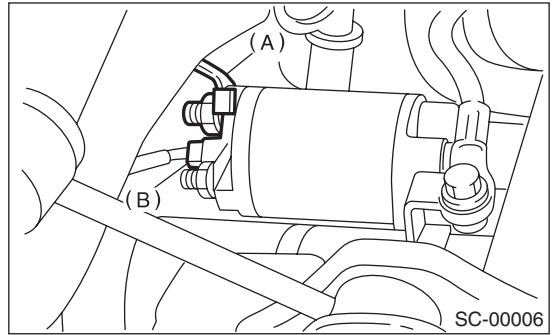
• MT model



• AT model



6) Disconnect the connector and terminal from starter.



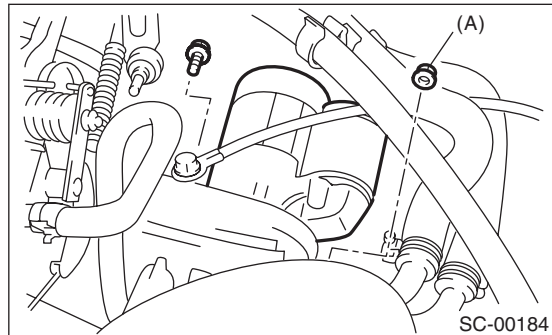
(A) Terminal

(B) Connector

7) Remove the starter from transmission.

NOTE:

For MT model, the bolt is used in place of nut (A) shown in the figure.



B: INSTALLATION

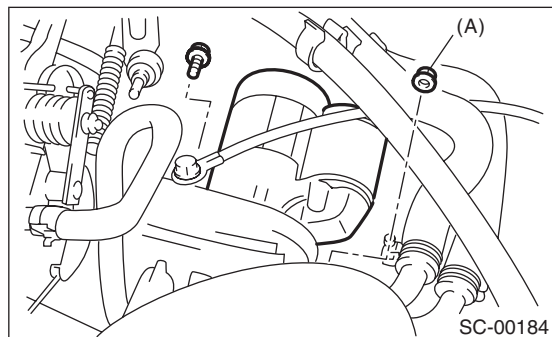
Install in the reverse order of removal.

NOTE:

For MT model, the bolt is used in place of nut (A) shown in the figure.

Tightening torque:

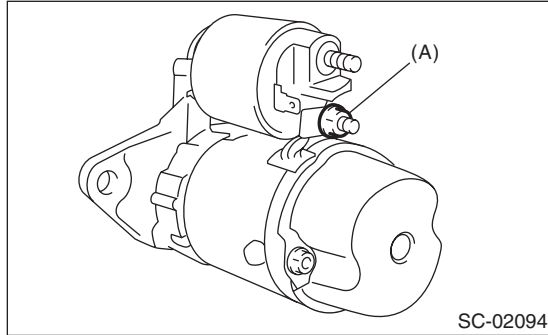
50 N·m (5.1 kgf-m, 37 ft-lb)



C: DISASSEMBLY

1. STARTER ASSEMBLY

1) Loosen the nuts fastening the switch assembly terminal M, then disconnect the connector.

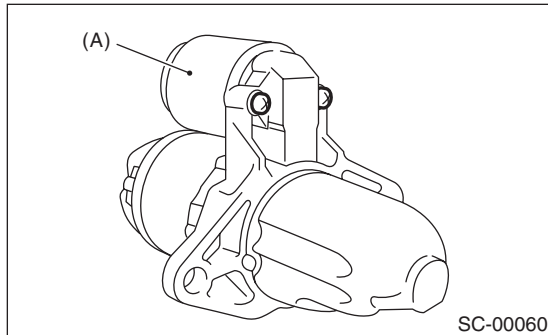


(A) Terminal M

2) Remove the bolts fastening the switch assembly, then remove the switch assembly, plunger and plunger spring as a unit from the starter.

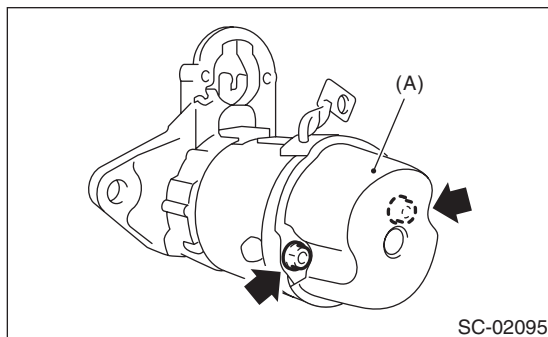
NOTE:

Be careful because the pinion gap adjustment washer may sometimes be used on the mounting surface of the switch assembly.



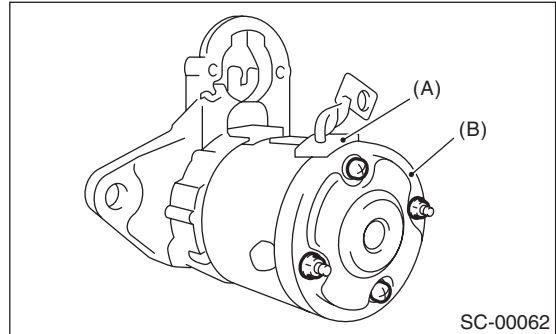
(A) Switch ASSY

3) Remove the bolts on both sides, then remove rear cover set.



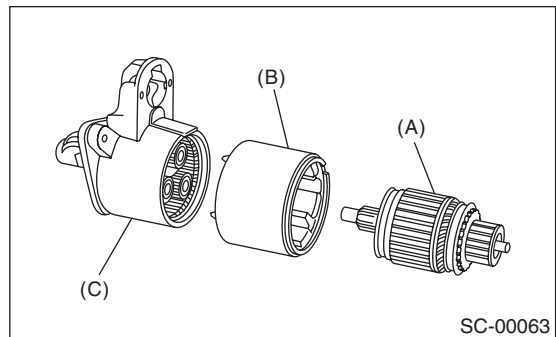
(A) Rear cover set

4) Remove the bolts passing through both sides, and the brush holder screws, then remove rear cover and brush holder assembly.



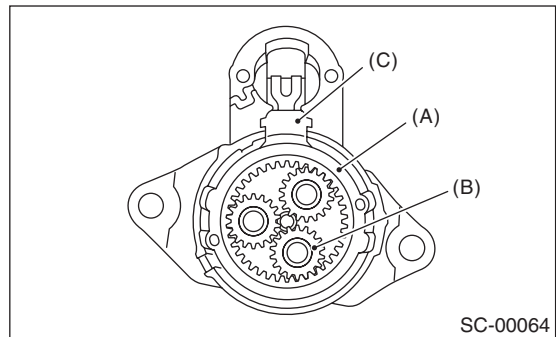
(A) Brush holder ASSY
(B) Rear cover

5) Remove the armature and yoke assembly from the front bracket.



(A) Armature
(B) Yoke ASSY
(C) Front bracket

6) Remove the packing A, planetary gears and packing B.

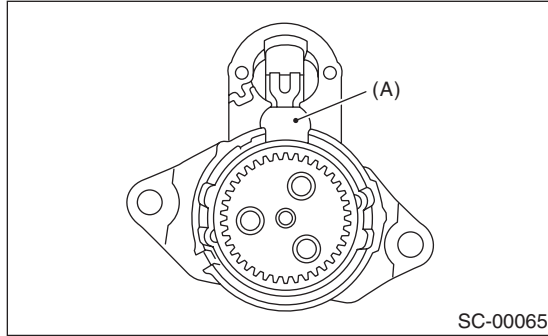


(A) Packing A
(B) Planetary gear
(C) Packing B

Starter

STARTING/CHARGING SYSTEMS

7) Remove the plate.



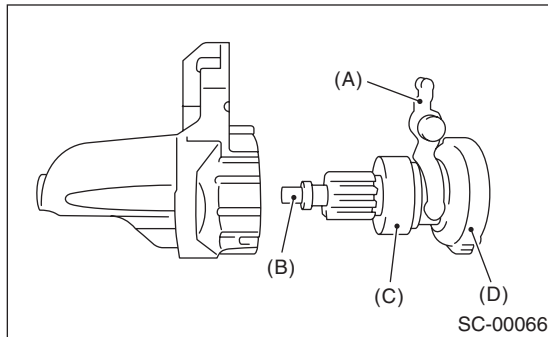
(A) Plate

8) Remove the front assembly and overrunning clutch from the front bracket.

NOTE:

Check the following points before removal.

- Lever direction
- Internal gear assembly position

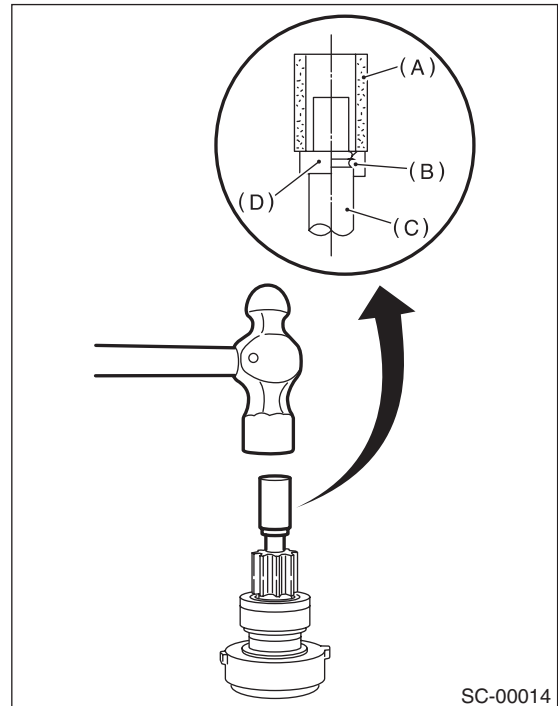


- (A) Lever
- (B) Shaft ASSY
- (C) Overrunning clutch
- (D) Internal gear ASSY

9) Use the following procedures to remove the overrunning clutch from the shaft assembly.

(1) Use the appropriate tool (such as the right size of socket wrench) to lightly tap on the stopper to remove it from the ring.

(2) Remove the ring, spacer, and clutch from the shaft.



- (A) Socket wrench
- (B) Ring
- (C) Shaft
- (D) Stopper

D: ASSEMBLY

NOTE:

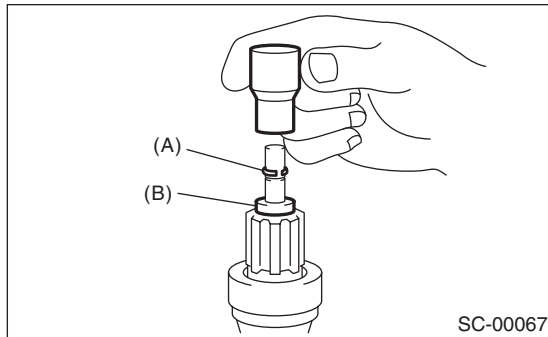
Apply grease to the following parts before assembly.

- Sleeve bearing
- Pinion shaft rotational portion
- Shaft spline portion
- Inside of reduction system
- Lever fulcrum/Clutch rotational portion

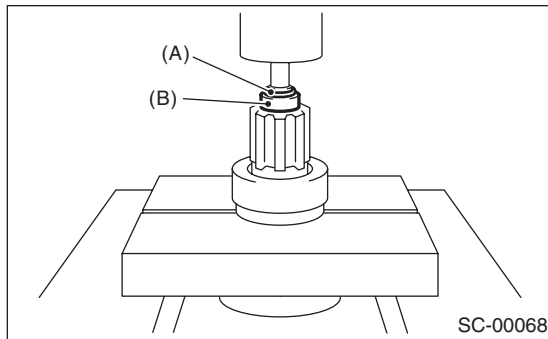
1) Install the overrunning clutch to the shaft assembly.

2) Use the following procedures to install stopper to the shaft assembly.

(1) Use the appropriate tool (such as the right size of socket wrench) to lightly tap on the ring to insert it into the shaft groove.



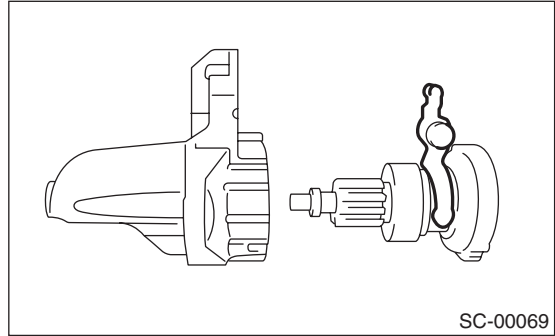
(2) Using the ST, press the stopper into the ring.



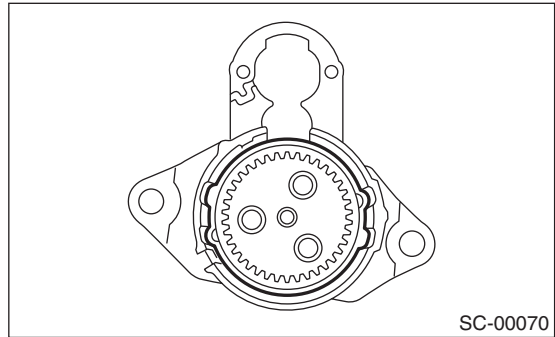
- (A) Ring
- (B) Stopper

3) Be careful of the following to install the shaft assembly to the front bracket.

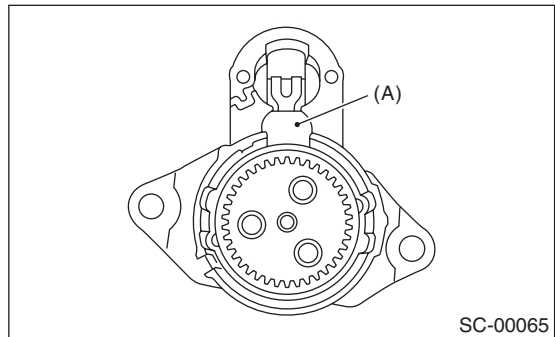
(1) Lever direction



(2) Internal gear position



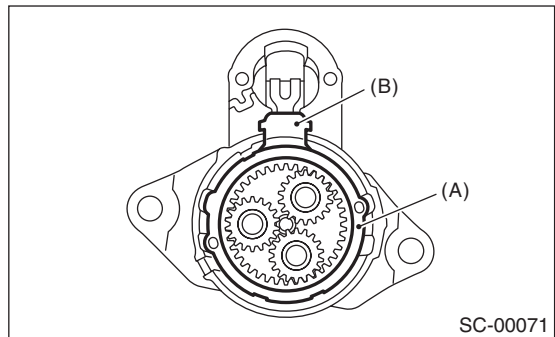
4) Install the plate.



- (A) Plate

5) Install the planetary gear.

6) Be careful of the installation position to install the packing A and B.



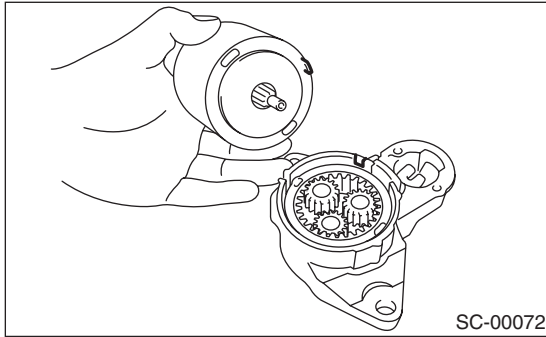
- (A) Packing A
- (B) Packing B

7) Install the armature to the yoke assembly.

Starter

STARTING/CHARGING SYSTEMS

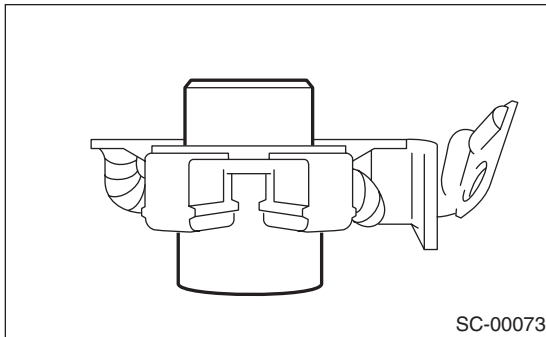
8) Align the yoke assembly with the groove and install it to the front bracket.



SC-00072

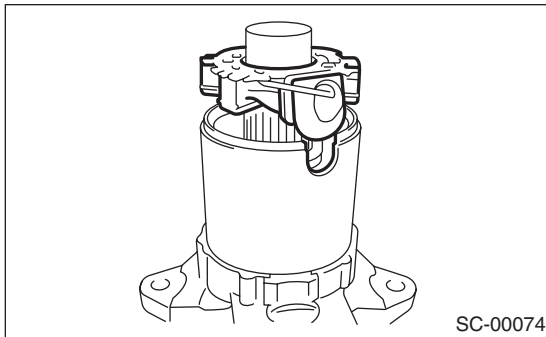
9) Use the following procedures to install the brush holder to the yoke assembly.

(1) Push the brush into the brush holder, then use the appropriate tool (such as the right size of socket wrench) to fasten in position.



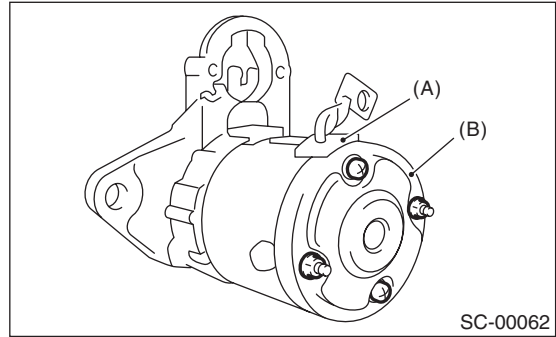
SC-00073

(2) Align the brush holder with the groove in the yoke assembly, the slide to install.



SC-00074

10) Align the rear cover groove with the brush holder assembly to install.

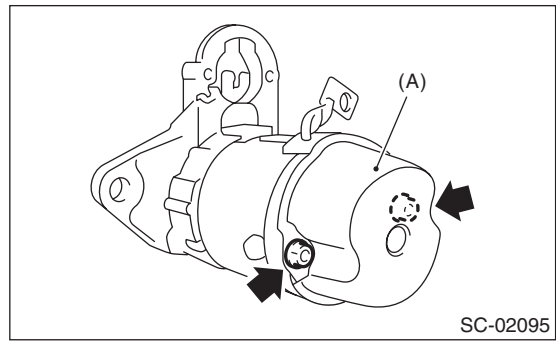


SC-00062

(A) Brush holder ASSY

(B) Rear cover

11) Install the rear cover set.



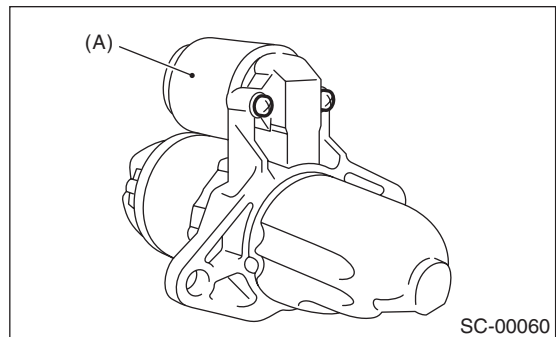
SC-02095

(A) Rear cover set

12) Use the following procedures to install the switch assembly to the front bracket.

(1) Insert the plunger and plunger spring into the switch assembly.

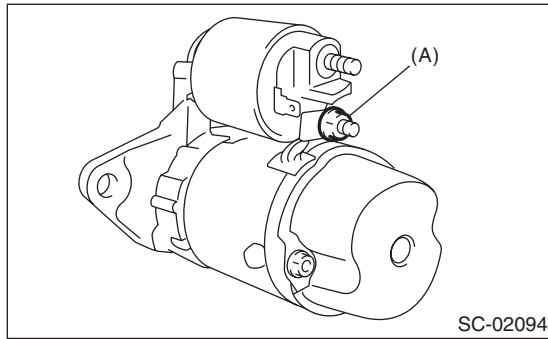
(2) Hook the protrusion on the plunger onto the lever end, then install to the front bracket.



SC-00060

(A) Switch ASSY

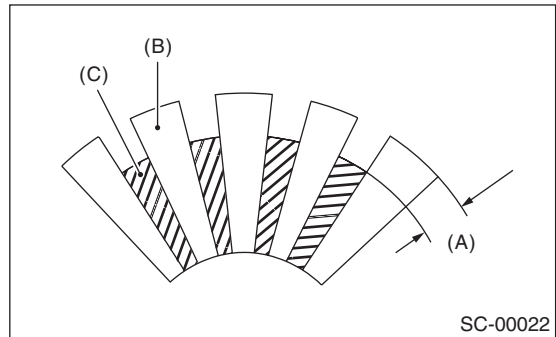
13) Install the connector to the switch assembly terminal M.



(A) Terminal M

3) Depth of segment mold
Check the depth of the segment mold.

Depth of segment mold:
0.5 mm (0.020 in)



(A) Depth of segment mold
(B) Segment
(C) Mold

E: INSPECTION

1. ARMATURE

1) Check the commutator for signs of seizure or stepped wear caused by roughness of the surface. If there is light wear, use sandpaper to repair.

2) Run-out test
Check for run-out on the commutator. If excessive, replace it.

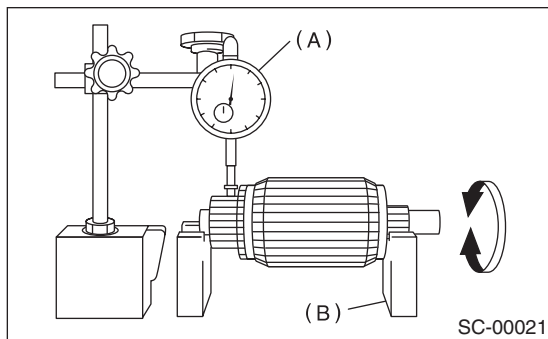
Commutator run-out:

Standard:

0.05 mm (0.0020 in)

Service limit:

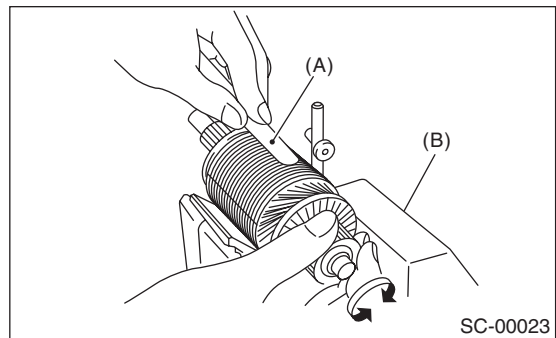
0.10 mm (0.0039 in) or less



(A) Dial gauge
(B) V-block

4) Armature short-circuit test

Place the armature on the growler tester to check for short circuits. While slowly turning the armature, support the steel seat for the armature core. If the circuits on the armature are shorted, the steel seat will vibrate, causing it to move to the core. When the steel seat has moved and vibrated, replace or repair the armature with the shorted circuit.



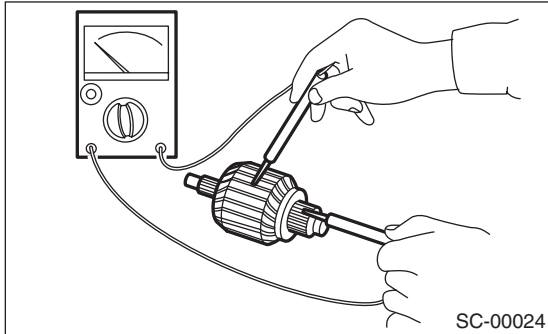
(A) Steel seat
(B) Growler tester

Starter

STARTING/CHARGING SYSTEMS

5) Armature ground test

Use a circuit tester to touch the probe of one side to the commutator segment, and the other probe to the shaft. If there is no continuity, it is normal. If there is continuity, the armature is grounded. If grounded, replace the armature.



2. YOKE

Make sure that the pole is set at the predetermined position.

3. OVERRUNNING CLUTCH

Check that there is no wear or damage to the piston teeth. Replace if damaged. If it rotates smoothly when rotated in the correct direction (counterclockwise) and does not return to the other direction, it is normal.

CAUTION:

To prevent spilling of grease, do not clean the overrunning clutch with oil.

4. BRUSH AND BRUSH HOLDER

1) Brush length

Measure the length of the brush. If it exceeds service limits, replace it.

Replace if there is wear or fissures.

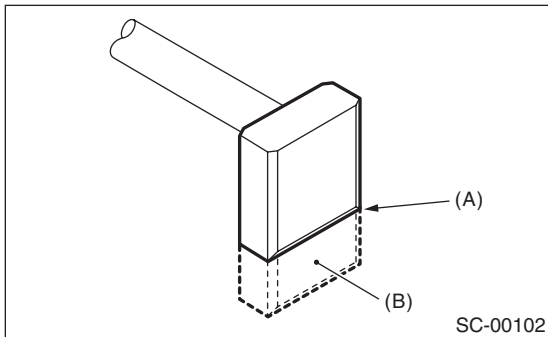
Brush length:

Standard:

12.3 mm (0.484 in)

Service limit:

7.0 mm (0.276 in)



(A) Service limit line

(B) Brush

2) Brush movement

Check that the brush moves smoothly in the brush holder.

3) Brush spring force

Measure the brush spring force with a spring scale. Replace the brush holder if below the service limit.

Brush spring force:

Standard:

15.9 — 19.5 N (1.62 — 1.99 kgf, 3.57 — 4.38 lb) (When new)

Service limit:

2.5 N (0.25 kgf, 0.56 lb)

5. SWITCH ASSEMBLY

Using a circuit tester (set in Ω), check that there is continuity between terminals S and M, and between terminal S and ground.

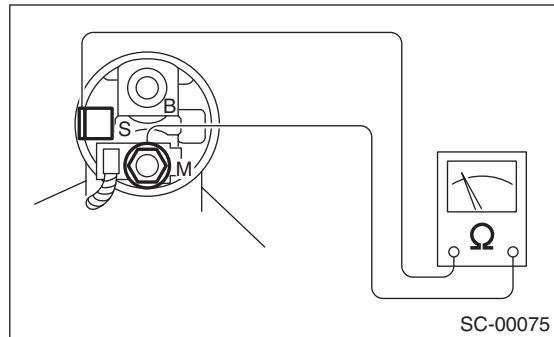
Also check to be sure there is no continuity between terminal M and B.

Terminal / Resistance:

S — M/1 Ω or less

S — Ground/1 Ω or less

M — B/1 M Ω or more



6. SWITCH ASSEMBLY OPERATION

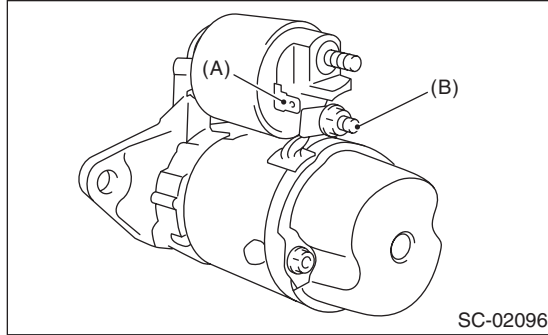
1) Using a lead wire, connect the terminal S of switch assembly to positive terminal of battery, and starter body to ground terminal of battery. The pinion should be forced endwise on shaft.

NOTE:

With the pinion forced endwise on shaft, starter motor can sometimes rotate because current flows, through pull-in coil, to motor. This is not a problem.

2) Disconnect the connector from terminal M. Then using a lead wire, connect the positive terminal of battery and terminal M and ground terminal to starter body.

In this test set up, the pinion should return to its original position even when it is pulled out with a screwdriver.



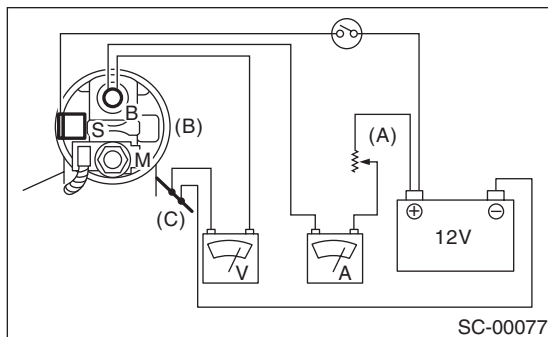
(A) Terminal S
(B) Terminal M

7. PERFORMANCE TEST

The starter should be submitted to performance tests whenever it has been overhauled, to assure its satisfactory performance when installed on the engine.

Three performance tests, no-load test, load test, and lock test, are presented here; however, if the load test and lock test cannot be performed, carry out at least the no-load test.

For these performance tests, use the circuit shown in figure.



(A) Variable resistance
(B) Starter body
(C) Magnetic switch

1) No-load test

With switch on, adjust the variable resistance until the voltage is 11 V, read the value of ammeter to measure starter speed. Compare these values with the standard.

No-load test (Standard):

Voltage/Current

MT model

Max. 11 V / 95 A

AT model

Max. 11 V / 90 A

Rotating speed:

MT model

More than 2,500 rpm

AT model

More than 2,000 rpm

2) Load test

Apply the specified braking torque to starter. The condition is normal if the current draw and starter speed are within standard.

Load test (Standard):

Voltage/Load:

MT model

7.5 V/8.84 N·m (0.90 kgf-m, 6.5 ft-lb)

AT model

7.7 V/16.7 N·m (1.7 kgf-m, 12.3 ft-lb)

Current/Speed:

MT model

300 A/870 rpm or more

AT model

400 A/710 rpm or more

3) Lock test

With the starter stalled, or not rotating, measure the torque developed and current draw when the voltage is adjusted to standard voltage.

Lock test (Standard):

Voltage/Current

MT model

4 V / 680 A or less

AT model

3.5 V / 960 A or less

Torque:

MT model

17.0 N·m (1.73 kgf-m, 12.5 ft-lb) or more

AT model

31.0 N·m (3.16 kgf-m, 22.9 ft-lb) or more

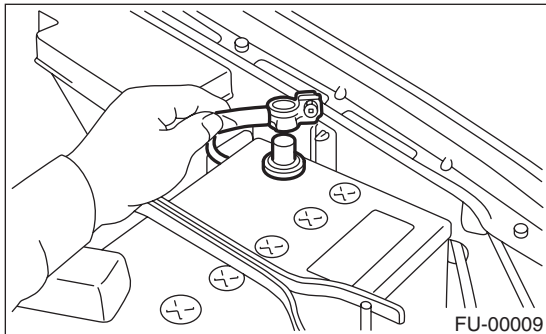
Generator

STARTING/CHARGING SYSTEMS

3. Generator

A: REMOVAL

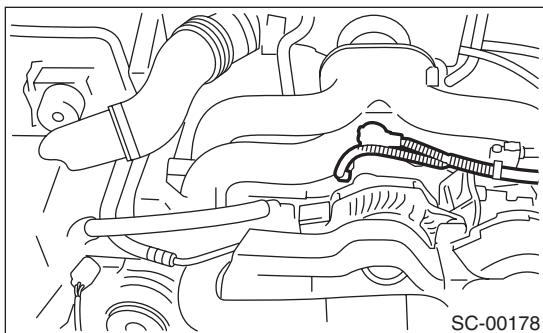
1) Disconnect the ground cable from the battery.



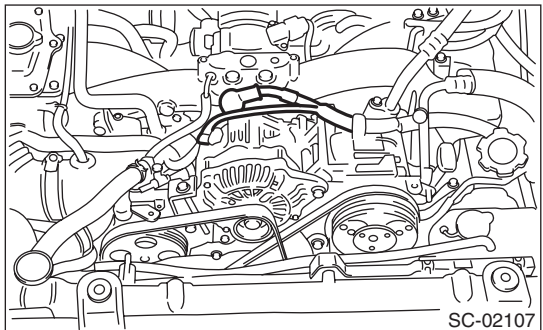
2) Remove the collector cover. (Turbo model)

3) Disconnect the connector and terminal from generator.

- Non-turbo model



- Turbo model

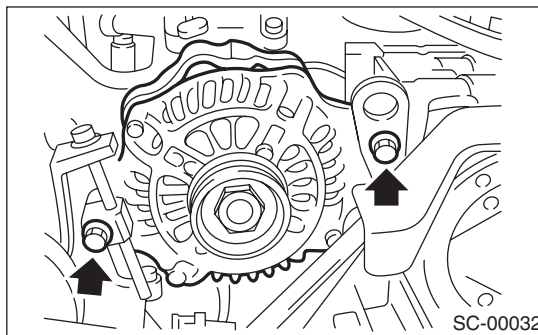


4) Remove the V-belt covers. (Non-turbo model)

5) Remove the front side V-belts.

<Ref. to ME(H4SO)-40, FRONT SIDE BELT, REMOVAL, V-belt.>

6) Remove the bolts which install the bracket to remove the generator.

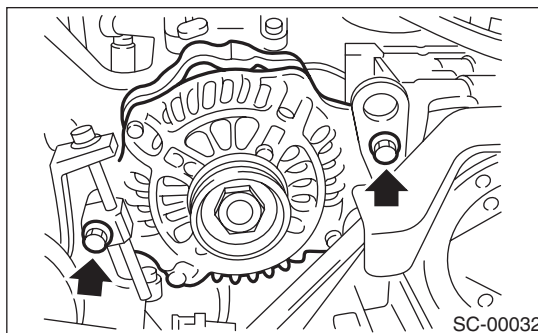


B: INSTALLATION

Install in the reverse order of removal.

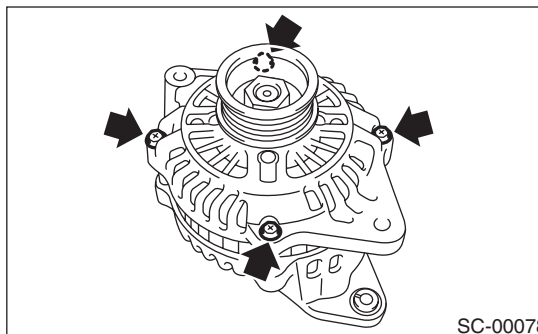
CAUTION:

Check and adjust the V-belt tension. <Ref. to ME(H4SO)-41, INSPECTION, V-belt.> or <Ref. to ME(H4DOTC)-41, INSPECTION, V-belt.>



C: DISASSEMBLY

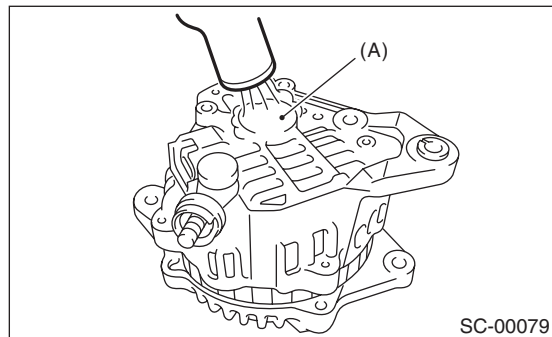
1) Remove the four through-bolts.



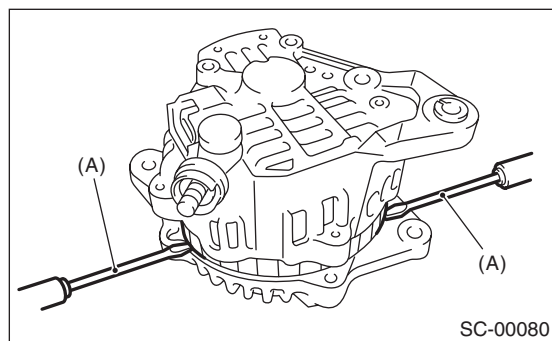
Generator

STARTING/CHARGING SYSTEMS

2) Use a drier to heat the rear cover (A) portion to 50°C (122°F).

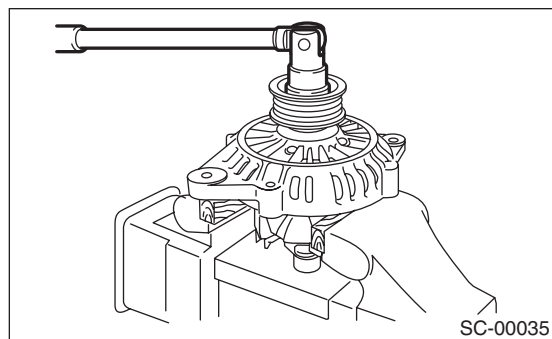


3) Insert the end of a flat tip screwdriver into the gap between stator core and front cover. Separate these to disassemble.



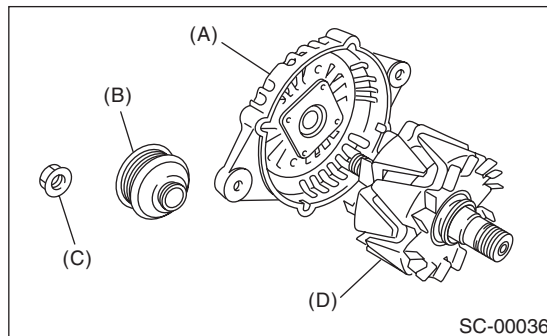
(A) Screwdriver

4) Using a vise, support the rotor and remove the pulley bolt.



CAUTION:

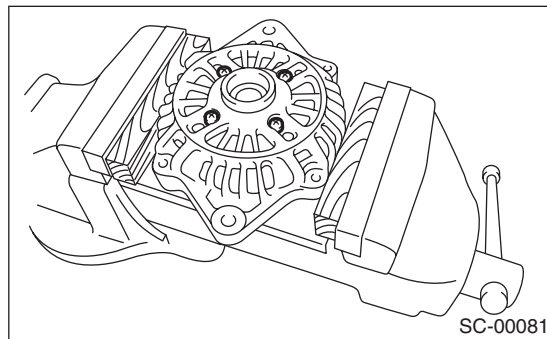
Insert the aluminum plate or wood piece into the contact surface of the vise while support the rotor in the vise to prevent damaging the rotor.



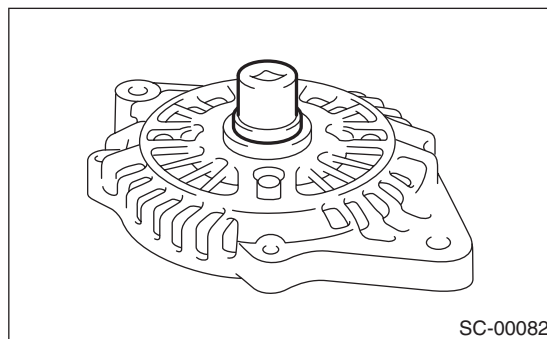
- (A) Front cover
- (B) Pulley
- (C) Nut
- (D) Rotor

5) Use the following procedures to remove the ball bearings.

(1) Remove the bolt, and then detach the bearing retainer.



(2) Firmly install the appropriate tool (such as the right size of socket wrench) to the bearing inner race.

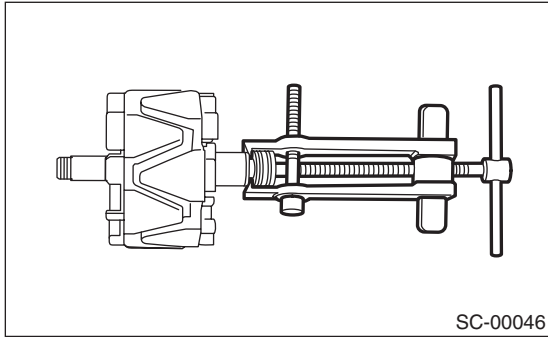


(3) Use the press to push the ball bearings from the front cover.

Generator

STARTING/CHARGING SYSTEMS

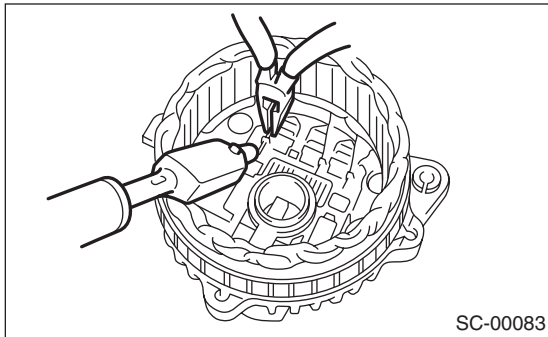
6) Using the bearing puller, remove the bearings from the rotor.



7) Disconnect the connection between the rectifier and stator coil, then remove the stator coil.

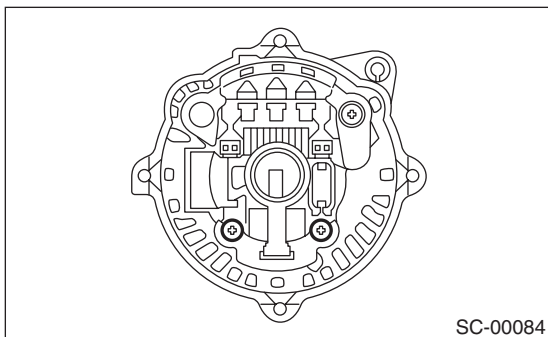
CAUTION:

Do not touch it with 180 to 270 W solder on its terminals for more than 5 seconds consecutively, because the rectifier cannot withstand so much heat.

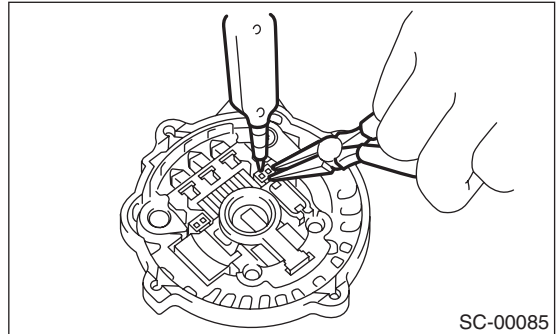


8) Use the following procedures to remove the IC regulator.

(1) Remove the screws which secure IC regulator to the rear cover.

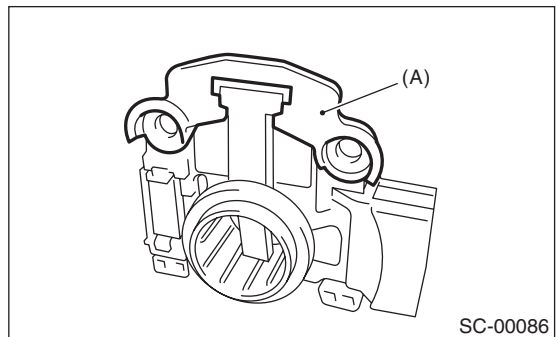


(2) Disconnect the connection between the IC regulator and rectifier, then remove the IC regulator.



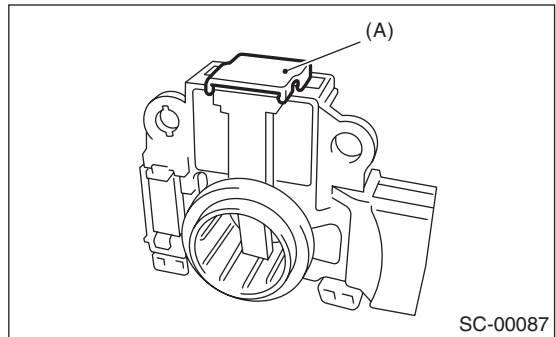
9) Use the following procedures to remove the brush.

(1) Remove the cover A.



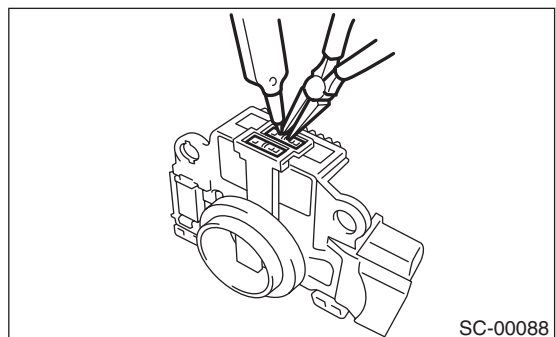
(A) Cover A

(2) Remove the cover B.



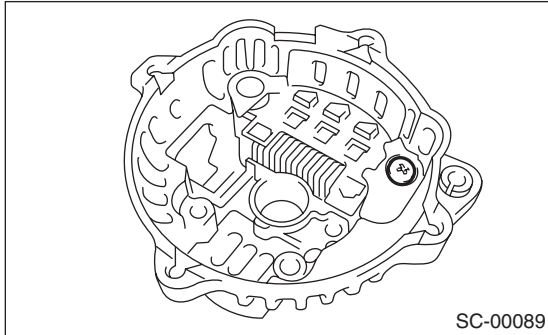
(A) Cover B

(3) Disconnect the connection and remove the brush.

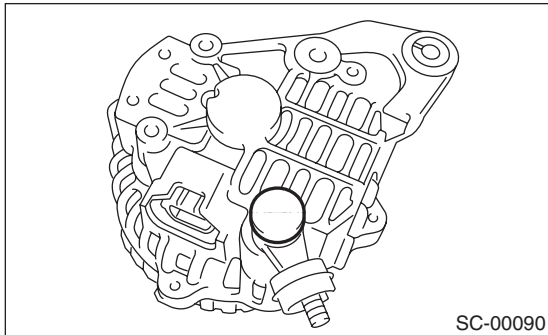


10) Use the following procedures to remove the rectifier.

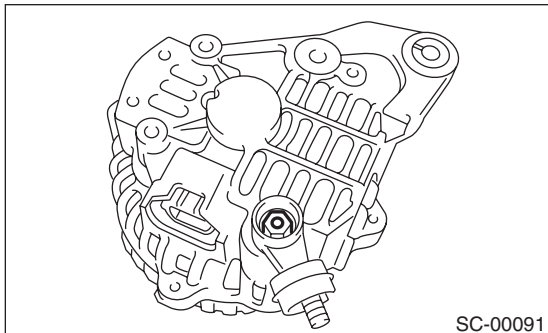
- (1) Remove the bolts which secure the rectifier.



- (2) Remove the cover on the terminal B.



- (3) Remove the nuts of the terminal B, then remove the rectifier.



D: ASSEMBLY

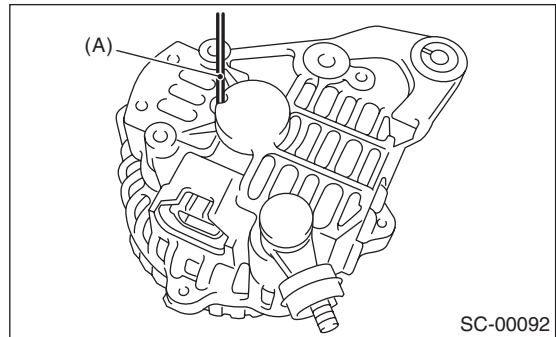
Assemble in the reverse order of disassembly.

- 1) Pull-out of the brush

Before assembling, push the brush into the brush holder. Then pass a wire through the hole (dia. 1 mm (0.0394 in), Length: 4 to 5 cm (1.6 to 2.0 in) and fasten at that position.

CAUTION:

After re-assembling, remove the wire.



(A) Wire

- 2) Install the ball bearings.

- (1) Set the ball bearings in the front cover, then firmly install the appropriate tool (such as the right size of socket wrench) to the bearing outer race.

- (2) Using a press to press the ball bearings into the specified positions.

- (3) Install the bearing retainer.

- 3) Using a press to install the bearings (rear side) to the rotor shaft.

- 4) Heat the bearing box inside the rear cover to [50 to 60° C (122 to 140° F)] and push the rear bearings into the rear cover.

CAUTION:

Do not apply grease to the rear bearings. If oil adheres to the bearing box, completely wipe it away.

- 5) After re-assembling, manually turn the pulley to check that the rotor rotates smoothly.

Generator

STARTING/CHARGING SYSTEMS

E: INSPECTION

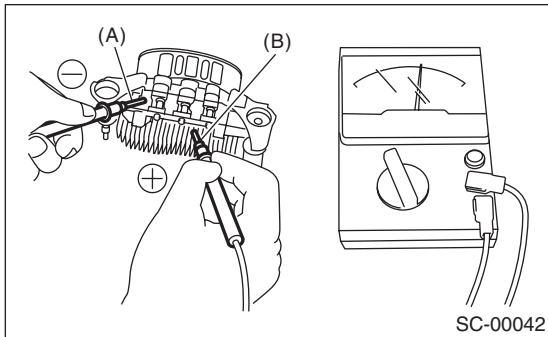
1. DIODE

CAUTION:

There is the possibility of damaging the diodes if a mega-tester (used to measure high voltages) or a similar measuring instrument is used. Therefore, absolutely never use in this test.

1) Check the positive diode

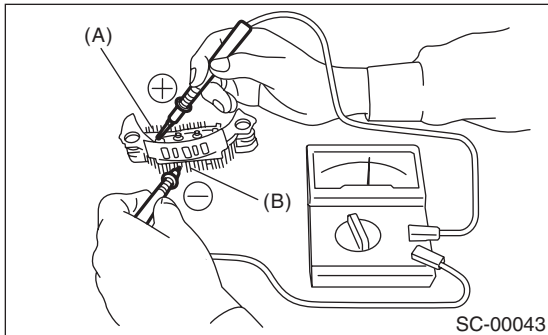
Check the continuity between the diode lead and positive side heat sink. If resistance is $1\ \Omega$ or less only in the direction from the diode lead to the heat sink, the positive diode is normal.



- (A) Diode lead
- (B) Heat sink (Positive side)

2) Check negative diode

Check the continuity between the diode lead and negative side heat sink. If resistance is $1\ \Omega$ or less only in the direction from the heat sink to the diode lead, the negative diode is normal.



- (A) Diode lead
- (B) Heat sink (Negative side)

2. ROTOR

1) Slip ring surface

Check that there is no dirt on the slip ring or roughness in the sliding surface. Repair the slip ring surface using a lathe or sand paper.

2) Slip ring outer diameter

Measure the slip ring outer diameter. Replace the rotor assembly if the slip ring is worn.

Slip ring outer diameter:

Standard:

22.7 mm (0.894 in)

Tolerance limit value:

22.1 mm (0.870 in)

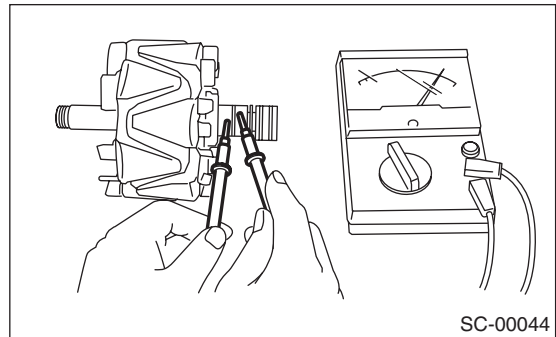
3) Continuity test

Using a circuit tester, check the resistance between slip rings.

Replace the rotor assembly if the resistance is not within the specified value.

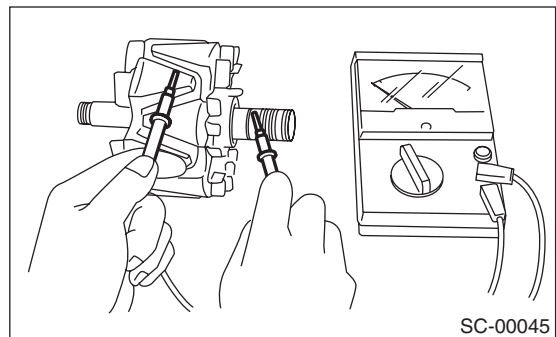
Specified resistance:

Approximately 1.8 — 2.2 Ω



4) Insulation test

Check the continuity between the slip ring and the rotor core or shaft. If the resistance is $1\ \Omega$ or less, replace the rotor assembly because the rotor coil is grounded.



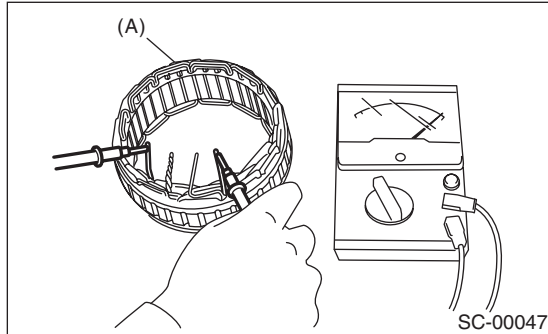
5) Ball bearings (rear side)

Check the rear ball bearings. If there is any noise, or the rotor does not rotate smoothly, replace.

3. STATOR

1) Continuity test

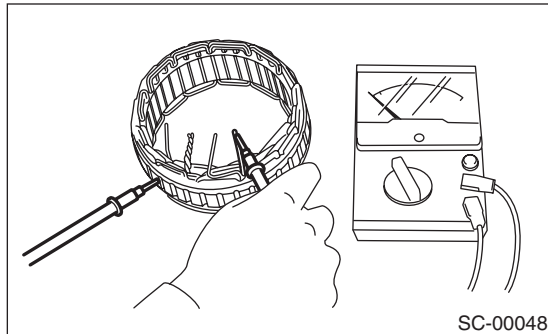
Inspect the continuity between the stator coil lead wire terminals. If the resistance is 1 M Ω or more, replace the stator assembly because the lead wire is damaged.



(A) Stator

2) Insulation test

Inspect the continuity between the stator coil stator core and lead wire terminals. If the resistance is 1 Ω or less, replace the stator assembly because the stator coil is grounded.



4. BRUSH

1) Measure the length of each brush. Replace the brush if wear exceeds service limits. There is a service limit mark (A) on each brush.

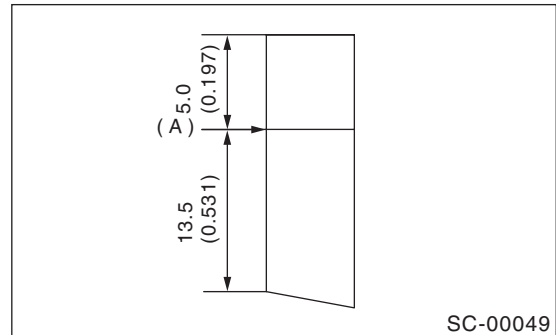
Brush length:

Standard:

18.5 mm (0.728 in)

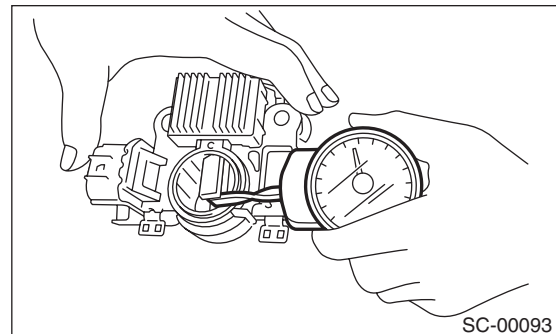
Service limit:

5.0 mm (0.197 in)



2) Check that there is appropriate pressure on the brush spring.

Use a spring pressure indicator to push the brush into the brush holder until the leading end protrudes 2 mm (0.08 in). Then, measure the brush spring pressure. If the pressure is 2.2 N (0.224 kgf, 7.91 oz) or less, replace the brush spring with a new part. 4.8 — 6.0 N (0.489 — 0.612 kgf, 17.26 — 21.60 oz) pressure is required for the new spring.



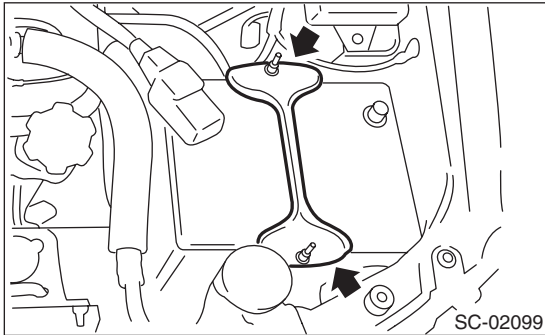
5. BEARINGS (FRONT SIDE)

Check the front ball bearings. Replace the ball bearings if there is resistance in the rotation, or if there is noise.

4. Battery

A: REMOVAL

- 1) Disconnect the positive (+) terminal after disconnecting the negative (-) terminal of battery.
- 2) Remove the flange nut from battery rod and remove battery holder.



- 3) Remove the battery.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

3.4 N·m (0.35 kgf-m, 2.5 ft-lb)

NOTE:

- Clean the battery cable terminals and apply grease to retard the formation of corrosion.
- Connect the positive (+) terminal, and then connect the negative (-) terminal of battery.
- Initial diagnosis of the electronic throttle control is performed after the battery is installed. Therefore, start the engine after 10 seconds or more have passed since turning the ignition switch to ON.

C: INSPECTION

WARNING:

- **Battery fluid is corrosive acid and has toxicity; be careful of handling the fluid.**
- **Do not let the battery fluid contact with skin, eyes or clothing. Especially at contact with eyes, flush with water for 15 minutes and get prompt medical attention.**
- **Do not let electrolyte contact with painted surfaces.**
- **Batteries produce explosive gases; be careful of handling.**
- **Keep open flames away from batteries.**
- **When working around batteries, be sure to protect eyes with safety glasses, etc., in case an explosion occurs. Never lean over a battery.**
- **Ventilate sufficiently when using or charging batteries in enclosed space.**
- **Before starting work, remove rings, watches and other metallic objects.**

- **When in contact with a metallic portion of the vehicle, never allow metallic tools held in the other hand to come into contact with the battery positive terminal or any hardware attached to the terminal.**

1. EXTERNAL PARTS

Check the battery case, top cover, vent plugs, and terminal posts for dirt or cracks. If necessary, clean with water and wipe with a dry cloth.

Apply a thin coat of grease on the terminal posts to prevent corrosion.

2. ELECTROLYTE LEVEL:

Check the electrolyte level in each cell. If the level is below MIN level, bring the level to MAX level by pouring distilled water into the battery cell. Do not fill beyond MAX LEVEL.

3. SPECIFIC GRAVITY OF ELECTROLYTE:

1) Measure specific gravity of electrolyte using a hydrometer and a thermometer.

Specific gravity varies with temperature of electrolyte so that it must be corrected at 20°C (68°F) using the following equation:

$$S_{20} = S_t + 0.0007 \times (t - 20)$$

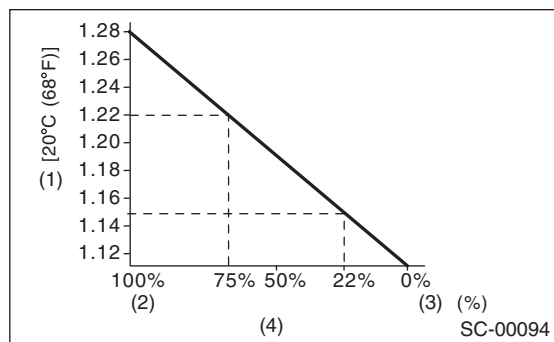
S_{20} : Specific gravity corrected at electrolytic solution temperature of 20°C (68°F)

S_t : Measured specific gravity

t : Measured temperature (°C)

Determine whether or not battery must be charged, according to corrected specific gravity.

Standard specific gravity: 1.220 — 1.290 [at 20°C (68°F)]



- (1) Specific gravity
- (2) Complete charge
- (3) State of charge
- (4) Specific gravity and state of charge

2) Measuring the specific gravity of the electrolytic solution in the battery will disclose the state of charge of the battery. The relation between specific gravity and state of charge is as shown in the figure.

D: MEASUREMENT

WARNING:

Do not bring an open flame close to the battery while working.

CAUTION:

- Prior to charging, corroded terminals should be cleaned with a brush and common caustic soda solution.
- Be careful since battery electrolytic solution overflows while charging the battery.
- Observe instructions when handling the battery charger.
- Before charging the battery on the vehicle, disconnect the battery ground terminal to prevent damage of generator diodes or other electrical units.

1. JUDGMENT OF BATTERY IN CHARGED CONDITION

1) Specific gravity of electrolyte should be held within the specific range from 1.250 to 1.290 for more than one hour.

2) Voltage per battery cell should be held at a specific value in a range from 2.5 to 2.8 V for more than one hour.

2. CHECK CONDITION OF CHARGE WITH HYDROMETER.

Hydrometer indicator	State of charge	Corrective action
Green dot	65% or more	Load test
Dark dot	65% or less	Charge battery
Clear dot	Low electrolyte	Replace the battery.* (If cranking is difficult)
* Check electrical system before replacement.		

3. NORMAL CHARGING

Charge the battery at the current value specified by manufacturer or at approximately 1/10 of battery's ampere-hour rating.

4. QUICK CHARGING

Quick charging is a method that the battery is charged in a short period of time with a relatively large current by using a quick charger.

Since a large current flow raises electrolyte temperature, the battery is subject to damage if the large current is used for prolonged time. For this reason, the quick charging must be carried out within a current range that will not increase the electrolyte temperature above 40°C (104°F).

Also the quick charging is a temporary mean to bring battery voltage up to some level, and battery should be charged slowly with low current as a rule.

CAUTION:

- Observe the items in 3. NORMAL CHARGING.
- Never use more than 10 A when charging the battery because it will shorten the battery life.

Battery

STARTING/CHARGING SYSTEMS

Basic Diagnostic Procedure

ENGINE (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

NOTE:

If the AT OIL TEMP warning light illuminates when the Subaru Select Monitor or general scan tool is connected, perform the following procedures.

1. Disconnect Subaru Select Monitor or general scan tool from the vehicle.
2. Repeat the ignition switch ON-OFF cycle three times.
3. Turn the ignition switch to ON.

If the malfunction indicator light turns off, the Subaru Select Monitor or general scan tool may be faulty. Connect a different Subaru Select Monitor or general scan tool, and if malfunction indicator light remains off, delete the DTC. <Ref. to EN(H4SO)(diag)-44, Clear Memory Mode.>

	Step	Check	Yes	No
1	CHECK ENGINE START FAILURE. 1) Ask the customer when and how the trouble occurred using the interview check list. <Ref. to EN(H4SO)(diag)-3, CHECK, Check List for Interview.> 2) Start the engine.	Does the engine start?	Go to step 2.	Inspection using "Diagnostics for Engine Start Failure". <Ref. to EN(H4SO)(diag)-53, Diagnostics for Engine Starting Failure.>
2	CHECK ILLUMINATION OF MALFUNCTION INDICATOR LIGHT.	Does the malfunction indicator light illuminate?	Go to step 3.	Inspection using "General Diagnostic Table". <Ref. to EN(H4SO)(diag)-337, INSPECTION, General Diagnostic Table.>
3	CHECK INDICATION OF DTC ON DISPLAY. 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or general scan tool to data link connector. 3) Turn the ignition switch to ON, and run the Subaru Select Monitor or general scan tool. 4) Read the DTC on Subaru Select Monitor or general scan tool.	Is DTC displayed on the Subaru Select Monitor or general scan tool?	Repair the trouble cause. <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).> Go to step 4.	Perform the diagnosis of the malfunction indicator light circuit or the combination meter. <Ref. to EN(H4SO)(diag)-48, Malfunction Indicator Light.>
4	PERFORM DIAGNOSIS. 1) Perform the Clear Memory Mode. <Ref. to EN(H4SO)(diag)-44, Clear Memory Mode.> 2) Perform the Inspection Mode. <Ref. to EN(H4SO)(diag)-35, Inspection Mode.>	Is DTC displayed on the Subaru Select Monitor or general scan tool?	Repair the trouble cause. <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Check List for Interview

ENGINE (DIAGNOSTICS)

2. Check List for Interview

A: CHECK

1. CHECK LIST NO. 1

Check the following item when problem has occurred.

NOTE:

Use copies of this page for interviewing customers.

Customer's name		Engine No.	
Date of purchase		Fuel brand	
Date of repair		Odometer reading	km
V.I.N. No.			miles
Weather	<input type="checkbox"/> Fine <input type="checkbox"/> Cloudy <input type="checkbox"/> Rainy <input type="checkbox"/> Snowy <input type="checkbox"/> Various/Others:		
Ambient air temperature	°C (°F)		
	<input type="checkbox"/> Hot <input type="checkbox"/> Warm <input type="checkbox"/> Cool <input type="checkbox"/> Cold		
Place	<input type="checkbox"/> Highway <input type="checkbox"/> Suburbs <input type="checkbox"/> Inner city <input type="checkbox"/> Uphill <input type="checkbox"/> Downhill <input type="checkbox"/> Rough road <input type="checkbox"/> Others :		
Engine temperature	<input type="checkbox"/> Cold <input type="checkbox"/> Warming-up <input type="checkbox"/> After warming-up <input type="checkbox"/> Any temperature <input type="checkbox"/> Others :		
Engine speed	rpm		
Vehicle speed	MPH		
Driving conditions	<input type="checkbox"/> Not affected <input type="checkbox"/> At starting <input type="checkbox"/> While idling <input type="checkbox"/> At racing <input type="checkbox"/> While accelerating <input type="checkbox"/> While cruising <input type="checkbox"/> While decelerating <input type="checkbox"/> While turning (RH/LH)		
Headlight	<input type="checkbox"/> ON / <input type="checkbox"/> OFF	Rear defogger	<input type="checkbox"/> ON / <input type="checkbox"/> OFF
Blower	<input type="checkbox"/> ON / <input type="checkbox"/> OFF	Radio	<input type="checkbox"/> ON / <input type="checkbox"/> OFF
A/C compressor	<input type="checkbox"/> ON / <input type="checkbox"/> OFF	CD/Cassette	<input type="checkbox"/> ON / <input type="checkbox"/> OFF
Radiator fan	<input type="checkbox"/> ON / <input type="checkbox"/> OFF	Car phone	<input type="checkbox"/> ON / <input type="checkbox"/> OFF
Front wiper	<input type="checkbox"/> ON / <input type="checkbox"/> OFF	Wireless device	<input type="checkbox"/> ON / <input type="checkbox"/> OFF
Rear wiper	<input type="checkbox"/> ON / <input type="checkbox"/> OFF		

Check List for Interview

ENGINE (DIAGNOSTICS)

2. CHECK LIST NO. 2

Check the following item about the vehicle's state when malfunction indicator light turns on.

NOTE:

Use copies of this page for interviewing customers.

a) Other warning lights or indicators turn on. <input type="checkbox"/> Yes / <input type="checkbox"/> No
<input type="checkbox"/> Low fuel warning light <input type="checkbox"/> Charge indicator light <input type="checkbox"/> AT diagnostic indicator light <input type="checkbox"/> ABS warning light <input type="checkbox"/> Oil pressure warning light
b) Fuel level
• Lack of gasoline: <input type="checkbox"/> Yes / <input type="checkbox"/> No • Indicator position of fuel gauge: • Experience of running out of fuel: <input type="checkbox"/> Yes / <input type="checkbox"/> No
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: <input type="checkbox"/> Yes / <input type="checkbox"/> No
• What:
d) Intentional connecting or disconnecting of hoses: <input type="checkbox"/> Yes / <input type="checkbox"/> No
• What:
e) Installing of other parts except genuine parts: <input type="checkbox"/> Yes / <input type="checkbox"/> No
• What: • Where:
f) Occurrence of noise: <input type="checkbox"/> Yes / <input type="checkbox"/> No
• From where: • What kind:
g) Occurrence of smell: <input type="checkbox"/> Yes / <input type="checkbox"/> No
• From where: • What kind:
h) Intrusion of water into engine compartment or passenger compartment: <input type="checkbox"/> Yes / <input type="checkbox"/> No
i) Troubles occurred
<input type="checkbox"/> Engine does not start. <input type="checkbox"/> Engine stalls during idling. <input type="checkbox"/> Engine stalls while driving. <input type="checkbox"/> Engine speed decreases. <input type="checkbox"/> Engine speed does not decrease. <input type="checkbox"/> Rough idling <input type="checkbox"/> Poor acceleration <input type="checkbox"/> Back fire <input type="checkbox"/> After fire <input type="checkbox"/> Does not shift. <input type="checkbox"/> Excessive shift shock

3. General Description

A: CAUTION

1) Airbag system wiring harness is routed near the ECM, main relay and fuel pump relay.

CAUTION:

- All airbag system wiring harnesses and connectors are yellow. Do not use the electrical test equipment on these circuits.
- Be careful not to damage the airbag system wiring harness when servicing the ECM, TCM, main relay and fuel pump relay.

2) Never connect the battery in reverse polarity.

- The ECM will be destroyed instantly.
- The fuel injector and other parts will be damaged in just a few minutes.

3) Do not disconnect the battery terminals while the engine is running.

A large counter electromotive force will be generated in the generator, and this voltage may damage electronic parts such as ECM etc.

4) Before disconnecting the connectors of each sensor and ECM, be sure to turn the ignition switch to OFF.

5) Use a tapered pin with a diameter of less than 0.64 mm (0.025 in) when measuring the voltage or resistance of individual sensor or all electrical control modules. Do not insert the pin more than 5 mm (0.20 in) into the part.

6) Before removing the ECM from the located position, disconnect two cables on battery. Otherwise, the ECM may be damaged.

CAUTION:

When replacing the ECM, be careful not to use the wrong spec. ECM to avoid any damage on the fuel injection system.

7) Connectors of each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. Even if the connectors are waterproof, take care not to allow water to get into them when washing the vehicle, or when servicing the vehicle in rainy weather.

8) Use ECM mounting stud bolts at the body side grounding point when measuring voltage and resistance inside the passenger compartment.

9) Use the engine ground terminal or engine assembly as the grounding point to the body when measuring the voltage and resistance in engine compartment.

10) Every MFI-related part is a precision part. Do not drop them.

11) Observe the following cautions when installing a radio in MFI equipped models.

CAUTION:

- The antenna must be kept as far apart as possible from control unit. (The ECM is located under the steering column, inside of the instrument panel lower trim panel.)

- The antenna feeder must be placed as far apart as possible from the ECM and MFI harness.

- Carefully adjust the antenna for correct matching.

- When mounting a large power type radio, pay special attention to the three items above mentioned.

- Incorrect installation of the radio may affect the operation of ECM.

12) Before disconnecting the fuel hose, release the fuel pressure. <Ref. to FU(H4SO)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

13) For the model with ABS, the ABS warning light may illuminate when performing driving test with jacked-up or lifted-up condition, but this is not a system malfunction. The reason for this is the speed difference between the front and rear wheels. After diagnosis of engine control system, perform the ABS memory clear procedure of self-diagnosis function.

General Description

ENGINE (DIAGNOSTICS)

B: INSPECTION

Before performing diagnostics, check the following item which might affect engine problems.

1. BATTERY

1) Measure the battery voltage and specific gravity of electrolyte.

Standard voltage:

12 V

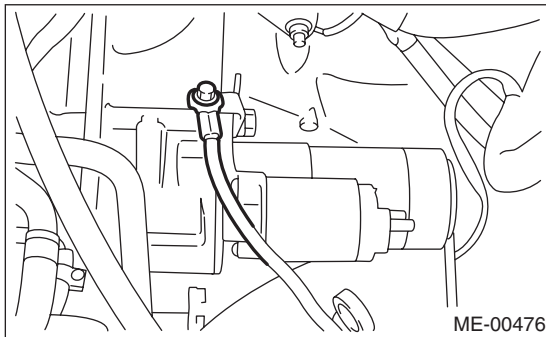
Specific gravity:

1.260 or more

2) Check the condition of the main and other fuses, and harnesses and connectors. Also check for proper grounding.

2. ENGINE GROUND

Make sure the engine ground terminal is properly connected to engine.



C: NOTE

1. GENERAL DESCRIPTION

- The on-board diagnosis (OBD) system detects and indicates a fault in various inputs and outputs of the complex electronic control. Malfunction indicator light in the combination meter indicates occurrence of a fault or trouble.
- Further, against such a failure or sensors as may disable the drive, the fail-safe function is provided to ensure the minimal driveability.
- The OBD system incorporated with the vehicles within this type of engine complies with OBD-II regulations. The OBD system monitors the components and the system malfunction listed in "Engine Section" which affects on emissions.
- When the system decides that a malfunction occurs, malfunction indicator light illuminates. At the same time of the malfunction indicator light illumination or blinking, a DTC and a freeze frame engine conditions are stored into on-board computer.
- The OBD system stores freeze frame engine condition data (engine load, engine coolant temperature, fuel trim, engine speed and vehicle speed, etc.) into on-board computer first when it detects a malfunction.

- If the OBD system detects the various malfunctions including the fault of fuel trim or misfire, the OBD system first stores freeze frame engine conditions about the fuel trim or misfire.
- When the malfunction does not occur again for three consecutive driving cycles, malfunction indicator light is turned off, but DTC remains at on-board computer.
- When troubleshooting the vehicle which complies with OBD-II regulations, connect the Subaru Select Monitor or general scan tool to the vehicle.

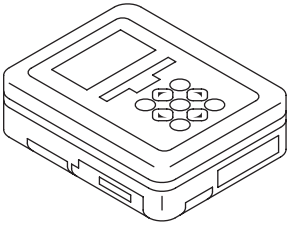
2. ENGINE AND EMISSION CONTROL SYSTEM

- The Multipoint Fuel Injection (MFI) system is a system that supplies the optimum air-fuel mixture to the engine for all the various operating conditions through the use of the latest electronic technology.
- With this system, the fuel which is pressurized at a constant pressure is injected into the intake air passage of the cylinder head. The injection quantity of fuel is controlled by an intermittent injection system, where the electro-magnetic injection valve (fuel injector) opens for a short period of time depending on the quantity of air required for one cycle of operation. In actual operation, the injection quantity is determined by the duration of an electric pulse applied to the fuel injector and this permits simple, yet highly precise metering of the fuel.
- Furthermore, all operating conditions of the engine are converted into electronic signals, and this enables additional system features with greatly improved adaptability, making it easier to add compensation features.

The MFI system also has the following features:

- Reduced emission of harmful exhaust gases
- Reduction in fuel consumption
- Increased engine output
- Superior acceleration and deceleration
- Superior startability and warm-up performance in cold weather since compensation is made for engine coolant and intake air temperature

D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST1B020XU0</p>	1B020XU0	SUBARU SELECT MONITOR KIT	Used for troubleshooting the electrical system.

Electrical Component Location

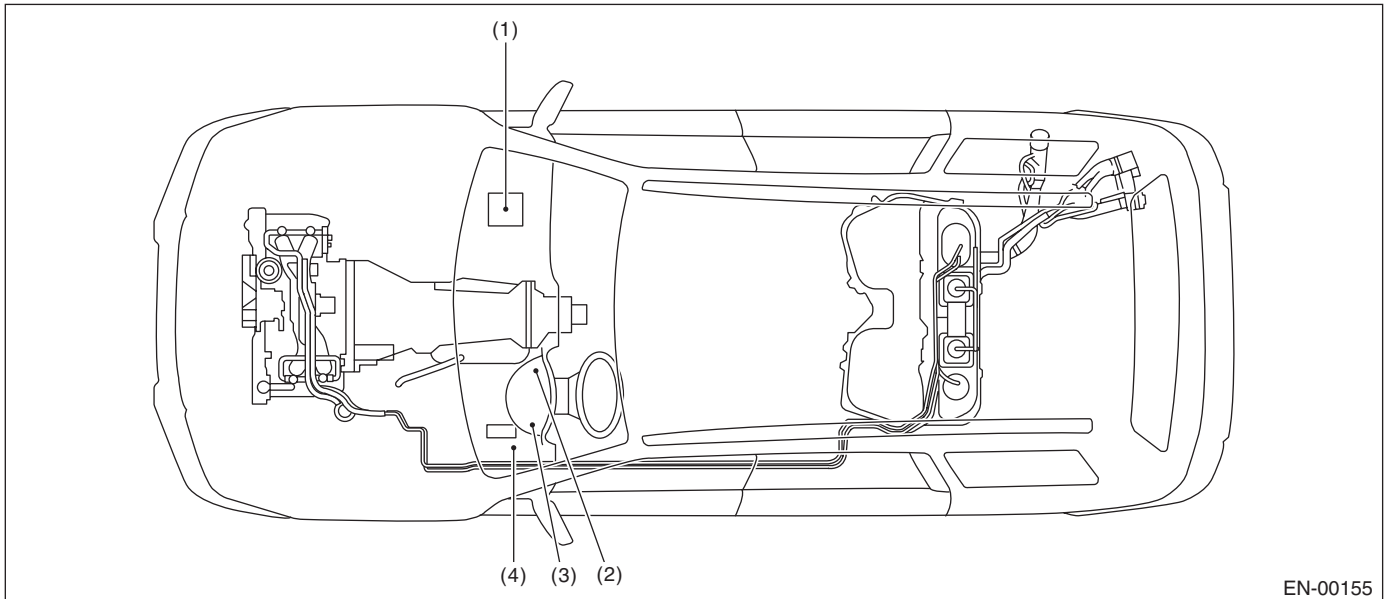
ENGINE (DIAGNOSTICS)

4. Electrical Component Location

A: LOCATION

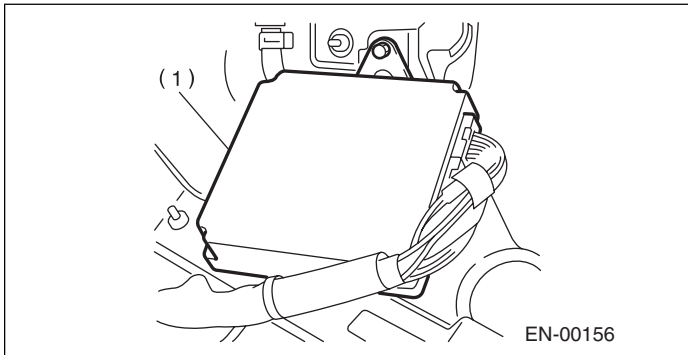
1. ENGINE

- Control module

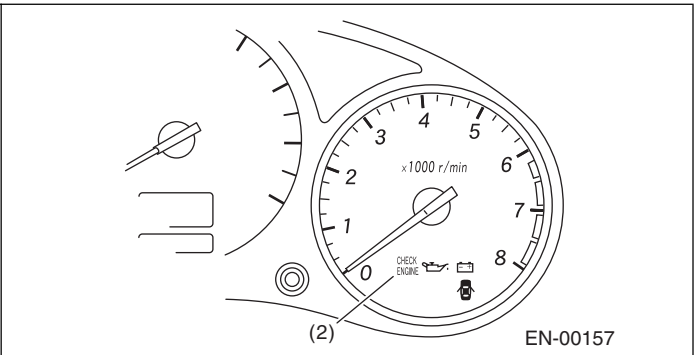


EN-00155

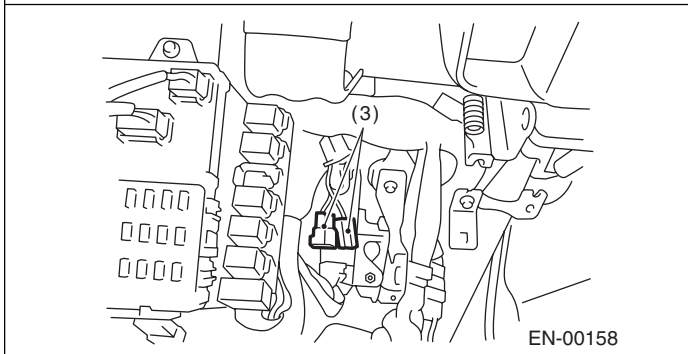
- (1) Engine control module (ECM) (3) Test mode connector (4) Data link connector
(2) Malfunction indicator light



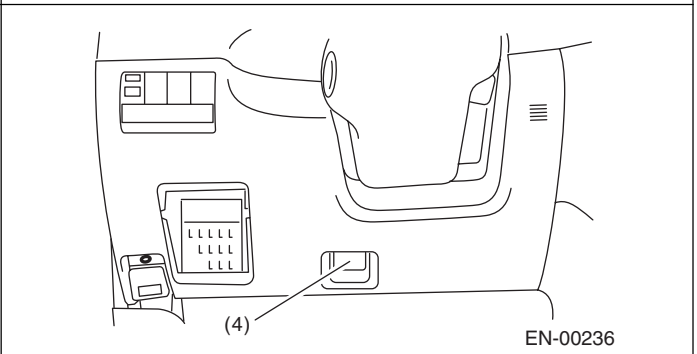
EN-00156



EN-00157



EN-00158

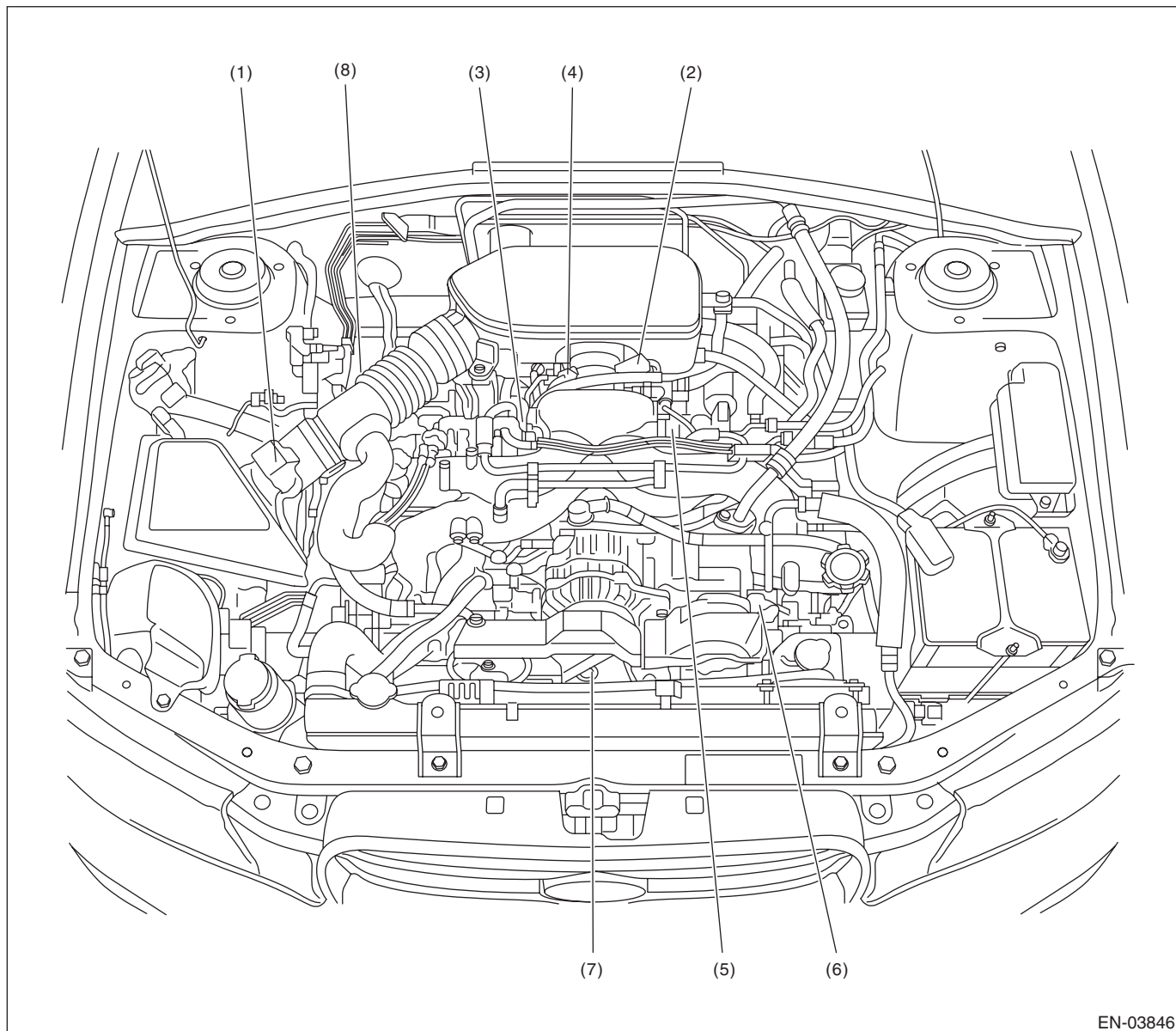


EN-00236

Electrical Component Location

ENGINE (DIAGNOSTICS)

- Sensor

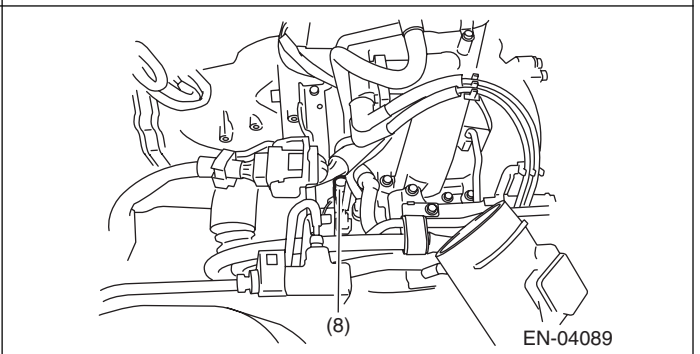
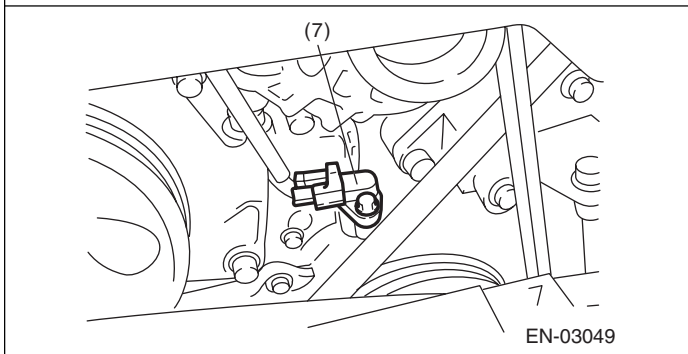
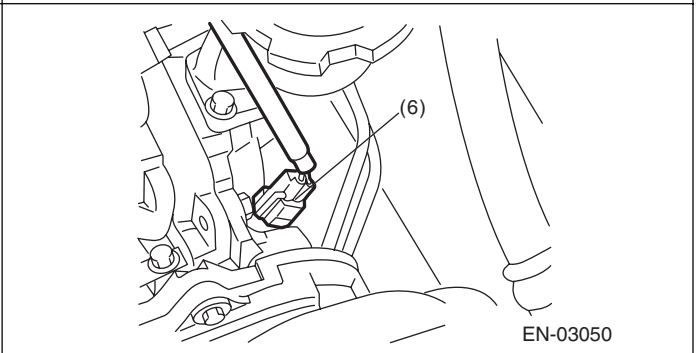
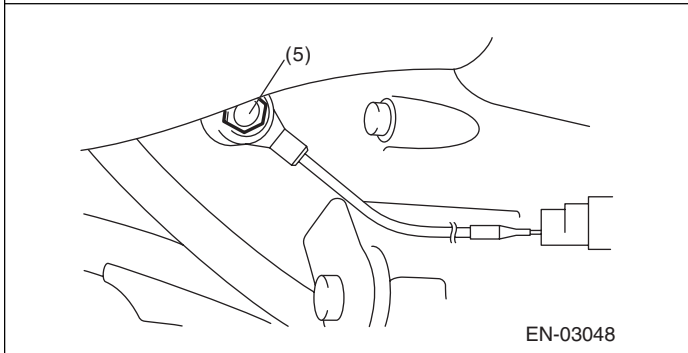
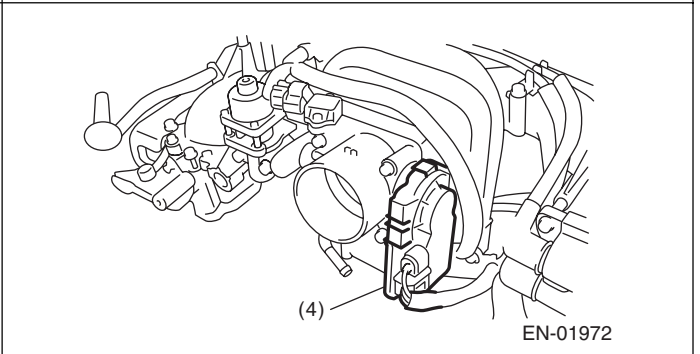
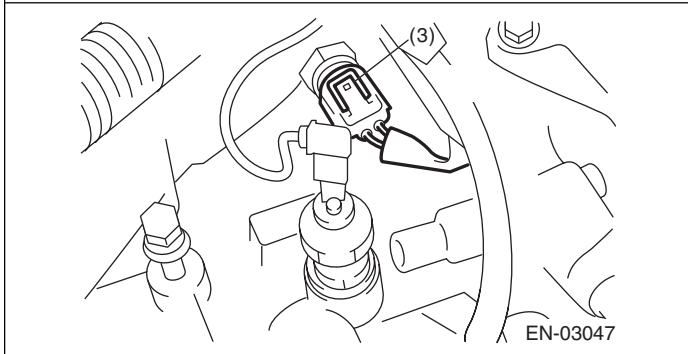
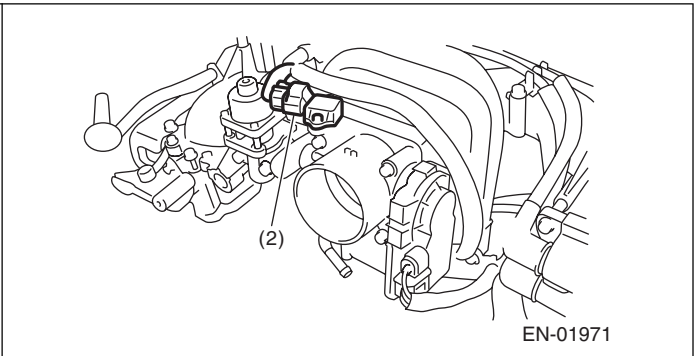
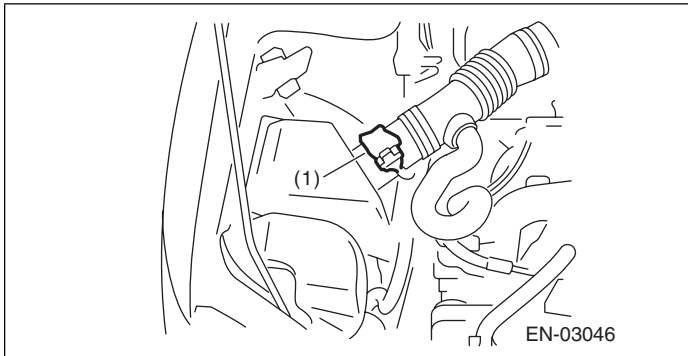


EN-03846

- | | | |
|---|------------------------------|--------------------------------|
| (1) Mass air flow and intake air temperature sensor | (4) Throttle position sensor | (7) Crankshaft position sensor |
| (2) Manifold absolute pressure sensor | (5) Knock sensor | (8) Oil temperature sensor |
| (3) Engine coolant temperature sensor | (6) Camshaft position sensor | |

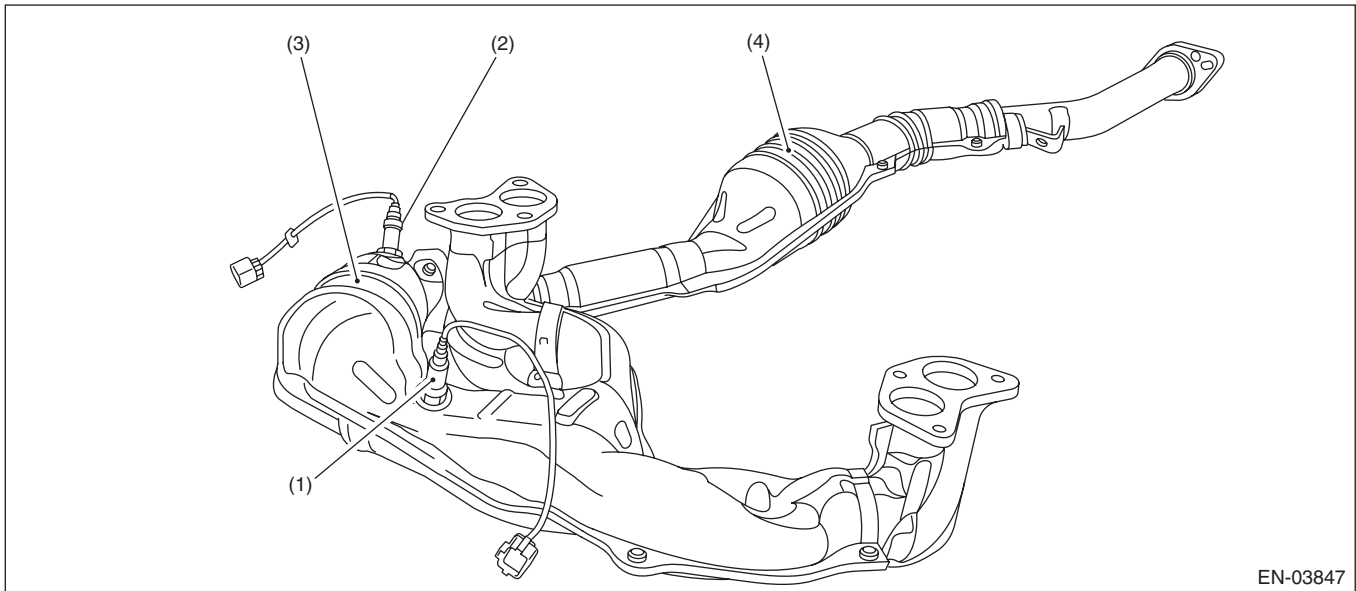
Electrical Component Location

ENGINE (DIAGNOSTICS)



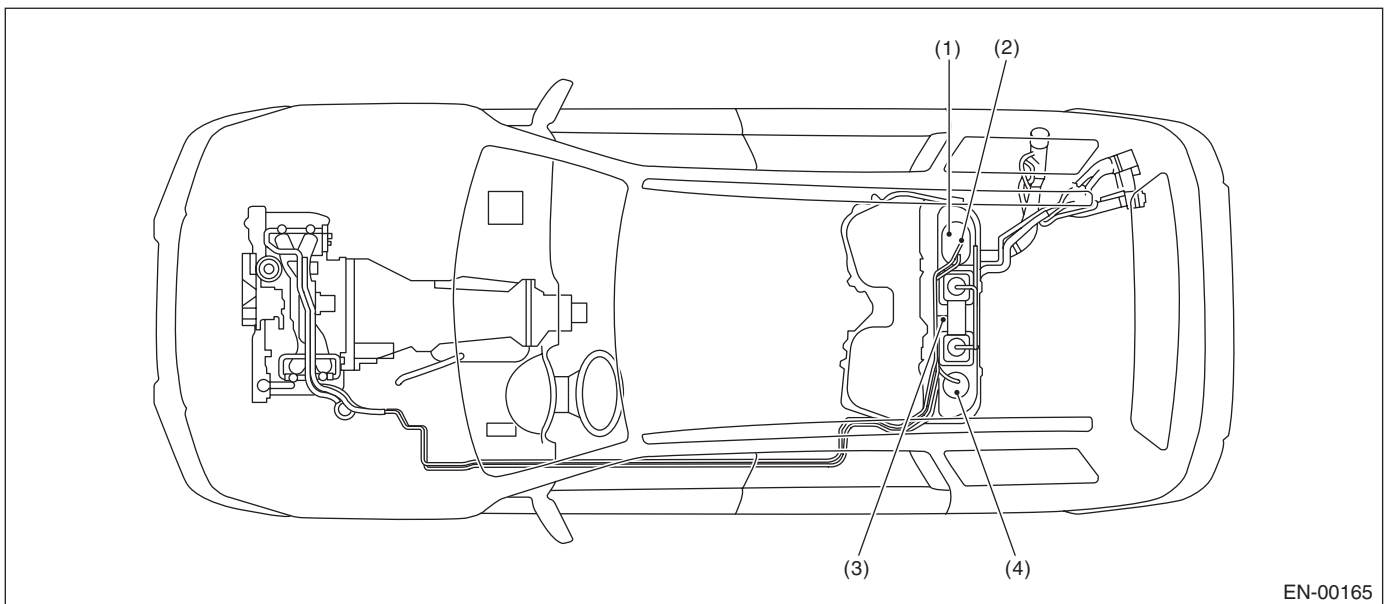
Electrical Component Location

ENGINE (DIAGNOSTICS)



EN-03847

- (1) Front oxygen (A/F) sensor
- (2) Rear oxygen sensor
- (3) Front catalytic converter
- (4) Rear catalytic converter

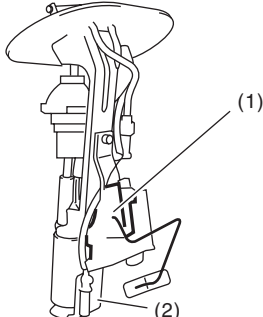
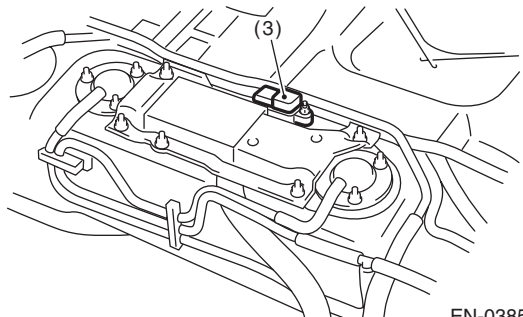
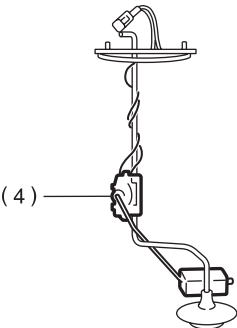


EN-00165

- (1) Fuel level sensor
- (2) Fuel temperature sensor
- (3) Fuel tank pressure sensor
- (4) Fuel sub level sensor

Electrical Component Location

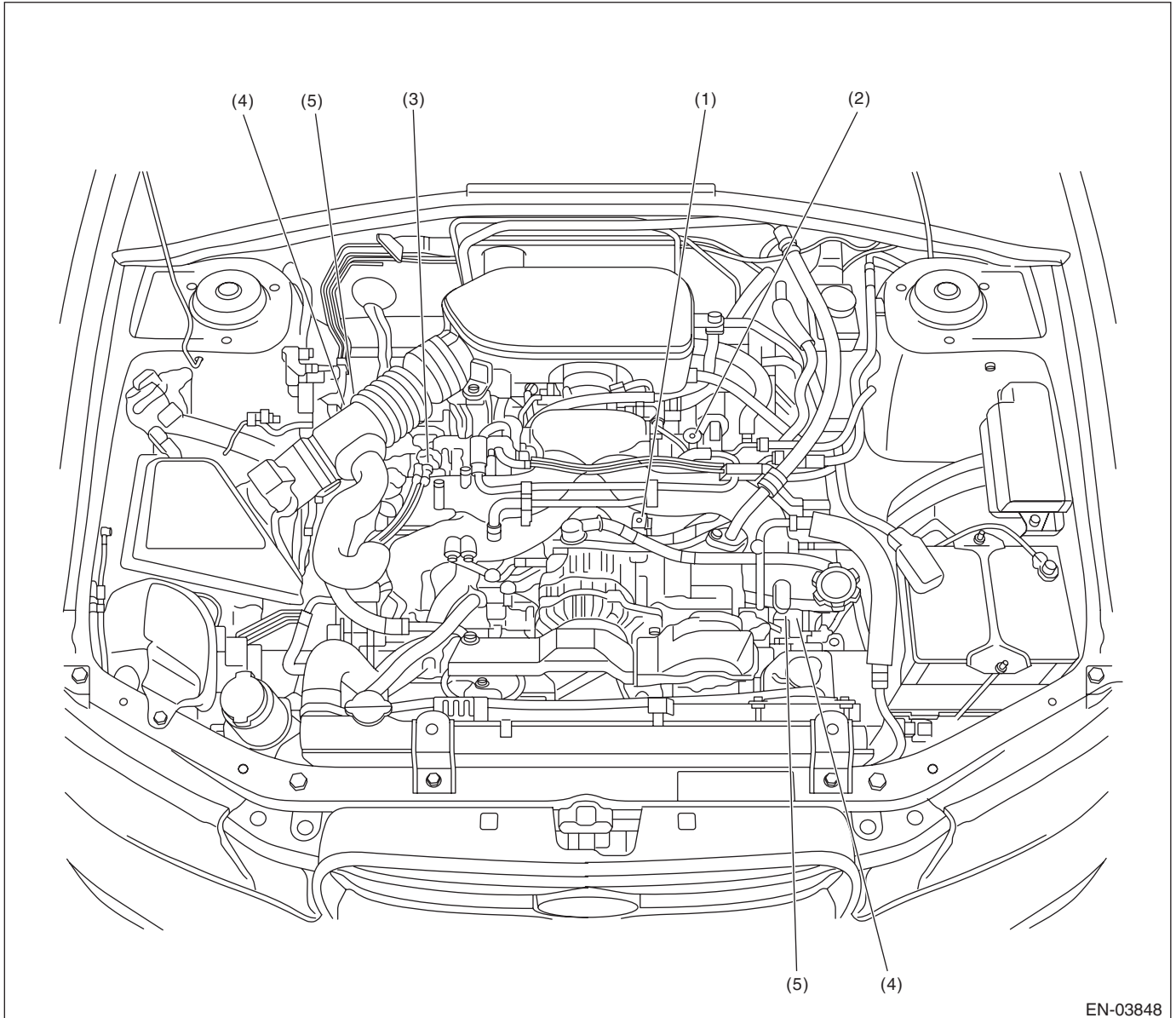
ENGINE (DIAGNOSTICS)

 <p>(1)</p> <p>(2)</p> <p>EN-03852</p>	 <p>(3)</p> <p>EN-03853</p>
 <p>(4)</p> <p>EN-00168</p>	<p>SUBARU.</p>

Electrical Component Location

ENGINE (DIAGNOSTICS)

- Solenoid valve, emission control system parts and ignition system parts



EN-03848

(1) Purge control solenoid valve

(3) Ignition coil and ignitor ASSY

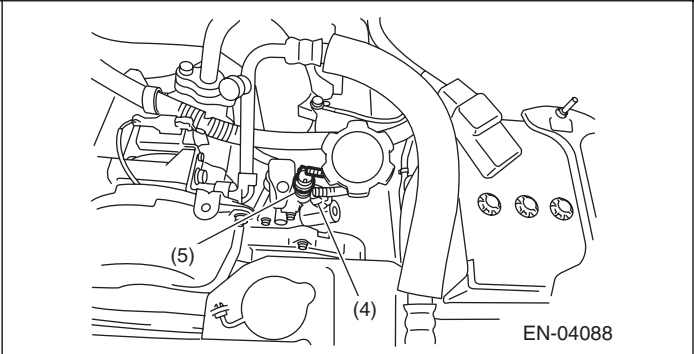
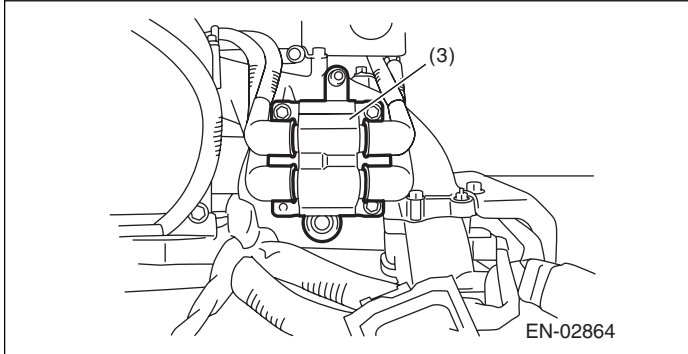
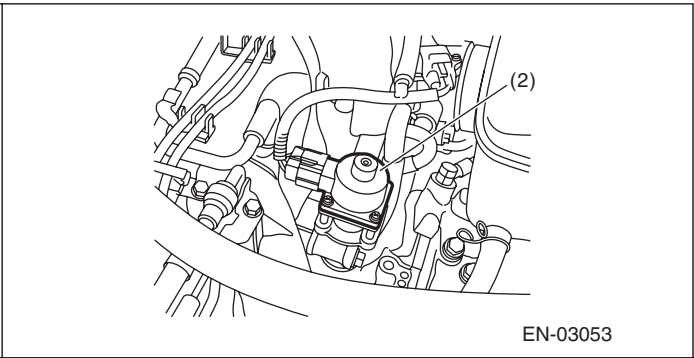
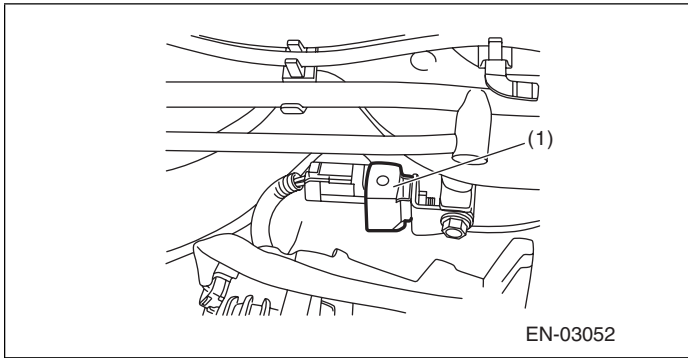
(5) Variable valve lift diagnosis oil pressure switch

(2) EGR valve

(4) Oil switching solenoid valve

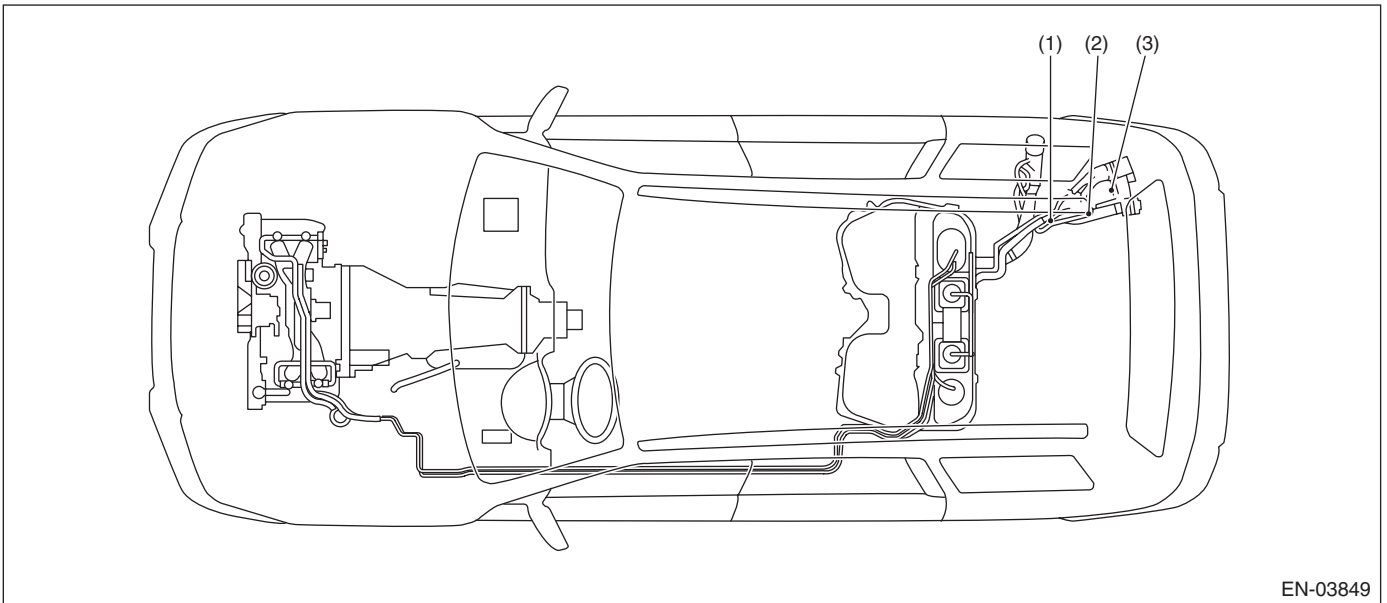
Electrical Component Location

ENGINE (DIAGNOSTICS)

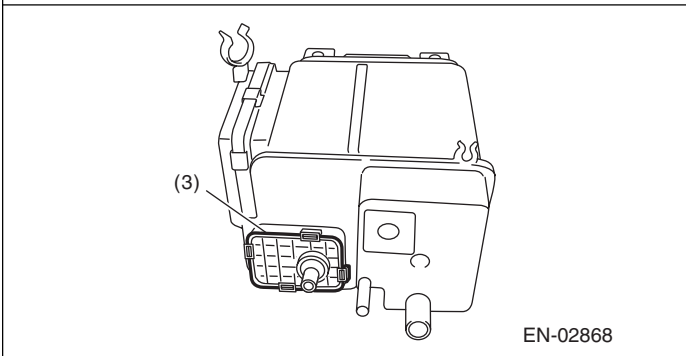
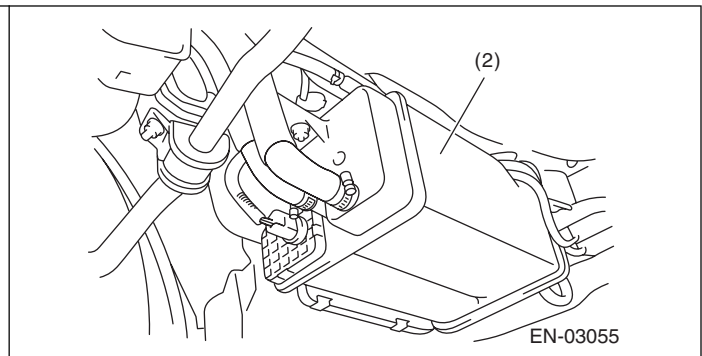
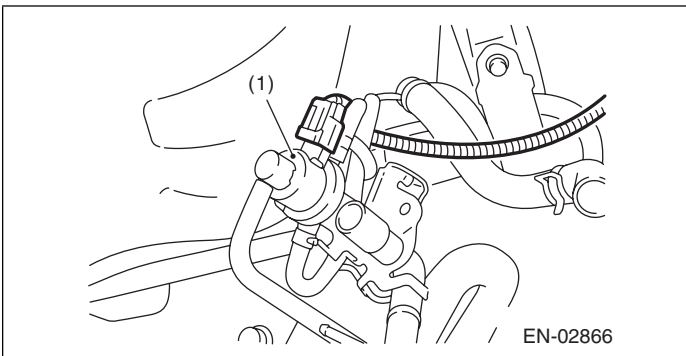


Electrical Component Location

ENGINE (DIAGNOSTICS)

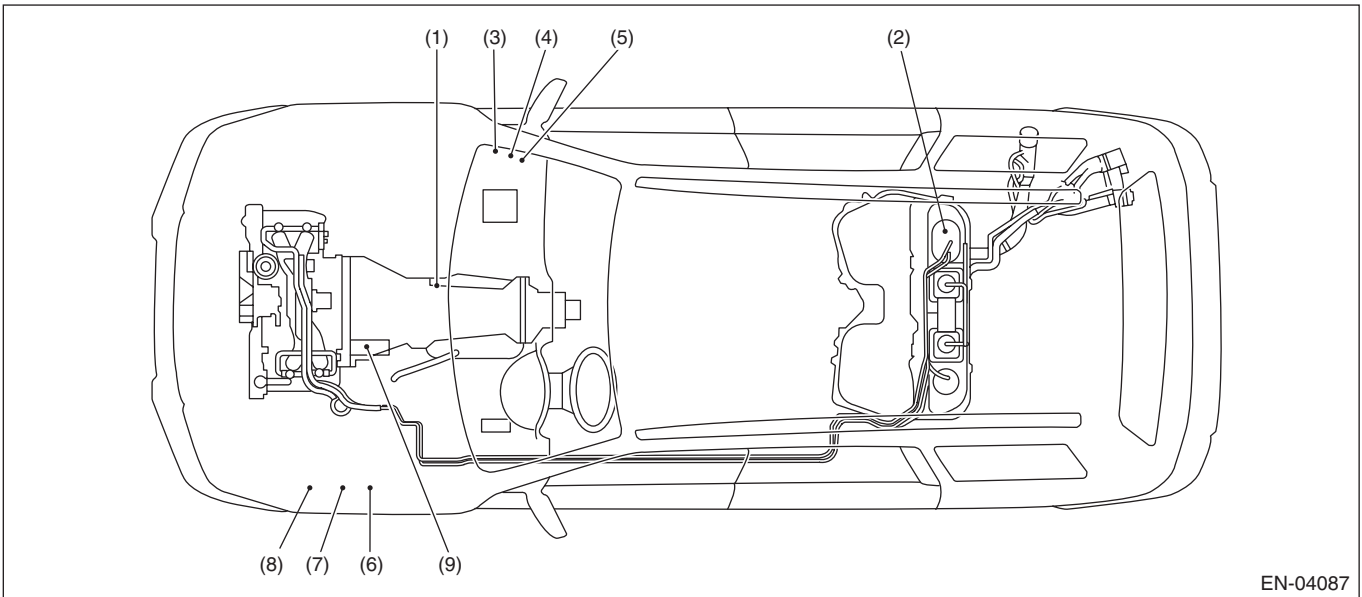


- (1) Pressure control solenoid valve (2) Canister (3) Drain valve

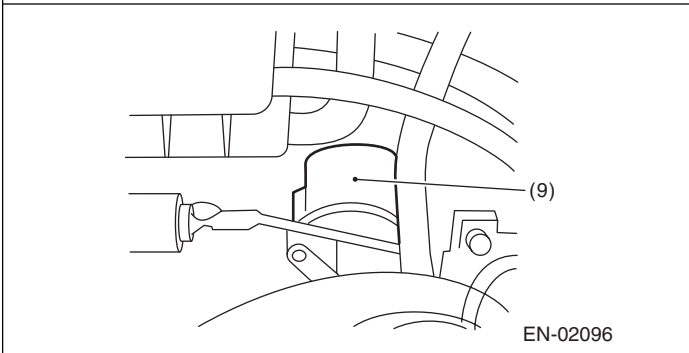
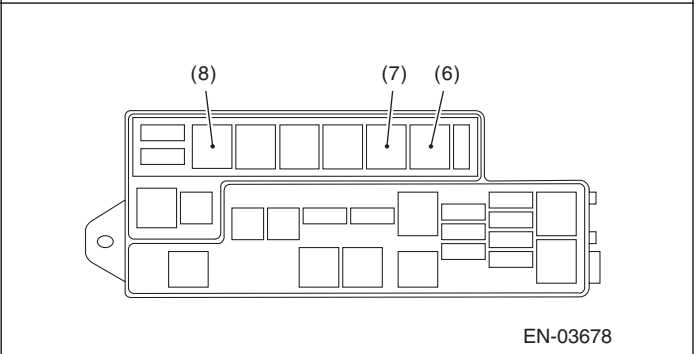
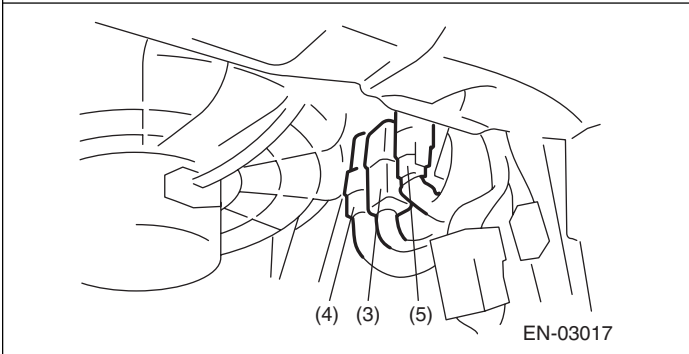
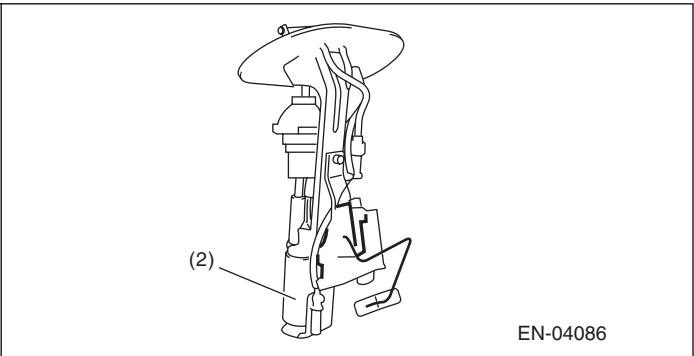
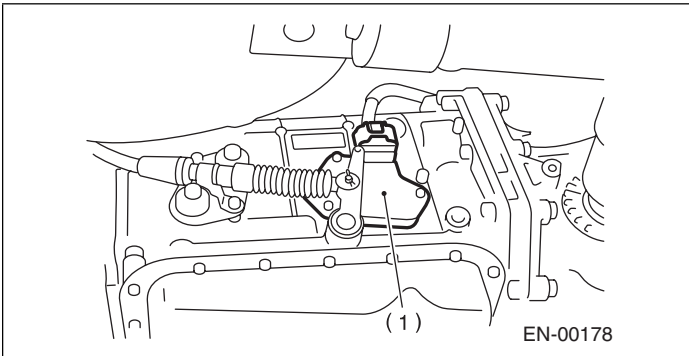


Electrical Component Location

ENGINE (DIAGNOSTICS)



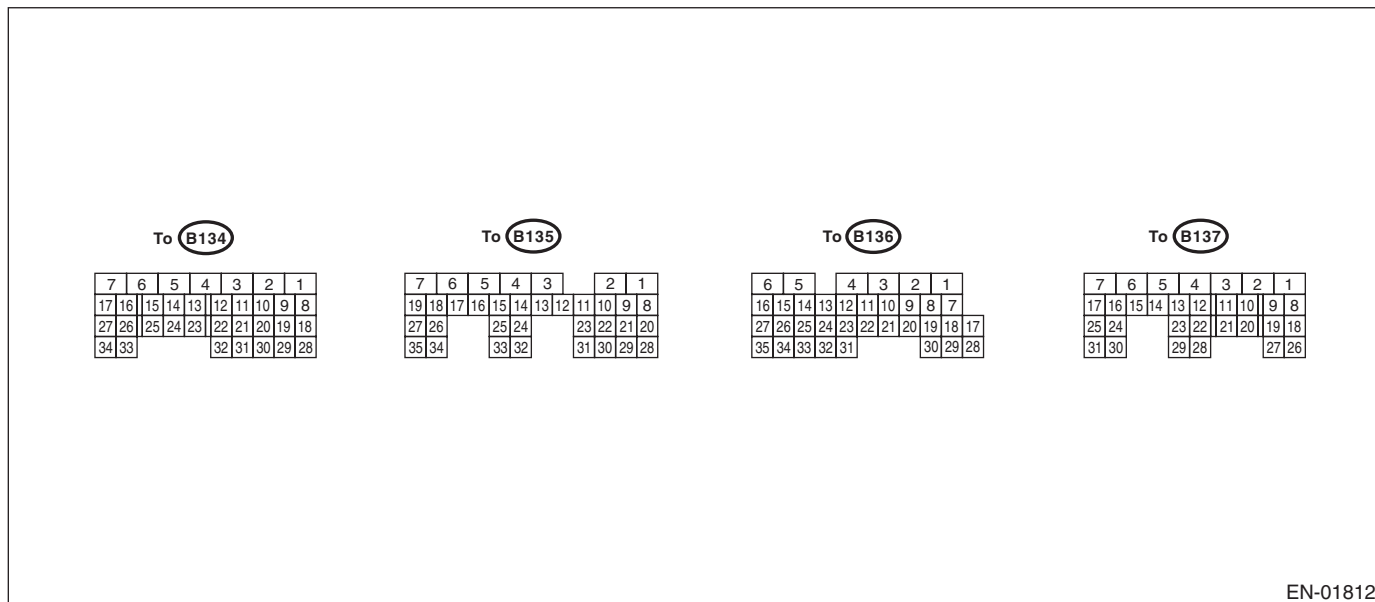
- | | | |
|----------------------|---------------------------------------|----------------------------|
| (1) Inhibitor switch | (4) Fuel pump relay | (7) Radiator sub fan relay |
| (2) Fuel pump | (5) Electronic throttle control relay | (8) Fan mode relay |
| (3) Main relay | (6) Radiator main fan relay | (9) Starter |



SUBARU.

5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



EN-01812

Content		Con- nector No.	Termi- nal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Crank- shaft posi- tion sensor	Signal (+)	B134	13	0	-7 — +7	Sensor output waveform
	Signal (-)	B134	14	0	0	—
	Shield	B134	24	0	0	—
Rear oxy- gen sen- sor	Signal	B135	4	0	0 — 0.9	—
	Shield	B135	1	0	0	—
Front oxy- gen (A/F) sensor heater	Signal 1	B136	3	10 — 13	1 — 14	Waveform
	Signal 2	B136	2	10 — 13	1 — 14	Waveform
Rear oxygen sensor heater signal		B136	4	10 — 13	1 — 14	Waveform
Engine coolant temper- ature sensor		B134	34	1.0 — 1.4	1.0 — 1.4	After engine is warmed-up.
Vehicle speed signal		B136	12	0 or 5	0 or 5	"5" and "0" are repeatedly dis- played when vehicle is driven.
Air flow sensor	Signal	B135	26	—	0.3 — 4.5	—
	Shield	B135	35	0	0	—
	Ground	B135	34	0	0	—
Intake air temperature sensor signal		B135	18	0.3 — 4.6	0.3 — 4.6	—
Camshaft position sensor	Signal (+)	B134	12	0	-7 — +7	Sensor output waveform
	Signal (-)	B134	22	0	0	—
	Shield	B134	24	0	0	—
Starter switch		B136	32	0	0	Cranking: 8 — 14
A/C switch		B136	23	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
A/C middle pressure switch		B136	33	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Ignition switch		B135	27	10 — 13	12 — 14	—

Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)

Content	Con- nector No.	Termi- nal No.	Signal (V)		Note
			Ignition SW ON (engine OFF)	Engine ON (idling)	
Neutral position switch	B136	31	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Test mode connector	B135	19	10 — 13	13 — 14	When connected: 0
Knock sensor	Signal	B134	15	2.5	—
	Shield	B134	25	0	—
Back-up power supply	B135	5	10 — 13	12 — 14	Ignition switch "OFF": 10 — 13
Control module power supply	B134	7	10 — 13	12 — 14	—
	B135	2	10 — 13	12 — 14	—
Ignition control	#1, #2	B137	18	0	Waveform
	#3, #4	B137	19	0	Waveform
Fuel injec- tor	#1	B137	8	10 — 13	Waveform
	#2	B137	9	10 — 13	Waveform
	#3	B137	10	10 — 13	Waveform
	#4	B137	11	10 — 13	Waveform
Fuel pump relay control	B136	13	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—
A/C relay control	B136	9	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—
Radiator fan relay 1 control	B136	18	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—
Radiator fan relay 2 control	B136	29	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	Model with A/C only
Starter relay control	B136	20	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—
Self-shutoff control	B136	24	0.5 or less	0.5 or less	—
Malfunction indicator light	B136	11	—	—	Light "ON": 1 or less Light "OFF": 10 — 14
Engine speed output	B136	22	—	0 — 13	Waveform
Purge control solenoid valve	B137	29	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	Sensor output waveform
Manifold absolute pres- sure sensor	B134	6	3.4 — 3.8	1.4 — 1.8	—
Fuel tank pressure sensor	Signal	B135	32	2.3 — 2.7	The valve operates when fuel filler cap is removed and rein- stalled.
	GND (sensor)	B135	30	0	—
Pressure control sole- noid valve	B136	28	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	—
Drain valve	B136	17	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	—
Fuel level sensor	B135	10	0.3 — 4.5	0.3 — 4.5	—
Fuel temperature sen- sor signal	B135	17	1 — 4	1 — 4	—
Small light switch	B135	15	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Blower fan switch	B135	16	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Rear defogger switch	B135	14	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—

Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)

Content	Con- nector No.	Termi- nal No.	Signal (V)		Note	
			Ignition SW ON (engine OFF)	Engine ON (idling)		
Power steering oil pressure switch	B134	33	ON: 1 or less OFF: 10 — 13	ON: 0 OFF: 12 — 14	—	
Front oxygen (A/F) sensor signal (+)	B135	9	—	2.7 — 2.9	—	
Front oxygen (A/F) sensor signal (-)	B135	8	—	2.35 — 2.55	—	
Front oxygen (A/F) sensor shield	B135	1	0	0	—	
SSM communication line	B136	16	1 or less ←→ 4 or more	1 or less ←→ 4 or more	—	
Electronic throttle control	Main	B134	18	0.64 — 0.72 Fully opened: 3.96	0.64 — 0.72 (After engine is warmed-up.)	Fully closed: 0.6 Fully opened: 3.96
	Sub	B134	28	1.51 — 1.58 Fully opened: 4.17	1.51 — 1.58 (After engine is warmed-up.)	Fully closed: 1.48 Fully opened: 4.17
	Power supply	B134	19	5	5	—
	GND (sensor)	B134	29	0	0	—
Electronic throttle control motor (+)	B137	5	Duty waveform	Duty waveform	Drive frequency: 500 Hz	
Electronic throttle control motor (-)	B137	4	Duty waveform	Duty waveform	Drive frequency: 500 Hz	
Electronic throttle control motor power supply	B136	1	10 — 13	12 — 14	—	
Electronic throttle control motor relay	B136	21	0	0	When ignition switch is turned to ON: ON	
Accelerator pedal position sensor	Main sensor signal	B135	23	Fully closed: 0.7 Fully opened: 3.0	Fully closed: 0.7 Fully opened: 3.0	—
	Main power supply	B135	21	5	5	—
	GND (Main sensor)	B135	29	0	0	—
	Sub sensor signal	B135	31	Fully closed: 0.7 Fully opened: 3.0	Fully closed: 0.7 Fully opened: 3.0	—
	Sub power supply	B135	22	5	5	—
	GND (Sub sensor)	B135	30	0	0	—
Cruise control set light	B135	3	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—	
Main light	B135	6	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—	
Clutch switch	B136	25	When clutch pedal is depressed: 0 When clutch pedal is released: 10 — 13	When clutch pedal is depressed: 0 When clutch pedal is released: 12 — 14	—	

Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)

Content	Con- nector No.	Termi- nal No.	Signal (V)		Note	
			Ignition SW ON (engine OFF)	Engine ON (idling)		
Brake switch 1	B135	20	When brake pedal is depressed: 0 When brake pedal is released: 10 — 13	When brake pedal is depressed: 0 When brake pedal is released: 12 — 14	—	
Brake switch 2	B135	28	When brake pedal is depressed: 10 — 13 When brake pedal is released: 0	When brake pedal is depressed: 12 — 14 When brake pedal is released: 0	—	
Cruise control com- mand switch	B135	24	When not operating: 3.5 — 4.5 When operating RES/ ACC: 2.5 — 3.5 When operating SET/ COAST: 0.5 — 1.5 When operating cancel: 0 — 0.5	When not operating: 3.5 — 4.5 When operating RES/ ACC: 2.5 — 3.5 When operating SET/ COAST: 0.5 — 1.5 When operating cancel: 0 — 0.5	—	
Cruise control main switch	B135	12	ON: 0 OFF: 5	ON: 0 OFF: 5	—	
Oil temperature sensor signal	B134	23	1.0 — 1.4	1.0 — 1.4	After engine is warmed-up.	
Variable valve lift diag- nosis Oil pressure switch RH	B134	31	0	0	—	
Variable valve lift diag- nosis Oil pressure switch LH	B134	32	0	0	—	
Oil switch- ing sole- noid valve RH	Signal (+)	B137	25	0	Duty waveform	Drive frequency: 300 Hz
	Signal (-)	B137	24	0	0	—
Oil switch- ing sole- noid valve LH	Signal (+)	B137	31	0	Duty waveform	Drive frequency: 300 Hz
	Signal (-)	B137	30	0	0	—
Blow-by leak diagnosis signal	B134	30	0	0	When there is an open circuit (malfunction): 10 — 14	
CAN com- munication	Signal (+)	B136	27	Pulse signal		—
	Signal (-)	B136	35	Pulse signal		—
EGR sole- noid valve	Signal 1	B134	8	10 — 13	0 or 12 — 14	—
	Signal 2	B134	9	10 — 13	0 or 12 — 14	—
	Signal 3	B134	10	10 — 13	0 or 12 — 14	—
	Signal 4	B134	20	10 — 13	0 or 12 — 14	—
Ground	(Engine 1)	B134	5	0	0	—
	(Engine 2)	B137	7	0	0	—
	(Engine 3)	B137	2	0	0	—
	(Engine 4)	B137	1	0	0	—
	(Engine 5)	B137	3	0	0	—
	(Ignition 1)	B137	26	0	0	—
	(Ignition 2)	B137	6	0	0	—
(Body)	B136	6	0	0	—	

6. Engine Condition Data

A: ELECTRICAL SPECIFICATION

Content		Specification
Engine load	Other than U5 model	17.6 — 35.6 (%): Idling
		15.4 — 31.1 (%): 2,500 rpm racing
	U5 model	14.4 — 29.2 (%): Idling
		15.7 — 31.8 (%): 2,500 rpm racing

Measuring condition:

- After engine is warmed-up.
- Gear position is in “N” or “P” range.
- A/C is turned OFF.
- Turn all the accessory switches to OFF.

Data Link Connector

ENGINE (DIAGNOSTICS)

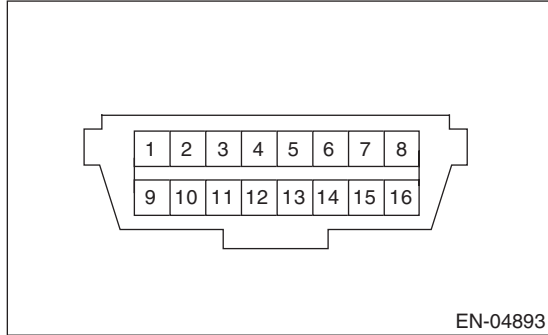
7. Data Link Connector

A: NOTE

This connector is used both for general scan tools and the Subaru Select Monitor.

CAUTION:

Do not connect any scan tools other than general scan tools and the Subaru Select Monitor, because the circuit for the Subaru Select Monitor may be damaged.



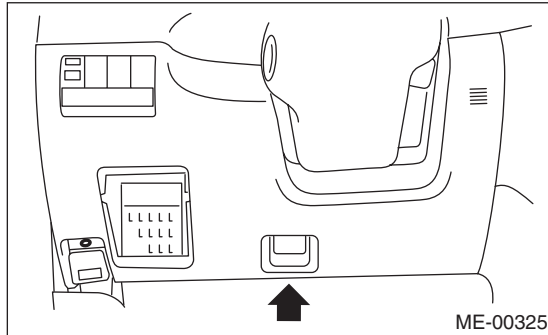
Terminal No.	Content	Terminal No.	Content
1	Blank	9	Blank
2	Blank	10	Blank
3	Ground	11	Blank
4	Blank	12	Blank
5	Blank	13	Blank
6	CAN-H	14	CAN-L
7	Subaru Select Monitor signal	15	Blank
8	Blank	16	Power supply

8. General Scan Tool

A: OPERATION

1. HOW TO USE GENERAL SCAN TOOL

- 1) Prepare a scan tool (general scan tool) required by SAE J1978.
- 2) Open the cover and connect the general scan tool to the data link connector located in the lower portion of instrument panel (on the driver's side).



- 3) Using the general scan tool, call up DTC and freeze frame data.

General scan tool functions consist of:

- (1) MODE \$01: Current powertrain diagnostic data
- (2) MODE \$02: Powertrain freeze frame data
- (3) MODE \$03: Emission-related powertrain DTC
- (4) MODE \$04: Clear/Reset emission-related diagnostic information
- (5) MODE \$06: Request on-board monitoring test results for intermittently monitored systems
- (6) MODE \$07: Request on-board monitoring test results for continuously monitored systems
- (7) MODE \$09: Request vehicle information

Read out the data according to repair procedures.
(For detailed operation procedure, refer to the general scan tool instruction manual.)

NOTE:

For details concerning DTC, refer to "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).>

General Scan Tool

ENGINE (DIAGNOSTICS)

2. MODE \$01 (CURRENT POWERTRAIN DIAGNOSTIC DATA)

Refer to data denoting the current operating condition of analog input/output, digital input/output or the powertrain system.

A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
01	Number of emission-related powertrain DTC and malfunction indicator light status and diagnosis support information	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	kPa
0C	Engine speed	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
0F	Intake air temperature	°C
10	Air flow rate from mass air flow sensor	g/sec
11	Throttle valve absolute opening angle	%
13	Check whether oxygen sensor is installed.	—
15	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor	V and %
1C	Supporting OBD system	—
24	A/F value and A/F sensor output voltage	— and V
34	A/F value and A/F current	— and mA
\$1F	Elapsed time after starting engine	sec
\$21	Elapsed time after MIL illuminates	km
\$2C	Target EGR	%
\$2D	EGR deviation	%
\$2E	Evaporative purge	%
\$2F	Fuel level	%
\$30	Engine speed for warm up after DTC clear	—
\$31	Travel distance after DTC clear	km
\$32	Tank pressure	mmHg
\$33	Atmospheric pressure	mmHg
\$3C	Catalytic temperature #1	°C
\$41	Diagnostic monitor of each DC	—
\$42	ECM power voltage	V
\$43	Absolute load	%
\$44	A/F target lambda	—
\$45	Relative throttle opening angle	%
\$46	Ambient temperature	°C
\$47	Absolute throttle opening angle 2	%
\$49	Absolute accelerator opening angle 1	%
\$4A	Absolute accelerator opening angle 2	%
\$4C	Target throttle opening angle	%
\$4D	Engine operating time during MIL illuminates	min
\$4E	Elapsed time after DTC clear	min
\$51	Fuel used	—
\$5A	Relative accelerator opening angle	%

NOTE:

Refer to general scan tool manufacturer's instruction manual to access generic OBD-II PIDs (MODE \$01).

3. MODE \$02 (POWERTRAIN FREEZE FRAME DATA)

Refer to data denoting the operating condition when trouble is detected by on-board diagnosis system. A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
02	DTC that caused the freeze frame data storage required by CARB	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	kPa
0C	Engine speed	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
0F	Intake air temperature	°C
10	Air flow rate from mass air flow sensor	g/sec
11	Throttle valve absolute opening angle	%
15	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor	V and %
1C	Supporting OBD system	—
\$1F	Elapsed time after starting engine	sec
\$2C	Target EGR	%
\$2D	EGR deviation	%
\$2E	Evaporative purge	%
\$2F	Fuel level	%
\$13	Air fuel ratio sensor	—
\$32	Tank pressure	mmHg
\$33	Atmospheric pressure	mmHg
\$42	ECM power voltage	V
\$43	Absolute load	%
\$44	A/F target lambda	—
\$45	Relative throttle opening angle	%
\$46	Ambient temperature	°C
\$47	Absolute throttle opening angle 2	%
\$49	Absolute accelerator opening angle 1	%
\$4A	Absolute accelerator opening angle 2	%
\$4C	Target throttle opening angle	%

NOTE:

Refer to general scan tool manufacturer's instruction manual to access freeze frame data (MODE \$02).

4. MODE \$03 (EMISSION-RELATED POWERTRAIN DTC)

Refer to "Read Diagnostic Trouble Code (DTC)" for information about data denoting emission-related powertrain DTC. <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).>

5. MODE \$04 (CLEAR/RESET EMISSION-RELATED DIAGNOSTIC INFORMATION)

Refer to the mode used to clear or reset emission-related diagnostic information (OBD-II trouble diagnostic information).

NOTE:

Refer to general scan tool manufacturer's instruction manual to clear the emission-related diagnostic information (MODE \$04).

General Scan Tool

ENGINE (DIAGNOSTICS)

6. MODE \$06

Refer to the test value of troubleshooting and data of test specification on the support data bit sequence table. A list of the support data is shown in the following table.

OBDMID	TID	SID	Test value & Test specification
\$01	\$81	\$0A	A/F sensor conduction abnormal (B1S1)
	\$82	\$8D	
	\$83	\$14	
	\$84	\$1E	A/F sensor range abnormal (B1S1)
	\$85	\$1E	A/F sensor response (B1S1)
	\$86	\$20	
\$02	\$87	\$0B	Oxygen sensor circuit abnormal (B1S2)
	\$88	\$0B	
	\$07	\$0B	Oxygen sensor drop abnormal (B1S2)
	\$08	\$0B	
	\$A5	\$0B	
	\$05	\$10	Oxygen sensor response abnormal (B1S2)
	\$06	\$10	
\$21	\$89	\$20	Catalyst degradation diagnosis (Bank 1)
\$31	\$8A	\$FD	EGR system diagnosis
\$39	\$93	\$FE	Evaporative emission control system (Cap off)
\$3B	\$94	\$FE	Evaporative emission control system (0.04)
	\$95	\$FE	
\$3C	\$96	\$FE	Evaporative emission control system (0.02)
	\$97	\$FE	
\$3D	\$98	\$FE	Evaporative emission control system (Purge flow)
\$41	\$99	\$24	A/F sensor heater abnormal (B1S1)
	\$9A	\$24	
	\$9B	\$14	A/F sensor heater performance abnormal (B1S1)
\$42	\$9C	\$24	Oxygen sensor heater abnormal (B1S2)
	\$9D	\$24	
\$A1	\$0B	\$24	Misfire monitoring (All cylinders)
	\$0C	\$24	
\$A2	\$0B	\$24	Misfire monitoring (#1 cylinder)
	\$0C	\$24	
\$A3	\$0B	\$24	Misfire monitoring (#2 cylinder)
	\$0C	\$24	
\$A4	\$0B	\$24	Misfire monitoring (#3 cylinder)
	\$0C	\$24	
\$A5	\$0B	\$24	Misfire monitoring (#4 cylinder)
	\$0C	\$24	

7. MODE \$07

Refer to the data of DTC (pending code) for troubleshooting result about emission in the first time.

8. MODE \$09

Refer to data of vehicle specification (V.I.N., calibration ID, diagnosis frequency etc.).

9. Subaru Select Monitor

A: OPERATION

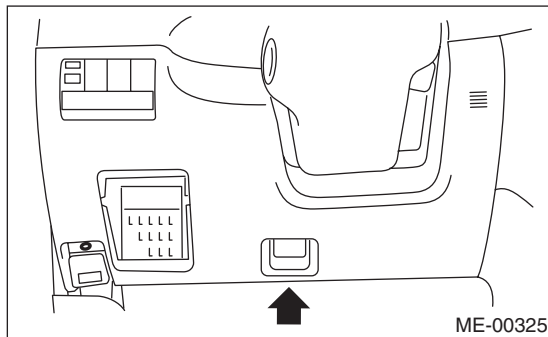
1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4SO)(diag)-7, PREPARATION TOOL, General Description.>

2) Connect the diagnosis cable to the Subaru Select Monitor.

3) Connect the Subaru Select Monitor to the data link connector.

(1) Data link connector is located in the lower portion of instrument panel (on the driver's side).



(2) Connect the diagnosis cable to the data link connector.

CAUTION:

Do not connect scan tools except for Subaru Select Monitor and general scan tool.

4) Turn the ignition switch to ON (engine OFF) and run the Subaru Select Monitor.

5) Using the Subaru Select Monitor, call up DTCs and various data, then record them.

2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE (NORMAL MODE)

Refer to "Read Diagnostic Trouble Code (DTC)" for information about how to display a DTC. <Ref. to EN(H4SO)(diag)-34, Read Diagnostic Trouble Code (DTC).>

3. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE (OBD MODE)

Refer to "Read Diagnostic Trouble Code (DTC)" for information about how to display a DTC. <Ref. to EN(H4SO)(diag)-34, Read Diagnostic Trouble Code (DTC).>

Subaru Select Monitor

ENGINE (DIAGNOSTICS)

4. READ CURRENT DATA FOR ENGINE (NORMAL MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check}.
 - 2) On the «System Selection Menu» display screen, select the {Engine Control System}.
 - 3) Select the [OK] after the information of engine type has been displayed.
 - 4) On the «Engine Diagnosis» display screen, select the {Current Data Display/Save}.
 - 5) On the «Display Menu» screen, select the {Data Display}.
 - 6) Using the scroll key, scroll the display screen up or down until the desired data is shown.
- A list of the support data is shown in the following table.

Contents	Display	Unit of measure	Note (at idling)
Engine load	Engine Load	%	21.0%
Engine coolant temperature signal	Coolant Temp.	°C or °F	92°C or 198°F (After warming up)
A/F correction #1	A/F Correction #1	%	-0.8%
A/F learning #1	A/F Learning #1	%	0.0%
Intake manifold absolute pressure	Mani. Absolute Pressure	mmHg, kPa, inHg or psig	200 — 300 mmHg, 26.7 — 40 kPa, 7.8 — 11.8 inHg or 3.8 — 5.8 psig
Engine speed signal	Engine Speed	rpm	600 — 800 rpm (Agree with the tachometer indication)
Meter vehicle speed signal	Meter Vehicle Speed	km/h or MPH	0 km/h or 0 MPH (at parking)
Ignition timing signal	Ignition Timing	deg	14 — 16 deg
Intake air temperature signal	Intake Air Temp.	°C or °F	(Ambient air temperature)
Intake air amount	Mass Air Flow	g/s or lb/m	2.8 — 3.2 g/s or 0.37 — 0.42 lb/m
Throttle opening angle signal	Throttle Opening Angle	%	2.0%
Rear oxygen sensor voltage	Rear O2 Sensor	V	0.1 — 0.7 V
Battery voltage	Battery Voltage	V	12 — 14 V
Mass air flow voltage	Air Flow Sensor Voltage	V	1.26 V
Injection 1 pulse width	Fuel Injection #1 Pulse	ms	2.82 ms
Knock sensor correction	Knocking Correction	deg	0.0 deg
Atmospheric absolute pressure signal	Atmospheric Pressure	mmHg, kPa, inHg or psig	(Atmosphere pressure)
Intake manifold relative pressure	Mani. Relative Pressure	mmHg, kPa, inHg or psig	(Air intake absolute pressure – atmosphere pressure)
Fuel tank pressure signal	Fuel Tank Pressure	mmHg, kPa, inHg or psig	+7.9 mmHg, +1.1 kPa, +0.31 inHg or +0.15 psig
Fuel temperature signal	Fuel Temp.	°C or °F	+20°C or +68°F
Fuel level signal	Fuel Level	V	0 — 5 V
Acceleration opening angle signal	Acceleration Opening Angle	%	0.0%
Purge control solenoid duty ratio	CPC Valve Duty Ratio	%	0 — 3%
No. of EGR steps	No. of EGR Step	STEP	0 STEP
A/F sensor current value 1	A/F Sensor #1 Current	mA	-0.2 — 0.2 mA
A/F sensor resistance value 1	A/F Sensor #1 Resistance	Ω	32 Ω
A/F sensor output lambda 1	A/F sensor output lambda 1	—	1.0
Ignition timing learning	Learned Ignition Timing	deg	—
A/F correction #3	A/F Correction #3	%	0.3%
A/F learning #3	A/F Learning #3	%	0.00%

Subaru Select Monitor

ENGINE (DIAGNOSTICS)

Contents	Display	Unit of measure	Note (at idling)
Throttle motor duty	Throttle Motor Duty	%	-15%
Throttle power supply voltage	Throttle Motor Voltage	V	(Battery voltage)
Sub throttle sensor voltage	Sub Throttle Sensor	V	1.52 V
Main throttle sensor voltage	Main Throttle Sensor	V	0.66 V
Sub accelerator sensor voltage	Sub Accelerator Sensor	V	0.68 V
Main accelerator sensor voltage	Main Accelerator Sensor	V	0.68 V
Memory vehicle speed	Memorized Cruise Speed	km/h or MPH	0 km/h or 0 MPH
Engine oil temperature	Engine Oil Temperature	°C	≥ 85°C (After engine warmed-up)
Oil switching solenoid valve duty R	Osv Duty R	%	16.9%
Oil switching solenoid valve duty L	OSV Duty L	%	16.9%
Oil switching solenoid valve current R	OSV Current R	mA	192 mA
Oil switching solenoid valve current L	OSV Current L	mA	192 mA
Variable valve lift lift mode	VVL Lift Mode	—	1
#1 cylinder roughness monitor	Roughness Monitor #1	—	0
#2 cylinder roughness monitor	Roughness Monitor #2	—	0
#3 cylinder roughness monitor	Roughness Monitor #3	—	0
#4 cylinder roughness monitor	Roughness Monitor #4	—	0
AT/MT identification terminal	AT Model ID Signal	—	AT model / MT model
Test mode terminal	Test Mode Terminal	—	U-check
Neutral position switch signal	Neutral Position Switch	—	Neutral
Soft idle switch signal	Idle Switch Signal	—	At idle
Ignition switch signal	Ignition Switch	—	ON input
Power steering switch signal	P/S Switch	—	OFF input (At OFF)
Air conditioning switch signal	A/C Switch	—	OFF input (At OFF)
Starter switch signal	Starter Switch	—	OFF input
Rear O ₂ monitor	Rear O2 Rich Signal	—	Rich/Lean
Knocking signal	Knocking Signal	—	None
Crankshaft position sensor signal	Crankshaft Position Signal	—	Provided
Camshaft position sensor signal	Camshaft Position Signal	—	Provided
Rear defogger switch signal	Rear Defogger Switch	—	OFF input (At OFF)
Blower fan switch signal	Blower Fan Switch	—	OFF input (At OFF)
Light switch signal	Light Switch	—	OFF input (At OFF)
A/C middle pressure switch signal	A/C Mid Pressure Switch	—	OFF input (At OFF)
Air conditioner compressor relay output signal	A/C Compressor Signal	—	OFF output (At OFF)
Radiator fan relay 1 signal	Radiator Fan Relay #1	—	OFF output (At OFF)
Radiator fan relay 2 signal	Radiator Fan Relay #2	—	OFF output (At OFF)
Fuel pump relay signal	Fuel Pump Relay	—	ON output
Pressure control solenoid valve signal	PCV Solenoid Valve	—	OFF output
PCV hose assembly diagnosis signal	Blow-by Leak Diagnosis Connector	—	Connect
D check request flag	D Check Request	—	OFF
Delivery mode connector	Delivery Mode	—	OFF
Drain valve signal	Vent. Solenoid Valve	—	OFF output
Variable valve lift diagnosis oil pressure switch signal 1	Eng. Oil Press. SW 1	—	ON
Variable valve lift diagnosis oil pressure switch signal 2	Eng. Oil Press. SW 2	—	ON
AT coordinate retard angle demand signal	Retard Signal from AT	—	None
AT coordinate fuel cut demand signal	Fuel Cut Signal from AT	—	None

Subaru Select Monitor

ENGINE (DIAGNOSTICS)

Contents	Display	Unit of measure	Note (at idling)
AT cooperative permission signal	Torque Control Permission Signal	—	ON
Electronic throttle control motor relay signal	ETC Motor Relay	—	ON
Clutch switch signal	Clutch Switch	—	OFF (At OFF)
Stop light switch signal	Stop Light Switch	—	OFF (At OFF)
SET/COAST switch signal	SET/COAST Switch	—	OFF (At OFF)
RES/ACC switch signal	RESUME/ACCEL Switch	—	OFF (At OFF)
Brake switch signal	Brake Switch	—	OFF (At OFF)
Main switch signal	Main Switch	—	OFF (At OFF)
Cruise control cancel switch signal	Cruise Control Cancel Switch	—	OFF (At OFF)

NOTE:

For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

5. READ CURRENT DATA FOR ENGINE (OBD MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check}.
 - 2) On the «System Selection Menu» display screen, select the {Engine Control System}.
 - 3) Select the [OK] after the information of engine type has been displayed.
 - 4) On the «Engine Diagnosis» display screen, select the {OBD System}.
 - 5) On the «OBD Menu» display screen, select the {Current Data Display/Save}.
 - 6) On the «Display Menu» screen, select the {Data Display}.
 - 7) Using the scroll key, scroll the display screen up or down until the desired data is shown.
- A list of the support data is shown in the following table.

Contents	Display	Unit of measure	Note (at idling)
Number of diagnosis code	Number of DTC	—	0
Condition of malfunction indicator light	MI (MIL)	—	ON or OFF
Monitoring test of misfire	Misfire monitoring	—	Finish or incomplete
Monitoring test of fuel system	Fuel system monitoring	—	Finish or incomplete
Monitoring test of comprehensive component	Component monitoring	—	Finish or incomplete
Test of catalyst	Catalyst Diagnosis	—	Finish or incomplete
Test of heated catalyst	Heated catalyst	—	No support
Test of evaporative emission purge control system	Evaporative purge system	—	Finish or incomplete
Secondary air system test	Secondary air system	—	No support
Test of air conditioning system refrigerant	A/C system refrigerant	—	No support
Oxygen sensor test	Oxygen sensor	—	Finish or incomplete
Oxygen sensor heater test	O2 Heater Diagnosis	—	Finish or incomplete
Test of EGR system	EGR system	—	Finish or incomplete
Air fuel ratio control system for bank 1	A/F Control #1	—	Normal CLOSE
Engine load data	Load	%	23.0%
Engine coolant temperature signal	Coolant Temp.	°C or °F	92°C or 198°F
Short term fuel trim by front oxygen (A/F) sensor	A/F Correction Value #1	%	-0.8%
Long term fuel trim by front oxygen (A/F) sensor	A/F Learning Value #1	%	+0.0%
Intake manifold absolute pressure	Mani. Absolute Pressure	mmHg, kPa, inHg or psig	211 mmHg, 28.1 kPa, 8.31 inHg or 4.08 psig
Engine speed signal	Engine Speed	rpm	700 rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH	0 km/h or 0 MPH
#1 Cylinder ignition timing	Ignition timing #1	°	+16.0°
Intake air temperature signal	Intake Air Temp.	°C or °F	36°C or 97°F

Subaru Select Monitor

ENGINE (DIAGNOSTICS)

Contents	Display	Unit of measure	Note (at idling)
Intake air amount	Mass Air Flow	g/s or lb/m	2.7 g/s or 0.36 lb/m
Throttle position signal	Throttle Opening Angle	%	13%
Oxygen sensor (Bank 1 Sensor 2)	Oxygen sensor #12	V	0.7 V
Air fuel ratio correction by rear oxygen sensor	A/F Correction #12	%	0.0%
On-board diagnostic system	OBD system	—	CARB-OBD2
Front oxygen (A/F) sensor (Bank 1 Sensor 1)	Oxygen sensor #11	—	Support
Oxygen sensor (Bank 1 Sensor 2)	Oxygen sensor #12	—	Support
Front oxygen (A/F) sensor (Bank 1 Sensor 1)	A/F sensor #11	—	1.001
Front oxygen (A/F) sensor (Bank 1 Sensor 1)	A/F sensor #11	V	2.79 V
Front oxygen (A/F) sensor (Bank 1 Sensor 1)	A/F sensor #11	—	1.001
Front oxygen (A/F) sensor (Bank 1 Sensor 1)	A/F sensor #11	mA	0.00 mA
Elapsed time after starting engine	Time Since Engine Start	sec	—
Travel distance after malfunction indicator light illuminating	Lighted MI lamp history	km or miles	—
Target EGR	Target EGR	%	—
EGR deviation	EGR deviation	%	—
Evaporative purge	Commanded Evap Purge	%	0%
Fuel level signal	Fuel Level	%	—
Engine speed for warm up after DTC clear	Number of warm-ups	—	—
Travel distance after DTC clear	Meter since DTC cleared	km or miles	—
Fuel tank pressure signal	Fuel Tank Pressure	mmHg, kPa, inHg or psig	+7.9 mmHg, +1.1 kPa, +0.31 inHg or +0.15 psig
Atmospheric absolute pressure signal	Atomosphere Pressure	mmHg, kPa, inHg or psig	(Atmosphere pressure)
Catalytic temperature #1	Catalyst Temperature #1	°C or °F	—
Diagnostic monitor of each drive cycle	Diagnostic monitor of each DC	—	—
ECM power voltage	Control module voltage	V	13.789 V
Absolute load	Absolute Load Value	%	22%
Air fuel ratio target lambda	Target Equivalence Ratio	—	0.976
Relative throttle opening angle	Relative Throttle Pos.	%	2%
Ambient temperature	Ambient Temperature	°C or °F	(Ambient air temperature)
Absolute throttle opening angle 2	Absolute Throttle Pos.#2	%	32%
Absolute accelerator opening angle 1	Accelerator Pedal Pos.#1	%	13%
Absolute accelerator opening angle 2	Accelerator Pedal Pos.#2	%	13%
Target throttle opening angle	Target Throt. Act. Cont.	%	0%
Engine operating time during MIL illuminates	Time while MIL lighted	min	—
Elapsed time after DTC clear	Time since DTC cleared	min	—
Fuel used	Type of fuel	—	GAS
Relative accelerator opening angle	Relative Accelerator Pos.	%	0%

NOTE:

For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

Subaru Select Monitor

ENGINE (DIAGNOSTICS)

6. READ FREEZE FRAME DATA FOR ENGINE (OBD MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check}.
 - 2) On the «System Selection Menu» display screen, select the {Engine Control System}.
 - 3) Select the [OK] after the information of engine type has been displayed.
 - 4) On the «Engine Diagnosis» display screen, select the {OBD System}.
 - 5) On the «OBD Menu» display screen, select the {Freeze Frame Data}.
- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Freeze frame data DTC code	Freeze frame data	DTC
Air fuel ratio control system for bank 1	Fuel system for Bank 1	Normal CLOSE or initial OPEN
Engine load data	Engine load	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg, kPa, inHg or psi
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Ignition timing signal	Ignition Timing	°
Intake air amount	Mass Air Flow	g/sec
Intake air temperature signal	Intake Air Temp.	°C or °F
Throttle position signal	Throttle Opening Angle	%
Oxygen sensor #12	Oxygen sensor #12	V
A/F Correction #12	A/F Correction #12	%
Oxygen sensor #11	Oxygen sensor #11	Support
Oxygen sensor #12	Oxygen sensor #12	Support
Supporting OBD	Supporting OBD	OBD2(CARB)
Target EGR	Target EGR	%
EGR deviation	EGR deviation	%
Evaporative purge	Commanded Evap Purge	%
Fuel level	Fuel Level	%
Fuel tank pressure signal	Fuel Tank Pressure	mmHg, kPa, inHg or psig
Atmospheric pressure	Atmosphere Pressure	mmHg, kPa, inHg or psig
ECM power voltage	Control module voltage	V
Absolute load	Absolute Load Value	%
Air fuel ratio target lambda	Target Equivalence Ratio	—
Relative throttle position	Relative Throttle Pos.	%
Ambient temperature	Ambient Temperature	°C or °F
Absolute throttle opening angle 2	Absolute Throttle Pos.#2	%
Absolute accelerator opening angle 1	Accelerator Pedal Pos.#1	%
Absolute accelerator opening angle 2	Accelerator Pedal Pos.#2	%
Target throttle opening angle	Target Throt. Act. Cont.	%
Front oxygen (A/F) sensor (Bank 1 Sensor 1)	Front oxygen (A/F) sensor (B1S1)	Support
Oxygen sensor (Bank 1 Sensor 2)	Oxygen sensor (B1S2)	Support

NOTE:

For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

7. V.I.N. REGISTRATION

- 1) On the «Main Menu» display screen, select the {Each System Check}.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System}.
- 3) Select the [OK] after the information of engine type has been displayed.
- 4) On the «Engine Diagnosis» display screen, select the {V.I.N. Registration}.
- 5) Perform the procedures shown on the display screen.

NOTE:

For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

Read Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

10. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check}.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System}.
- 3) Select the [OK] after the information of engine type has been displayed.
- 4) On the «Engine Diagnosis» screen, select the {DTC Display}.
- 5) On the «Diagnostic Code(s) Display» screen, select the {Current Diagnostic Code(s)} or {History Diagnostic Code(s)}.

NOTE:

- For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.
- For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (OBD MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check}.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System}.
- 3) Select the [OK] after the information of engine type has been displayed.
- 4) On the «Engine Diagnosis» display screen, select the {OBD System}.
- 5) On the «OBD Menu» display screen, select the Diagnostic Code(s) Display.
- 6) Make sure DTC is shown on the screen.

NOTE:

- For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.
- For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).>

3. GENERAL SCAN TOOL

Refer to data denoting emission-related powertrain DTC.

For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).>

NOTE:

Refer to general scan tool manufacturer’s instruction manual to access powertrain DTC (MODE \$03).

11. Inspection Mode

A: PROCEDURE

Carry out trouble diagnosis shown in the following DTC table.

When performing trouble diagnosis which is not shown in the DTC table, refer to the Drive cycle. <Ref. to EN(H4SO)(diag)-40, Drive Cycle.>

DTC	Item	Condition
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	—
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	—
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	—
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	—
P0077	Intake Valve Control Solenoid Circuit High (Bank 1)	—
P0083	Intake Valve Control Solenoid Circuit High (Bank 2)	—
P0102	Mass or Volume Air Flow Circuit Low Input	—
P0103	Mass or Volume Air Flow Circuit High Input	—
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	—
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	—
P0112	Intake Air Temperature Sensor 1 Circuit Low	—
P0113	Intake Air Temperature Sensor 1 Circuit High	—
P0117	Engine Coolant Temperature Circuit Low	—
P0118	Engine Coolant Temperature Circuit High	—
P0122	Throttle/Pedal Position Sensor/Switch "A" Circuit Low	—
P0123	Throttle/Pedal Position Sensor/ Switch "A" Circuit High	—
P0131	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	—
P0132	O2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	—
P0137	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	—
P0138	O2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	—
P0140	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 2)	—
P0182	Fuel Temperature Sensor "A" Circuit Low Input	—
P0183	Fuel Temperature Sensor "A" Circuit High Input	—
P0197	Engine Oil Temperature Sensor Low	—
P0198	Engine Oil Temperature Sensor High	—
P0222	Throttle/Pedal Position Sensor/Switch "B" Circuit Low	—
P0223	Throttle/Pedal Position Sensor/Switch "B" Circuit High	—
P0327	Knock Sensor 1 Circuit Low (Bank 1 or Single Sensor)	—
P0328	Knock Sensor 1 Circuit High (Bank 1 or Single Sensor)	—
P0335	Crankshaft Position Sensor "A" Circuit	—
P0336	Crankshaft Position Sensor "A" Circuit Range/Performance	—
P0340	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	—
P0341	Camshaft Position Sensor "A" Circuit Range/Performance (Bank 1 or Single Sensor)	—
P0447	Evaporative Emission Control System Vent Control Circuit Open	—
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	—
P0452	Evaporative Emission Control System Pressure Sensor Low Input	—
P0453	Evaporative Emission Control System Pressure Sensor High Input	—
P0458	Evaporative Emission System Purge Control Valve Circuit Low	—
P0462	Fuel Level Sensor "A" Circuit Low	—
P0463	Fuel Level Sensor "A" Circuit High	—
P0502	Vehicle Speed Sensor "A" Circuit Low Input	—
P0503	Vehicle Speed Sensor "A" Intermittent/Erratic/High	—
P0512	Starter Request Circuit	—

Inspection Mode

ENGINE (DIAGNOSTICS)

DTC	Item	Condition
P0519	Idle Air Control System Performance	—
P0600	Serial Communication Link	—
P0604	Internal Control Module Random Access Memory (RAM) Error	—
P0605	Internal Control Module Read Only Memory (ROM) Error	—
P0607	Control Module Performance	—
P0638	Throttle Actuator Control Range/Performance (Bank 1)	—
P0691	Fan 1 Control Circuit Low	—
P0692	Fan 1 Control Circuit High	—
P0700	Transmission Control System (MIL Request)	—
P0851	Park/Neutral Switch Input Circuit Low	—
P0852	Park/Neutral Switch Input Circuit High	—
P1152	O2 Sensor Circuit Range/Performance (Low) (Bank 1 Sensor 1)	—
P1153	O2 Sensor Circuit Range/Performance (High) (Bank 1 Sensor 1)	—
P1160	Return Spring Failure	—
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	—
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	—
P1491	Positive Crankcase Ventilation (Blow-by) Function Problem	—
P1518	Starter Switch Circuit Low Input	—
P1560	Back-up Voltage Circuit Malfunction	—
P2101	Throttle Actuator Control Motor Circuit Range/Performance	—
P2102	Throttle Actuator Control Motor Circuit Low	—
P2109	Throttle/Pedal Position Sensor "A" Minimum Stop Performance	—
P2122	Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input	—
P2123	Throttle/Pedal Position Sensor/Switch "D" Circuit High Input	—
P2127	Throttle/Pedal Position Sensor/Switch "E" Circuit Low Input	—
P2128	Throttle/Pedal Position Sensor/Switch "E" Circuit High Input	—
P2135	Throttle/Pedal Position Sensor/Switch "A"/"B" Voltage Correlation	—
P2138	Throttle/Pedal Position Sensor/Switch "D"/"E" Voltage Correlation	—
P2227	Barometric Pressure Circuit Range/ Performance	—
P2228	Barometric Pressure Circuit Low	—
P2229	Barometric Pressure Circuit High	—

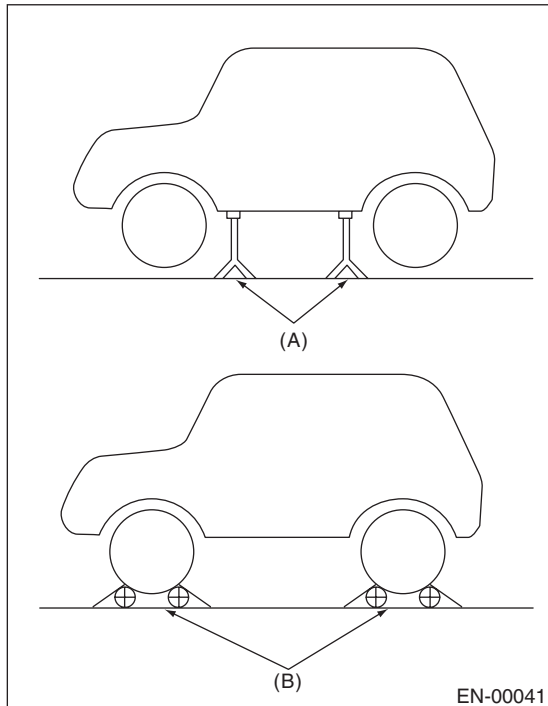
1. PREPARATION FOR THE INSPECTION MODE

1) Check battery voltage is more than 12 V and fuel remains half [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)].

2) Lift-up the vehicle using a garage jack and place it on rigid racks, or drive the vehicle onto free rollers.

WARNING:

- Before raising the vehicle, ensure parking brakes are applied.
- Do not use a pantograph jack in place of a rigid rack.
- Secure a rope or wire to the front or rear towing hooks to prevent the lateral runout of front wheels.
- Do not abruptly depress/release clutch pedal or accelerator pedal during works even when the engine is operating at low speeds since this may cause vehicle to jump off free rollers.
- In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the rigid racks and vehicle.
- Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.



- (A) Rigid rack
(B) Free rollers

2. SUBARU SELECT MONITOR

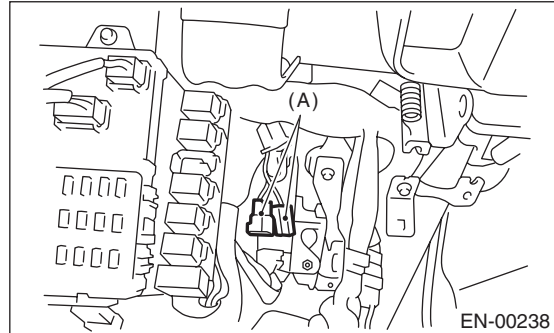
1) After clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H4SO)(diag)-44, Clear Memory Mode.>

2) Warm up the engine.

3) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4SO)(diag)-7, PREPARATION TOOL, General Description.>

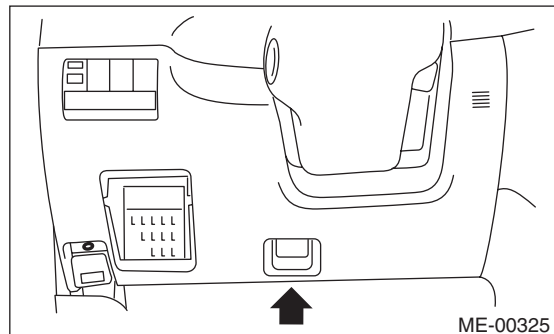
4) Connect the diagnosis cable to the Subaru Select Monitor.

5) Connect the test mode connector (A) at the lower portion of instrument panel (on the driver's side).



6) Connect the Subaru Select Monitor to the data link connector.

(1) Data link connector is located in the lower portion of instrument panel (on the driver's side).



(2) Connect the diagnosis cable to the data link connector.

CAUTION:

Do not connect the scan tools except for Subaru Select Monitor and general scan tool.

7) Turn the ignition switch to ON (engine OFF) and run the Subaru Select Monitor.

8) On the «Main Menu» display screen, select the {Each System Check}.

9) On the «System Selection Menu» display screen, select the {Engine Control System}.

10) Select the [OK] after the information of engine type has been displayed.

11) On the «Engine Diagnosis» display screen, select the {Dealer Check Mode Procedure}.

12) When the "Perform Inspection (Dealer Check Mode)" is shown on the screen, select the [OK].

Inspection Mode

ENGINE (DIAGNOSTICS)

13) Perform subsequent procedures as instructed on the display screen.

- If trouble still remains in the memory, the corresponding DTC appears on the display screen.

NOTE:

- For detailed operation procedure, refer to the "SUBARU SELECT MONITOR OPERATION MANUAL".
- For details concerning DTC, refer to "List of Diagnostic Trouble Code (DTC)".
<Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).>
- Release the parking brake.
- The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunctions. When engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

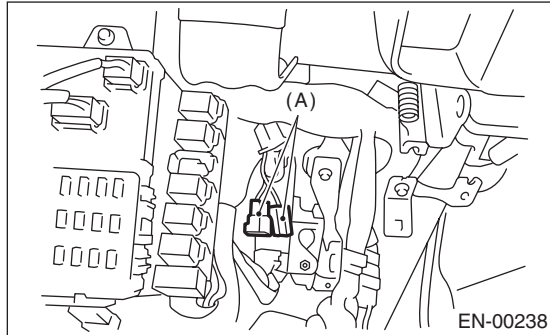
3. GENERAL SCAN TOOL

1) After clearing the memory, check for any remaining unresolved trouble data.

<Ref. to EN(H4SO)(diag)-44, Clear Memory Mode.>

2) Warm up the engine.

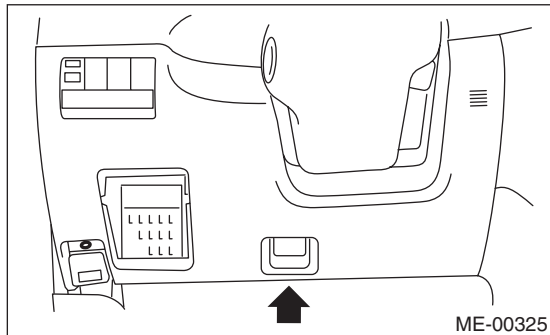
3) Connect the test mode connector (A) at the lower portion of instrument panel (on the driver's side).



4) Connect the general scan tool to its data link connector.

CAUTION:

Do not connect the scan tools except for Subaru Select Monitor and general scan tool.



5) Start the engine.

NOTE:

- Ensure the selector lever is placed in "P" range before starting. (AT model)

- Depress the clutch pedal when starting engine. (MT model)

6) Using the selector lever or shift lever, turn the "P" position switch and "N" position switch to ON.

7) Depress the brake pedal to turn the brake switch ON. (AT model)

8) Keep the engine speed in 2,500 — 3,000 rpm range for 40 seconds.

9) Place the selector lever or shift lever in "D" range (AT model) or "1st" gear (MT model) and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

NOTE:

- For AWD model, release the parking brake.

- The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunctions. When engine control diagnosis is finished, perform the ABS memory clearance procedure of self-diagnosis system.

10) Using the general scan tool, check DTC and record the result(s).

NOTE:

- For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".

- For details concerning DTC, refer to "List of Diagnostic Trouble Code (DTC)".

<Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).>

Drive Cycle

ENGINE (DIAGNOSTICS)

12. Drive Cycle

A: PROCEDURE

There are 6 drive patterns of drive cycles A — F for the trouble diagnosis. Performing the specified drive pattern allows to diagnose malfunctioning items listed below. After the malfunctioning items listed below are repaired, always check if they correctly resume their functions by performing the required drive pattern.

1. PREPARATION FOR DRIVE CYCLE

- 1) Check battery voltage is more than 12 V and fuel remains half [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)].
- 2) After clearing the memory, check for any remaining unresolved trouble data. <Ref. to EN(H4SO)(diag)-44, Clear Memory Mode.>
- 3) Disconnect the test mode connector.

NOTE:

- Except for the water temperature specified items at starting, be sure to carry out the diagnosis after the engine is warmed up.
- For the DTC which has * mark on it, carry out the diagnosis twice. After finishing first diagnosis, stop the engine, and do the second diagnosis at the same condition.

2. DRIVE CYCLE A (AFTER RUNNING 20 MINUTES AT 80 KM/H (50 MPH), IDLE THE ENGINE FOR 1 MINUTE.)

DTC	Item	Condition
*P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	Coolant temperature at start is less than 20°C (68°F).
*P0128	Coolant Thermostat (Engine Coolant Temperature Below Thermostat Regulating Temperature)	—
*P0133	O2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	—
*P0171	System too Lean (Bank 1)	Diagnosis completes in drive cycle B or C as well.
*P0172	System too Rich (Bank 1)	Diagnosis completes in drive cycle B or C as well.
*P0196	Engine Oil Temperature Sensor Circuit Range/Performance	—
*P0301	Cylinder 1 Misfire Detected	Diagnosis completes in drive cycle B or C as well.
*P0302	Cylinder 2 Misfire Detected	Diagnosis completes in drive cycle B or C as well.
*P0303	Cylinder 3 Misfire Detected	Diagnosis completes in drive cycle B or C as well.
*P0304	Cylinder 4 Misfire Detected	Diagnosis completes in drive cycle B or C as well.
*P0420	Catalyst System Efficiency Below Threshold (Bank 1)	—
*P0442	Evaporative Emission Control System Leak Detected (Small Leak)	Coolant temperature at start is less than 25°C (77°F).
*P0451	Evaporative Emission Control System Pressure Sensor	—
*P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)	Coolant temperature at start is less than 25°C (77°F).
*P0457	Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)	Coolant temperature at start is less than 25°C (77°F).
*P0459	Evaporative Emission Control System Purge Control Valve Circuit High	—
P1443	Vent Control Solenoid Valve Function Problem	—
*P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	Diagnosis completes in drive cycle B or C as well.
*P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	Diagnosis completes in drive cycle B or C as well.
P2103	Throttle Actuator Control Motor Circuit High	Diagnosis completes in drive cycle B or C as well.

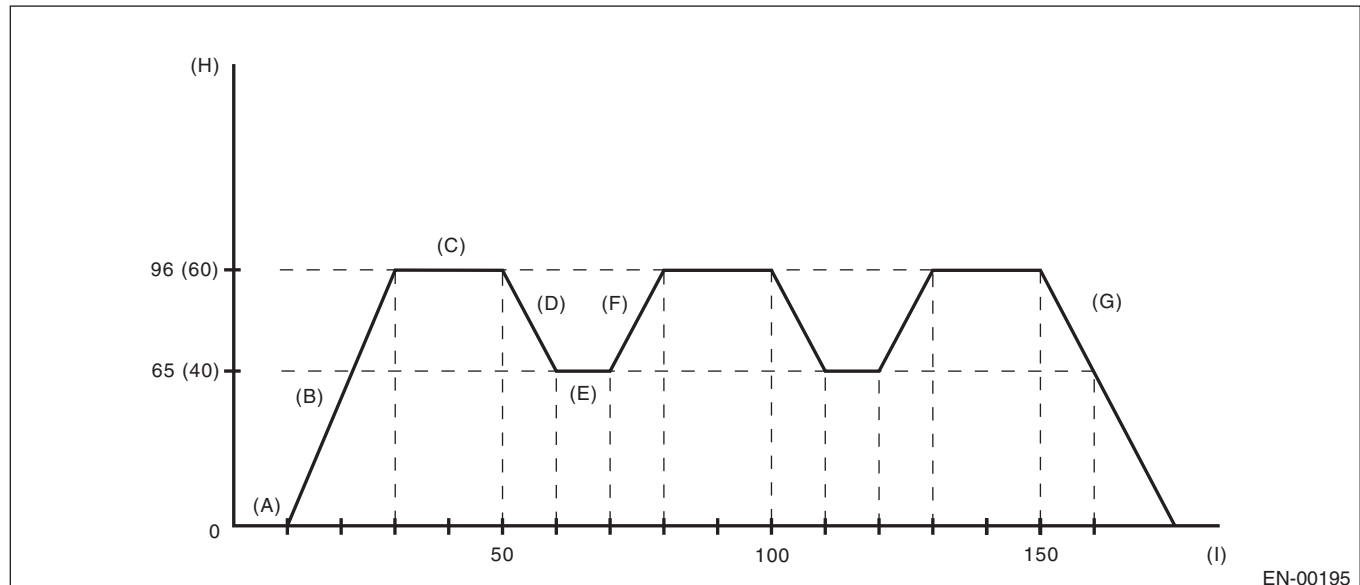
3. DRIVE CYCLE B (TEN MINUTES IDLING)

NOTE:

Drive the vehicle in more than 10 km/h (6 MPH) before diagnosis.

DTC	Item	Condition
*P0126	Insufficient Coolant Temperature for Stable Operation	—
*P0171	System Too Lean (Bank 1)	Diagnosis completes in drive cycle A or C as well.
*P0172	System Too Rich (Bank 1)	Diagnosis completes in drive cycle A or C as well.
*P0301	Cylinder 1 Misfire Detected	Diagnosis completes in drive cycle A or C as well.
*P0302	Cylinder 2 Misfire Detected	Diagnosis completes in drive cycle A or C as well.
*P0303	Cylinder 3 Misfire Detected	Diagnosis completes in drive cycle A or C as well.
*P0304	Cylinder 4 Misfire Detected	Diagnosis completes in drive cycle A or C as well.
*P0464	Fuel Level Sensor Circuit Intermittent	—
*P0483	Fan Rationality Check	—
*P0506	Idle Air Control System RPM Lower Than Expected	—
*P0507	Idle Air Control System RPM Higher Than Expected	—
*P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	Diagnosis completes in drive cycle A or C as well.
*P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	Diagnosis completes in drive cycle A or C as well.
P2103	Throttle Actuator Control Motor Circuit High	Diagnosis completes in drive cycle A or C as well.

4. DRIVE CYCLE C (DRIVE ACCORDING TO THE FOLLOWING DRIVE PATTERN)



EN-00195

- | | | |
|---|--|--|
| (A) Idle the engine for 1 minute. | (D) Decelerate the vehicle to 65 km/h (40 MPH) with throttle fully closed. | (G) Stop vehicle with the throttle fully closed. |
| (B) Accelerate the vehicle to 96 km/h (60 MPH) within 20 seconds. | (E) Drive the vehicle at 65 km/h (40 MPH) for 10 seconds. | (H) Vehicle speed km/h (MPH) |
| (C) Drive the vehicle at 96 km/h (60 MPH) for 20 seconds. | (F) Accelerate the vehicle to 96 km/h (60 MPH) within 10 seconds. | (I) Sec. |

Drive Cycle

ENGINE (DIAGNOSTICS)

DTC	Item	Condition
P0026	Intake Valve Control Solenoid Circuit Range/Performance (Bank 1)	—
P0028	Intake Valve Control Solenoid Circuit Range/Performance (Bank 2)	—
*P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	—
*P0068	Manifold Absolute Pressure/Barometric Pressure Circuit Range/Performance	—
P0076	Intake Valve Control Solenoid Circuit Low (Bank 1)	—
P0082	Intake Valve Control Solenoid Circuit Low (Bank 2)	—
*P0101	Mass or Volume Air Flow Circuit Range/Performance	—
P0134	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	—
*P0139	O2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	—
*P0171	System Too Lean (Bank 1)	Diagnosis completes in drive cycle A or B as well.
*P0172	System Too Rich (Bank 1)	Diagnosis completes in drive cycle A or B as well.
*P0301	Cylinder 1 Misfire Detected	Diagnosis completes in drive cycle A or B as well.
*P0302	Cylinder 2 Misfire Detected	Diagnosis completes in drive cycle A or B as well.
*P0303	Cylinder 3 Misfire Detected	Diagnosis completes in drive cycle A or B as well.
*P0304	Cylinder 4 Misfire Detected	Diagnosis completes in drive cycle A or B as well.
*P0400	Exhaust Gas Recirculation Flow	—
P1492	EGR Solenoid Valve Signal #1 Circuit Malfunction (Low Input)	—
P1493	EGR Solenoid Valve Signal #1 Circuit Malfunction (High Input)	—
P1494	EGR Solenoid Valve Signal #2 Circuit Malfunction (Low Input)	—
P1495	EGR Solenoid Valve Signal #2 Circuit Malfunction (High Input)	—
P1496	EGR Solenoid Valve Signal #3 Circuit Malfunction (Low Input)	—
P1497	EGR Solenoid Valve Signal #3 Circuit Malfunction (High Input)	—
P1498	EGR Solenoid Valve Signal #4 Circuit Malfunction (Low Input)	—
P1499	EGR Solenoid Valve Signal #4 Circuit Malfunction (High Input)	—
*P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	Diagnosis completes in drive cycle A or B as well.
*P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	Diagnosis completes in drive cycle A or B as well.
P2103	Throttle Actuator Control Motor Circuit High	Diagnosis completes in drive cycle A or B as well.

5. DRIVE CYCLE D

DRIFT DIAGNOSIS

- 1) Make sure that the engine coolant temperature at engine starting is less than 30°C (86°F).
- 2) Make sure that fuel remains more than 9.0 ℓ (2.4 US gal, 2.0 Imp gal) and the battery voltage is more than 10.9 V.
- 3) Make sure that the engine coolant temperature rises for more than 10°C (18°F) from the level of engine starting and is also above 75°C (167°F).
- 4) Idle the engine for more than 120 seconds in the condition of step 3.

STUCK DIAGNOSIS

- 1) Make sure that the battery voltage is more than 10.9 V.
- 2) Perform the Clear Memory Mode. <Ref. to EN(H4SO)(diag)-44, Clear Memory Mode.>
- 3) Drive the vehicle for the distance equal to the fuel of 50 ℓ (13.2 US gal, 11 Imp gal).

NOTE:

- It is acceptable to drive the vehicle intermittently.
- Do not disconnect the terminal of battery during diagnosis. (Data will be cleared when disconnecting the battery terminals.)

DTC	Item	Condition
P0181	Fuel Temperature Sensor "A" Circuit Range/Performance	—

6. DRIVE CYCLE E

- 1) Make sure that the battery voltage is more than 10.9 V.
- 2) Perform the Clear Memory Mode. <Ref. to EN(H4SO)(diag)-44, Clear Memory Mode.>
- 3) Drive the vehicle for the distance equal to the fuel of 30 ℓ (7.9 US gal, 6.6 Imp gal).

NOTE:

- It is acceptable to drive the vehicle intermittently.
- Do not disconnect the terminal of battery during diagnosis. (Data will be cleared when disconnecting the battery terminals.)

DTC	Item	Condition
P0461	Fuel Level Sensor "A" Circuit Range/Performance	—

7. DRIVE CYCLE F

- 1) Make sure that the engine coolant temperature at engine starting is less than 30°C (86°F).
- 2) Warm-up the engine until engine coolant temperature rises above 95°C (203°F) after starting the engine.
- 3) Idle the engine for more than 10 minutes in the condition of step 2.

NOTE:

Do not disconnect the terminal of battery during diagnosis. (Data will be cleared when disconnecting the battery terminals.)

DTC	Item	Condition
P0111	Intake Air Temperature Sensor 1 Circuit Range/Performance	—

8. DRIVE CYCLE H

- 1) Perform the Clear Memory Mode. <Ref. to EN(H4SO)(diag)-44, Clear Memory Mode.>
- 2) Read the engine coolant temperature, intake air temperature and fuel temperature with ignition switch ON. <Ref. to EN(H4SO)(diag)-28, READ CURRENT DATA FOR ENGINE (NORMAL MODE), OPERATION, Subaru Select Monitor.>
- 3) Start the engine if the value in step 2) meets the following two conditions.

Condition:

$$| \text{engine coolant temperature} - \text{intake air temperature} | \leq 5^{\circ}\text{C} (41^{\circ}\text{F})$$

$$| \text{engine coolant temperature} - \text{fuel temperature} | \leq 2^{\circ}\text{C} (36^{\circ}\text{F})$$

NOTE:

- If the value does not meet the conditions, turn the ignition switch to OFF and wait until it meets.
 - Start the engine in P range (AT model) or in N position (MT model).
- 4) Idle the engine for one minute in the condition of step 3.

DTC	Item	Condition
*P1602	Control Module Programming Error	—

Clear Memory Mode

ENGINE (DIAGNOSTICS)

13. Clear Memory Mode

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check}.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System}.
- 3) Select the [OK] after the information of engine type has been displayed.
- 4) On the «Engine Diagnosis» display screen, select the {Clear Memory}.
- 5) When the “Done” and “Turn Ignition Switch OFF” are shown on the display screen, turn the ignition switch to OFF, and then close the Subaru Select Monitor.

NOTE:

- Initial diagnosis of the electronic throttle control is performed after the memory is erased. Therefore, start the engine after 10 seconds or more have passed since turning the ignition switch to ON.
- For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

2. SUBARU SELECT MONITOR (OBD MODE)

- 1) On the «Main Menu» display screen, select the {Each System Check}.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System}.
- 3) Select the [OK] after the information of engine type has been displayed.
- 4) On the «Engine Diagnosis» display screen, select the {OBD System}.
- 5) On the «OBD Menu» display screen, select {DTC Clear}.
- 6) When the “Clear Diagnostic Code?” is shown on the screen, select the [OK].
- 7) Turn the ignition switch to OFF and close the Subaru Select Monitor.

NOTE:

For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

3. GENERAL SCAN TOOL

For clear memory procedures using the general scan tool, refer to “General Scan Tool Instruction Manual”.

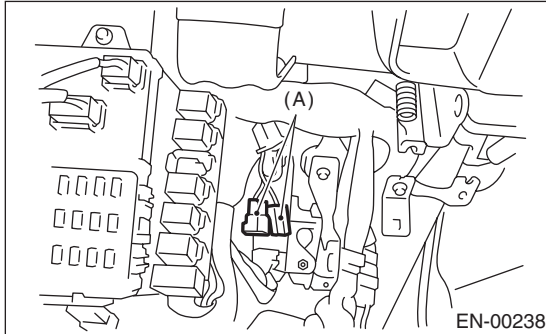
NOTE:

Initial diagnosis of the electronic throttle control is performed after the memory is erased. Therefore, start the engine after 10 seconds or more have passed since turning the ignition switch to ON.

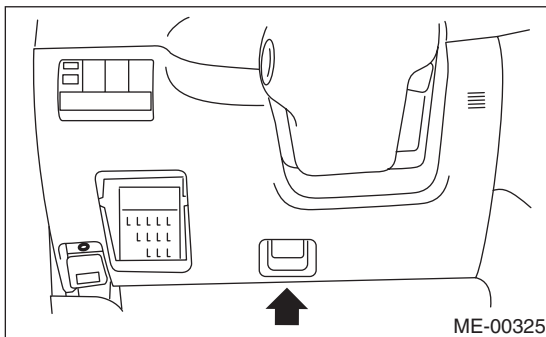
14. Compulsory Valve Operation Check Mode

A: OPERATION

- 1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4SO)(diag)-7, PREPARATION TOOL, General Description.>
- 2) Connect the diagnosis cable to the Subaru Select Monitor.
- 3) Connect the test mode connector (A) at the lower portion of instrument panel (on the driver's side).



- 4) Connect the Subaru Select Monitor to the data link connector.
 - (1) Data link connector is located in the lower portion of instrument panel (on the driver's side).



- (2) Connect the diagnosis cable to the data link connector.

CAUTION:

Do not connect scan tools except for Subaru Select Monitor and general scan tool.

- 5) Turn the ignition switch to ON (engine OFF) and run the Subaru Select Monitor.
- 6) On the «Main Menu» display screen, select the {Each System Check}.
- 7) On the «System Selection Menu» display screen, select the {Engine Control System}.
- 8) Select the [OK] after the information of engine type has been displayed.
- 9) On the «Engine Diagnosis» display screen, select the {System Operation Check Mode}.
- 10) On the «System Operation Check Mode» display screen, select the {Actuator ON/OFF Operation}.

- 11) Select the desired compulsory actuator on the «Actuator ON/OFF Operation» display screen.
- 12) Selecting the [NO] completes the compulsory valve operation check mode. The display will then return to the «Actuator ON/OFF Operation» screen.

- A list of the support data is shown in the following table.

Contents	Display
Compulsory fuel pump relay operation check	Fuel Pump Relay
Compulsory radiator fan relay operation check	Radiator Fan Relay
Compulsory air conditioning relay operation check	A/C Compressor Relay
Compulsory purge control solenoid valve operation check	CPC Valve Duty Ratio
Compulsory pressure control solenoid valve operation check	PCV Solenoid Valve
Compulsory air assist vent control solenoid valve operation check	Vent Control Solenoid Valve

NOTE:

- The following parts will be displayed but not functional.

Display
EGR Solenoid Valve
ASV Solenoid Valve
FICD Solenoid
Pressure Switching Sol.1
Pressure Switching Sol.2
Turbocharger Wastegate Solenoid
AAI Solenoid Valve
Emission-bypass Valve
Fuel Tank Sensor Control Valve
Secondary Air Combination Valve 1
Secondary Air Combination Valve 2
Secondary Air Pump Relay

- For detailed operation procedure, refer to the «SUBARU SELECT MONITOR OPERATION MANUAL».

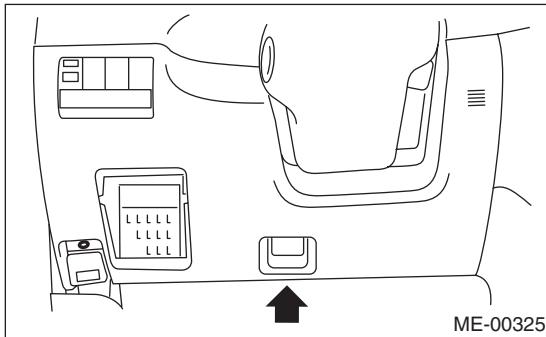
System Operation Check Mode

ENGINE (DIAGNOSTICS)

15. System Operation Check Mode

A: OPERATION

- 1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4SO)(diag)-7, PREPARATION TOOL, General Description.>
- 2) Connect the diagnosis cable to the Subaru Select Monitor.
- 3) Connect the Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).



CAUTION:

Do not connect scan tools except for Subaru Select Monitor and general scan tool.

- 4) Turn the ignition switch to ON (engine OFF) and run the Subaru Select Monitor.
- 5) On the «Main Menu» display screen, select the {Each System Check}.
- 6) On the «System Selection Menu» display screen, select the {Engine Control System}.
- 7) Select the [OK] after the information of engine type has been displayed.
- 8) On the «Engine Diagnosis» display screen, select the {System Operation Check Mode}.
- 9) The following items are displayed on the monitor.

Display
Fuel Pump Control
Idling Ignition Timing Fixed
Idle Speed Control
Injector Control
EGR Valve Control

1. FUEL PUMP CONTROL (OFF OPERATION)

CAUTION:

After carrying out the Operation Check Mode, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

- 1) On the «System Operation Check Mode» display screen, select the {Fuel Pump Control}.
- 2) On the «Fuel Pump Control» display screen, select the {OFF Operation}.
- 3) On the «Start the Engine» display screen, start the engine and select the [OK].
- 4) Selecting the [NO] completes the OFF Operation. The display will then return to the «Fuel Pump Control» screen.

2. FUEL PUMP CONTROL (ON/OFF OPERATION)

CAUTION:

After carrying out the Operation Check Mode, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

- 1) On the «System Operation Check Mode» display screen, select the {Fuel Pump Control}.
- 2) On the «Fuel Pump Control» display screen, select the {ON/OFF Operation}.
- 3) On the «Turn Ignition Switch ON with Engine Stalled» display screen, select the [OK].
- 4) Selecting the [NO] completes the ON/OFF Operation. The display will then return to the «Fuel Pump Control» screen.

3. IDLING IGNITION TIMING FIXED

CAUTION:

After carrying out the Operation Check Mode, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

- 1) On the «System Operation Check Mode» display screen, select the {Idling Ignition Timing Fixed}.
- 2) On the «Start the Engine» display screen, start the engine and select the [OK].
- 3) Selecting the [NO] completes the Idling Ignition Timing Fixed. The display will then return to the «System Operation Check Mode» screen.

4. IDLE SPEED CONTROL

CAUTION:

After carrying out the Operation Check Mode, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

- 1) On the «System Operation Check Mode» display screen, select the {Idle Speed Control}.
- 2) On the «Start the Engine» display screen, start the engine and select the [OK].
- 3) On the «Idle Speed Control» display screen, select [△] or [▽] to change the setting value, and select the [OK].

It is possible to set by 50 rpm, ranging from 500 rpm to 2,000 rpm. However, the actual idle speed that can be controlled is varied by vehicle type.

- 4) Selecting the [NO] completes the Idling Speed Control. The display will then return to the «System Operation Check Mode» screen.

5. INJECTOR CONTROL (INJECTION STOP MODE)

CAUTION:

After carrying out the Operation Check Mode, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

- 1) On the «System Operation Check Mode» display screen, select the {Injector Control}.
- 2) On the «Injector Control» display screen, select the {Injection Stop Mode}.
- 3) By the desired injector number on the «Injection Stop Mode» select the [OK].
- 4) On the «Start the Engine» display screen, start the engine and select the [OK].
- 5) Selecting the [NO] completes the Injection Stop Mode. The display will then return to the «Injector Control» screen.

6. INJECTOR CONTROL (INJECTION QUANTITY CONTROL)

CAUTION:

After carrying out the Operation Check Mode, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

- 1) On the «System Operation Check Mode» display screen, select the {Injector Control}.
- 2) On the «Injector Control» display screen, select the {Injection Quantity Control}.
- 3) On the «Start the Engine» display screen, start the engine and select the [OK].
- 4) On the «Injection Quantity Control» display screen, Select [△] or [▽] to change the setting value, and select the [OK].

It is possible to set by 1%, ranging from 0 to 20%.

- 5) Selecting the [NO] completes the Injection Quantity Control. The display will then return to the «Injector Control» screen.

7. EGR VALVE CONTROL

CAUTION:

After carrying out the Operation Check Mode, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

- 1) On the «System Operation Check Mode» display screen, select the {EGR Valve Control}.
- 2) On the «Start the Engine» display screen, start the engine and select the [OK].
- 3) On the «EGR Valve Control» display screen, select [△] or [▽] to change the setting value, and select the [OK].

It is possible to set by 1 STEP. However, the actual STEP amount that can be controlled is varied by vehicle type.

- 4) Selecting the [NO] completes the EGR Valve Control. The display will then return to the «System Operation Check Mode» screen.

NOTE:

For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

16. Malfunction Indicator Light

A: PROCEDURE

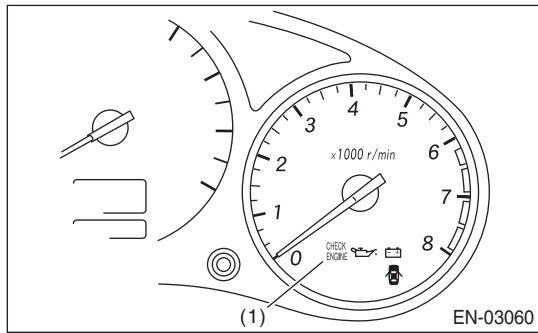
1. Activation of malfunction indicator light. <Ref. to EN(H4SO)(diag)-49, ACTIVATION OF MALFUNCTION INDICATOR LIGHT, Malfunction Indicator Light.>
↓
2. Malfunction indicator light does not come on. <Ref. to EN(H4SO)(diag)-50, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>
↓
3. Malfunction indicator light does not go off. <Ref. to EN(H4SO)(diag)-52, MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF, Malfunction Indicator Light.>

B: ACTIVATION OF MALFUNCTION INDICATOR LIGHT

1) When the ignition switch is turned on (engine off), the malfunction indicator light in the combination meter illuminates.

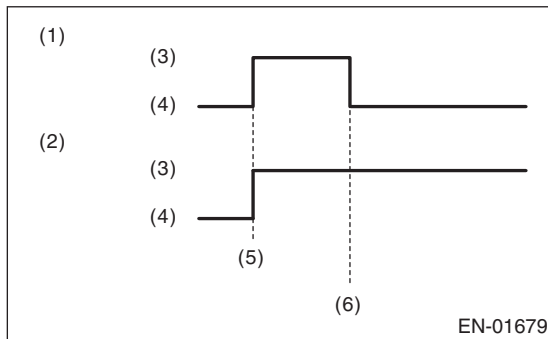
NOTE:

If the malfunction indicator light does not illuminate, perform diagnostics of the malfunction indicator light circuit or the combination meter circuit. <Ref. to EN(H4SO)(diag)-50, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>



(1) Malfunction indicator light

2) After starting the engine, the malfunction indicator light goes out. If it does not go off, either the engine or emission control system has malfunction.



- (1) No faulty
- (2) Trouble occurs
- (3) ON
- (4) OFF
- (5) Ignition switch ON
- (6) Engine start

Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

C: MALFUNCTION INDICATOR LIGHT DOES NOT COME ON

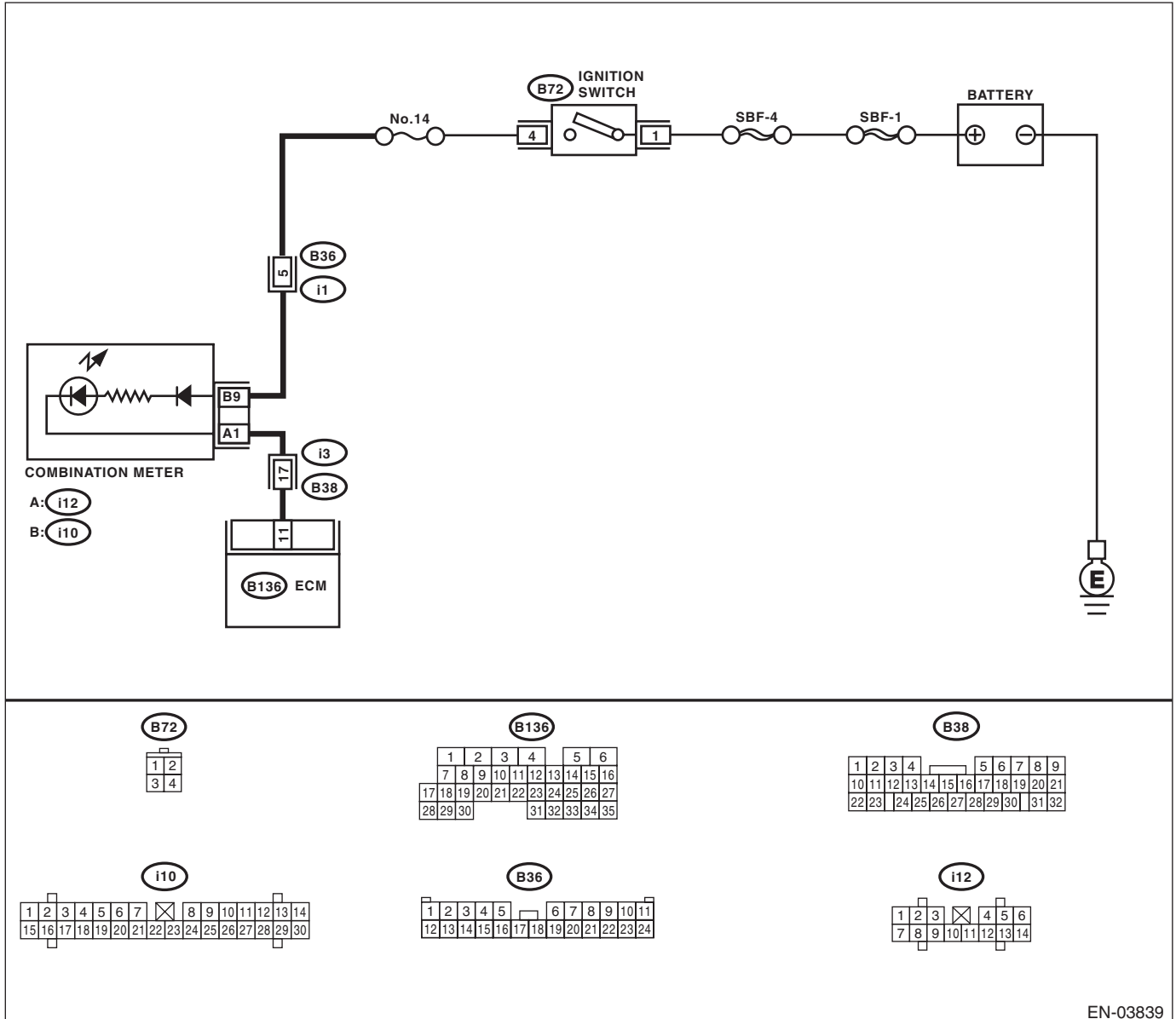
DIAGNOSIS:

The malfunction indicator light circuit is open or shorted.

TROUBLE SYMPTOM:

When the ignition switch is turned to ON (engine OFF), malfunction indicator light does not come on.

WIRING DIAGRAM:



EN-03839

Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B136) No. 11 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 4.	Go to step 2.
2 CHECK POOR CONTACT. Check for poor connection by shaking or pulling ECM connector and harness.	Does the malfunction indicator light illuminate?	Repair poor contact in ECM connector.	Go to step 3.
3 CHECK ECM CONNECTOR. Check the connection of ECM connector.	Is the ECM connector correctly connected?	Replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>	Repair the connection of ECM connector.
4 CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Remove the combination meter. <Ref. to IDI-10, Combination Meter.> 3) Disconnect the connector from ECM and combination meter. 4) Measure the resistance of harness between ECM and combination meter connector. <i>Connector & terminal</i> <i>(B136) No. 11 — (i12) No. 1:</i>	Is the resistance less than 1 Ω ?	Go to step 5.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and combination meter connector • Poor contact in coupling connector
5 CHECK POOR CONTACT. Check poor contact of combination meter connector.	Is there poor contact in combination meter connector?	Repair the poor contact of combination meter connector.	Go to step 6.
6 CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between combination meter connector and chassis ground. <i>Connector & terminal</i> <i>(i10) No. 9 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Replace the combination meter circuit board. <Ref. to IDI-10, Combination Meter.>	Check the following item and repair if necessary. NOTE: • Blown out of fuse (No. 13) • Open or short circuit in harness between fuse (No. 13) and battery terminal • Poor contact in ignition switch connector

Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

D: MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF

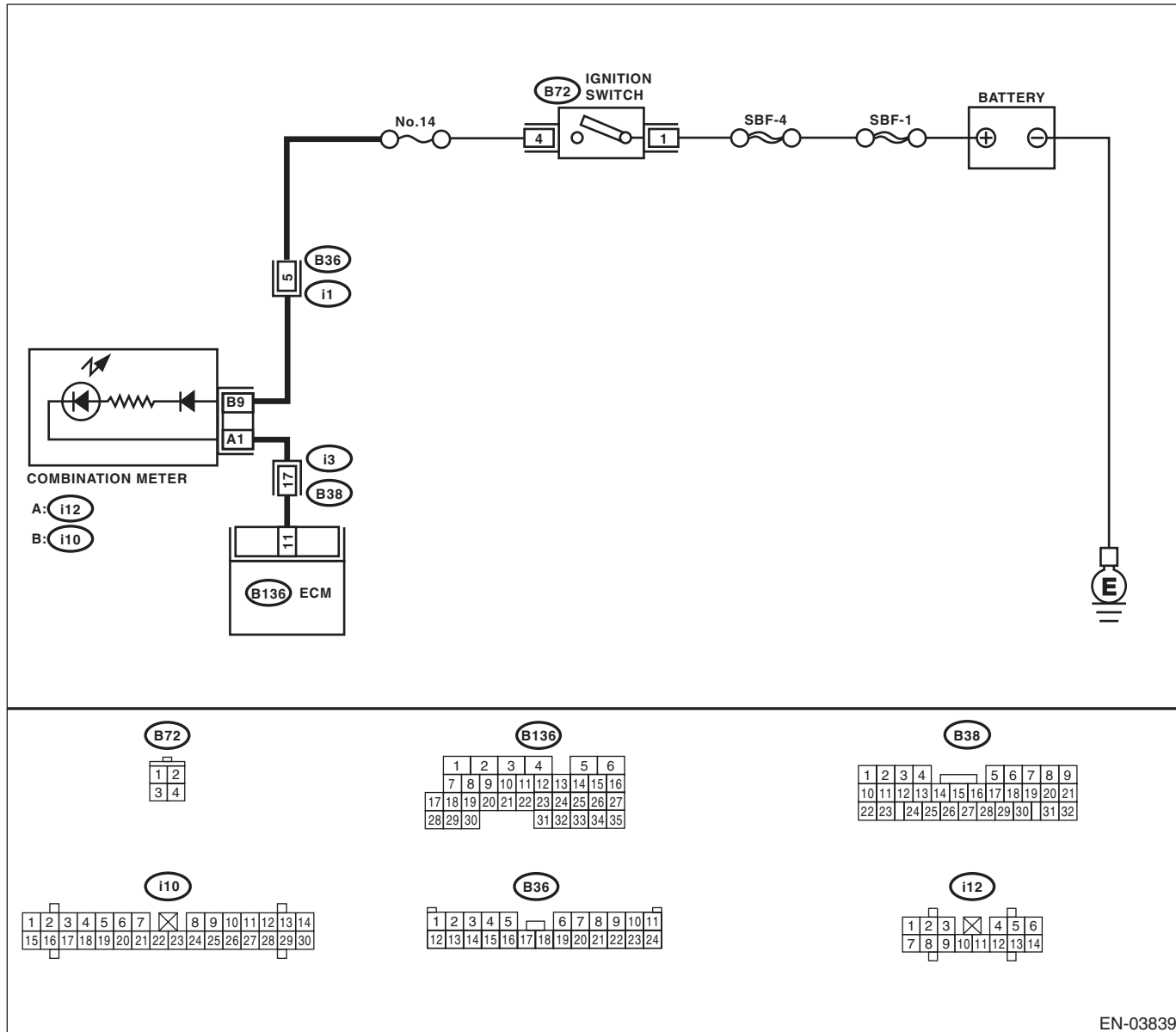
DIAGNOSIS:

The malfunction indicator light circuit is shorted.

TROUBLE SYMPTOM:

Although malfunction indicator light comes on when the engine runs, DTC is not shown on the Subaru Select Monitor or general scan tool display.

WIRING DIAGRAM:



Step	Check	Yes	No
1 CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Turn the ignition switch to ON.	Does the malfunction indicator light illuminate?	Repair the short circuit of harness between combination meter and ECM connector.	Replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>

17. Diagnostics for Engine Starting Failure

A: PROCEDURE

1. Check of the fuel amount.
↓
2. Inspection of starter motor circuit. <Ref. to EN(H4SO)(diag)-54, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ECM power supply and ground line. <Ref. to EN(H4SO)(diag)-57, CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM), Diagnostics for Engine Starting Failure.>
↓
4. Inspection of ignition control system. <Ref. to EN(H4SO)(diag)-59, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel pump circuit. <Ref. to EN(H4SO)(diag)-62, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
6. Inspection of fuel indicator circuit. <Ref. to EN(H4SO)(diag)-65, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

Diagnostics for Engine Starting Failure

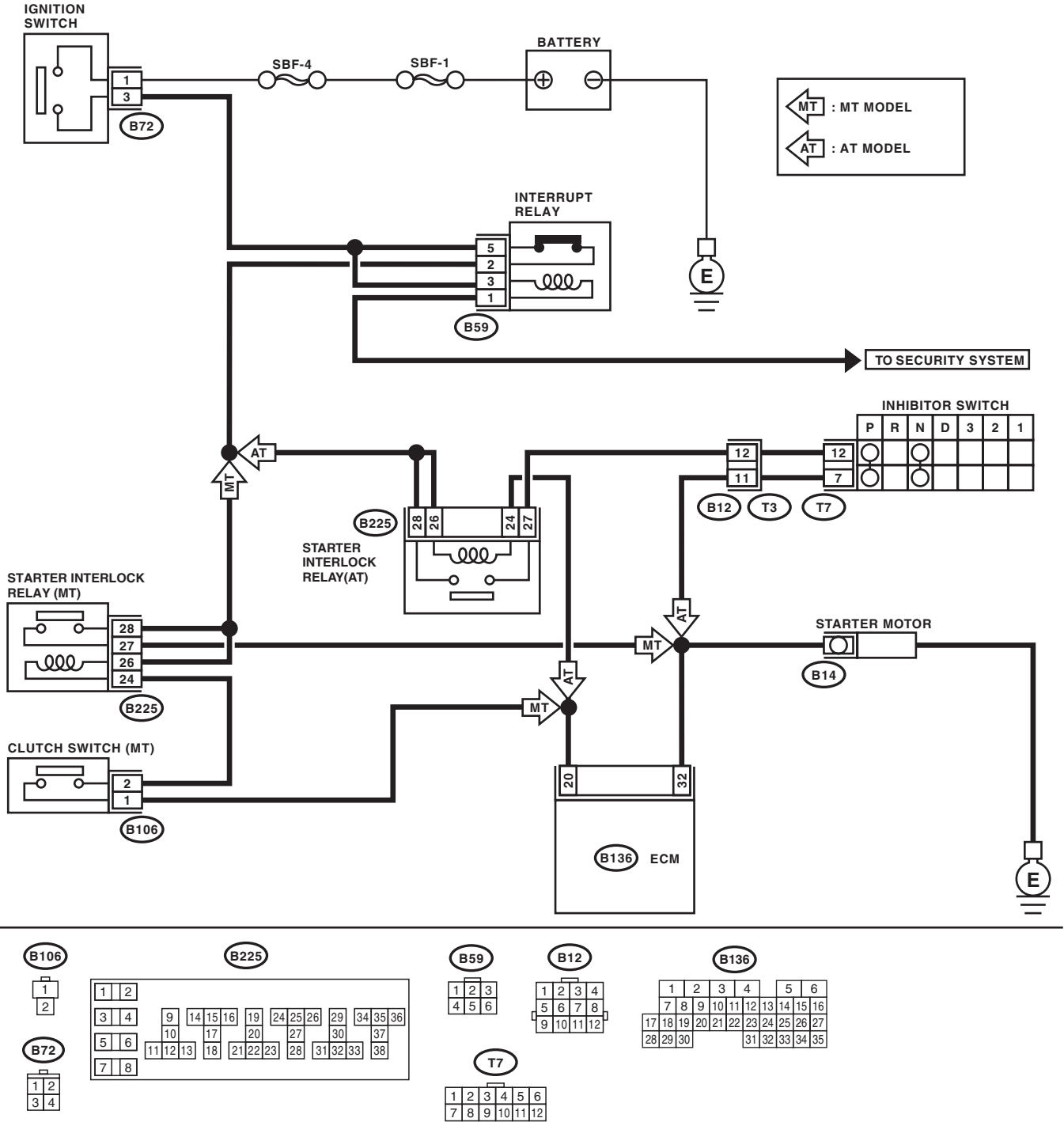
ENGINE (DIAGNOSTICS)

B: STARTER MOTOR CIRCUIT

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04767

Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No	
1	CHECK BATTERY. Check the battery voltage.	Is the voltage 12 V or more?	Go to step 2.	Charge or replace the battery.
2	CHECK OPERATION OF STARTER MOTOR. NOTE: Check the security alarm is not sounding. (model with security alarm)	Does the starter motor operate?	Go to step 3.	Go to step 4.
3	CHECK DTC.	Is DTC displayed? <Ref. to EN(H4SO)(diag)-34, OPERATION, Read Diagnostic Trouble Code (DTC).>	Check the appropriate DTC using the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).>	Repair poor contact in ECM connector.
4	CHECK INPUT SIGNAL FOR STARTER MOTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter motor. 3) Turn the ignition switch to ST. 4) Measure the power supply voltage between starter motor connector terminal and engine ground. Connector & terminal (B14) No. 1 (+) — Engine ground (-): NOTE: • For AT model, place the select lever in “P” or “N” range. • For MT model, depress the clutch pedal.	Is the voltage 10 V or more?	Check the starter motor. <Ref. to SC (H4SO)-6, Starter.>	Go to step 5.
5	CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR. 1) Disconnect the connector from ignition switch. 2) Measure the power supply voltage between ignition switch connector and chassis ground. Connector & terminal (B72) No. 1 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 6.	Repair the open circuit of harness between ignition switch and battery, and check fuse SBF No. 4 and SBF No. 1.
6	CHECK IGNITION SWITCH. 1) Disconnect the connector from ignition switch. 2) Measure the resistance between ignition switch terminals after turning the ignition switch to “ST” position. Terminals No. 1 — No. 3:	Is the resistance less than 5 Ω?	Go to step 7.	Replace the ignition switch.
7	CHECK TRANSMISSION TYPE.	Is the transmission type AT?	Go to step 8.	Go to step 12.
8	CHECK INPUT VOLTAGE OF STARTER INTERLOCK RELAY. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter interlock relay. 3) Connect the connector to ignition switch. 4) Measure the input voltage between starter interlock relay connector and chassis ground after turning the ignition switch to ST. Connector & terminal (B225) No. 26 (+) — Chassis ground (-): (B225) No. 28 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 9.	Repair open or short circuit to ground in harness between starter interlock relay and ignition switch. NOTE: Check security system (if equipped). <Ref. to SL-21, Security System.>

Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

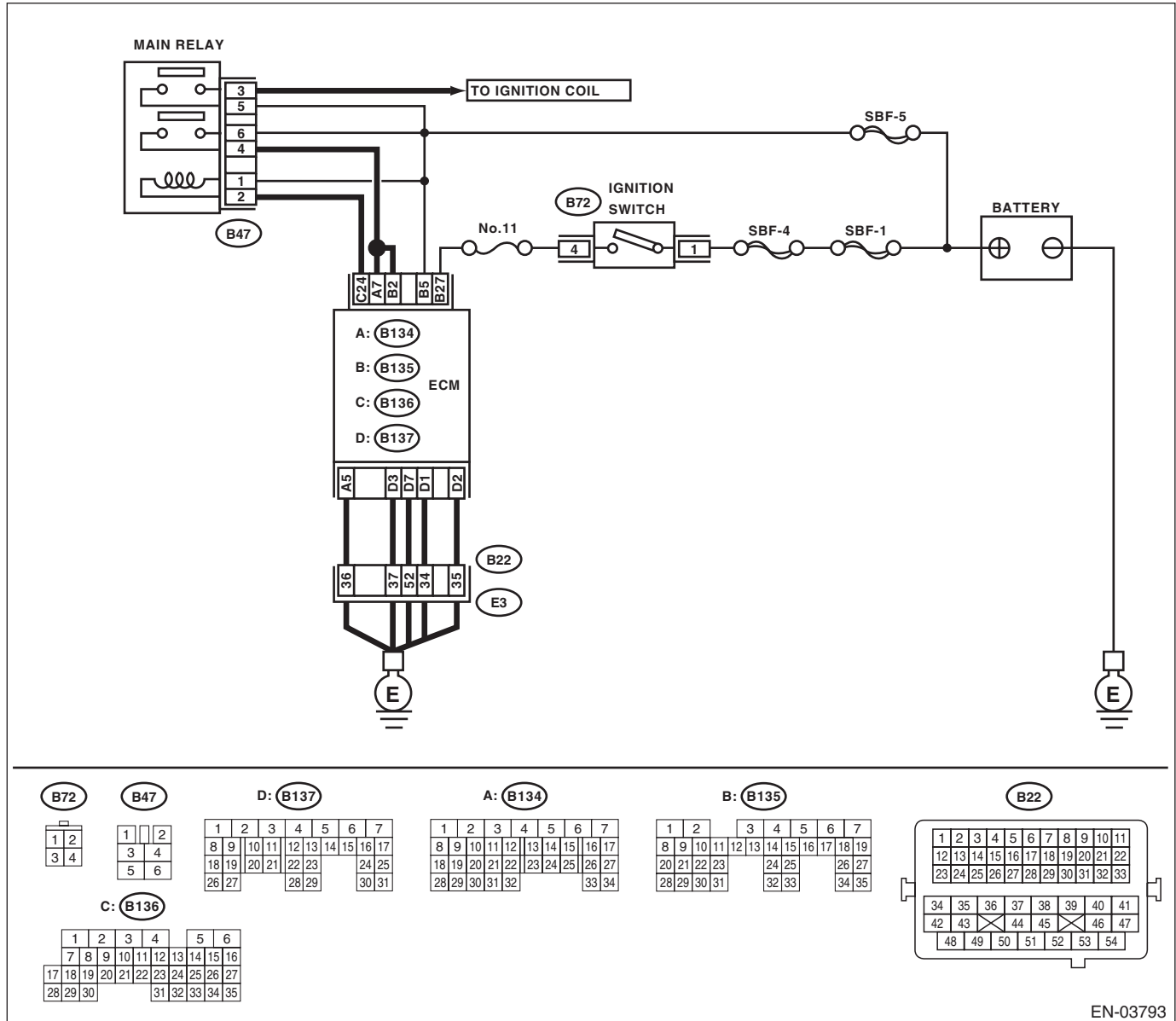
Step	Check	Yes	No
9 CHECK STARTER INTERLOCK RELAY. 1) Connect the battery to starter interlock relay terminals No. 26 and No. 24. 2) Measure the resistance between starter interlock relay terminals. <i>Terminals</i> No. 27 — No. 28:	Is the resistance less than 1 Ω ?	Go to step 10.	Replace the starter interlock relay.
10 CHECK INPUT VOLTAGE OF INHIBITOR SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from inhibitor switch. 3) Connect the connector to the ignition switch. 4) Measure the input voltage between inhibitor switch connector terminal and engine ground while turning the ignition switch to ST. <i>Connector & terminal</i> (B12) No. 12 (+) — Engine ground (-):	Is the voltage 10 V or more?	Go to step 11.	Repair open or ground short circuit in harness between inhibitor switch and starter interlock relay. NOTE: Check security system (if equipped). <Ref. to SL-21, Security System.>
11 CHECK INHIBITOR SWITCH. 1) Place the select lever in "P" or "N" range. 2) Measure the resistance between inhibitor switch terminals. <i>Connector & terminal</i> (T3) No. 11 — No. 12:	Is the resistance less than 1 Ω ?	Repair open or ground short circuit in harness between inhibitor switch and starter motor.	Replace the inhibitor switch. <Ref. to 4AT-47, Inhibitor Switch.>
12 CHECK INPUT VOLTAGE OF STARTER INTERLOCK RELAY. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter interlock relay. 3) Connect the connector to ignition switch. 4) Measure the input voltage between starter interlock relay connector and chassis ground after turning the ignition switch to ST. <i>Connector & terminal</i> (B225) No. 26 (+) — Chassis ground (-): (B225) No. 28 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 13.	Repair open or short circuit to ground in harness between starter interlock relay and ignition switch. NOTE: Check security system (if equipped). <Ref. to SL-21, Security System.>
13 CHECK STARTER INTERLOCK RELAY. 1) Connect the battery to starter interlock relay terminals No. 26 and No. 24. 2) Measure the resistance between starter interlock relay terminals. <i>Terminals</i> No. 27 — No. 28:	Is the resistance less than 1 Ω ?	Go to step 14.	Replace the starter interlock relay.
14 CHECK GROUND CIRCUIT OF CLUTCH SWITCH. 1) Disconnect the connector from clutch switch. 2) Measure the resistance between the clutch switch connector and chassis ground. <i>Connector & terminal</i> (B106) No. 1 — Chassis ground:	Is the resistance less than 1 Ω ?	Go to step 15.	Repair the open circuit of ground cable.
15 CHECK CLUTCH SWITCH. Measure the resistance between clutch switch terminals while depressing the clutch pedal. <i>Terminals</i> No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Go to step 16.	Replace the clutch switch. <Ref. to CL-28, Clutch Switch.>
16 CHECK CLUTCH SWITCH CIRCUIT. 1) Connect the connector to the clutch switch. 2) Measure the resistance between starter interlock relay connector and chassis ground while depressing the clutch pedal. <i>Connector & terminal</i> (B225) No. 24 — Chassis ground:	Is the resistance less than 1 Ω ?	Repair the ground short of the harness between starter interlock relay and starter motor.	Repair the open circuit in harness between starter interlock relay and clutch switch.

C: CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM)

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>

WIRING DIAGRAM:



Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

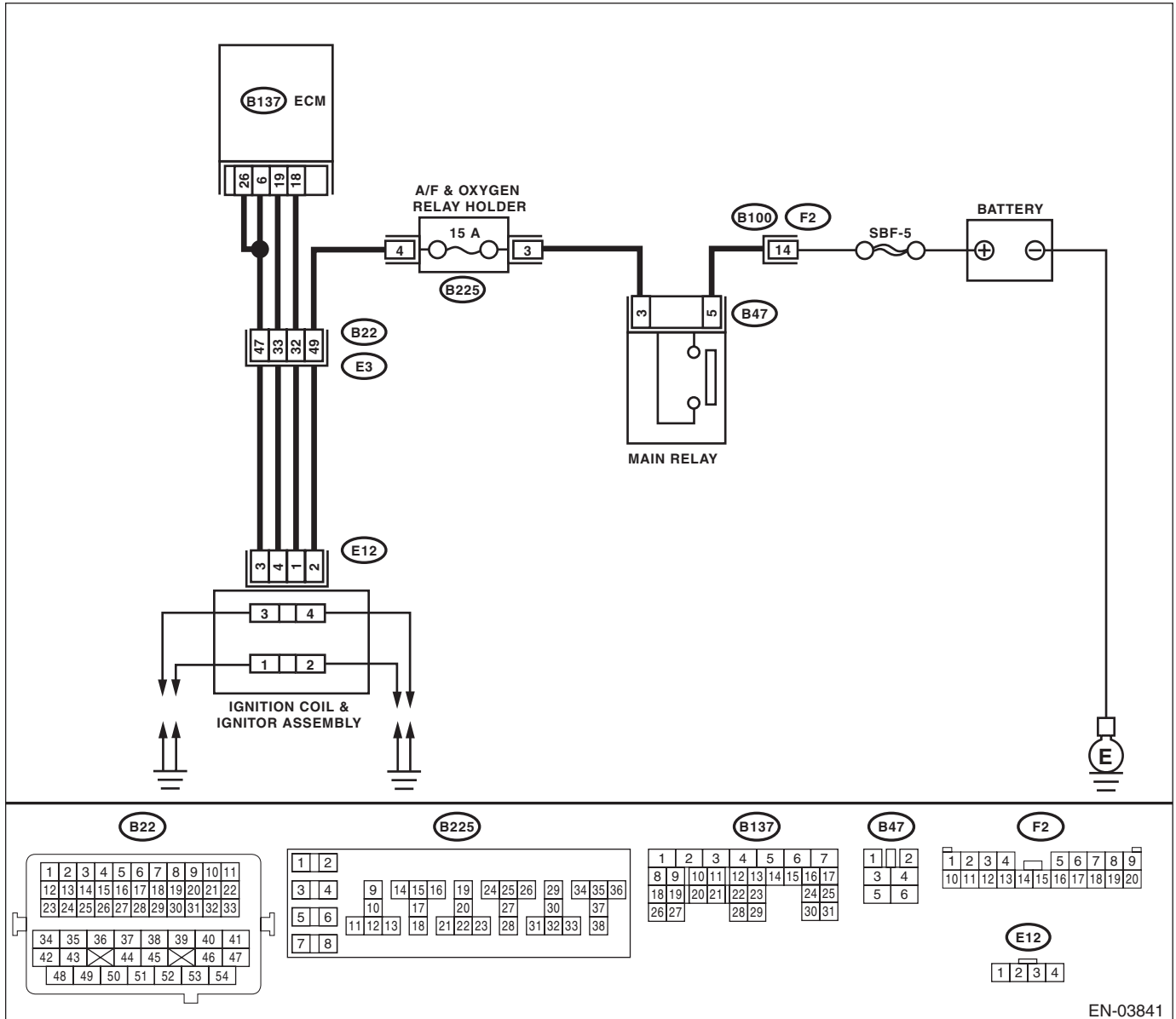
Step	Check	Yes	No
1 CHECK MAIN RELAY. 1) Turn the ignition switch to OFF. 2) Remove the main relay. 3) Connect the battery to main relay terminals No. 1 and No. 2. 4) Measure the resistance between main relay terminals. Terminals No. 3 — No. 5: No. 4 — No. 6:	Is the resistance less than 10 Ω ?	Go to step 2.	Replace the main relay.
2 CHECK GROUND CIRCUIT FOR ECM. 1) Disconnect the connectors from ECM. 2) Measure the resistance of harness between ECM and chassis ground. Connector & terminal (B134) No. 5 — Chassis ground: (B137) No. 1 — Chassis ground: (B137) No. 2 — Chassis ground: (B137) No. 3 — Chassis ground: (B137) No. 7 — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 3.	Repair the open circuit of harness between ECM connector and engine grounding terminal.
3 CHECK INPUT VOLTAGE OF ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 5 (+) — Chassis ground (-): (B135) No. 27 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 4.	Repair the open or ground short circuit of power supply circuit.
4 CHECK INPUT VOLTAGE OF MAIN RELAY. Measure the voltage between main relay connector and chassis ground. Connector & terminal (B47) No. 1 (+) — Chassis ground (-): (B47) No. 5 (+) — Chassis ground (-): (B47) No. 6 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 5.	Repair the open or ground short circuit of harness of power supply circuit.
5 CHECK INPUT VOLTAGE OF ECM. 1) Connect the main relay connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 7 (+) — Chassis ground (-): (B135) No. 2 (+) — Chassis ground (-): (B136) No. 24 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Check ignition control system. <Ref. to EN(H4SO)(diag)-59, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair the open or ground short circuit of harness between ECM connector and main relay connector.

D: IGNITION CONTROL SYSTEM

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03841

Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK IGNITION SYSTEM FOR SPARKS.</p> <p>1) Remove the plug cord cap from each spark plug.</p> <p>2) Install a new spark plug on plug cord cap.</p> <p>CAUTION: Do not remove the spark plug from engine.</p> <p>3) Contact the spark plug's thread portion to the engine.</p> <p>4) While opening the throttle valve fully, crank the engine to check that spark occurs at each cylinder.</p>	Does spark occur at each cylinder?	Check fuel pump system. <Ref. to EN(H4SO)(diag)-62, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step 2.
<p>2</p> <p>CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL AND IGNITOR ASSEMBLY.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from ignition coil and ignitor assembly.</p> <p>3) Turn the ignition switch to ON.</p> <p>4) Measure the power supply voltage between ignition coil and ignitor assembly connector and engine ground.</p> <p>Connector & terminal (E12) No. 2 (+) — Engine ground (-):</p>	Is the voltage 10 V or more?	Go to step 3.	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit in harness between the ignition coil and ignitor assembly and ignition switch connector • Poor contact in coupling connector
<p>3</p> <p>CHECK HARNESS OF IGNITION COIL AND IGNITOR ASSEMBLY GROUND CIRCUIT.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Measure the resistance between the ignition coil and ignitor assembly connector and engine ground.</p> <p>Connector & terminal (E12) No. 3 — Engine ground:</p>	Is the resistance less than 5 Ω?	Go to step 4.	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit of harness between ignition coil and ignitor assembly connector and engine grounding terminal
<p>4</p> <p>CHECK IGNITION COIL AND IGNITOR ASSEMBLY.</p> <p>1) Remove the spark plug cords.</p> <p>2) Measure the resistance between spark plug cord contact portions to check secondary coil.</p> <p>Terminals No. 1 — No. 2: No. 3 — No. 4:</p>	Is the resistance between 10 and 15 kΩ?	Go to step 5.	Replace the ignition coil and ignitor assembly. <Ref. to IG(H4SO)-6, Ignition Coil and Ignitor Assembly.>
<p>5</p> <p>CHECK INPUT SIGNAL FOR IGNITION COIL AND IGNITOR ASSEMBLY.</p> <p>1) Connect the connector to the Ignition coil and ignitor assembly.</p> <p>2) Check if voltage varies synchronously with engine speed when cranking, while monitoring voltage between ignition coil and ignitor assembly connector and engine ground.</p> <p>Connector & terminal (E12) No. 1 (+) — Engine ground (-): (E12) No. 4 (+) — Engine ground (-):</p>	Does the voltage vary more than 10 V?	Go to step 6.	Replace the ignition coil and ignitor assembly. <Ref. to IG(H4SO)-6, Ignition Coil and Ignitor Assembly.>

Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>6</p> <p>CHECK HARNESS BETWEEN ECM AND IGNITION COIL AND IGNITOR ASSEMBLY CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connector from ignition coil and ignitor assembly. 4) Measure the resistance of harness between ECM and ignition coil and ignitor assembly connector.</p> <p>Connector & terminal <i>(B137) No. 18 — (E12) No. 1:</i> <i>(B137) No. 19 — (E12) No. 4:</i></p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 7.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and ignition coil and ignitor assembly connector • Poor contact in coupling connector
<p>7</p> <p>CHECK HARNESS BETWEEN ECM AND IGNITION COIL AND IGNITOR ASSEMBLY CONNECTOR.</p> <p>Measure the resistance of harness between ECM and engine ground.</p> <p>Connector & terminal: <i>(B137) No. 18 — Engine ground:</i> <i>(B137) No. 19 — Engine ground:</i></p>	<p>Is the resistance 1 MΩ or more?</p>	<p>Go to step 8.</p>	<p>Repair the ground short circuit of harness between ECM and ignition coil and ignitor assembly connector.</p>
<p>8</p> <p>CHECK POOR CONTACT.</p> <p>Check poor contact of ECM connector.</p>	<p>Is there poor contact in ECM connector?</p>	<p>Repair poor contact in ECM connector.</p>	<p>Check fuel pump circuit. <Ref. to EN(H4SO)(diag)-62, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.></p>

Diagnostics for Engine Starting Failure

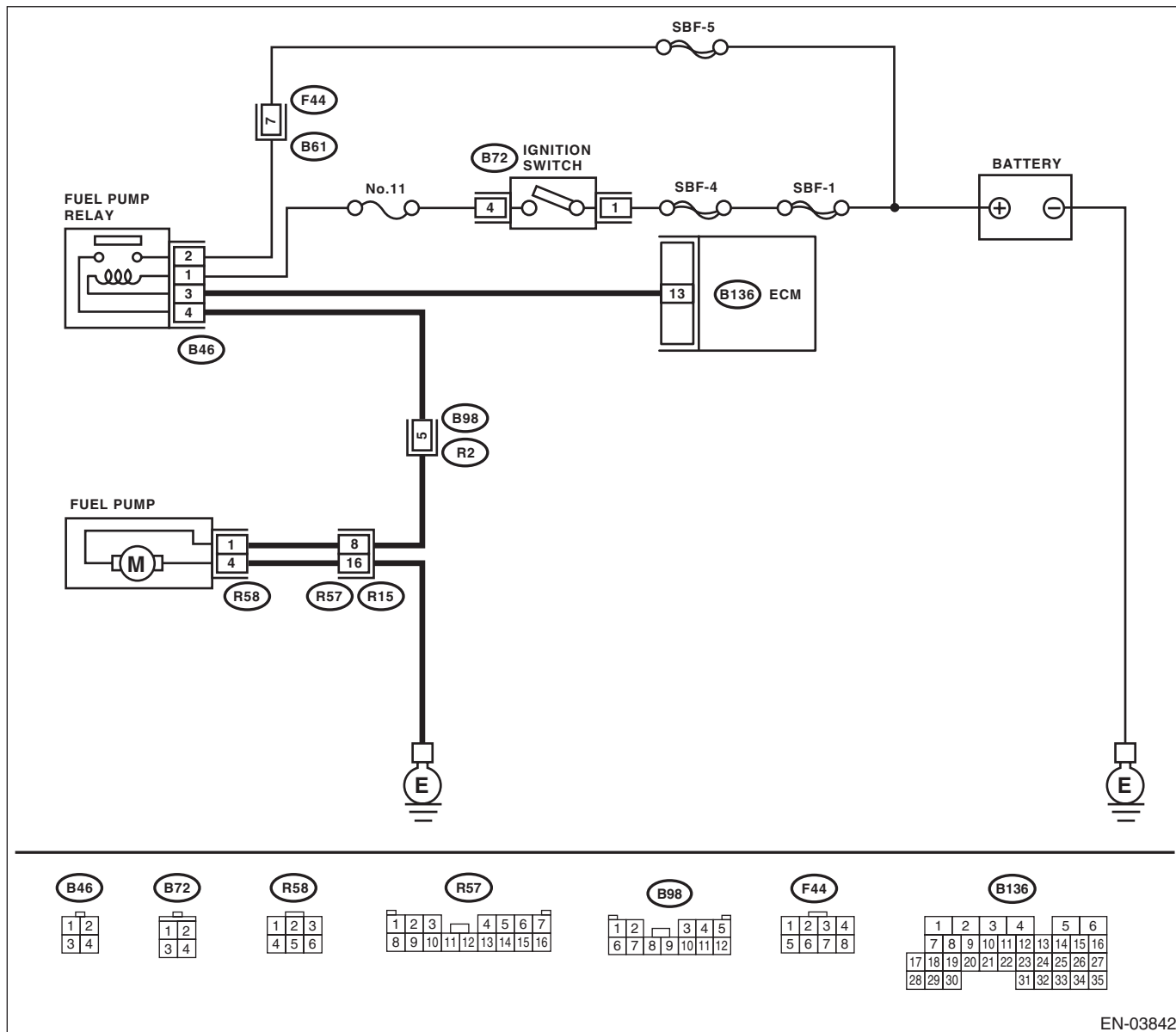
ENGINE (DIAGNOSTICS)

E: FUEL PUMP CIRCUIT

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03842

Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1 CHECK OPERATING SOUND OF FUEL PUMP. Make sure that fuel pump is in operation for 2 seconds when turning the ignition switch to ON. NOTE: The fuel pump can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-45, Compulsory Valve Operation Check Mode.></p>	Does the fuel pump emit operating sound?	Check the fuel injector circuit. <Ref. to EN(H4SO)(diag)-65, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step 2.
<p>2 CHECK GROUND CIRCUIT OF FUEL PUMP. 1) Turn the ignition switch to OFF. 2) Remove the fuel pump access hole lid. 3) Disconnect the connector from fuel pump. 4) Measure the resistance of harness connector between fuel pump and chassis ground. Connector & terminal (R58) No. 4 — Chassis ground:</p>	Is the resistance less than 5 Ω?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between fuel pump connector and chassis grounding terminal • Poor contact in coupling connector
<p>3 CHECK POWER SUPPLY TO FUEL PUMP. 1) Turn the ignition switch to ON. 2) Measure the voltage of power supply circuit between fuel pump connector and chassis ground. Connector & terminal (R58) No. 1 (+) — Chassis ground (-):</p>	Is the voltage 10 V or more?	Replace the fuel pump. <Ref. to FU(H4SO)-52, Fuel Pump.>	Go to step 4.
<p>4 CHECK HARNESS BETWEEN FUEL PUMP AND FUEL PUMP RELAY CONNECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness connector between fuel pump and fuel pump relay. Connector & terminal (R58) No. 1 — (B46) No. 4:</p>	Is the resistance less than 1 Ω?	Go to step 5.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between fuel pump connector and chassis grounding terminal • Poor contact in coupling connector
<p>5 CHECK HARNESS BETWEEN FUEL PUMP AND FUEL PUMP RELAY CONNECTOR. Measure the resistance of harness between fuel pump and fuel pump relay connector. Connector & terminal (R58) No. 1 — Chassis ground:</p>	Is the resistance 1 MΩ or more?	Go to step 6.	Repair the short circuit of harness between fuel pump and fuel pump relay connector.
<p>6 CHECK FUEL PUMP RELAY. 1) Disconnect the connectors from fuel pump relay and main relay. 2) Remove the fuel pump relay and main relay with bracket. 3) Connect the battery to fuel pump relay connector terminals No. 1 and No. 3. 4) Measure the resistance between connector terminals of fuel pump relay. Terminals No. 2 — No. 4:</p>	Is the resistance less than 10 Ω?	Go to step 7.	Replace the fuel pump relay. <Ref. to FU(H4SO)-42, Fuel Pump Relay.>

Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

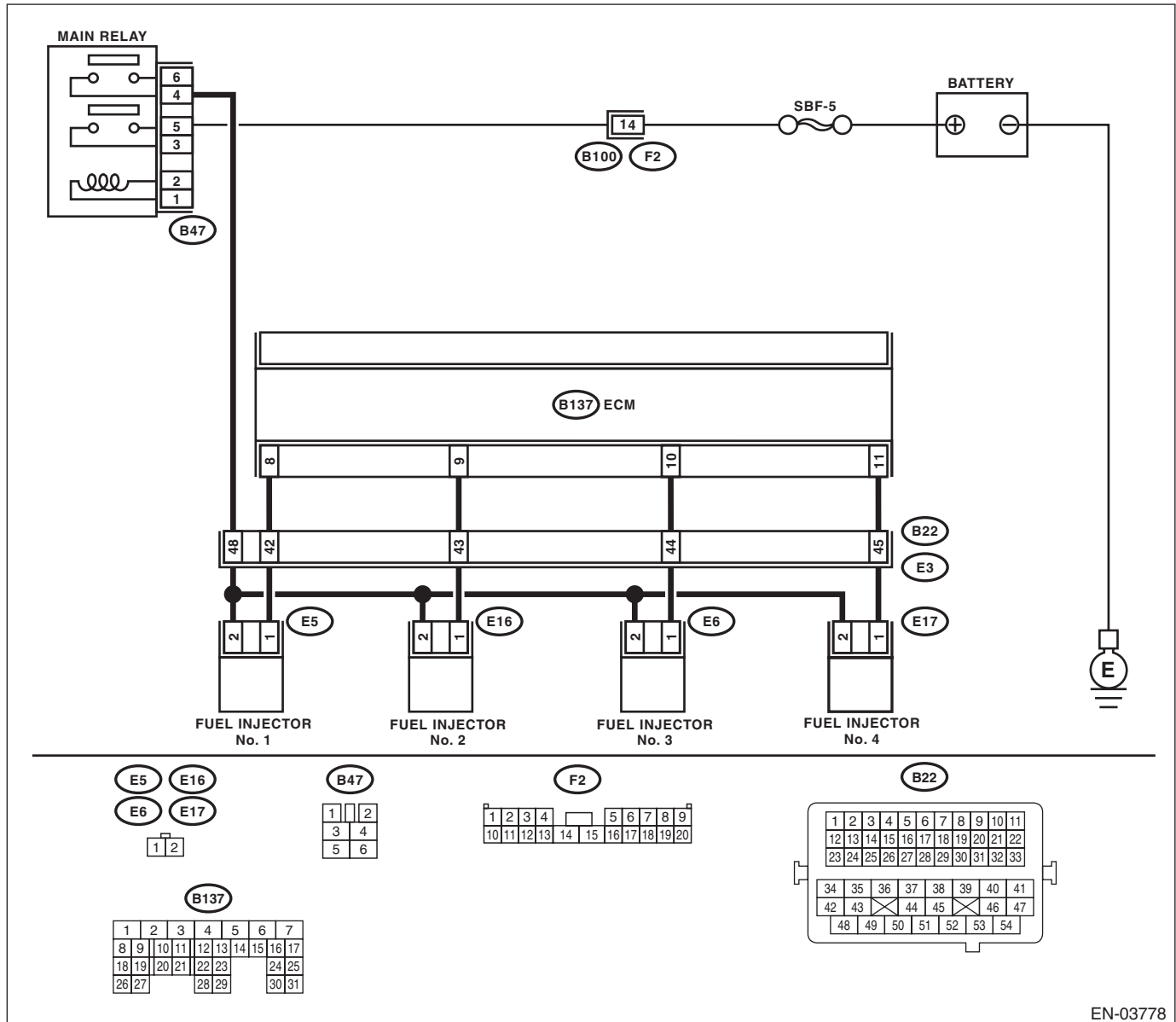
Step	Check	Yes	No
7 CHECK HARNESS BETWEEN ECM AND FUEL PUMP RELAY CONNECTOR. 1) Disconnect the connectors from ECM. 2) Measure the resistance of harness between ECM and fuel pump relay connector. Connector & terminal (B136) No. 13 — (B46) No. 3:	Is the resistance less than 1 Ω ?	Go to step 8 .	Repair the open circuit of harness between ECM and fuel pump relay connector.
8 CHECK POOR CONTACT. Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Check the fuel injector circuit. <Ref. to EN(H4SO)(diag)-65, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

F: FUEL INJECTOR CIRCUIT

CAUTION:

- Check or repair only faulty parts.
- After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03778

Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OPERATION OF EACH FUEL INJECTOR. While cranking the engine, check that each fuel injector emits the "operating" sound. Use a sound scope or attach a screwdriver to the injector for this check.	Does the fuel injector operate?	Check the fuel pressure. <Ref. to ME(H4SO)-29, INSPECTION, Fuel Pressure.>	Go to step 2.
2 CHECK POWER SUPPLY TO EACH FUEL INJECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between fuel injector terminal and engine ground. Connector & terminal #1 (E5) No. 2 (+) — Engine ground (-): #2 (E16) No. 2 (+) — Engine ground (-): #3 (E6) No. 2 (+) — Engine ground (-): #4 (E17) No. 2 (+) — Engine ground (-):	Is the voltage 10 V or more?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between main relay and fuel injector connector • Poor contact in main relay connector • Poor contact in coupling connector • Poor contact in fuel injector connector
3 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. 1) Disconnect the connectors from ECM. 2) Measure the resistance of harness between ECM and fuel injector connector. Connector & terminal #1 (B137) No. 8 — (E5) No. 1: #2 (B137) No. 9 — (E16) No. 1: #3 (B137) No. 10 — (E6) No. 1: #4 (B137) No. 11 — (E17) No. 1:	Is the resistance less than 1 Ω?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
4 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. Measure the resistance of harness between ECM and fuel injector connector. Connector & terminal #1 (B137) No. 8 — Chassis ground: #2 (B137) No. 9 — Chassis ground: #3 (B137) No. 10 — Chassis ground: #4 (B137) No. 11 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 5.	Repair the ground short circuit of harness between ECM and fuel injector connector.
5 CHECK EACH FUEL INJECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between each fuel injector terminals. Terminals No. 1 — No. 2:	Is the resistance between 5 and 20 Ω?	Go to step 6.	Replace the faulty fuel injector.
6 CHECK POOR CONTACT. Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Inspection using "General Diagnostic Table" <Ref. to EN(H4SO)(diag)-337, INSPECTION, General Diagnostic Table.>

List of Diagnostic Trouble Code (DTC)

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18. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Note
P0026	Intake Valve Control Solenoid Circuit Range/Performance (Bank 1)	<Ref. to EN(H4SO)(diag)-74, DTC P0026 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0028	Intake Valve Control Solenoid Circuit Range/Performance (Bank 2)	<Ref. to EN(H4SO)(diag)-76, DTC P0028 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to EN(H4SO)(diag)-78, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to EN(H4SO)(diag)-80, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to EN(H4SO)(diag)-83, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to EN(H4SO)(diag)-85, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to EN(H4SO)(diag)-88, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0068	MAP/MAF - Throttle Position Correlation	<Ref. to EN(H4SO)(diag)-90, DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0076	Intake Valve Control Solenoid Circuit Low (Bank 1)	<Ref. to EN(H4SO)(diag)-92, DTC P0076 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0077	Intake Valve Control Solenoid Circuit High (Bank 1)	<Ref. to EN(H4SO)(diag)-94, DTC P0077 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0082	Intake Valve Control Solenoid Circuit Low (Bank 2)	<Ref. to EN(H4SO)(diag)-96, DTC P0082 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0083	Intake Valve Control Solenoid Circuit High (Bank 2)	<Ref. to EN(H4SO)(diag)-98, DTC P0083 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0101	Mass or Volume Air Flow Circuit Range/Performance	<Ref. to EN(H4SO)(diag)-100, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0102	Mass or Volume Air Flow Circuit Low Input	<Ref. to EN(H4SO)(diag)-102, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0103	Mass or Volume Air Flow Circuit High Input	<Ref. to EN(H4SO)(diag)-105, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to EN(H4SO)(diag)-107, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to EN(H4SO)(diag)-110, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

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DTC	Item	Note
P0111	Intake Air Temperature Sensor 1 Circuit Range/Performance	<Ref. to EN(H4SO)(diag)-113, DTC P0111 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0112	Intake Air Temperature Sensor 1 Circuit Low	<Ref. to EN(H4SO)(diag)-115, DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0113	Intake Air Temperature Sensor 1 Circuit High	<Ref. to EN(H4SO)(diag)-117, DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0117	Engine Coolant Temperature Circuit Low	<Ref. to EN(H4SO)(diag)-120, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0118	Engine Coolant Temperature Circuit High	<Ref. to EN(H4SO)(diag)-122, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0122	Throttle/Pedal Position Sensor/Switch "A" Circuit Low	<Ref. to EN(H4SO)(diag)-125, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0123	Throttle/Pedal Position Sensor/Switch "A" Circuit High	<Ref. to EN(H4SO)(diag)-127, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	<Ref. to EN(H4SO)(diag)-129, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0126	Insufficient Engine Coolant Temperature for Stable Operation	<Ref. to EN(H4SO)(diag)-131, DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0128	Coolant Thermostat (Engine Coolant Temperature Below Thermostat Regulating Temperature)	<Ref. to EN(H4SO)(diag)-133, DTC P0128 COOLANT THERMOSTAT (ENGINE COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0131	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to EN(H4SO)(diag)-134, DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0132	O2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to EN(H4SO)(diag)-136, DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0133	O2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to EN(H4SO)(diag)-138, DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0134	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to EN(H4SO)(diag)-140, DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0137	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to EN(H4SO)(diag)-142, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0138	O2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to EN(H4SO)(diag)-145, DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0139	O2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	<Ref. to EN(H4SO)(diag)-148, DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0140	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 2)	<Ref. to EN(H4SO)(diag)-150, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	System Too Lean (Bank 1)	<Ref. to EN(H4SO)(diag)-152, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

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DTC	Item	Note
P0172	System Too Rich (Bank 1)	<Ref. to EN(H4SO)(diag)-153, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0181	Fuel Temperature Sensor "A" Circuit Range/Performance	<Ref. to EN(H4SO)(diag)-155, DTC P0181 FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0182	Fuel Temperature Sensor "A" Circuit Low Input	<Ref. to EN(H4SO)(diag)-157, DTC P0182 FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0183	Fuel Temperature Sensor "A" Circuit High Input	<Ref. to EN(H4SO)(diag)-159, DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0196	Engine Oil Temperature Sensor Circuit Range/Performance	<Ref. to EN(H4SO)(diag)-162, DTC P0196 ENGINE OIL TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0197	Engine Oil Temperature Sensor Low	<Ref. to EN(H4SO)(diag)-164, DTC P0197 ENGINE OIL TEMPERATURE SENSOR LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0198	Engine Oil Temperature Sensor High	<Ref. to EN(H4SO)(diag)-166, DTC P0198 ENGINE OIL TEMPERATURE SENSOR HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0222	Throttle/Pedal Position Sensor/Switch "B" Circuit Low	<Ref. to EN(H4SO)(diag)-168, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0223	Throttle/Pedal Position Sensor/Switch "B" Circuit High	<Ref. to EN(H4SO)(diag)-170, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0301	Cylinder 1 Misfire Detected	<Ref. to EN(H4SO)(diag)-172, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 Misfire Detected	<Ref. to EN(H4SO)(diag)-172, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 Misfire Detected	<Ref. to EN(H4SO)(diag)-172, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 Misfire Detected	<Ref. to EN(H4SO)(diag)-173, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0327	Knock Sensor 1 Circuit Low (Bank 1 or Single Sensor)	<Ref. to EN(H4SO)(diag)-179, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock Sensor 1 Circuit High (Bank 1 or Single Sensor)	<Ref. to EN(H4SO)(diag)-181, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft Position Sensor "A" Circuit	<Ref. to EN(H4SO)(diag)-183, DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0336	Crankshaft Position Sensor "A" Circuit Range/Performance	<Ref. to EN(H4SO)(diag)-185, DTC P0336 CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0340	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	<Ref. to EN(H4SO)(diag)-187, DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0341	Camshaft Position Sensor "A" Circuit Range/Performance (Bank 1 or Single Sensor)	<Ref. to EN(H4SO)(diag)-189, DTC P0341 CAMSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0400	Exhaust Gas Recirculation Flow	<Ref. to EN(H4SO)(diag)-192, DTC P0400 EXHAUST GAS RECIRCULATION FLOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to EN(H4SO)(diag)-195, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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DTC	Item	Note
P0442	Evaporative Emission Control System Leak Detected (Small Leak)	<Ref. to EN(H4SO)(diag)-199, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0447	Evaporative Emission Control System Vent Control Circuit Open	<Ref. to EN(H4SO)(diag)-202, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	<Ref. to EN(H4SO)(diag)-204, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0451	Evaporative Emission Control System Pressure Sensor	<Ref. to EN(H4SO)(diag)-206, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0452	Evaporative Emission Control System Pressure Sensor Low Input	<Ref. to EN(H4SO)(diag)-208, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0453	Evaporative Emission Control System Pressure Sensor High Input	<Ref. to EN(H4SO)(diag)-211, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)	<Ref. to EN(H4SO)(diag)-214, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0457	Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)	<Ref. to EN(H4SO)(diag)-217, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0458	Evaporative Emission System Purge Control Valve Circuit Low	<Ref. to EN(H4SO)(diag)-220, DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0459	Evaporative Emission System Purge Control Valve Circuit High	<Ref. to EN(H4SO)(diag)-222, DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0461	Fuel Level Sensor "A" Circuit Range/Performance	<Ref. to EN(H4SO)(diag)-224, DTC P0461 FUEL LEVEL SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0462	Fuel Level Sensor "A" Circuit Low	<Ref. to EN(H4SO)(diag)-226, DTC P0462 FUEL LEVEL SENSOR "A" CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0463	Fuel Level Sensor "A" Circuit High	<Ref. to EN(H4SO)(diag)-229, DTC P0463 FUEL LEVEL SENSOR "A" CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to EN(H4SO)(diag)-232, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0483	Fan Rationality Check	<Ref. to EN(H4SO)(diag)-234, DTC P0483 FAN RATIONALITY CHECK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0502	Vehicle Speed Sensor "A" Circuit Low Input	<Ref. to EN(H4SO)(diag)-234, DTC P0502 VEHICLE SPEED SENSOR "A" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0503	Vehicle Speed Sensor "A" Intermittent/Erratic/High	<Ref. to EN(H4SO)(diag)-235, DTC P0503 VEHICLE SPEED SENSOR "A" INTERMITTENT/ERRATIC/HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0506	Idle Air Control System RPM Lower Than Expected	<Ref. to EN(H4SO)(diag)-237, DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0507	Idle Air Control System RPM Higher Than Expected	<Ref. to EN(H4SO)(diag)-239, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0512	Starter Request Circuit	<Ref. to EN(H4SO)(diag)-241, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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DTC	Item	Note
P0519	Idle Air Control System Performance	<Ref. to EN(H4SO)(diag)-244, DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0600	Serial Communication Link	<Ref. to EN(H4SO)(diag)-246, DTC P0600 SERIAL COMMUNICATION LINK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to EN(H4SO)(diag)-248, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0605	Internal Control Module Read Only Memory (ROM) Error	<Ref. to EN(H4SO)(diag)-249, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0607	Control Module Performance	<Ref. to EN(H4SO)(diag)-250, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<Ref. to EN(H4SO)(diag)-251, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0691	Fan 1 Control Circuit Low	<Ref. to EN(H4SO)(diag)-252, DTC P0691 FAN 1 CONTROL CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0692	Fan 1 Control Circuit High	<Ref. to EN(H4SO)(diag)-253, DTC P0692 FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0700	Transmission Control System (MIL Request)	<Ref. to EN(H4SO)(diag)-253, DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0851	Park/Neutral Switch Input Circuit Low (AT Model)	<Ref. to EN(H4SO)(diag)-254, DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> or <Ref. to EN(H4SO)(diag)-256, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0852	Park/Neutral Switch Input Circuit High	<Ref. to EN(H4SO)(diag)-258, DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).> or <Ref. to EN(H4SO)(diag)-261, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1152	O2 Sensor Circuit Range/Performance (Low) (Bank 1 Sensor 1)	<Ref. to EN(H4SO)(diag)-263, DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1153	O2 Sensor Circuit Range/Performance (High) (Bank 1 Sensor 1)	<Ref. to EN(H4SO)(diag)-265, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1160	Return Spring Failure	<Ref. to EN(H4SO)(diag)-266, DTC P1160 RETURN SPRING FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to EN(H4SO)(diag)-267, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	<Ref. to EN(H4SO)(diag)-269, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1443	Vent Control Solenoid Valve Function Problem	<Ref. to EN(H4SO)(diag)-271, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1491	Positive Crankcase Ventilation (Blow-by) Function Problem	<Ref. to EN(H4SO)(diag)-273, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1492	EGR Solenoid Valve Signal #1 Circuit Malfunction (Low Input)	<Ref. to EN(H4SO)(diag)-274, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

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DTC	Item	Note
P1493	EGR Solenoid Valve Signal #1 Circuit Malfunction (High Input)	<Ref. to EN(H4SO)(diag)-274, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1494	EGR Solenoid Valve Signal #2 Circuit Malfunction (Low Input)	<Ref. to EN(H4SO)(diag)-274, DTC P1494 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1495	EGR Solenoid Valve Signal #2 Circuit Malfunction (High Input)	<Ref. to EN(H4SO)(diag)-275, DTC P1495 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1496	EGR Solenoid Valve Signal #3 Circuit Malfunction (Low Input)	<Ref. to EN(H4SO)(diag)-275, DTC P1496 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1497	EGR Solenoid Valve Signal #3 Circuit Malfunction (High Input)	<Ref. to EN(H4SO)(diag)-275, DTC P1497 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1498	EGR Solenoid Valve Signal #4 Circuit Malfunction (Low Input)	<Ref. to EN(H4SO)(diag)-276, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1499	EGR Solenoid Valve Signal #4 Circuit Malfunction (High Input)	<Ref. to EN(H4SO)(diag)-279, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1518	Starter Switch Circuit Low Input	<Ref. to EN(H4SO)(diag)-282, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-Up Voltage Circuit Malfunction	<Ref. to EN(H4SO)(diag)-285, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1602	Control Module Programming Error	<Ref. to EN(H4SO)(diag)-287, DTC P1602 CONTROL MODULE PROGRAMMING ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	<Ref. to EN(H4SO)(diag)-299, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	<Ref. to EN(H4SO)(diag)-305, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2101	Throttle Actuator Control Motor Circuit Range/Performance	<Ref. to EN(H4SO)(diag)-311, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2102	Throttle Actuator Control Motor Circuit Low	<Ref. to EN(H4SO)(diag)-317, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2103	Throttle Actuator Control Motor Circuit High	<Ref. to EN(H4SO)(diag)-319, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2109	Throttle/Pedal Position Sensor "A" Minimum Stop Performance	<Ref. to EN(H4SO)(diag)-320, DTC P2109 THROTTLE/PEDAL POSITION SENSOR "A" MINIMUM STOP PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2122	Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input	<Ref. to EN(H4SO)(diag)-321, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2123	Throttle/Pedal Position Sensor/Switch "D" Circuit High Input	<Ref. to EN(H4SO)(diag)-323, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2127	Throttle/Pedal Position Sensor/Switch "E" Circuit Low Input	<Ref. to EN(H4SO)(diag)-325, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DTC	Item	Note
P2128	Throttle/Pedal Position Sensor/Switch "E" Circuit High Input	<Ref. to EN(H4SO)(diag)-327, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2135	Throttle/Pedal Position Sensor/Switch "A"/"B" Voltage Correlation	<Ref. to EN(H4SO)(diag)-329, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A"/"B" VOLTAGE CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2138	Throttle/Pedal Position Sensor/Switch "D"/"E" Voltage Correlation	<Ref. to EN(H4SO)(diag)-332, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D"/"E" VOLTAGE CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2227	Barometric Pressure Circuit Range/Performance	<Ref. to EN(H4SO)(diag)-335, DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2228	Barometric Pressure Circuit Low	<Ref. to EN(H4SO)(diag)-335, DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2229	Barometric Pressure Circuit High	<Ref. to EN(H4SO)(diag)-336, DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

19. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P0026 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-8, DTC P0026 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

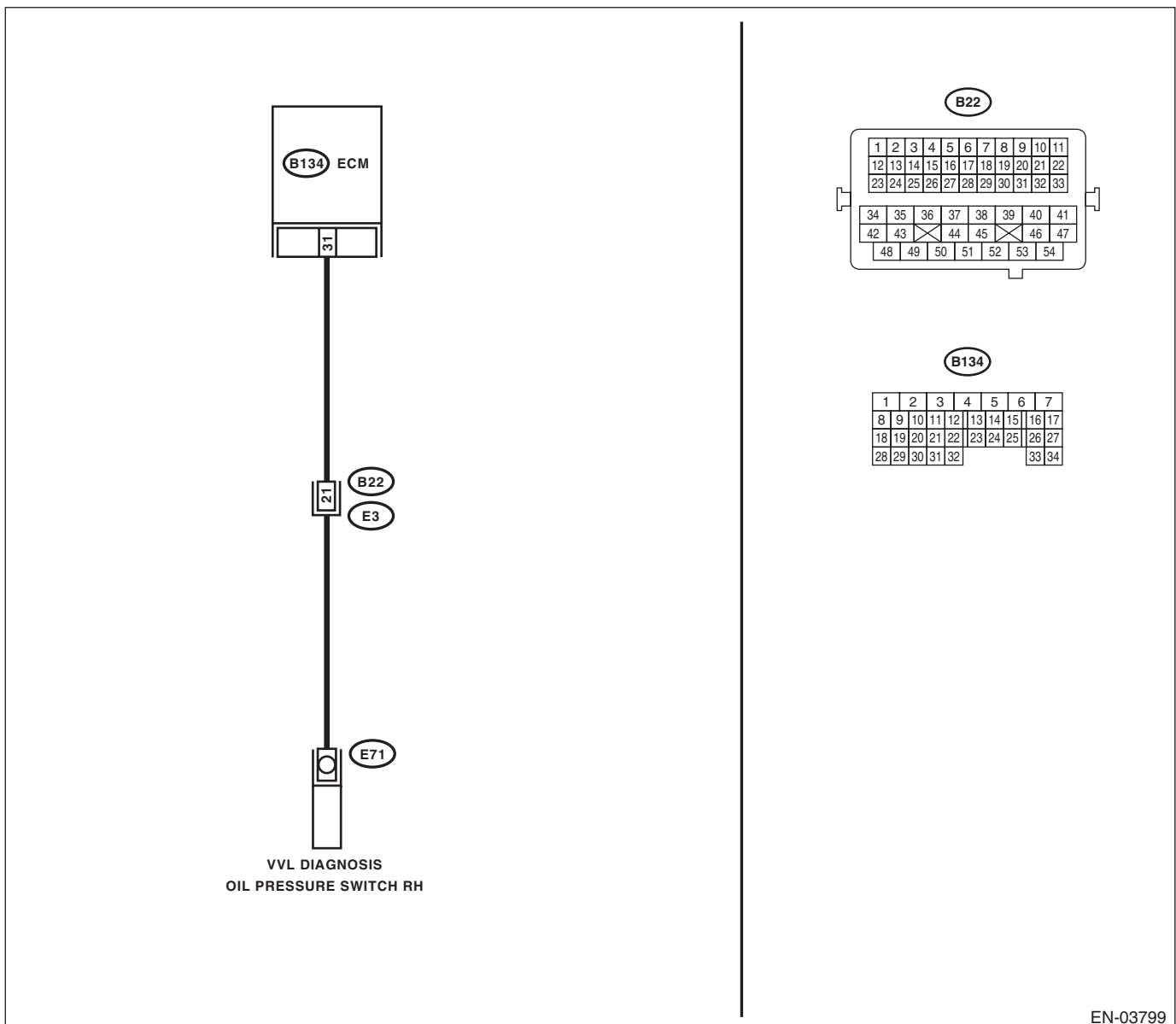
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03799

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE LIFT DIAGNOSIS OIL PRESSURE SWITCH CONNECTOR. 1) Warm up the engine. 2) Turn the ignition switch to OFF. 3) Disconnect the connectors from ECM and variable valve lift diagnosis oil pressure switch connector. 4) Measure the resistance of harness between variable valve lift diagnosis oil pressure switch connector and engine ground. Connector & terminal (E71) No. 1 — Engine ground:	Is the resistance 1 MΩ or more?	Go to step 3.	Repair the ground short circuit of harness between ECM and variable valve lift diagnosis oil pressure switch connector.
3 CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE LIFT DIAGNOSIS OIL PRESSURE SWITCH CONNECTOR. Measure the resistance of harness between ECM and variable valve lift diagnosis oil pressure switch connector. Connector & terminal (B134) No. 31 — (E71) No. 1:	Is the resistance less than 1 Ω?	Replace the variable valve lift diagnosis oil pressure switch. <Ref. to FU(H4SO)-34, Variable Valve Lift Diagnosis Oil Pressure Switch.> Go to step 4.	Repair the open circuit of harness between ECM and variable valve lift diagnosis oil pressure switch connector.
4 CHECK DTC. 1) Erase the memory. <Ref. to EN(H4SO)(diag)-44, Clear Memory Mode.> 2) After idling the engine, check the DTC.	Is DTC displayed?	Replace the oil switching solenoid valve. <Ref. to ME(H4SO)-85, Oil Switching Solenoid Valve.> Go to step 5.	END.
5 CHECK DTC. 1) Erase the memory. <Ref. to EN(H4SO)(diag)-44, Clear Memory Mode.> 2) After idling the engine, check the DTC.	Is DTC displayed?	Check the oil flow path.	END.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

B: DTC P0028 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-10, DTC P0028 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

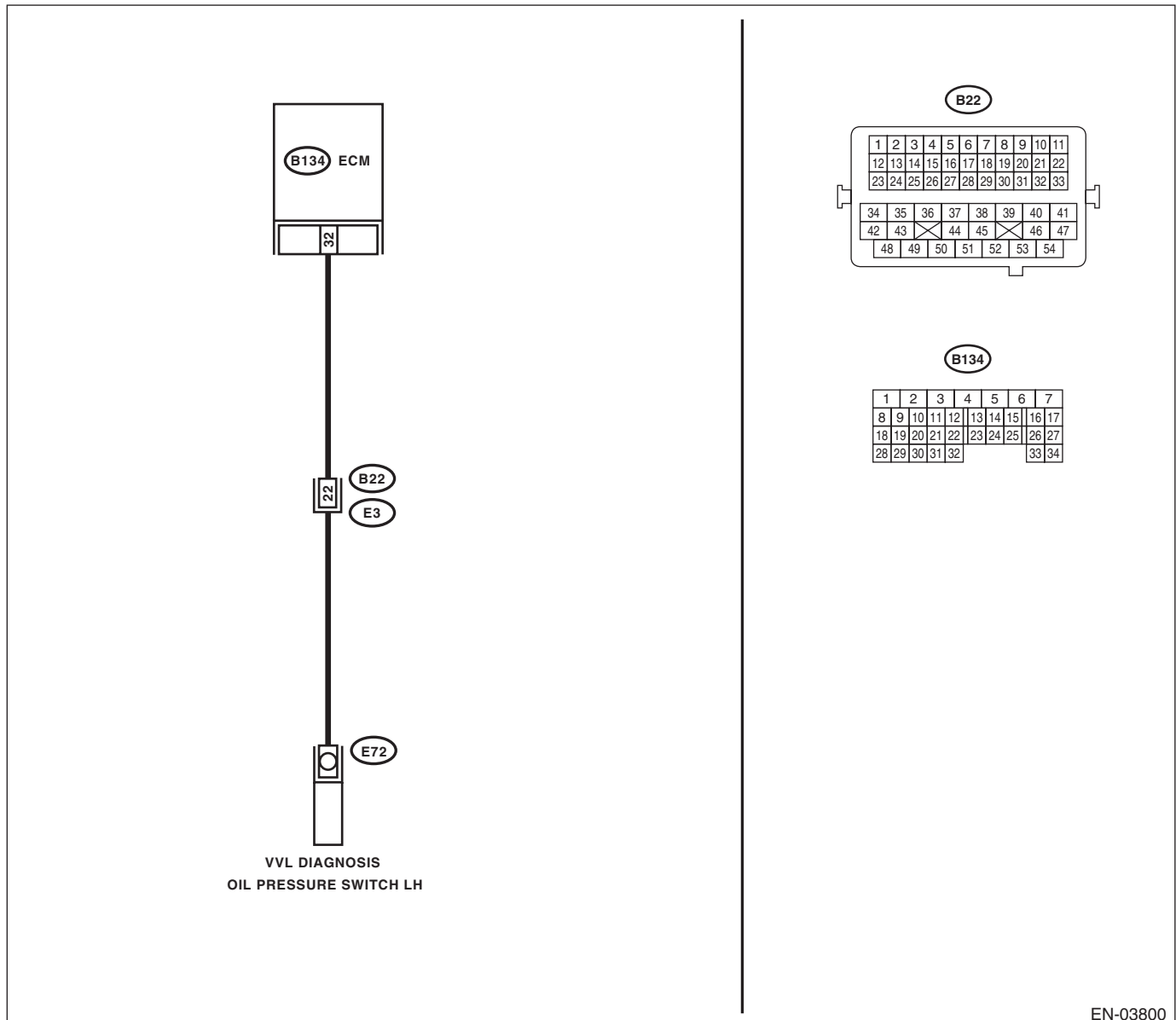
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03800

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE LIFT DIAGNOSIS OIL PRESSURE SWITCH CONNECTOR. 1) Warm up the engine. 2) Turn the ignition switch to OFF. 3) Disconnect the connectors from ECM and variable valve lift diagnosis oil pressure switch connector. 4) Measure the resistance of harness between variable valve lift diagnosis oil pressure switch connector and engine ground. Connector & terminal (E72) No. 1 — Engine ground:	Is the resistance 1 MΩ or more?	Go to step 3.	Repair the ground short circuit of harness between ECM and variable valve lift diagnosis oil pressure switch connector.
3	CHECK HARNESS BETWEEN ECM AND VARIABLE VALVE LIFT DIAGNOSIS OIL PRESSURE SWITCH CONNECTOR. Measure the resistance of harness between ECM and variable valve lift diagnosis oil pressure switch connector. Connector & terminal (B134) No. 32 — (E72) No. 1:	Is the resistance less than 1 Ω?	Replace the variable valve lift diagnosis oil pressure switch. <Ref. to FU(H4SO)-34, Variable Valve Lift Diagnosis Oil Pressure Switch.> Go to step 4.	Repair the open circuit of harness between ECM and variable valve lift diagnosis oil pressure switch connector.
4	CHECK DTC. 1) Erase the memory. <Ref. to EN(H4SO)(diag)-44, Clear Memory Mode.> 2) After idling the engine, check the DTC.	Is DTC displayed?	Replace the oil switching solenoid valve. <Ref. to ME(H4SO)-85, Oil Switching Solenoid Valve.> Go to step 5.	end.
5	CHECK DTC. 1) Erase the memory. <Ref. to EN(H4SO)(diag)-44, Clear Memory Mode.> 2) After idling the engine, check the DTC.	Is DTC displayed?	Check the oil flow path.	end.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

C: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

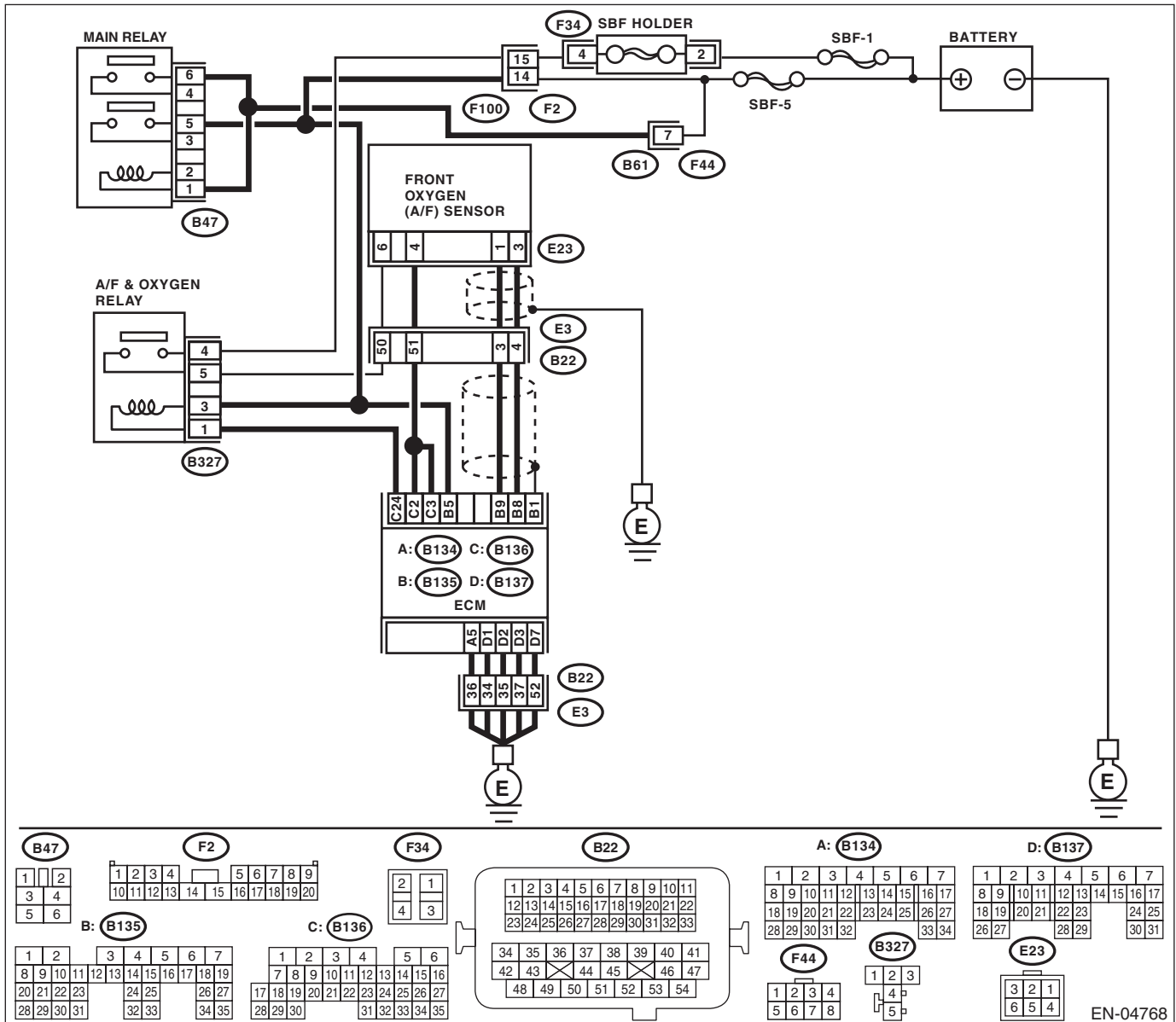
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-11, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</p> <p>1) Start and warm-up the engine. 2) Turn the ignition switch to OFF. 3) Disconnect the connectors from ECM and front oxygen (A/F) sensor. 4) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p>Connector & terminal (B136) No. 2 — (E23) No. 4: (B136) No. 3 — (E23) No. 4:</p>	Is the resistance less than 1 Ω?	Go to step 2.	Repair the open circuit of harness between ECM and front oxygen (A/F) sensor connector.
<p>2 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</p> <p>Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p>Connector & terminal (B135) No. 8 — (E23) No. 4: (B135) No. 9 — (E23) No. 3:</p>	Is the resistance less than 1 Ω?	Go to step 3.	Repair the open circuit of harness between ECM and front oxygen (A/F) sensor connector.
<p>3 CHECK HARNESS BETWEEN A/F & OXYGEN SENSOR RELAY AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</p> <p>Measure the resistance of harness between main relay and front oxygen (A/F) sensor connector.</p> <p>Connector & terminal (B327) No. 5 — (E23) No. 6:</p>	Is the resistance less than 1 Ω?	Go to step 4.	Repair the open circuit of harness between A/F & oxygen sensor relay and front oxygen (A/F) sensor connector.
<p>4 CHECK FRONT OXYGEN (A/F) SENSOR.</p> <p>Measure the resistance between front oxygen (A/F) sensor connector terminals.</p> <p>Terminals No. 1 — No. 4:</p>	Is the resistance less than 5 Ω?	Go to step 5.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-36, Front Oxygen (A/F) Sensor.>
<p>5 CHECK POOR CONTACT.</p> <p>Check the poor contact of ECM and front oxygen (A/F) sensor connector.</p>	Is there poor contact in ECM or the front oxygen (A/F) sensor connector?	Repair the poor contact in ECM or the front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-36, Front Oxygen (A/F) Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

D: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

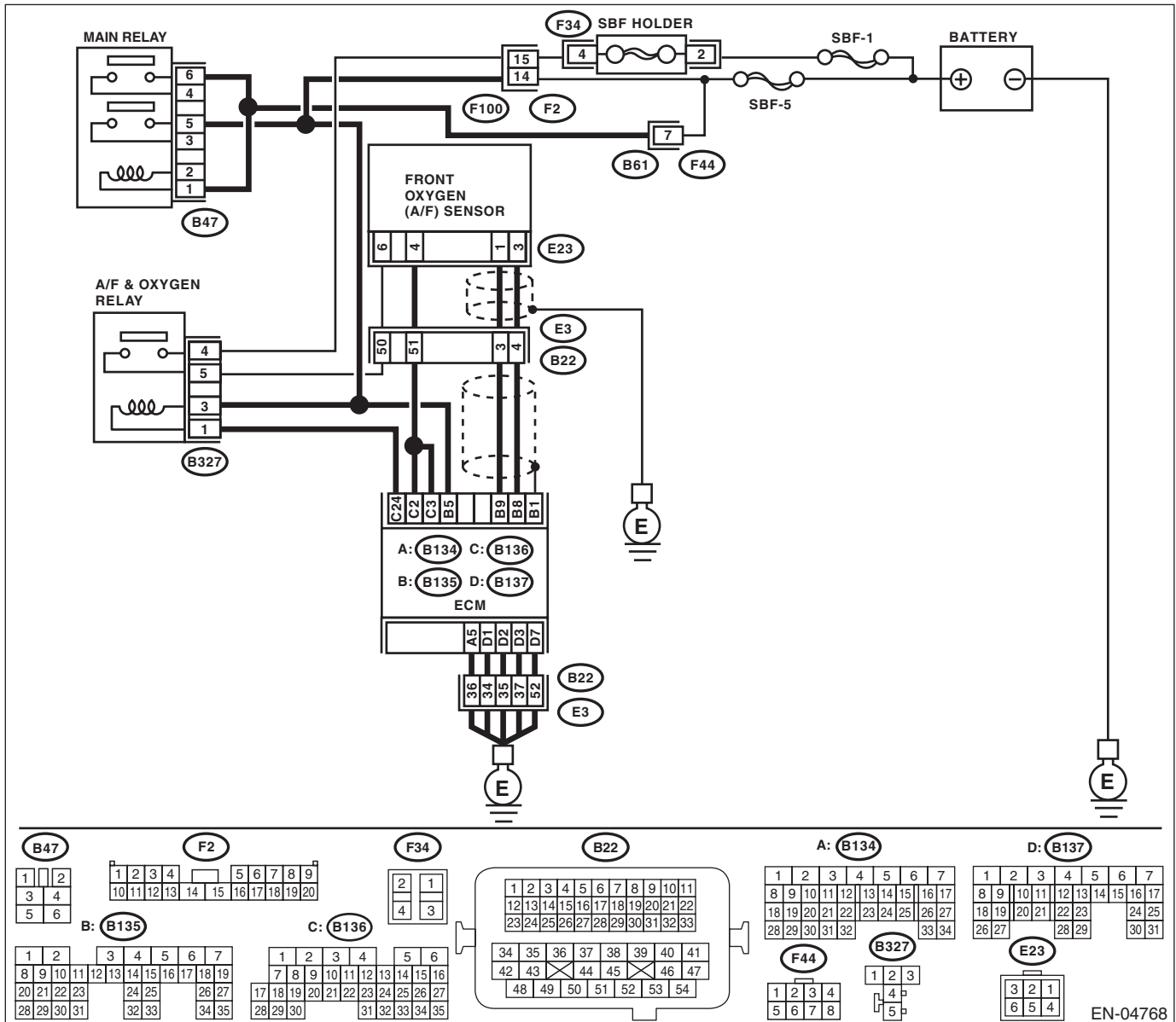
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-13, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Are DTC P0031 and P0037 displayed at the same time on the Subaru Select Monitor or general scan tool?	Go to step 2.	Go to step 5.
2 CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from front oxygen (A/F) sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between front oxygen (A/F) sensor connector and engine ground. Connector & terminal (E23) No. 6 (+) — Engine ground (-):	Is the voltage 10 V or more?	Go to step 3.	Repair the power supply line. NOTE: In this case, repair the following item: • Open circuit in harness between main relay and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in main relay connector
3 CHECK GROUND CIRCUIT FOR ECM. Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B134) No. 5 — Chassis ground: (B137) No. 1 — Chassis ground: (B137) No. 2 — Chassis ground: (B137) No. 3 — Chassis ground: (B137) No. 7 — Chassis ground:	Is the resistance less than 5 Ω?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and engine ground terminal • Poor contact in ECM connector • Poor contact in coupling connector
4 CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of front oxygen (A/F) sensor heater current using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is the current 0.2 A or more?	Repair the poor contact of connector. NOTE: In this case, repair the following item: • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector	Go to step 5.
5 CHECK INPUT SIGNAL OF ECM. 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 3 (+) — Chassis ground (-): (B136) No. 2 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 7.	Go to step 6.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK OUTPUT SIGNAL OF ECM. Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B136) No. 3 (+) — Chassis ground (-):</i> <i>(B136) No. 2 (+) — Chassis ground (-):</i>	Does the voltage change when shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Go to step 7.
7 CHECK FRONT OXYGEN (A/F) SENSOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between front oxygen (A/F) sensor connector terminals. <i>Terminals</i> <i>No. 4 — No. 6:</i>	Is the resistance less than 10 Ω ?	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open or ground short circuit of harness between front oxygen (A/F) sensor and ECM connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector 	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-36, Front Oxygen (A/F) Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

E: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

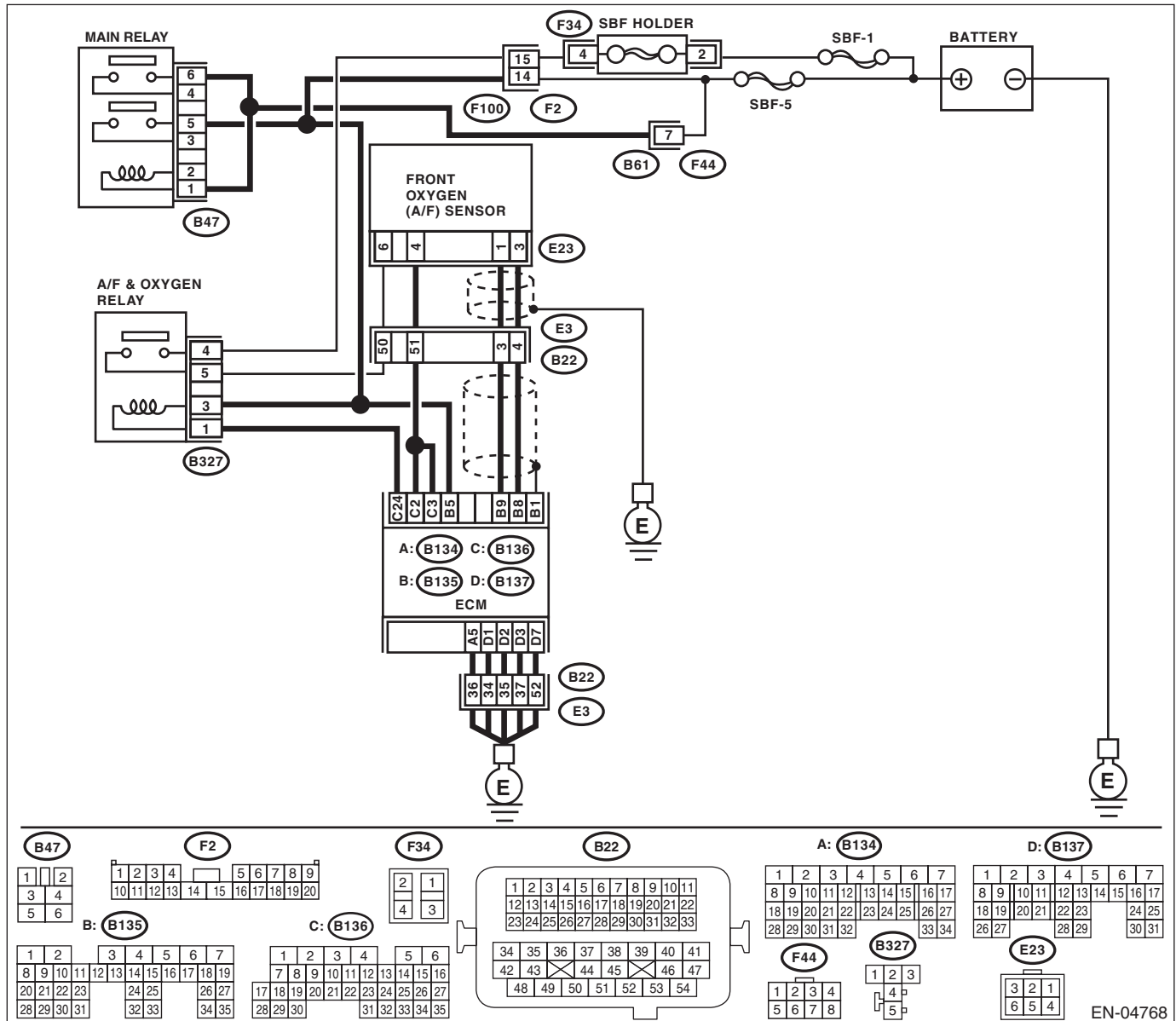
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-15, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04768

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal <i>(B136) No. 2 (+) — Chassis ground (-):</i> <i>(B136) No. 3 (+) — Chassis ground (-):</i>	Is the voltage 8 V or more?	Go to step 2.	Go to step 3.
2 CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT. 1) Turn the ignition switch to OFF. 2) Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector. 3) Turn the ignition switch to ON. 4) Read the data of front oxygen (A/F) sensor heater current using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is the current 2.3 A or more?	Replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>	END.
3 CHECK OUTPUT SIGNAL OF ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal <i>(B136) No. 2 (+) — Chassis ground (-):</i> <i>(B136) No. 3 (+) — Chassis ground (-):</i>	Does the voltage change when shaking the ECM harness and connector?	Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector.	END.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

F: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

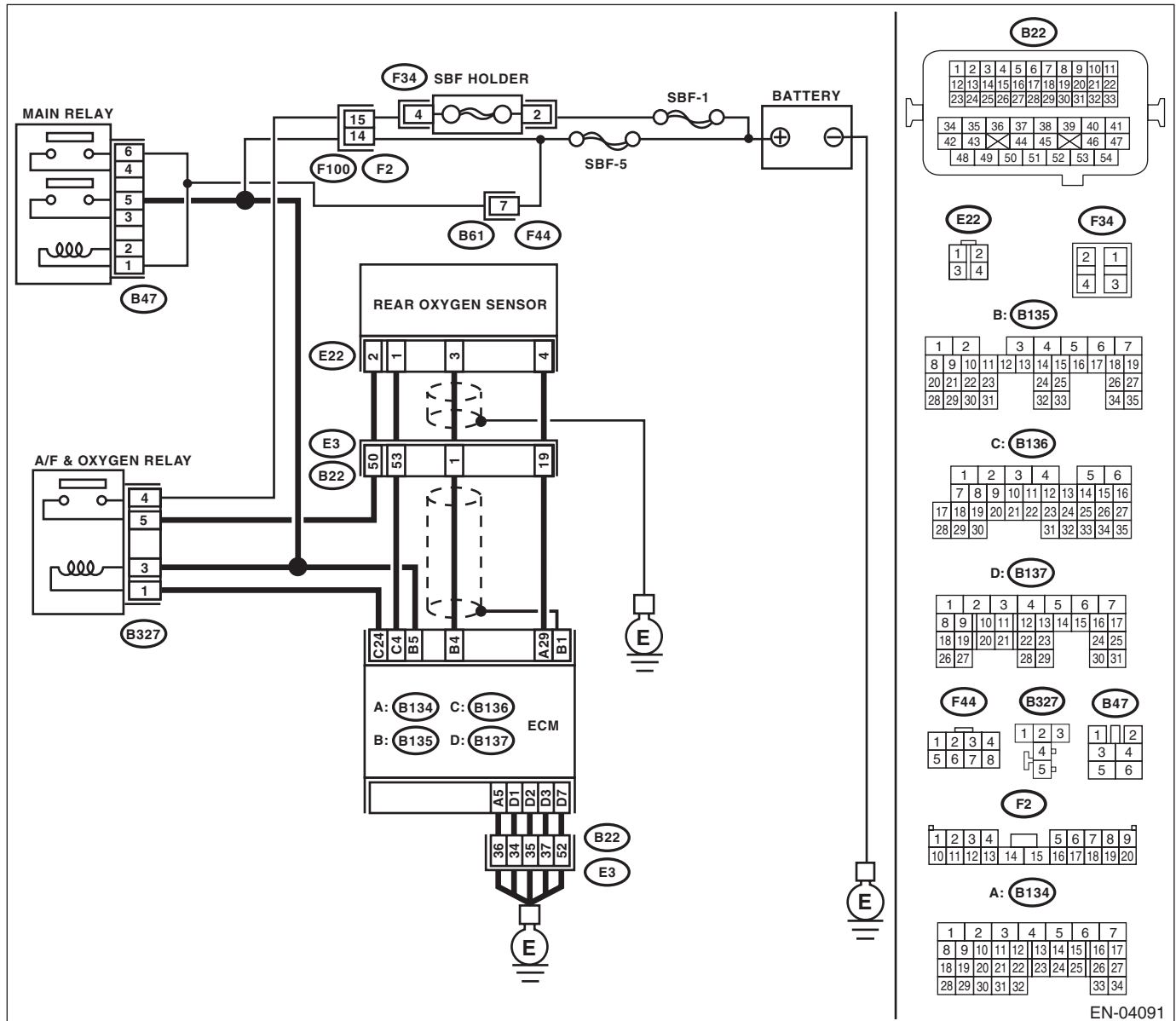
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-17, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04091

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK GROUND CIRCUIT FOR ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal <i>(B134) No. 5 — Chassis ground:</i> <i>(B137) No. 1 — Chassis ground:</i> <i>(B137) No. 2 — Chassis ground:</i> <i>(B137) No. 3 — Chassis ground:</i> <i>(B137) No. 7 — Chassis ground:</i>	Is the resistance less than 5 Ω?	Go to step 2.	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open circuit in harness between ECM and engine ground terminal • Poor contact in ECM connector • Poor contact in coupling connector
2 CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of rear oxygen sensor heater current using Subaru Select Monitor or general scan tool. NOTE: <ul style="list-style-type: none"> • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.> <ul style="list-style-type: none"> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is the current 0.2 A or more?	Repair the connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Poor contact in rear oxygen sensor connector • Poor contact in rear oxygen sensor connecting harness connector • Poor contact in ECM connector 	Go to step 3.
3 CHECK OUTPUT SIGNAL OF ECM. 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal <i>(B136) No. 4 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 6.	Go to step 4.
4 CHECK OUTPUT SIGNAL OF ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal <i>(B136) No. 4 (+) — Chassis ground (-):</i>	Does the voltage change when shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Go to step 5.
5 CHECK OUTPUT SIGNAL OF ECM. 1) Disconnect the connector from the rear oxygen sensor. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal <i>(B136) No. 4 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>	Repair the battery short circuit of harness between ECM and rear oxygen sensor connector. After repair, replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>6</p> <p>CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from the rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor connector and engine ground or chassis ground.</p> <p>Connector & terminal (E22) No. 2 (+) — Chassis ground (-):</p>	<p>Is the voltage 10 V or more?</p>	<p>Go to step 7.</p>	<p>Repair the power supply line.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit in harness between main relay and rear oxygen sensor connector • Poor contact in rear oxygen sensor connector • Poor contact in coupling connector
<p>7</p> <p>CHECK REAR OXYGEN SENSOR.</p> <p>1) Turn the ignition switch to OFF. 2) Measure the resistance between rear oxygen sensor connector terminals.</p> <p>Terminals No. 1 — No. 2:</p>	<p>Is the resistance less than 30 Ω?</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector • Poor contact in coupling connector 	<p>Replace the rear oxygen sensor.</p> <p><Ref. to FU(H4SO)-38, Rear Oxygen Sensor.></p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

G: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

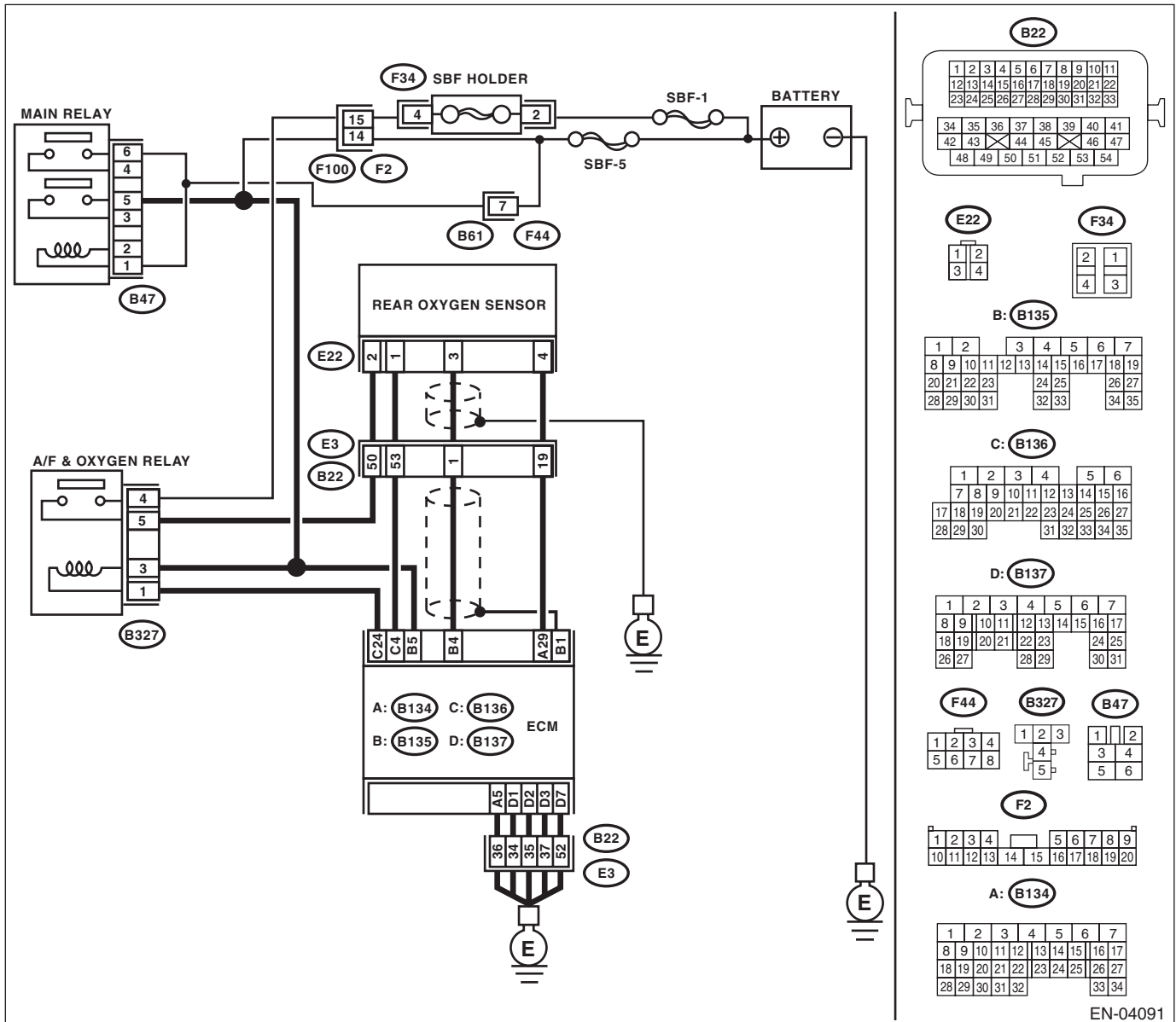
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-19, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04091

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK INPUT SIGNAL OF ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 4 (+) — Chassis ground (-):</p>	Is the voltage 8 V or more?	Go to step 2.	Go to step 3.
2	<p>CHECK CURRENT DATA. 1) Turn the ignition switch to OFF. 2) Repair the battery short circuit of harness between ECM and rear oxygen sensor connector. 3) Turn the ignition switch to ON. 4) Read the data of rear oxygen sensor heater current using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	Is the current 7 A or more?	Replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>	END.
3	<p>CHECK POOR CONTACT. Check poor contact of ECM connector.</p>	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	END.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

H: DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION

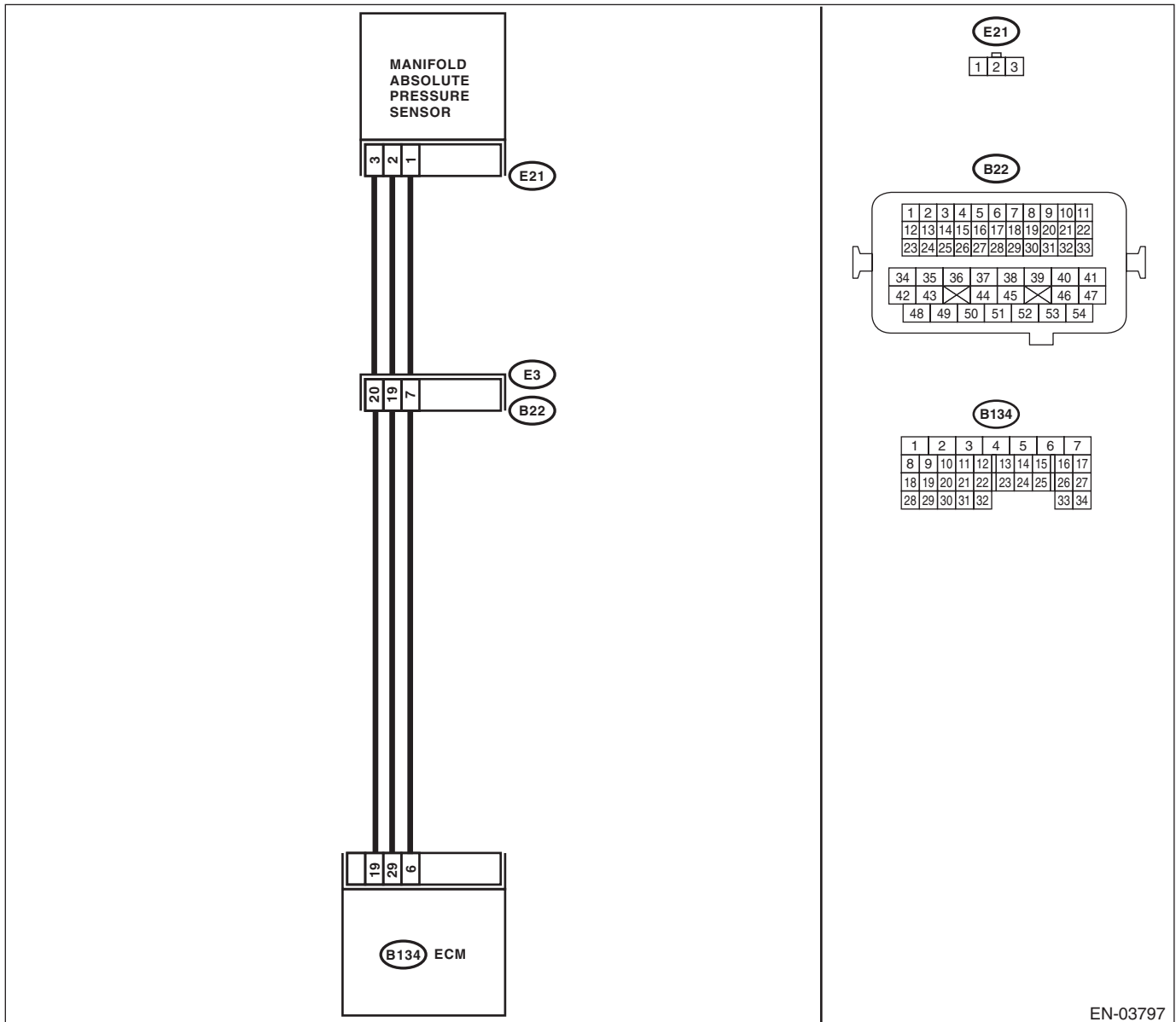
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-21, DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK AIR INTAKE SYSTEM.	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step 3.
3	CHECK MANIFOLD ABSOLUTE PRESSURE SENSOR. 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the select lever or shift lever in "P" or "N" range. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of intake manifold pressure sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is the measured value 73.3 — 106.6 kPa (550 — 800 mmHg, 21.65 — 31.50 inHg) when the ignition is turned ON, and 20.0 — 46.7 kPa (150 — 350 mmHg, 5.91 — 13.78 inHg) during idling?	Go to step 4.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4SO)-27, Manifold Absolute Pressure Sensor.>
4	CHECK THROTTLE OPENING ANGLE. Read the data of throttle position signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is the measured value less than 5% when throttle is fully closed?	Go to step 5.	Adjust or replace the throttle position sensor. <Ref. to FU(H4SO)-26, Throttle Position Sensor.>
5	CHECK THROTTLE OPENING ANGLE.	Is the measured value more than 85% when throttle is fully open?	Replace the manifold absolute pressure sensor. <Ref. to FU(H4SO)-27, Manifold Absolute Pressure Sensor.>	Replace the throttle position sensor. <Ref. to FU(H4SO)-26, Throttle Position Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

I: DTC P0076 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-23, DTC P0076 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

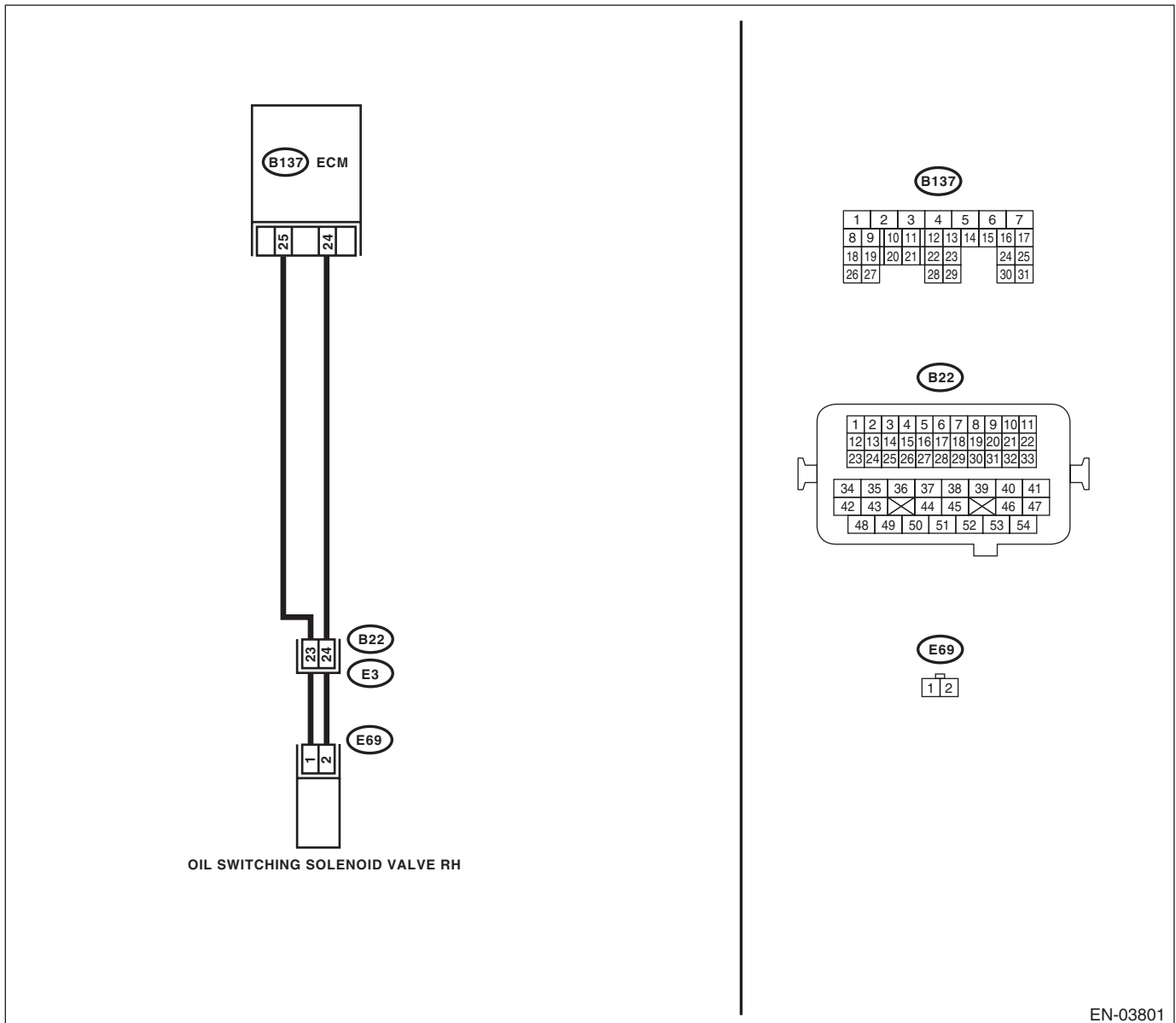
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK HARNESS BETWEEN ECM AND OIL SWITCHING SOLENOID VALVE.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil switching solenoid valve. 3) Measure the resistance between ECM and oil switching solenoid valve.</p> <p>Connector & terminal (B137) No. 25 — (E69) No. 1: (B137) No. 24 — (E69) No. 2:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 2.</p>	<p>Repair the open circuit of harness between ECM and oil switching solenoid valve connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and oil switching solenoid valve connector • Poor contact in coupling connector
<p>2</p> <p>CHECK OIL SWITCHING SOLENOID VALVE.</p> <p>1) Remove the oil switching solenoid valve connector. 2) Measure the resistance between oil switching solenoid valve terminals.</p> <p>Terminals No. 1 — No. 2:</p>	<p>Is the resistance between 6 and 12 Ω?</p>	<p>Repair the poor contact of ECM and oil switching solenoid valve.</p>	<p>Replace the oil switching solenoid valve. <Ref. to ME(H4SO)-85, Oil Switching Solenoid Valve.></p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

J: DTC P0077 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-24, DTC P0077 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

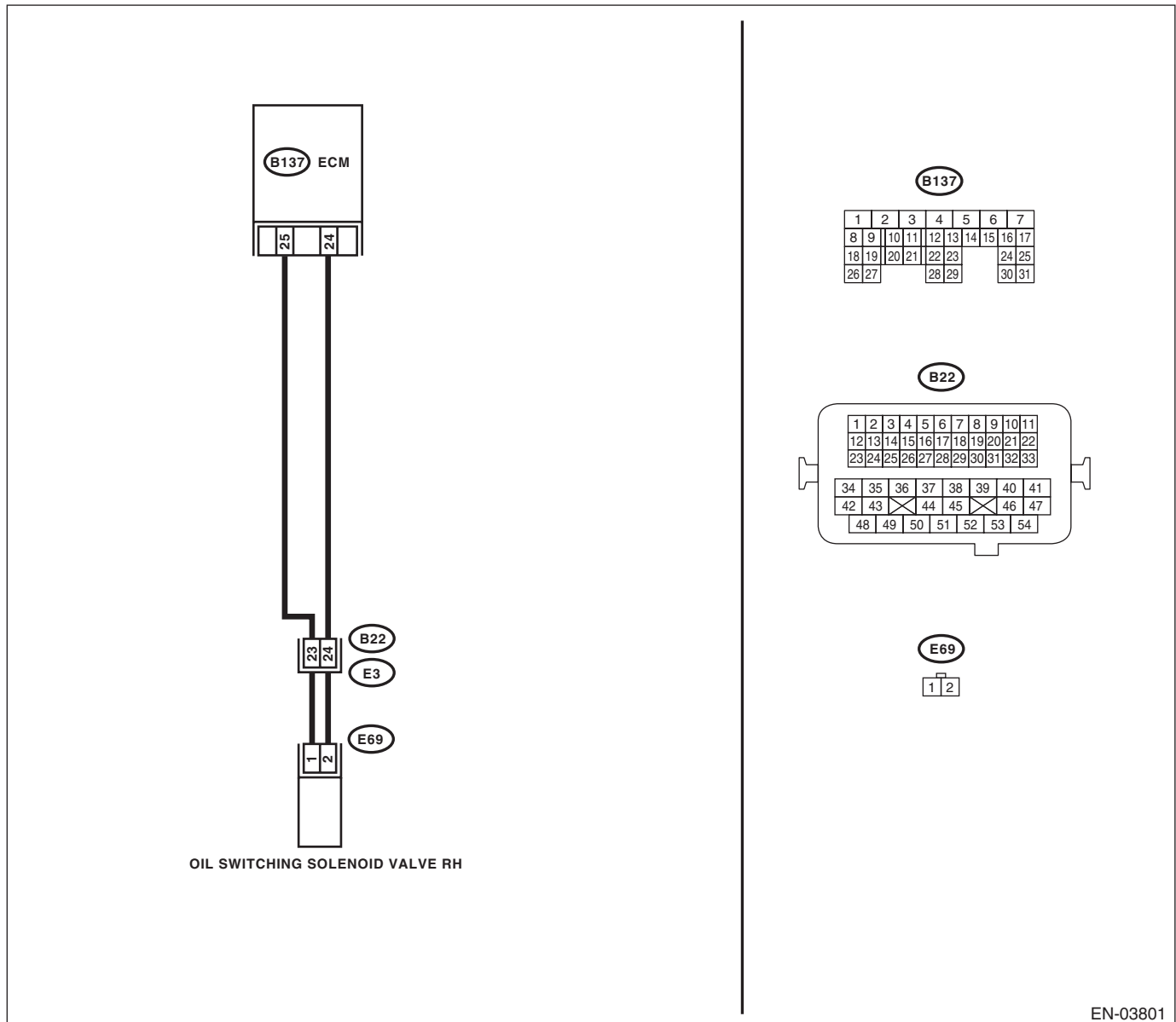
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK HARNESS BETWEEN ECM AND OIL SWITCHING SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil switching solenoid valve. 3) Measure the resistance between oil switching solenoid valve and engine ground. Connector & terminal (E69) No. 1 — Engine ground: (E69) No. 2 — Engine ground:	Is the resistance 1 M Ω or more?	Go to step 2.	Repair the short circuit between ECM and oil switching solenoid valve connector.
2	CHECK OIL SWITCHING SOLENOID VALVE. 1) Remove the oil switching solenoid valve connector. 2) Measure the resistance between oil switching solenoid valve terminals. Terminals No. 1 — No. 2:	Is the resistance between 6 and 12 Ω ?	Repair the poor contact of ECM and oil switching solenoid valve.	Replace the oil switching solenoid valve. <Ref. to ME(H4SO)-85, Oil Switching Solenoid Valve.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

K: DTC P0082 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-25, DTC P0082 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

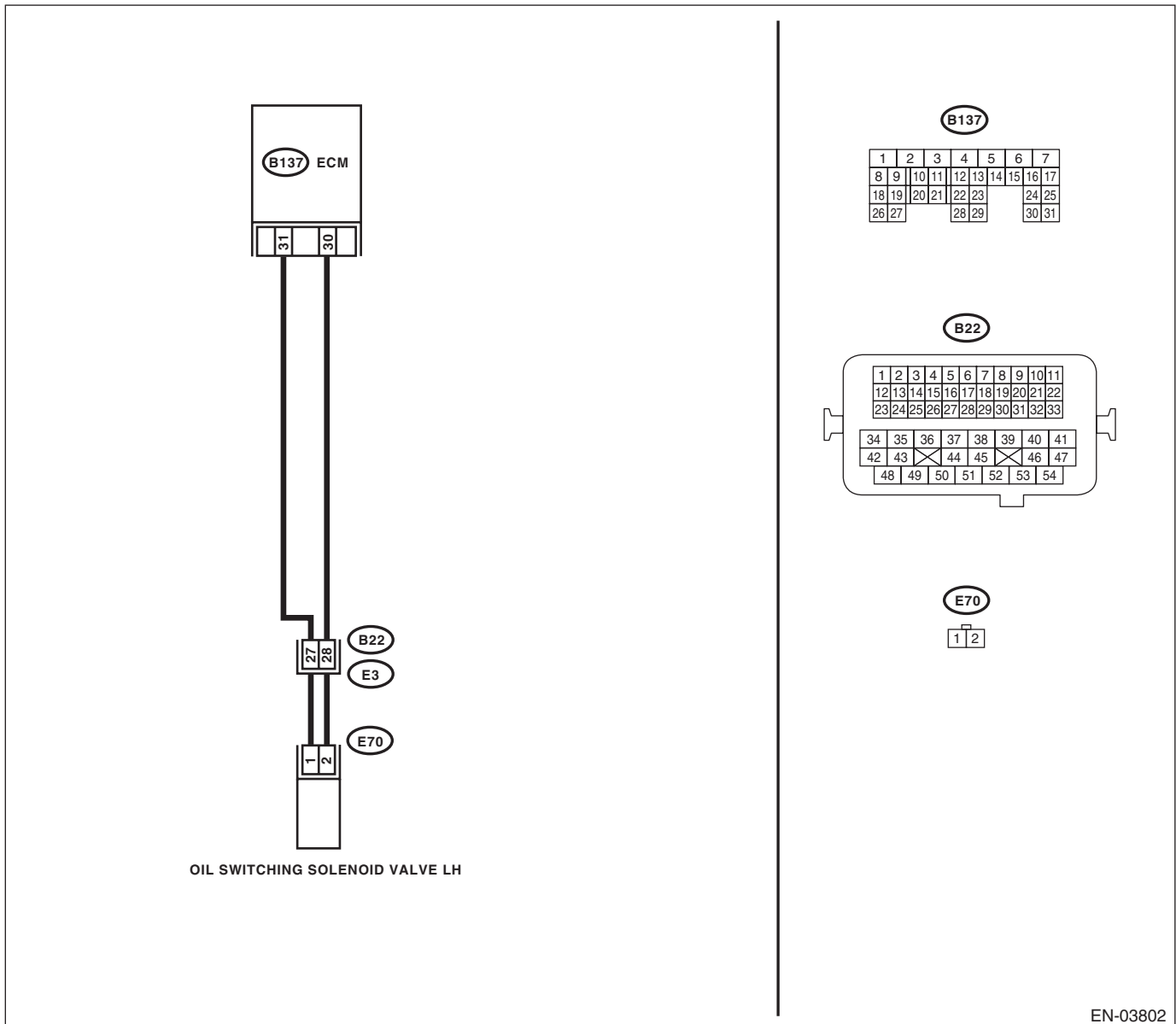
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03802

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
<p>1</p> <p>CHECK HARNESS BETWEEN ECM AND OIL SWITCHING SOLENOID VALVE.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connectors from ECM and oil switching solenoid valve.</p> <p>3) Measure the resistance between ECM and oil switching solenoid valve.</p> <p>Connector & terminal (B137) No. 31 — (E70) No. 1: (B137) No. 30 — (E70) No. 2:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 2.</p>	<p>Repair the open circuit of harness between ECM and oil switching solenoid valve connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and oil switching solenoid valve connector • Poor contact in coupling connector 	
<p>2</p> <p>CHECK OIL SWITCHING SOLENOID VALVE.</p> <p>1) Remove the oil switching solenoid valve connector.</p> <p>2) Measure the resistance between oil switching solenoid valve terminals.</p> <p>Terminals No. 1 — No. 2:</p>	<p>Is the resistance between 6 and 12 Ω?</p>	<p>Repair the poor contact of ECM and oil switching solenoid valve.</p>	<p>Replace the oil switching solenoid valve. <Ref. to ME(H4SO)-85, Oil Switching Solenoid Valve.></p>	

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

L: DTC P0083 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-25, DTC P0083 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

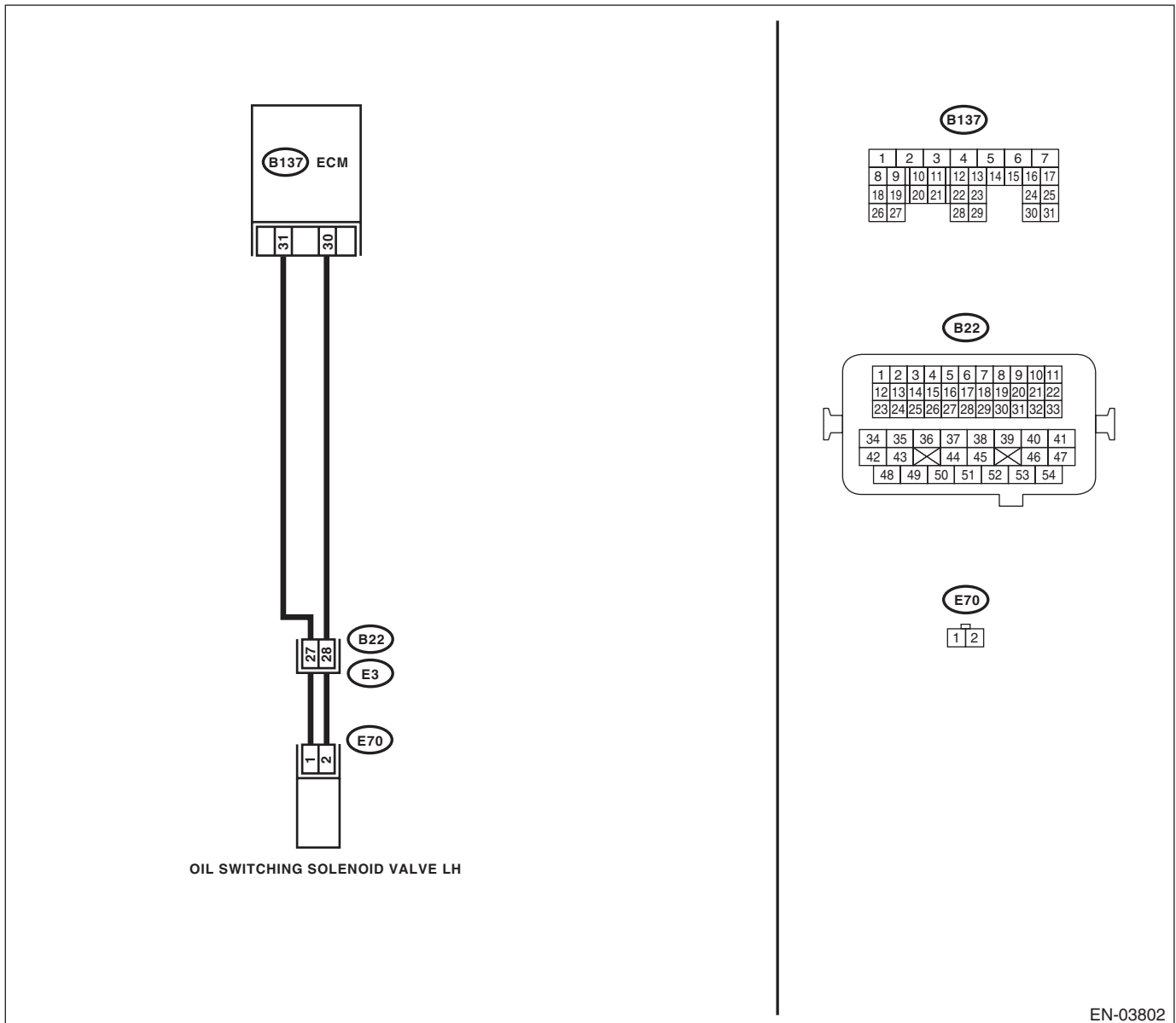
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03802

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK HARNESS BETWEEN ECM AND OIL SWITCHING SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil switching solenoid valve. 3) Measure the resistance between oil switching solenoid valve and engine ground. Connector & terminal (E70) No. 1 — Engine ground: (E70) No. 2 — Engine ground:	Is the resistance 1 M Ω or more?	Go to step 2.	Repair the short circuit between ECM and oil switching solenoid valve connector.
2	CHECK OIL SWITCHING SOLENOID VALVE. 1) Remove the oil switching solenoid valve connector. 2) Measure the resistance between oil switching solenoid valve terminals. Terminals No. 1 — No. 2:	Is the resistance between 6 and 12 Ω ?	Repair the poor contact of ECM and oil switching solenoid valve.	Replace the oil switching solenoid valve. <Ref. to ME(H4SO)-85, Oil Switching Solenoid Valve.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

M: DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-26, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

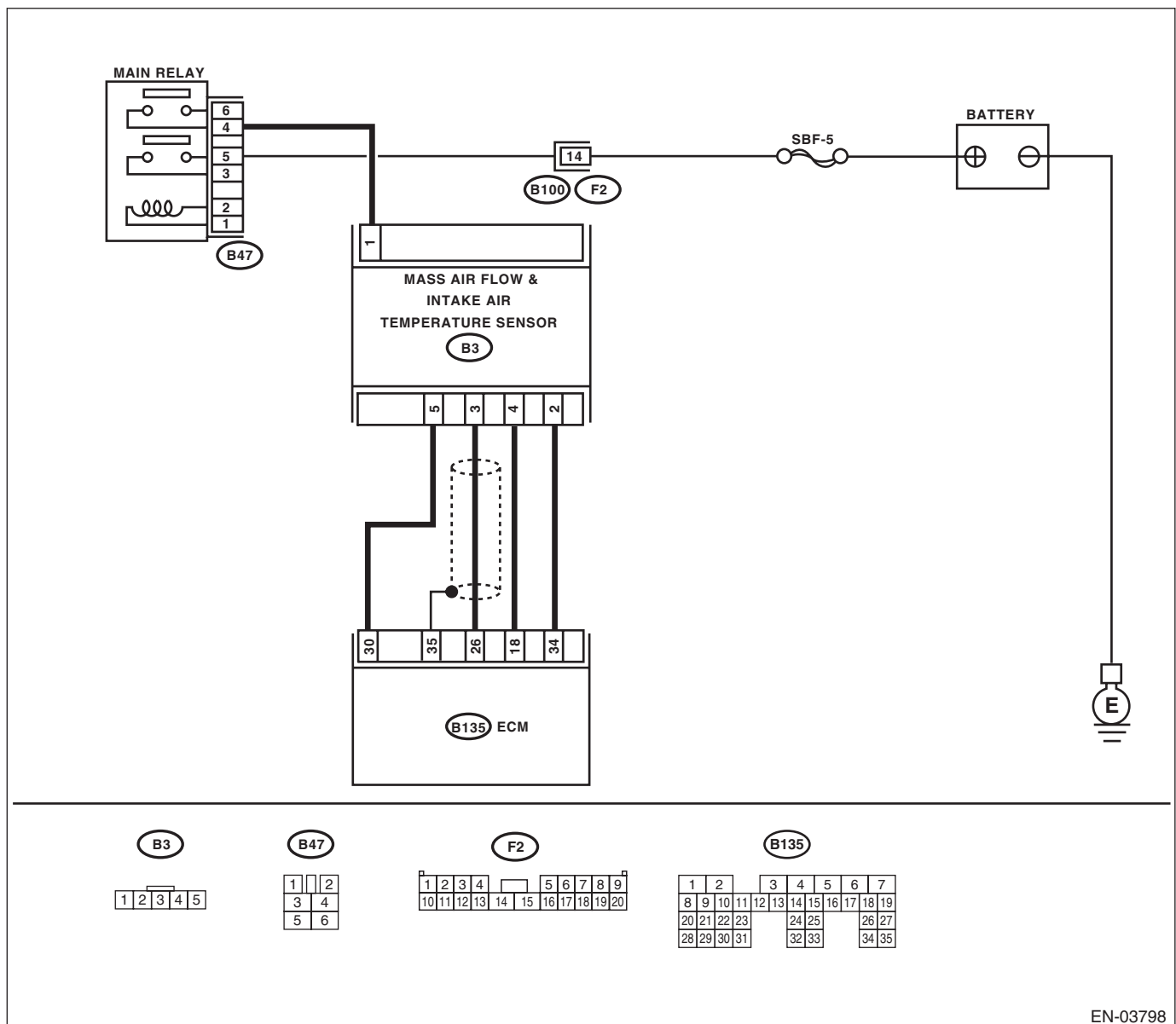
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03798

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0101.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4SO)-28, Mass Air Flow and Intake Air Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

N: DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-29, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

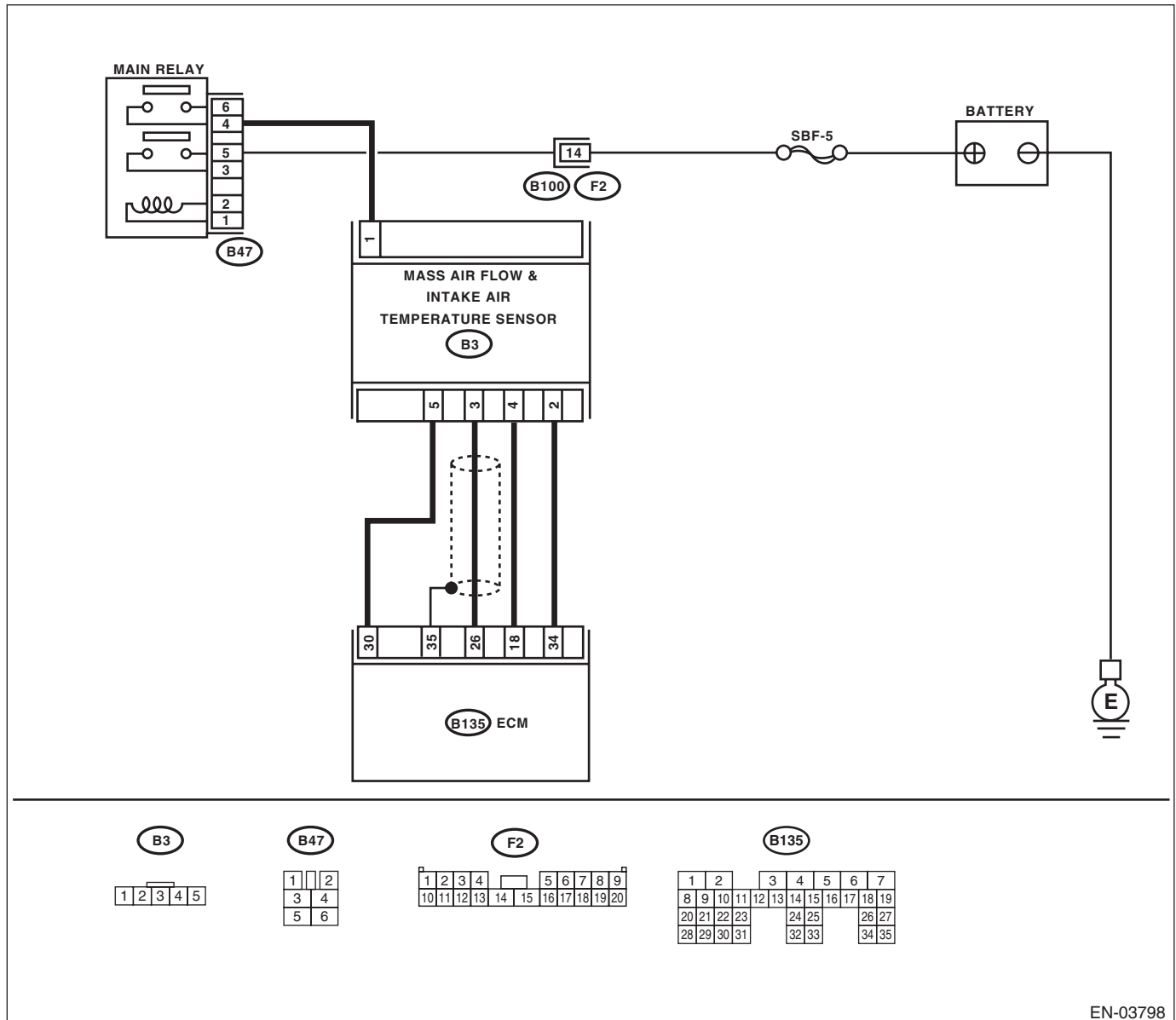
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03798

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1 CONNECT SUBARU SELECT MONITOR OR THE GENERAL SCAN TOOL, AND READ DATA.</p> <p>1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or general scan tool to data link connector. 3) Turn the ignition switch to ON, and the Subaru Select Monitor or general scan tool power switch to ON. 4) Start the engine. 5) Read the mass air flow sensor voltage using Subaru Select Monitor or general scan tool.</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Is the voltage 0.2 — 4.7 V?</p>	<p>Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Temporary poor contact of connector or harness may be the cause. Repair the harness or connector in mass air flow sensor.</p> <p>NOTE: In this case, repair the following item: • Open or ground short circuit in harness between mass air flow sensor and ECM connector • Poor contact in mass air flow sensor or ECM connector</p>	<p>Go to step 2.</p>
<p>2 CHECK INPUT SIGNAL OF ECM. Measure the voltage between ECM connector and chassis ground while engine is idling. Connector & terminal (B135) No. 26 (+) — Chassis ground (-):</p>	<p>Is the voltage 0.2 V or more?</p>	<p>Go to step 3.</p>	<p>Repair poor contact in ECM connector.</p>
<p>3 CHECK POWER SUPPLY TO MASS AIR FLOW SENSOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between mass air flow sensor connector and chassis ground. Connector & terminal (B3) No. 1 (+) — Chassis ground (-):</p>	<p>Is the voltage 5 V or more?</p>	<p>Go to step 4.</p>	<p>Repair the open circuit between mass air flow sensor and main relay.</p>
<p>4 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM and mass air flow sensor connector. Connector & terminal (B135) No. 26 — (B3) No. 3: (B135) No. 34 — (B3) No. 2: (B135) No. 30 — (B3) No. 5:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 5.</p>	<p>Repair the open circuit between ECM and mass air flow sensor connector.</p>
<p>5 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR. Measure the resistance of harness between ECM and chassis ground. Connector & terminal (B135) No. 26 — Chassis ground: (B135) No. 34 — Chassis ground: (B135) No. 30 — Chassis ground:</p>	<p>Is the resistance 1 MΩ or more?</p>	<p>Go to step 6.</p>	<p>Repair the ground short circuit between ECM and mass air flow sensor connector.</p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
6	CHECK POOR CONTACT. Check poor contact of mass air flow sensor connector.	Is there poor contact in mass air flow sensor connector?	Repair the poor contact of mass air flow sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4SO)-28, Mass Air Flow and Intake Air Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

O: DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-31, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

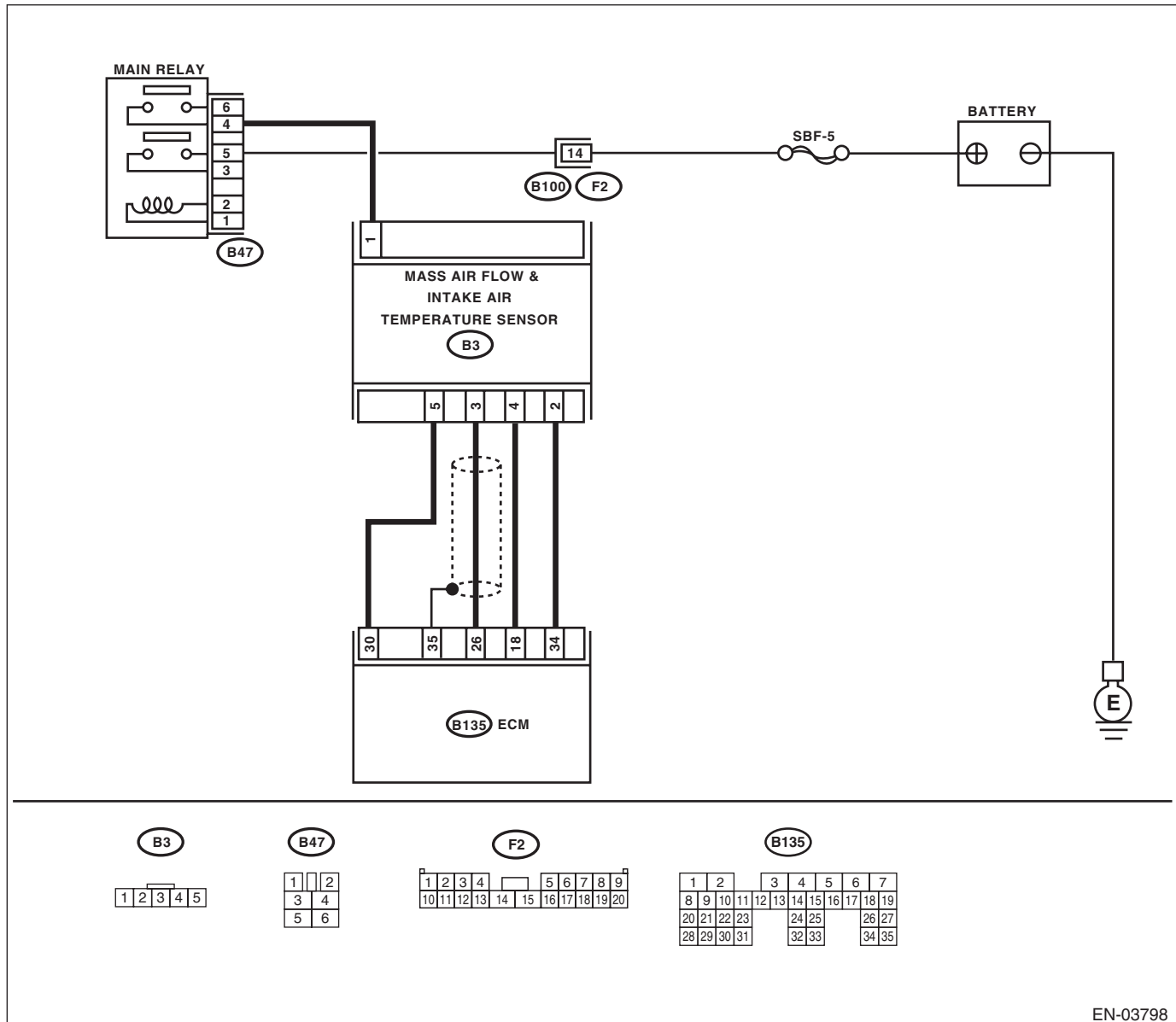
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03798

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1 CONNECT SUBARU SELECT MONITOR OR THE GENERAL SCAN TOOL, AND READ DATA.</p> <p>1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or general scan tool to data link connector. 3) Turn the ignition switch to ON, and the Subaru Select Monitor or general scan tool power switch to ON. 4) Start the engine. 5) Read the mass air flow sensor voltage using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • General scan tool <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Is the voltage 0.2 — 4.7 V?</p>	<p>Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.</p>	<p>Go to step 2.</p>
<p>2 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass airflow sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between mass air flow sensor connector and chassis ground.</p> <p>Connector & terminal (B3) No. 3 (+) — Chassis ground (-):</p>	<p>Is the voltage 5 V or more?</p>	<p>Repair the battery short circuit of harness between mass air flow sensor connector and ECM connector.</p>	<p>Go to step 3.</p>
<p>3 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM connector and mass air flow sensor connector.</p> <p>Connector & terminal (B3) No. 2 — (B135) No. 34:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Replace the mass air flow sensor. <Ref. to FU(H4SO)-28, Mass Air Flow and Intake Air Temperature Sensor.></p>	<p>Repair the open circuit of harness between mass air flow sensor connector and ECM connector.</p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

P: DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

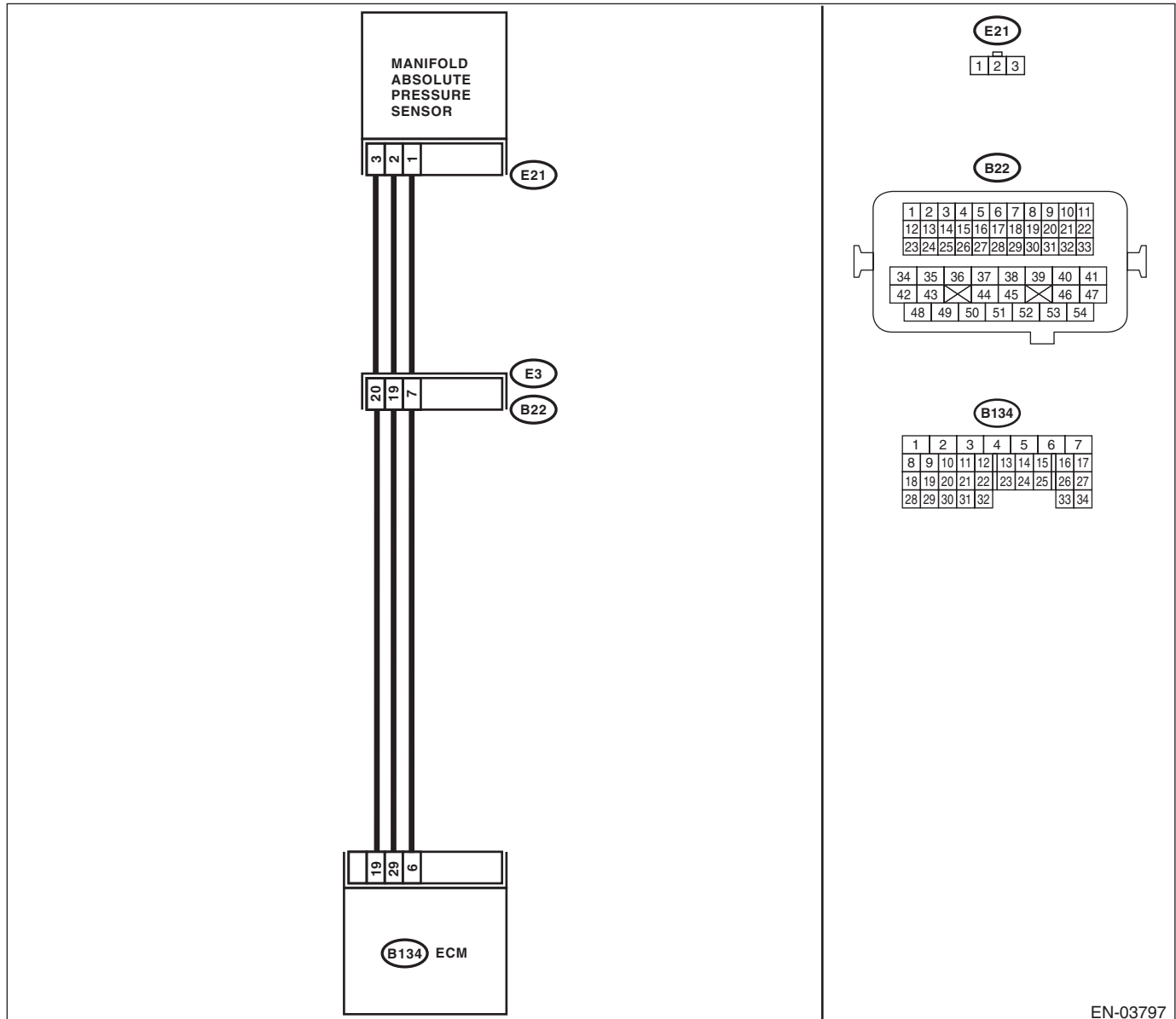
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-33, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03797

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is the measured value less than 13.3 kPa (100 mmHg, 3.94 inHg) ?	Go to step 3.	Go to step 2.
2 CHECK POOR CONTACT. Check the poor contact in ECM and manifold pressure sensor connector.	Is there poor contact in ECM or manifold pressure sensor connector?	Repair the poor contact in ECM or manifold pressure sensor connector.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.
3 CHECK OUTPUT SIGNAL OF ECM. Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 19 (+) — Chassis ground (-):</i>	Is the voltage 4.5 V or more?	Go to step 4.	Repair poor contact in ECM connector.
4 CHECK INPUT SIGNAL OF ECM. Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 29 (+) — Chassis ground (-):</i>	Is the voltage less than 0.2 V?	Go to step 6.	Go to step 5.
5 CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR). Read the data of atmospheric absolute pressure signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.>	Is the measured value more than 13.3 kPa (100 mmHg, 3.94 inHg) when shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Go to step 6.
6 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from manifold absolute pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between manifold absolute pressure sensor connector and engine ground. <i>Connector & terminal</i> <i>(E21) No. 3 (+) — Engine ground (-):</i>	Is the voltage 4.5 V or more?	Go to step 7.	Repair the open circuit of harness between ECM and manifold absolute pressure sensor connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7	CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. Connector & terminal (B134) No. 6 — (E21) No. 1:	Go to step 8.	Repair the open circuit of harness between ECM and manifold absolute pressure sensor connector.
8	CHECK POOR CONTACT. Check poor contact of manifold absolute pressure sensor connector.	Repair the poor contact of manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4SO)-27, Manifold Absolute Pressure Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Q: DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

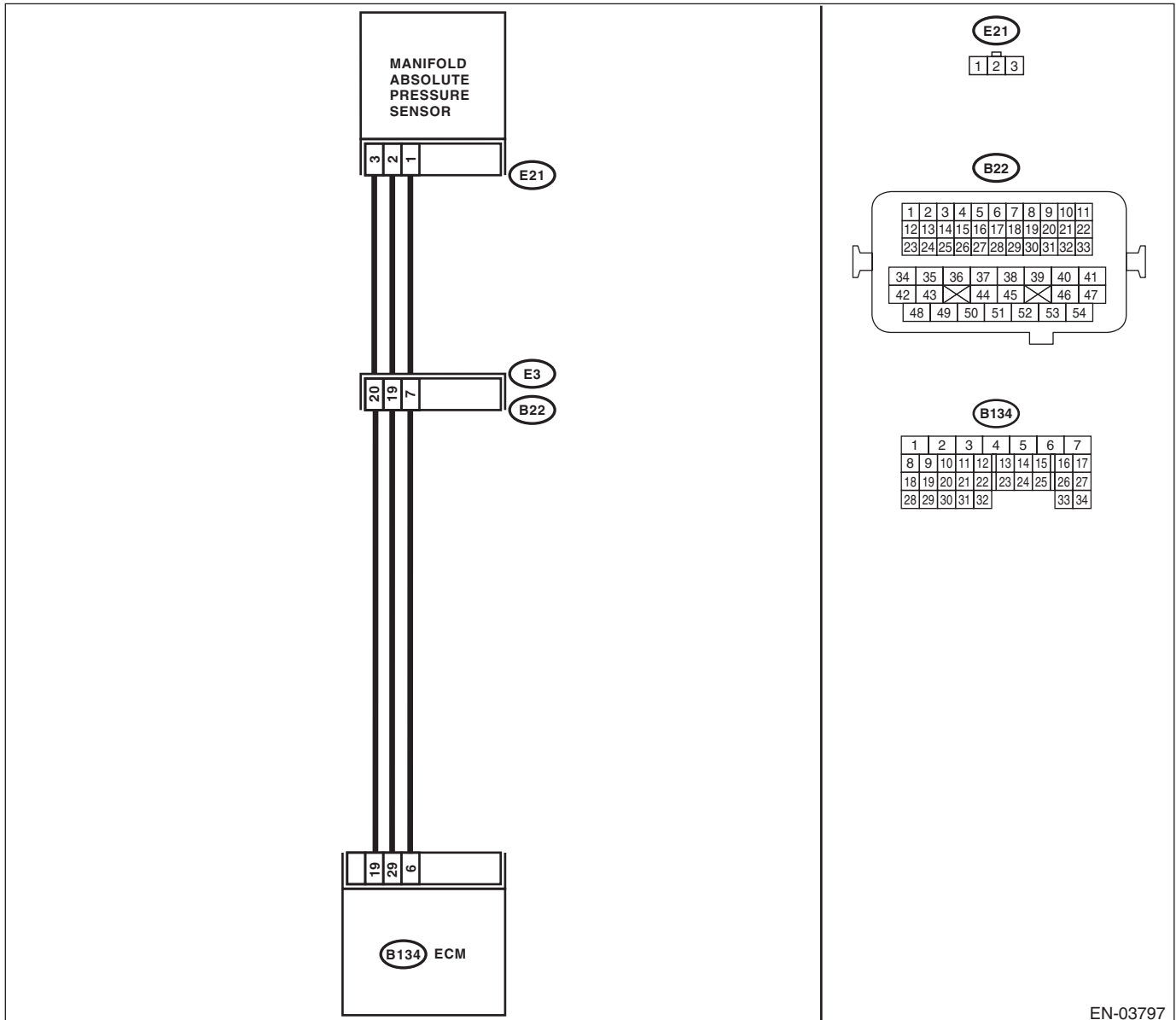
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-35, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03797

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Is the measured value more than 119.5 kPa (896.5 mmHg, 35.29 inHg) ?</p>	<p>Go to step 9.</p>	<p>Go to step 2.</p>
<p>2</p> <p>CHECK OUTPUT SIGNAL OF ECM. Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 19 (+) — Chassis ground (-):</i></p>	<p>Is the voltage 4.5 V or more?</p>	<p>Go to step 3.</p>	<p>Repair poor contact in ECM connector.</p>
<p>3</p> <p>CHECK INPUT SIGNAL OF ECM. Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 29 (+) — Chassis ground (-):</i></p>	<p>Is the voltage less than 0.2 V?</p>	<p>Go to step 5.</p>	<p>Go to step 4.</p>
<p>4</p> <p>CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR). Read the data of atmospheric absolute pressure signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.></p>	<p>Is the measured value more than 13.3 kPa (100 mmHg, 3.94 inHg) when shaking the ECM harness and connector?</p>	<p>Repair poor contact in ECM connector.</p>	<p>Go to step 5.</p>
<p>5</p> <p>CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from manifold absolute pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between manifold absolute pressure sensor connector and engine ground. <i>Connector & terminal</i> <i>(E21) No. 3 (+) — Engine ground (-):</i></p>	<p>Is the voltage 4.5 V or more?</p>	<p>Go to step 6.</p>	<p>Repair the open circuit of harness between ECM and manifold absolute pressure sensor connector.</p>
<p>6</p> <p>CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. <i>Connector & terminal</i> <i>(B134) No. 29 — (E21) No. 2:</i></p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 7.</p>	<p>Repair the open circuit of harness between ECM and manifold absolute pressure sensor connector.</p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR. Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. <i>Connector & terminal (B134) No. 6 — (E21) No. 1:</i>	Is the resistance less than 1 Ω?	Go to step 8.	Repair the open circuit of harness between ECM and manifold absolute pressure sensor connector.
8 CHECK POOR CONTACT. Check poor contact of manifold absolute pressure sensor connector.	Is there poor contact in manifold absolute pressure sensor connector?	Repair the poor contact of manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4SO)-27, Manifold Absolute Pressure Sensor.>
9 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF and Subaru Select Monitor or the general scan tool switch to OFF. 2) Disconnect the connector from manifold absolute pressure sensor. 3) Turn the ignition switch to ON, and the Subaru Select Monitor or general scan tool power switch to ON. 4) Read the data of intake manifold absolute pressure signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is the measured value more than 119.5 kPa (896.5 mmHg, 35.29 inHg) ?	Repair the battery short circuit of harness between ECM and manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4SO)-27, Manifold Absolute Pressure Sensor.>

R: DTC P0111 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-37, DTC P0111 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

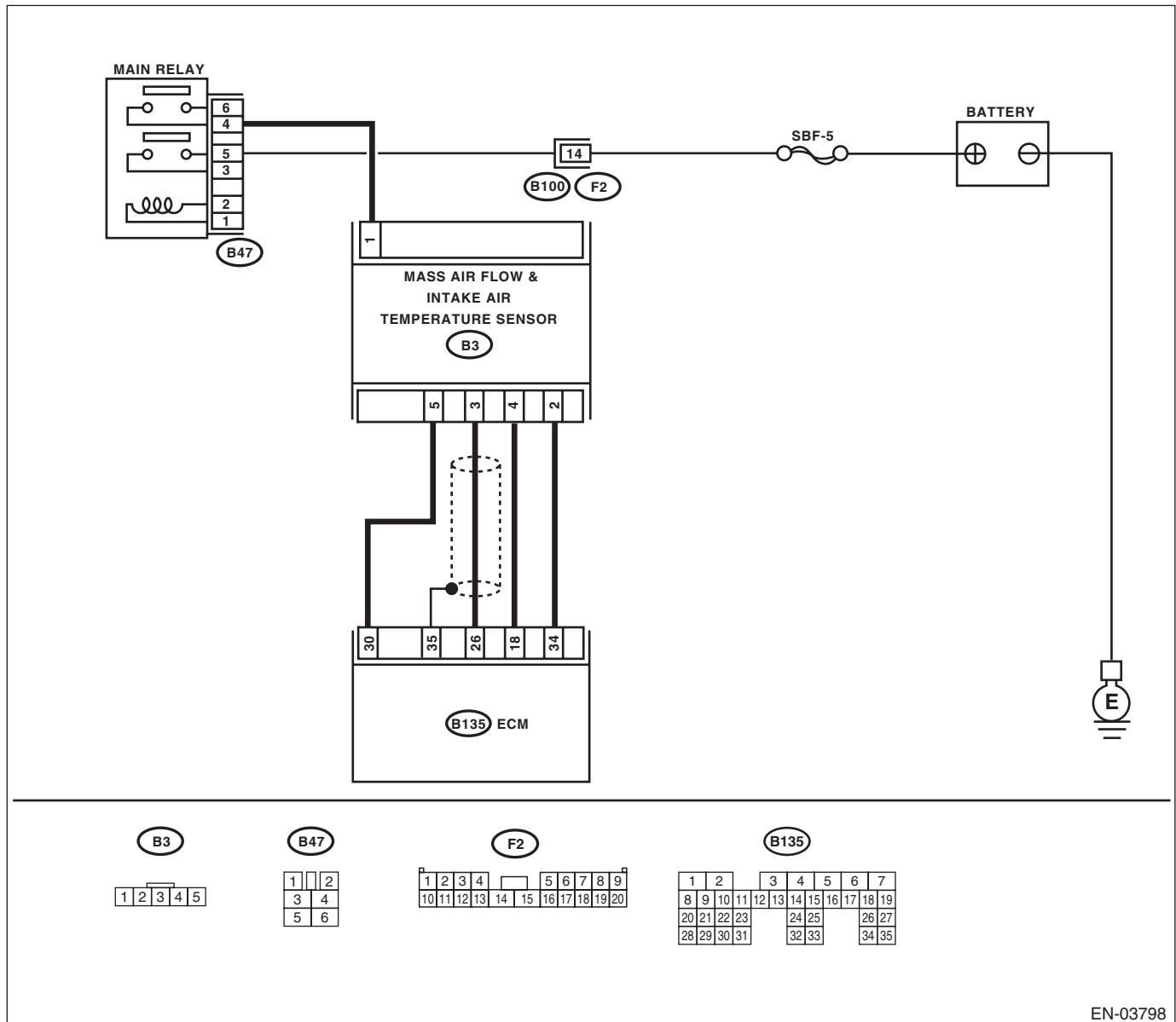
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03798

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0111.	Replace the intake air temperature sensor. <Ref. to FU(H4SO)-28, Mass Air Flow and Intake Air Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

S: DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-39, DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

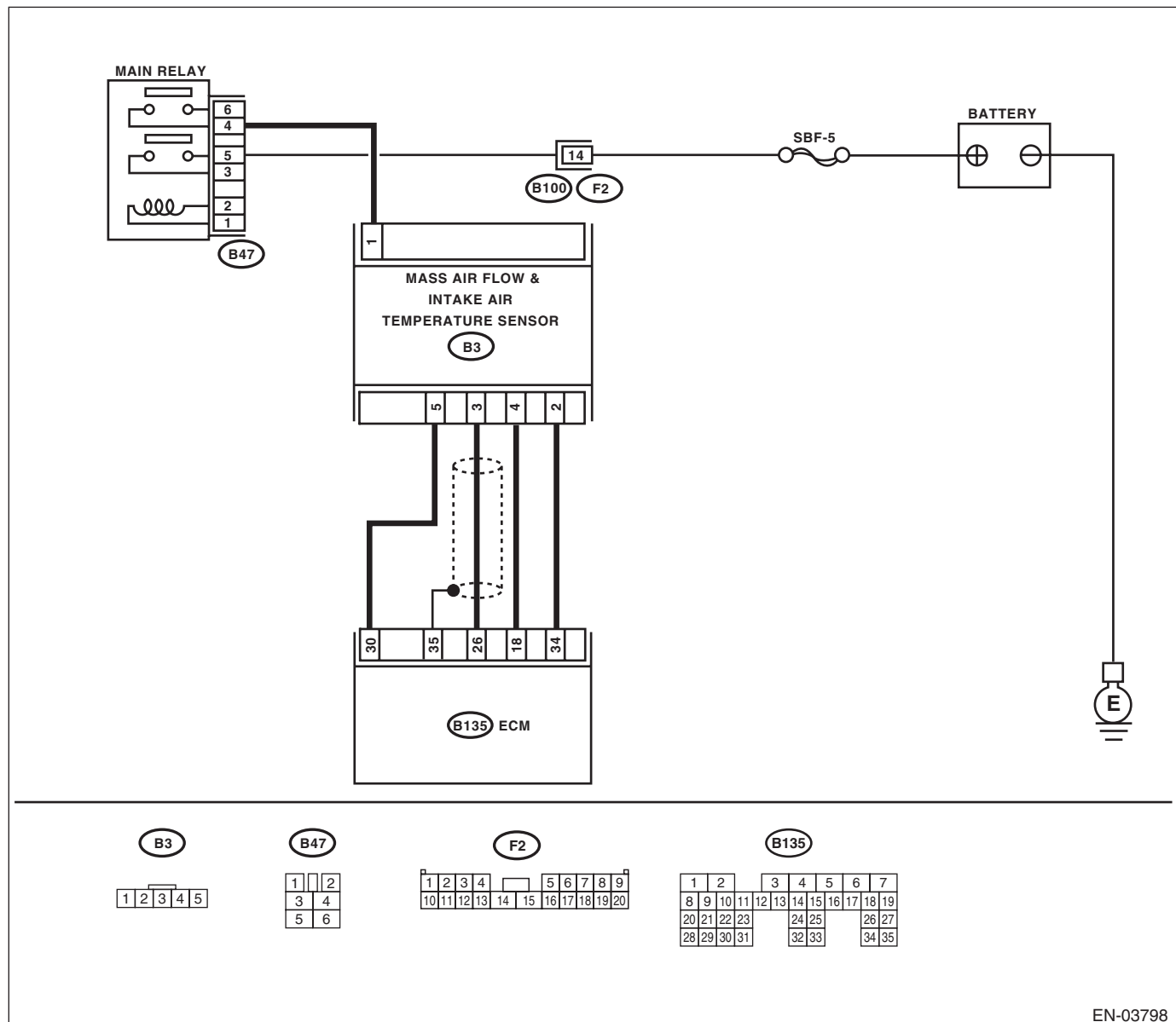
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03798

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK CURRENT DATA.</p> <p>1) Start the engine.</p> <p>2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> Subaru Select Monitor <p>For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.></p> <ul style="list-style-type: none"> General scan tool <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Is the intake air temperature above 120°C (248°F) ?</p>	<p>Go to step 2.</p>	<p>Repair the poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following item:</p> <ul style="list-style-type: none"> Poor contact in intake air temperature sensor Poor contact in ECM Poor contact in coupling connector Poor contact in joint connector
2	<p>CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from intake air temperature sensor.</p> <p>3) Turn the ignition switch to ON.</p> <p>4) Read the data of intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> Subaru Select Monitor <p>For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.></p> <ul style="list-style-type: none"> General scan tool <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Is the intake air temperature less than -40°C (-40°F) ?</p>	<p>Replace the intake air temperature sensor. <Ref. to FU(H4SO)-28, Mass Air Flow and Intake Air Temperature Sensor.></p>	<p>Repair the ground short circuit of harness between intake air temperature sensor and ECM connector.</p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

T: DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-41, DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

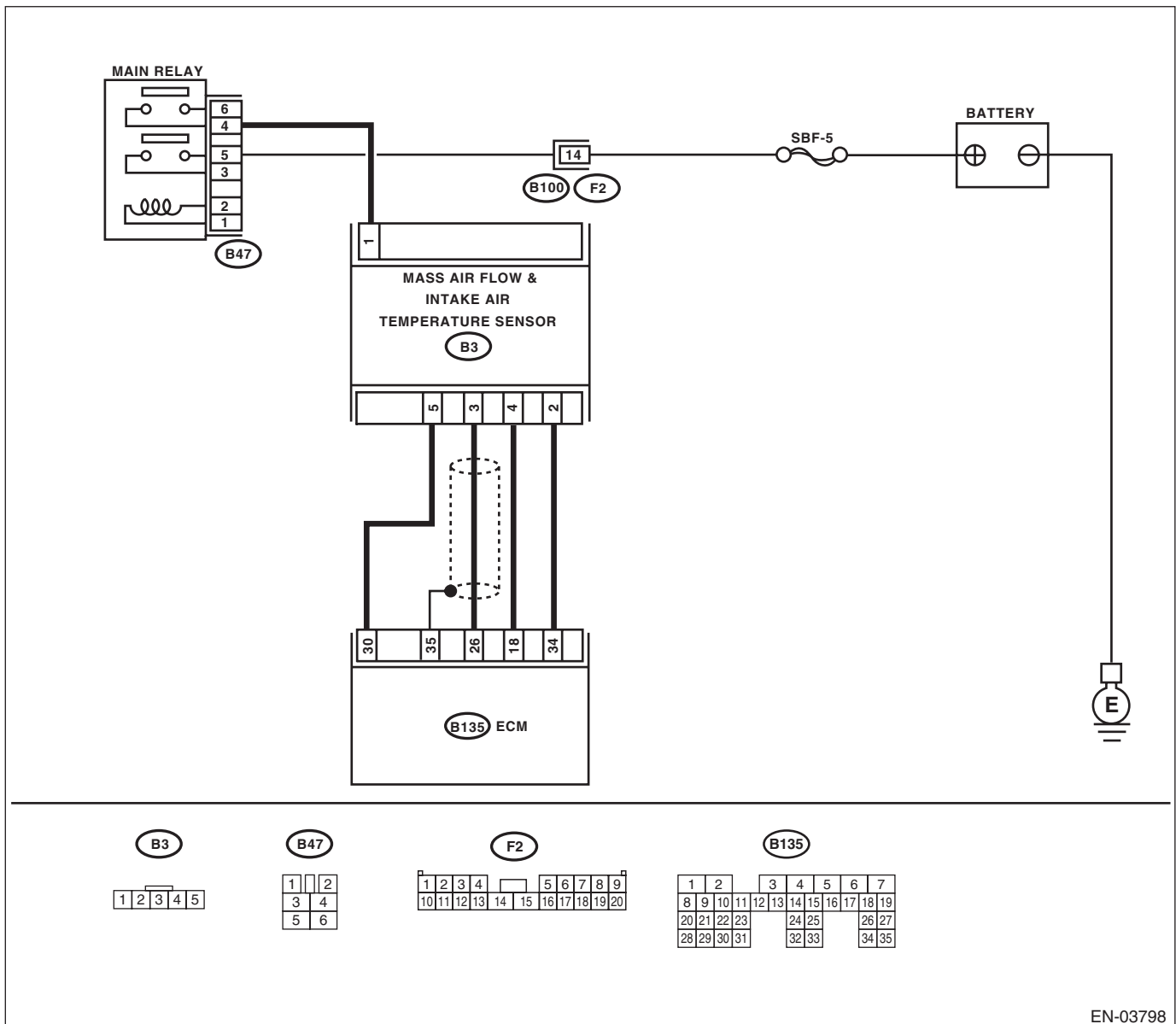
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03798

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK CURRENT DATA.</p> <p>1) Start the engine.</p> <p>2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • General scan tool <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Is the intake air temperature less than -40°C (-40°F) ?</p>	<p>Go to step 2.</p>	<p>Repair the poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following item:</p> <ul style="list-style-type: none"> • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
<p>2</p> <p>CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from intake air temperature sensor.</p> <p>3) Measure the voltage between intake air temperature sensor connector and engine ground.</p> <p>Connector & terminal (B3) No. 4 (+) — Engine ground (-):</p>	<p>Is the voltage 10 V or more?</p>	<p>Repair the battery short circuit of harness between intake air temperature sensor and ECM connector.</p>	<p>Go to step 3.</p>
<p>3</p> <p>CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between intake air temperature sensor connector and engine ground.</p> <p>Connector & terminal (B3) No. 4 (+) — Engine ground (-):</p>	<p>Is the voltage 10 V or more?</p>	<p>Repair the battery short circuit of harness between intake air temperature sensor and ECM connector.</p>	<p>Go to step 4.</p>
<p>4</p> <p>CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>Measure the voltage between intake air temperature sensor connector and engine ground.</p> <p>Connector & terminal (B3) No. 4 (+) — Engine ground (-):</p>	<p>Is the voltage 3 V or more?</p>	<p>Go to step 5.</p>	<p>Repair the harness and connector.</p> <p>NOTE:</p> <p>In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit in harness between intake air temperature sensor and ECM connector • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>5</p> <p>CHECK HARNESS BETWEEN INTAKE AIR TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Measure the resistance of harness between intake air temperature sensor connector and engine ground.</p> <p>Connector & terminal (B3) No. 5 — Engine ground:</p>	<p>Is the resistance less than 5 Ω?</p>	<p>Replace the intake air temperature sensor. <Ref. to FU(H4SO)-28, Mass Air Flow and Intake Air Temperature Sensor.></p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit in harness between intake air temperature sensor and ECM connector • Poor contact in intake air temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

U: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-43, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

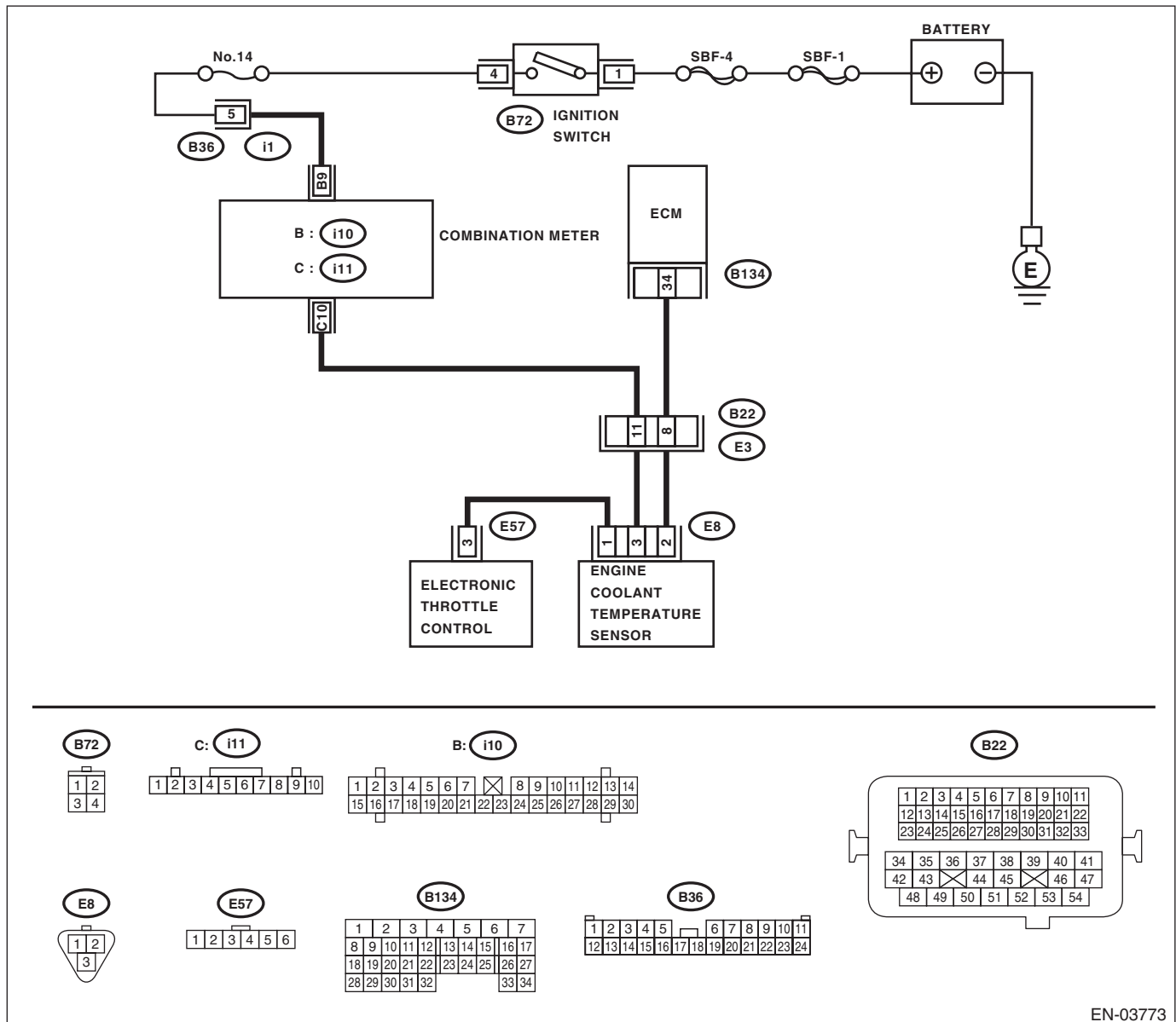
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03773

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK CURRENT DATA.</p> <p>1) Start the engine.</p> <p>2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • General scan tool <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Is the engine coolant temperature above 150°C (302°F) ?</p>	<p>Go to step 2.</p>	<p>Repair the poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following item:</p> <ul style="list-style-type: none"> • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
2	<p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connectors from the engine coolant temperature sensor.</p> <p>3) Turn the ignition switch to ON.</p> <p>4) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • General scan tool <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Is the engine coolant temperature less than -40°C (-40°F) ?</p>	<p>Replace the engine coolant temperature sensor. <Ref. to FU(H4SO)-22, Engine Coolant Temperature Sensor.></p>	<p>Repair the ground short circuit of harness between engine coolant temperature sensor and ECM connector.</p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

V: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-45, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

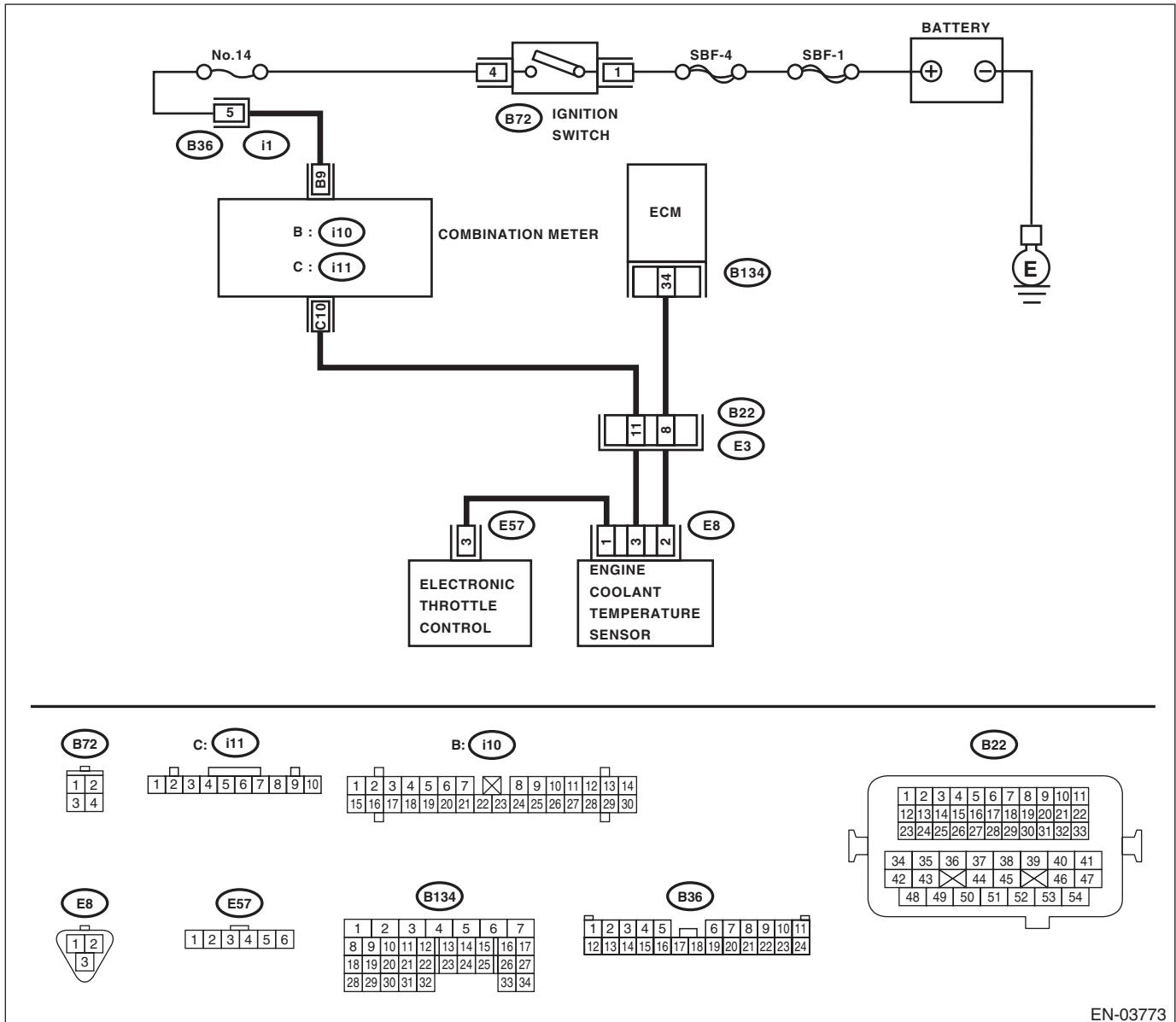
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03773

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK CURRENT DATA.</p> <p>1) Start the engine.</p> <p>2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • General scan tool <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Is the engine coolant temperature less than -40°C (-40°F) ?</p>	<p>Go to step 2.</p>	<p>Repair the poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following item:</p> <ul style="list-style-type: none"> • Poor contact in engine coolant temperature sensor • Poor contact in ECM • Poor contact in coupling connector • Poor contact in joint connector
<p>2</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connectors from the engine coolant temperature sensor.</p> <p>3) Measure the voltage between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal (E8) No. 2 (+) — Engine ground (-):</p>	<p>Is the voltage 10 V or more?</p>	<p>Repair the battery short circuit of harness between ECM and engine coolant temperature sensor connector.</p>	<p>Go to step 3.</p>
<p>3</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal (E8) No. 2 (+) — Engine ground (-):</p>	<p>Is the voltage 10 V or more?</p>	<p>Repair the battery short circuit of harness between ECM and engine coolant temperature sensor connector.</p>	<p>Go to step 4.</p>
<p>4</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>Measure the voltage between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal (E8) No. 2 (+) — Engine ground (-):</p>	<p>Is the voltage 4 V or more?</p>	<p>Go to step 5.</p>	<p>Repair the harness and connector.</p> <p>NOTE:</p> <p>In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>5</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Measure the resistance of harness between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal (E8) No. 3 — Engine ground:</p>	<p>Is the resistance less than 5 Ω?</p>	<p>Replace the engine coolant temperature sensor. <Ref. to FU(H4SO)-22, Engine Coolant Temperature Sensor.></p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none">• Open circuit in harness between ECM and engine coolant temperature sensor connector• Poor contact in engine coolant temperature sensor connector• Poor contact in ECM connector• Poor contact in coupling connector• Poor contact in joint connector

W: DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-47, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

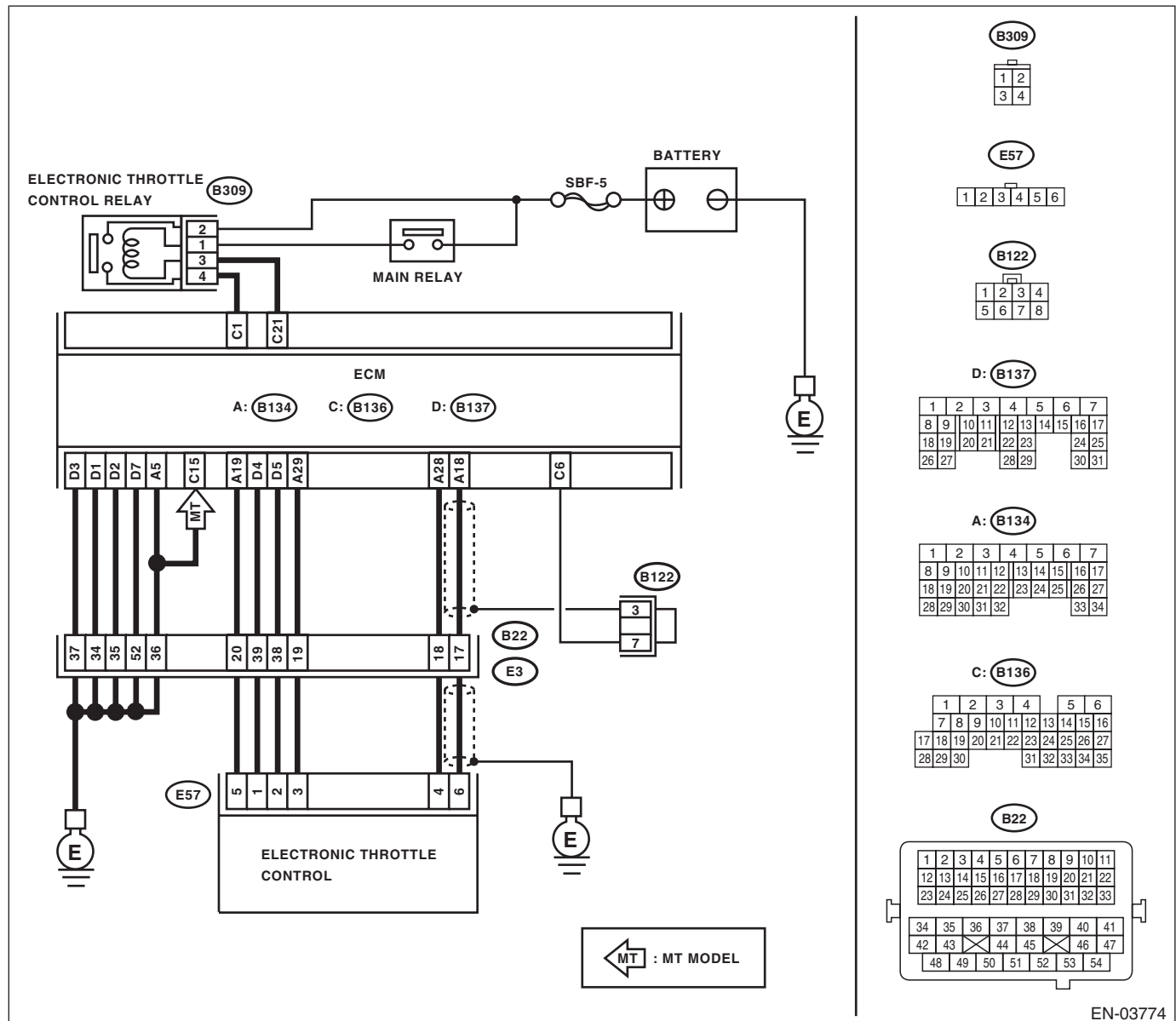
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SENSOR OUTPUT. 1) Turn the ignition switch to ON. 2) Read the data of main throttle sensor signal using Subaru Select Monitor.	Is the voltage 0.4 V or more?	Go to step 2.	Go to step 3.
2 CHECK POOR CONTACT. Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact in connector between ECM and electronic throttle control?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. <i>Connector & terminal</i> <i>(B134) No. 18 — (E57) No. 6:</i> <i>(B134) No. 19 — (E57) No. 5:</i>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit of harness connector.
4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. Measure the resistance between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 18 — Chassis ground:</i> <i>(B134) No. 19 — Chassis ground:</i>	Is the resistance 1 M Ω or more?	Go to step 5.	Repair the chassis short circuit of harness.
5 CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. <i>Connector & terminal</i> <i>(E57) No. 5 (+) — Engine ground (-):</i>	Is the voltage 4.5 — 5.5 V?	Go to step 6.	Repair poor contact in ECM connector.
6 CHECK SHORT CIRCUIT INSIDE THE ECM. 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. <i>Connector & terminal</i> <i>(E57) No. 6 — Engine ground:</i>	Is the resistance 10 Ω or more?	Repair the poor contact of electronic throttle control connector. Replace the accelerator pedal position sensor if defective.	Repair poor contact in ECM connector.

X: DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-49, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

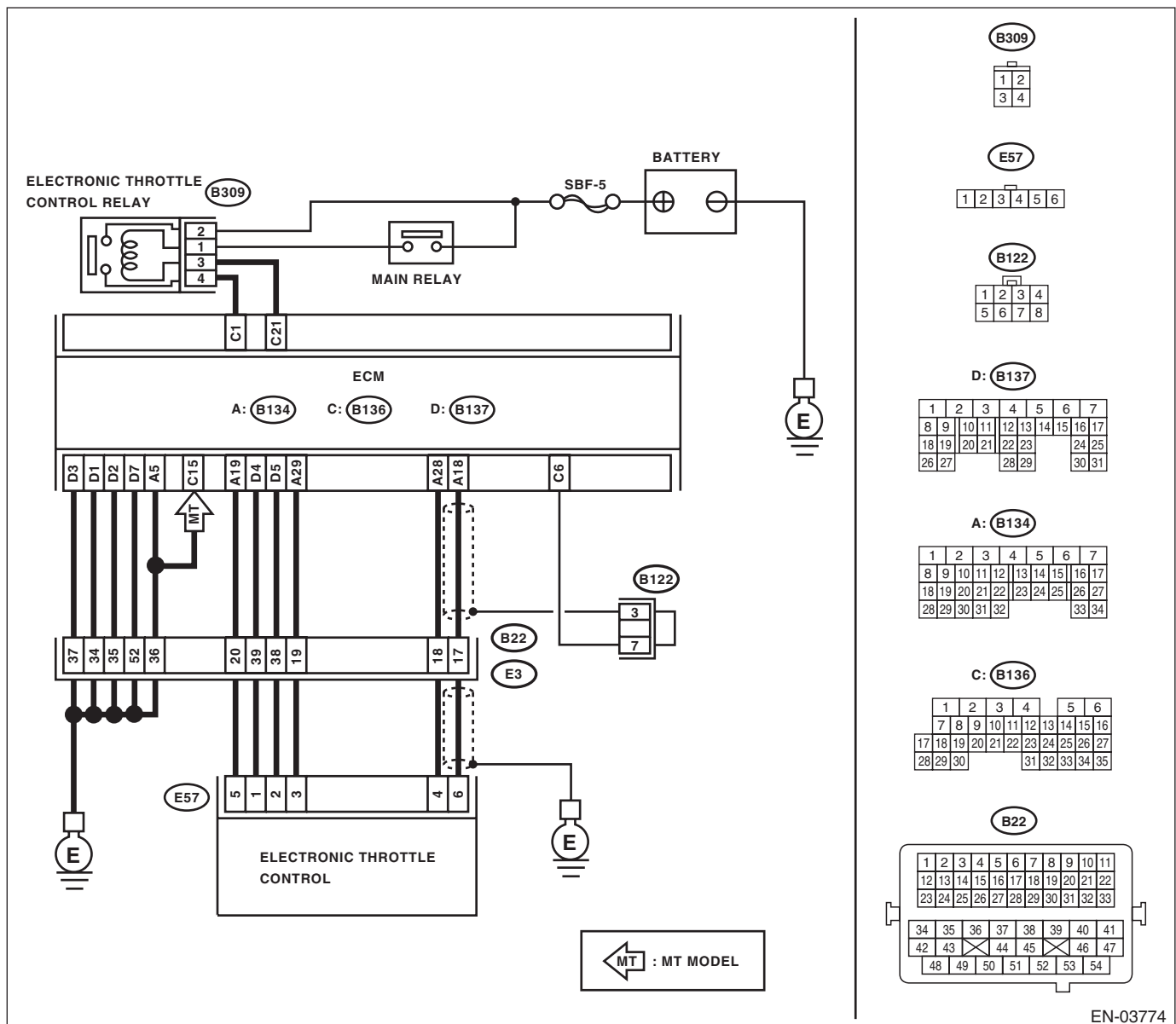
TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03774

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK SENSOR OUTPUT. 1) Turn the ignition switch to ON. 2) Read the data of main throttle sensor signal using Subaru Select Monitor.	Is the voltage less than 4.63 V?	Go to step 2.	Go to step 3.
2	CHECK POOR CONTACT. Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact in connector between ECM and electronic throttle control?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. Connector & terminal (B134) No. 18 — (E57) No. 6: (B134) No. 29 — (E57) No. 3:	Is the resistance less than 1 Ω?	Go to step 4.	Repair the open circuit of harness connector.
4	CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM connector. 2) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 3 — Engine ground:	Is the resistance less than 5 Ω?	Go to step 5.	Repair poor contact in ECM connector.
5	CHECK SENSOR OUTPUT POWER SUPPLY. Measure the voltage between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 6 (+) — Engine ground (-):	Is the voltage less than 10 V?	Replace the electronic throttle control. <Ref. to FU(H4SO)-12, Throttle Body.>	Repair the battery short circuit of harness between ECM connector and electronic throttle control connector.

Y: DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-51, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Trouble Code (DTC) Detecting Criteria.>

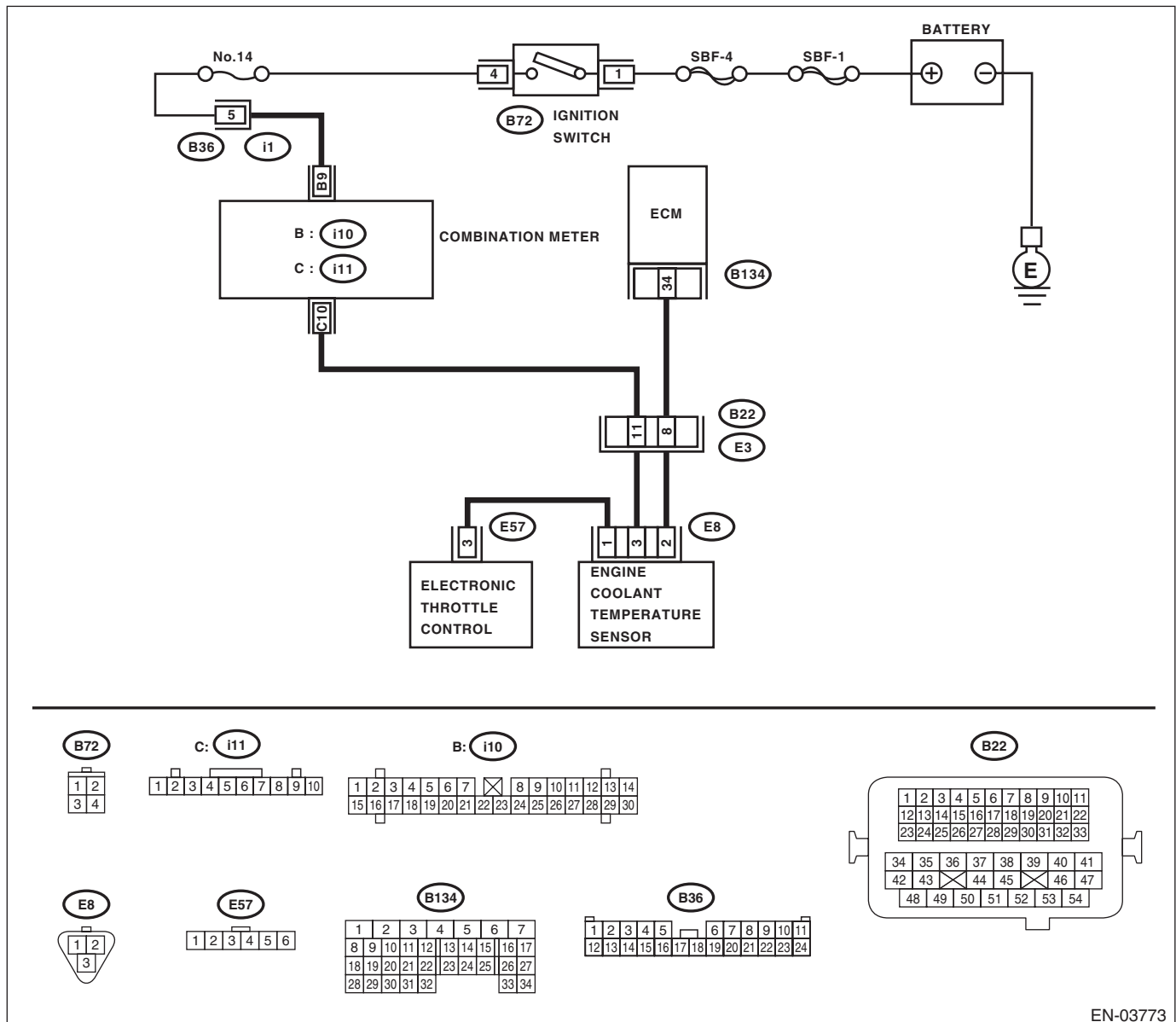
TROUBLE SYMPTOM:

Engine does not return to idle.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03773

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0125.	Go to step 2.
2 CHECK THERMOSTAT.	Does the thermostat remain opened?	Replace the thermostat. <Ref. to CO(H4SO)-25, Thermostat.>	Replace the engine coolant temperature sensor. <Ref. to FU(H4SO)-22, Engine Coolant Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Z: DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-53, DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

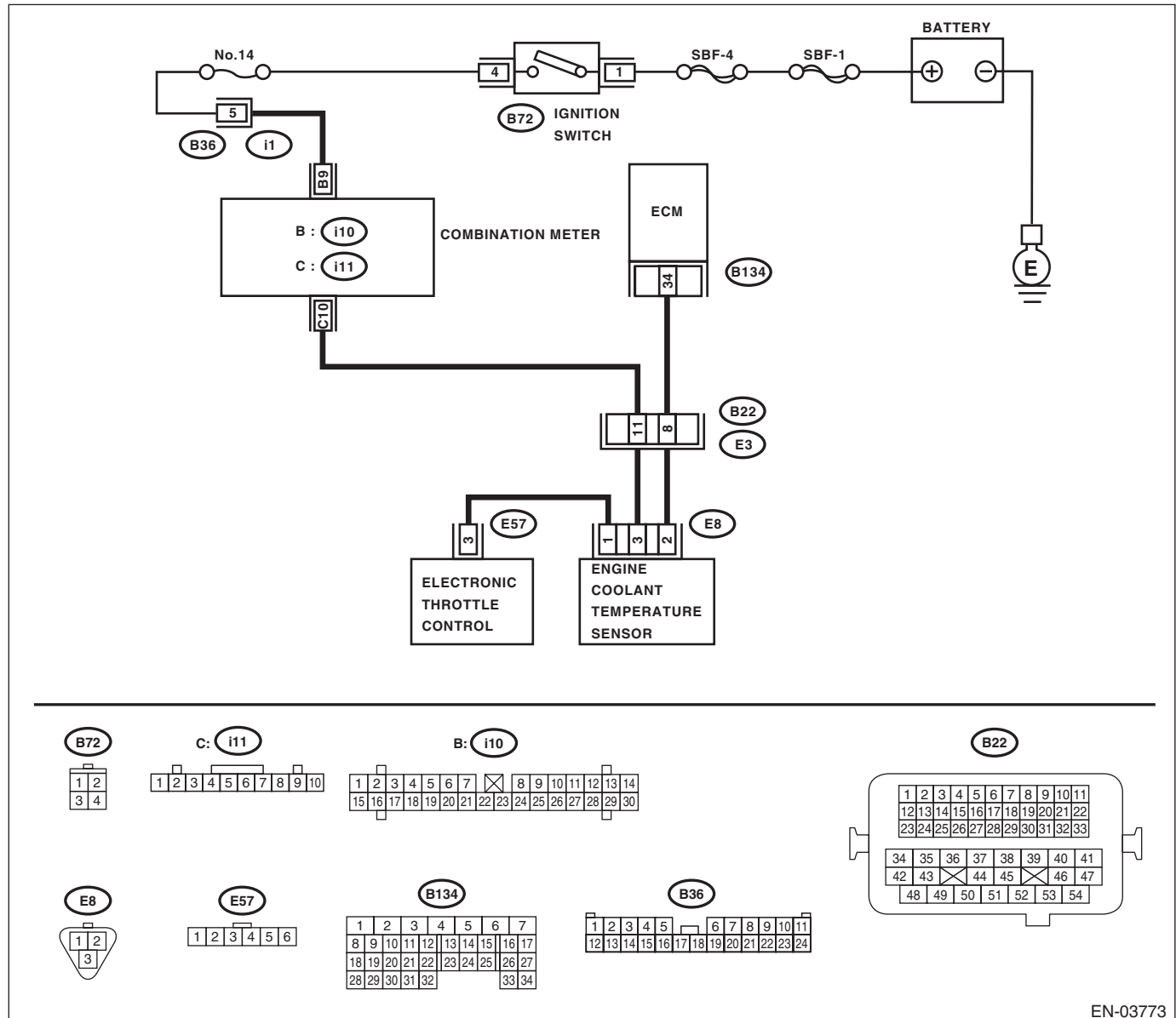
TROUBLE SYMPTOM:

Engine does not return to idle.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03773

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK ENGINE COOLANT TEMPERATURE SENSOR. Measure the resistance between engine coolant temperature sensor terminals when engine is cold and warm up. Terminals No. 1 — No. 2:	Does the resistance change when engine is cold and warm up?	Repair poor contact in ECM connector.	Replace the engine coolant temperature sensor. <Ref. to FU(H4SO)-22, Engine Coolant Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AA:DTC P0128 COOLANT THERMOSTAT (ENGINE COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-55, DTC P0128 COOLANT THERMOSTAT (ENGINE COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Thermostat remains open.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK VEHICLE CONDITION.	Was the vehicle driven or idled with the engine partially submerged under water?	In this case, it is not necessary to inspect DTC P0128.	Go to step 2.
2 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).>	Go to step 3.
3 CHECK ENGINE COOLANT.	Are the coolant level and mixture ratio of engine coolant to anti-freeze solution correct?	Go to step 4.	Replace the engine coolant. <Ref. to CO(H4SO)-18, REPLACEMENT, Engine Coolant.>
4 CHECK RADIATOR FAN. 1) Start the engine. 2) Check radiator fan operation.	Does the radiator fan continuously rotate for more than 3 minutes during idling?	Repair radiator fan circuit. <Ref. to CO(H4SO)-34, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4SO)-41, Radiator Sub Fan and Fan Motor.>	Replace the thermostat. <Ref. to CO(H4SO)-25, Thermostat.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AB:DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

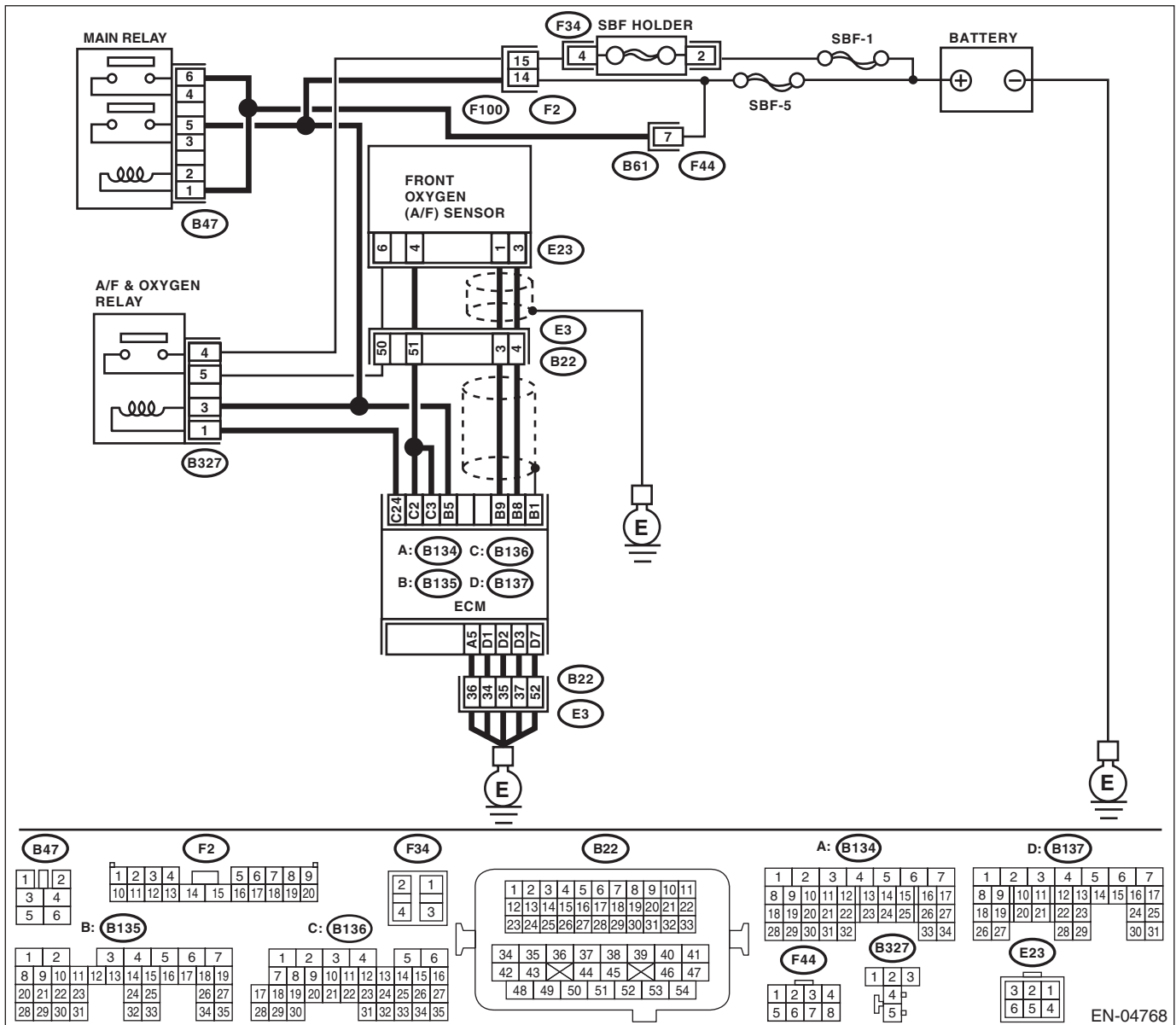
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-57, DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.	Does water enter the connector?	Dry the water thoroughly.	Go to step 2.
2	CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. Connector & terminal (B135) No. 8 — Chassis ground: (B135) No. 9 — Chassis ground:	Is the resistance 1 MΩ or more?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-36, Front Oxygen (A/F) Sensor.>	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AC:DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

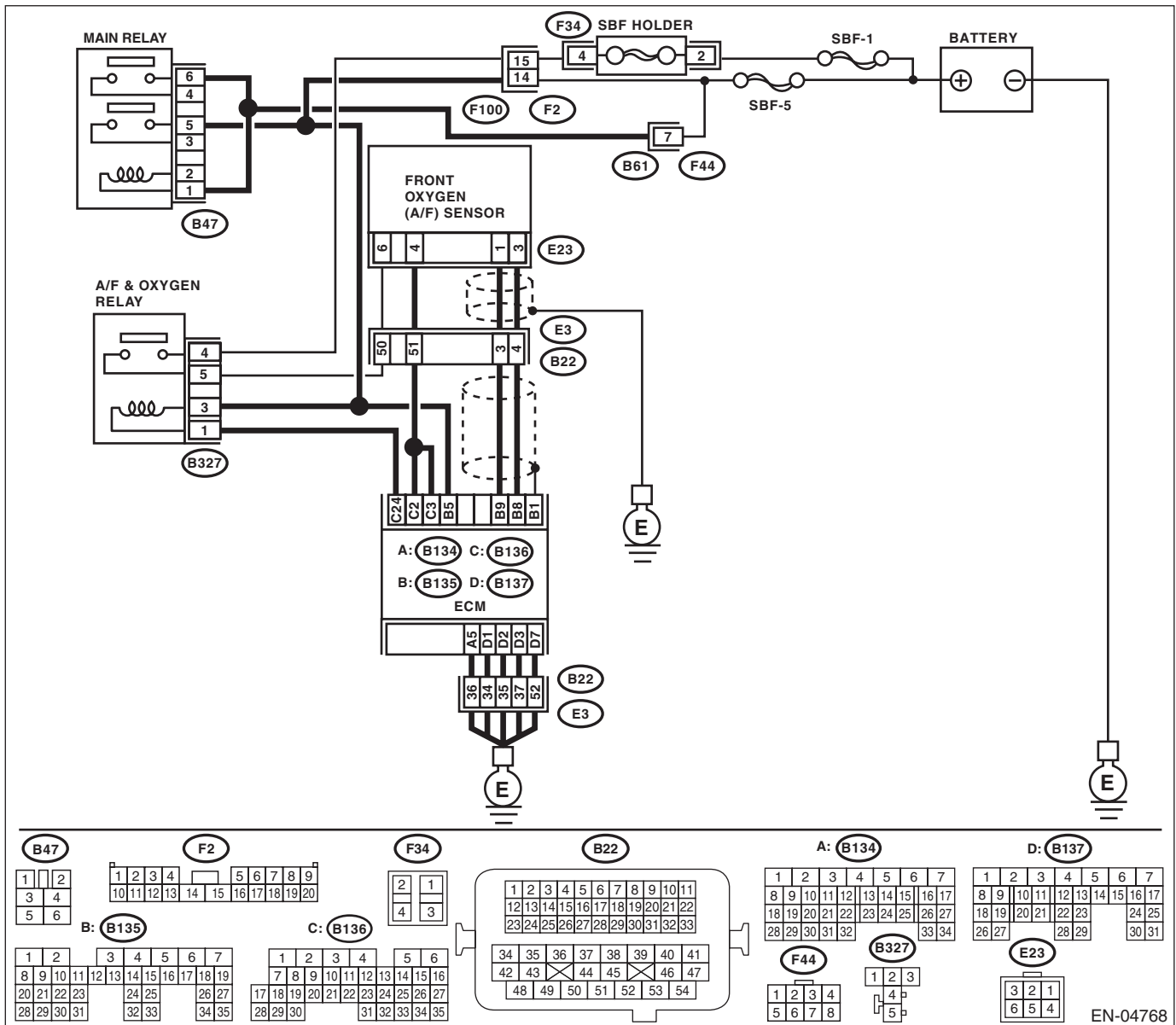
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-59, DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04768

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.	Does water enter the connector?	Dry the water thoroughly.	Go to step 2.
2	CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. 1) Turn the ignition switch to ON. 2) Disconnect the connector from front oxygen (A/F) sensor. 3) Measure the voltage of harness between ECM connector and chassis ground. Connector & terminal <i>(B135) No. 8 (+) — Chassis ground (-):</i> <i>(B135) No. 9 (+) — Chassis ground (-):</i>	Is the voltage 8 V or more?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-36, Front Oxygen (A/F) Sensor.>	Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AD:DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

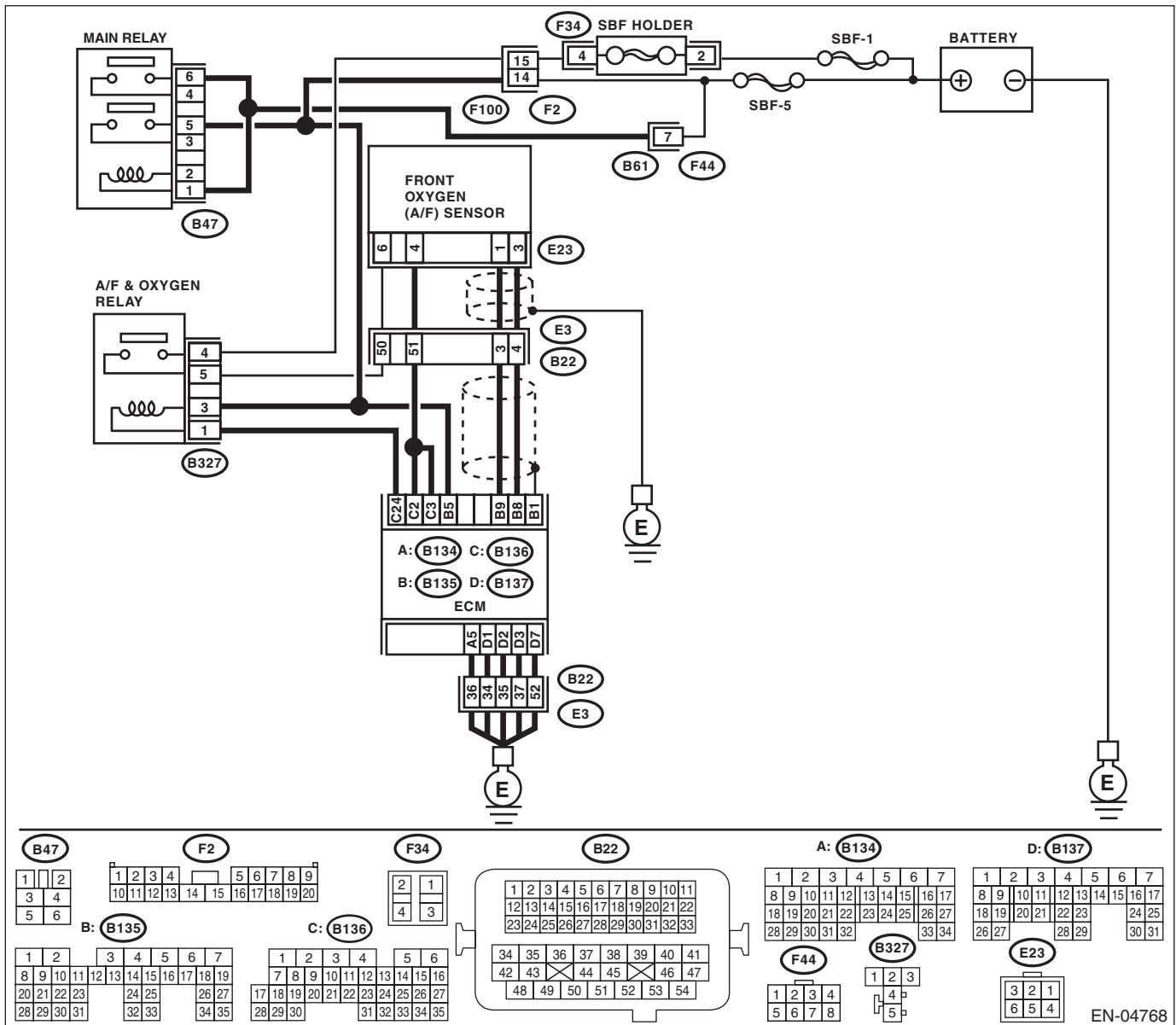
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-61, DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0133.	Go to step 2.
2 CHECK EXHAUST SYSTEM. NOTE: Check the following items. <ul style="list-style-type: none">• Loose installation of front portion of exhaust pipe onto cylinder heads• Loose connection between front exhaust pipe and front catalytic converter• Damage of exhaust pipe resulting in a hole	Is there any fault in exhaust system?	Repair the exhaust system.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-36, Front Oxygen (A/F) Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AE:DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

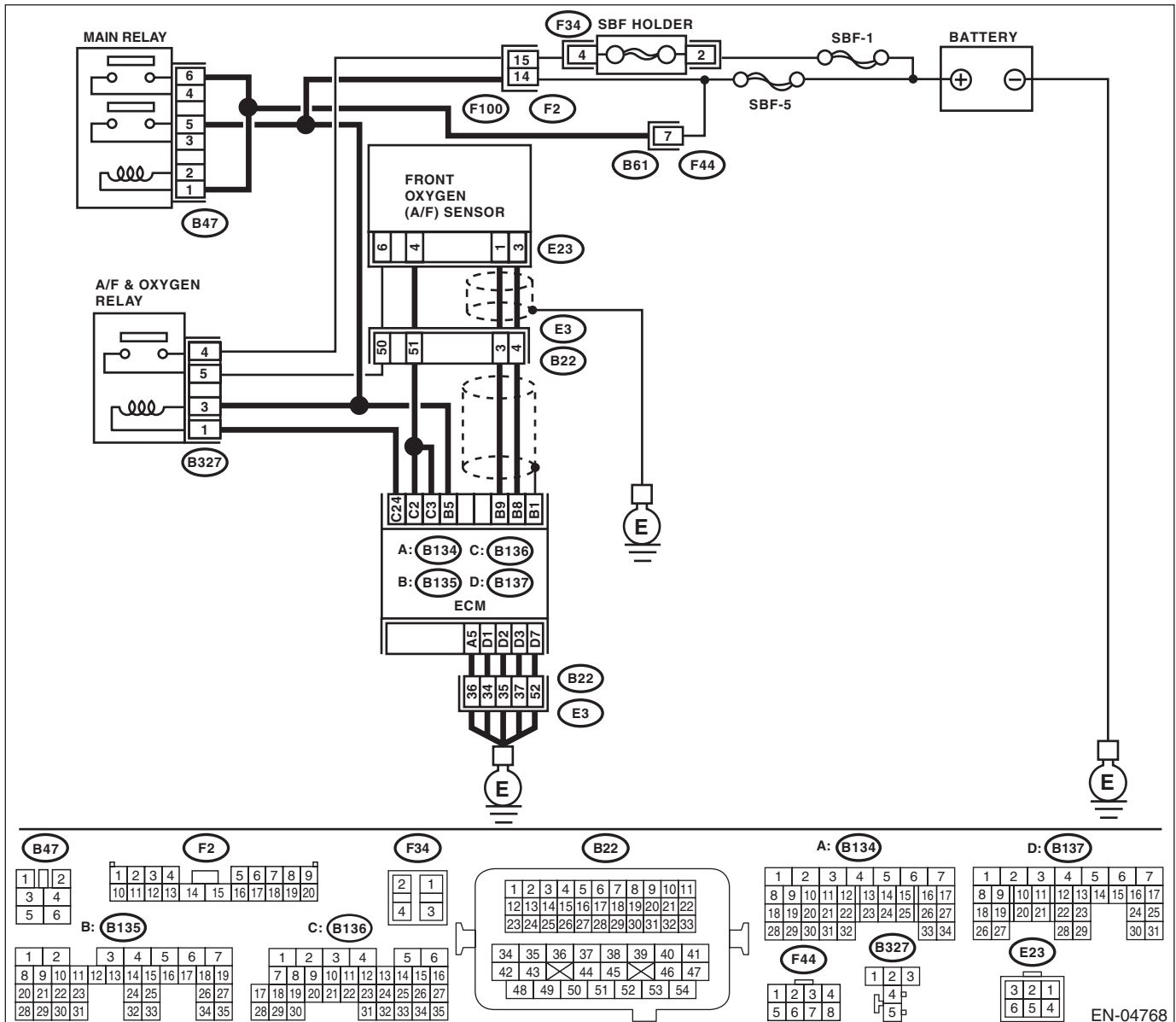
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-64, DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p>Connector & terminal (B135) No. 8 — (E23) No. 3: (B135) No. 9 — (E23) No. 1:</p>	Is the resistance less than 1 Ω?	Go to step 2.	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit of harness between ECM and front oxygen (A/F) sensor connector • Poor contact in coupling connector
2	<p>CHECK POOR CONTACT.</p> <p>Check poor contact of ECM and the front oxygen (A/F) sensor connector.</p>	Is there poor contact in ECM or the front oxygen (A/F) sensor connector?	Repair the poor contact in ECM or the front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-36, Front Oxygen (A/F) Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AF:DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

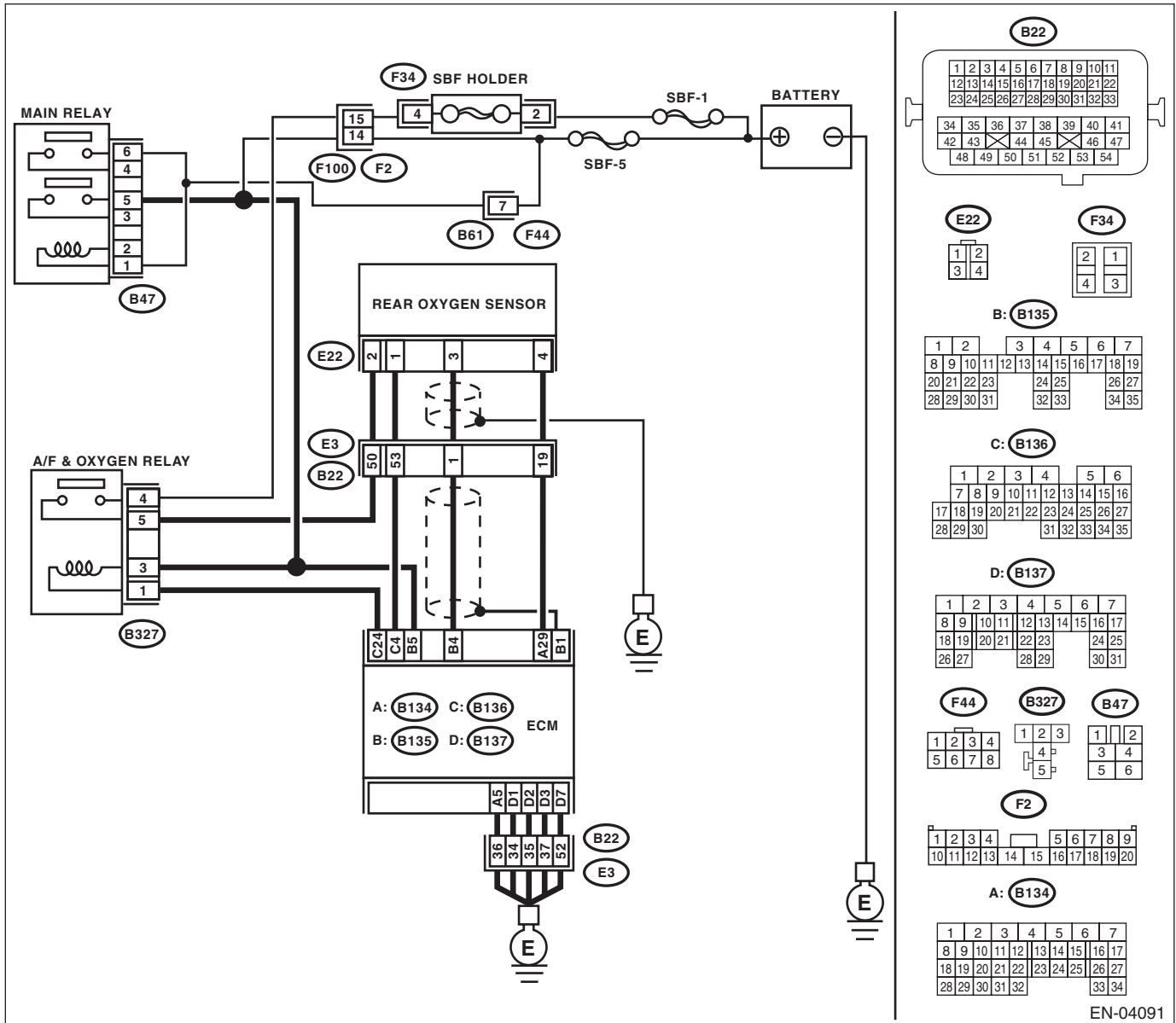
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-66, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0137.	Go to step 2.
2	CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (Max. 2 minutes) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: <ul style="list-style-type: none"> • For MT model, depress the clutch pedal. • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.> <ul style="list-style-type: none"> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is the voltage 490 mV or more?	Go to step 6.	Go to step 3.
3	CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.	Does water enter the connector?	Dry the water thoroughly.	Go to step 4.
4	CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. Connector & terminal (B135) No. 4 — (E22) No. 3: (B134) No. 29 — (E22) No. 4:	Is the resistance 3 Ω or more?	Repair the open circuit of harness between ECM and rear oxygen sensor connector.	Go to step 5.
5	CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. Connector & terminal (E22) No. 3 (+) — Engine ground (-):	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4SO)-38, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
6	CHECK EXHAUST SYSTEM. Check exhaust system parts. NOTE: Check the following items. <ul style="list-style-type: none">• Loose installation of portions• Damage (crack, hole etc.) of parts• Looseness and improper attachment of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H4SO)-38, Rear Oxygen Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AG:DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

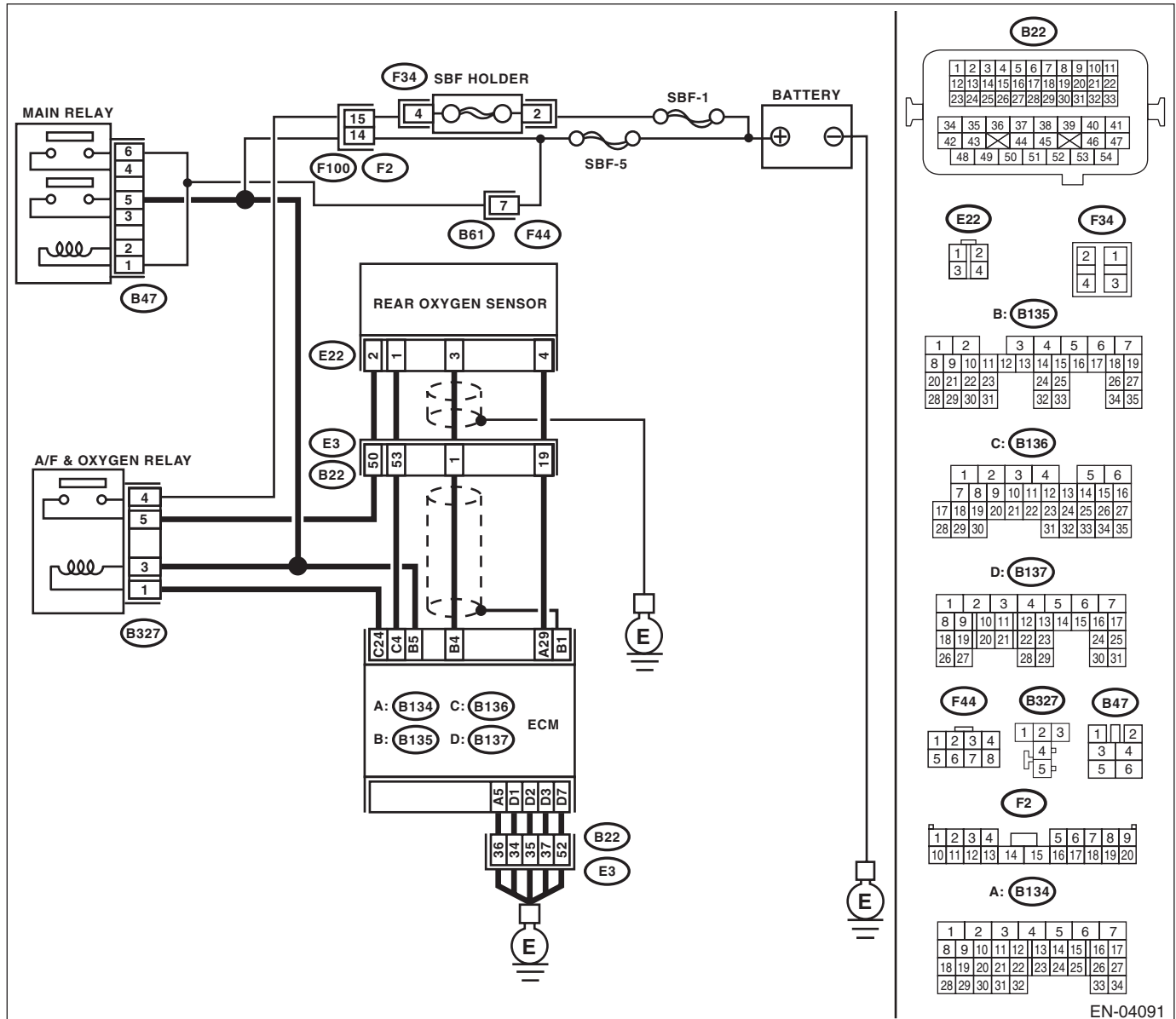
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-69, DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04091

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0138.	Go to step 2.
2 CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • For MT model, depress the clutch pedal. • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is the voltage 250 mV or less?	Go to step 6.	Go to step 3.
3 CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.	Does water enter the connector?	Dry the water thoroughly.	Go to step 4.
4 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. Connector & terminal (B135) No. 4 — (E22) No. 3: (B134) No. 29 — (E22) No. 4:	Is the resistance 3 Ω or more?	Repair the open circuit of harness between ECM and rear oxygen sensor connector.	Go to step 5.
5 CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. Connector & terminal (E22) No. 3 (+) — Engine ground (-):	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4SO)-38, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK EXHAUST SYSTEM. Check exhaust system parts. NOTE: Check the following items. <ul style="list-style-type: none">• Loose installation of portions• Damage (crack, hole etc.) of parts• Looseness and improper attachment of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H4SO)-38, Rear Oxygen Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AH:DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

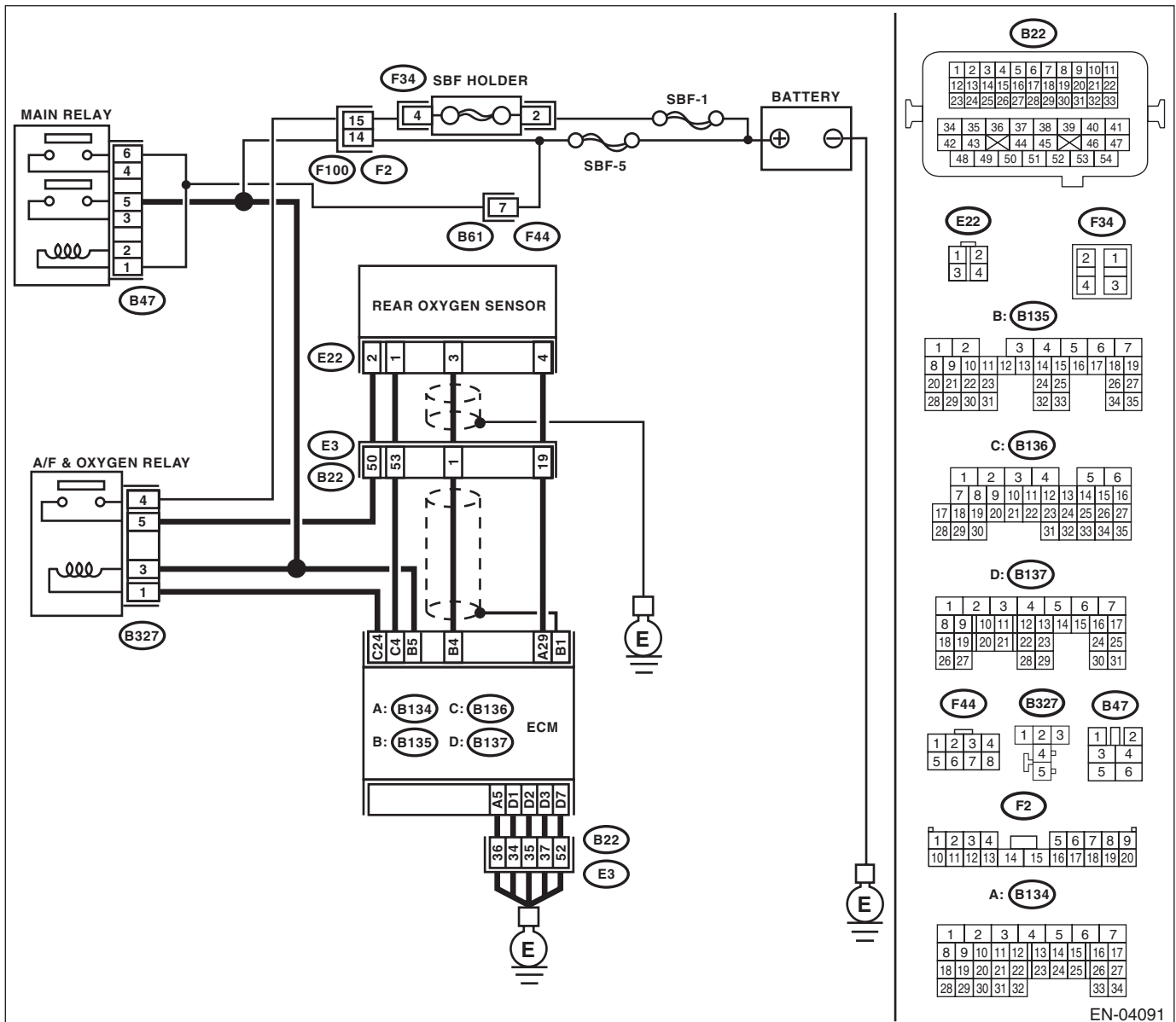
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-70, DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0139.	Go to step 2.
2	CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. Connector & terminal (B135) No. 4 — (E22) No. 3:	Is the resistance less than 1 Ω?	Go to step 3.	Repair the open circuit of harness between ECM and rear oxygen sensor connector.
3	CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. Measure the resistance between rear oxygen sensor harness connector and chassis ground. Connector & terminal (E22) No. 3 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 4.	Repair the chassis short circuit of harness.
4	CHECK REAR OXYGEN SENSOR. Measure the resistance between rear oxygen sensor terminals. Terminals No. 3 — No. 4:	Is the resistance less than 1 Ω?	Replace the rear oxygen sensor. <Ref. to FU(H4SO)-38, Rear Oxygen Sensor.>	Temporary poor contact occurs. Check the poor contact of connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AI: DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2)

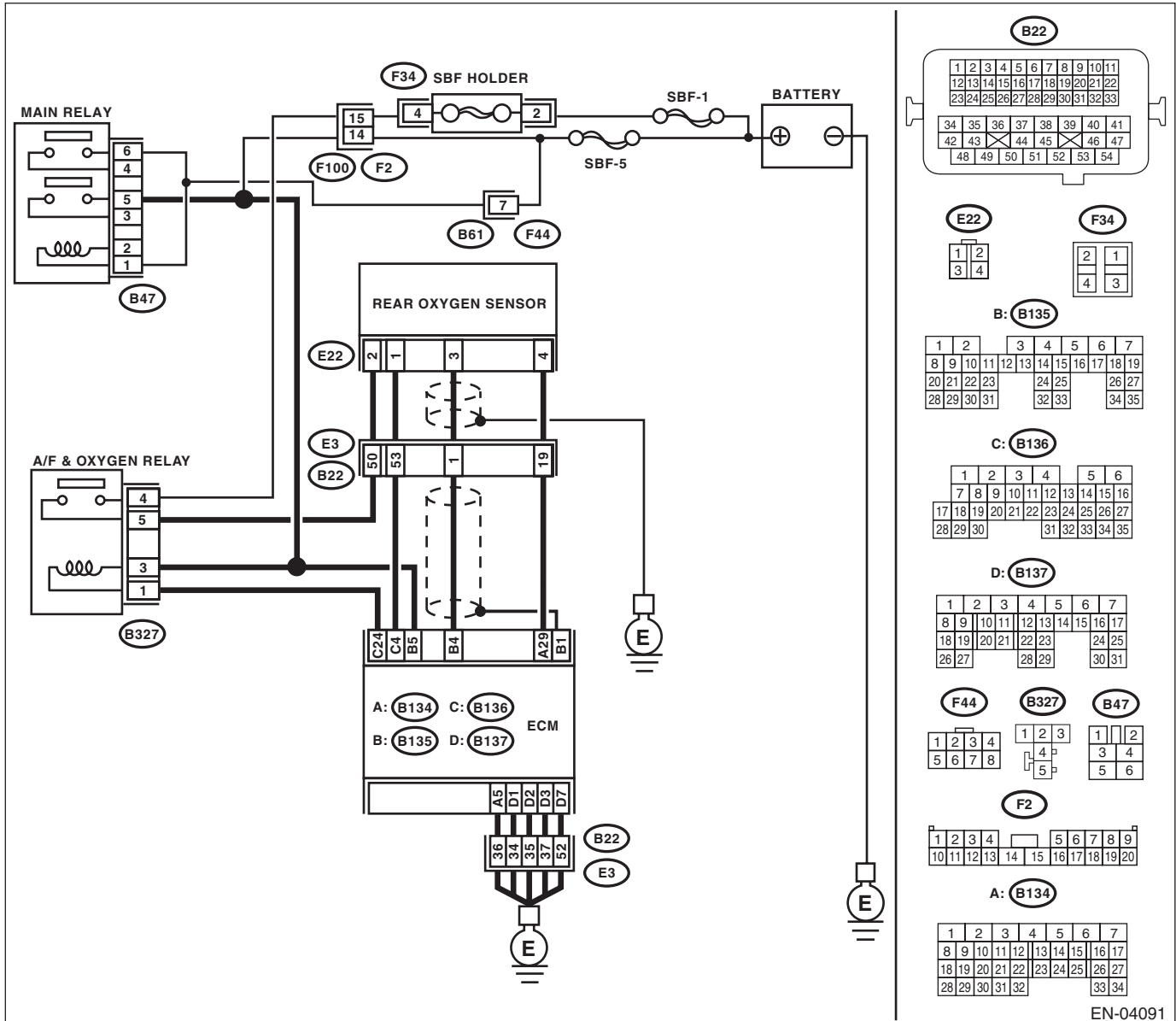
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-75, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0140.	Go to step 2.
2	CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (Max. 2 minutes) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • For MT model, depress the clutch pedal. • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is the voltage 490 mV or more?	Go to step 7.	Go to step 3.
3	CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • For MT model, depress the clutch pedal. • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is the voltage 250 mV or less?	Go to step 7.	Go to step 4.
4	CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.	Does water enter the connector?	Dry the water thoroughly.	Go to step 5.
5	CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. Connector & terminal (B135) No. 4 — (E22) No. 3: (B134) No. 29 — (E22) No. 4:	Is the resistance 3 Ω or more?	Repair the open circuit of harness between ECM and rear oxygen sensor connector.	Go to step 6.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>6</p> <p>CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from the rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and chassis ground.</p> <p>Connector & terminal (E22) No. 3 (+) — Chassis ground (-):</p>	<p>Is the voltage 0.2 — 0.5 V?</p>	<p>Replace the rear oxygen sensor. <Ref. to FU(H4SO)-38, Rear Oxygen Sensor.></p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector
<p>7</p> <p>CHECK EXHAUST SYSTEM.</p> <p>Check exhaust system parts.</p> <p>NOTE: Check the following items.</p> <ul style="list-style-type: none"> • Looseness and improper attachment of exhaust system parts • Damage (crack, hole etc.) of parts • Looseness and improper attachment of parts between front oxygen (A/F) sensor and rear oxygen sensor 	<p>Is there any fault in exhaust system?</p>	<p>Repair or replace faulty parts.</p>	<p>Replace the rear oxygen sensor. <Ref. to FU(H4SO)-38, Rear Oxygen Sensor.></p>

AJ:DTC P0171 SYSTEM TOO LEAN (BANK 1)

Refer to DTC P0172 for diagnostic procedure. <Ref. to EN(H4SO)(diag)-153, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AK:DTC P0172 SYSTEM TOO RICH (BANK 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-79, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK EXHAUST SYSTEM.	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step 2.
2 CHECK AIR INTAKE SYSTEM.	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step 3.
3 CHECK FUEL PRESSURE. WARNING: • Place “NO FIRE” signs near the working area. • Be careful not to spill fuel. Measure the fuel pressure. <Ref. to ME(H4SO)-29, INSPECTION, Fuel Pressure.> WARNING: Release fuel pressure before removing the fuel pressure gauge.	Is the measured value 339.5 — 360.5 kPa (3.5 — 3.7 kgf/cm ² , 49 — 52 psi)?	Go to step 4.	Repair the following item. Fuel pressure is too high: • Clogged fuel line or bent hose Fuel pressure is too low: • Improper fuel pump discharge • Clogged fuel line
4 CHECK ENGINE COOLANT TEMPERATURE SENSOR. 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the “General Scan Tool Instruction Manual”.	Is the engine coolant temperature above 60°C (140°F) ?	Go to step 5.	Replace the engine coolant temperature sensor. <Ref. to FU(H4SO)-22, Engine Coolant Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>5</p> <p>CHECK THE MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.</p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).</p> <p>2) Place the select lever in “N” or “P” position.</p> <p>3) Turn the A/C switch to OFF.</p> <p>4) Turn all the accessory switches to OFF.</p> <p>5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor.</p> <p>NOTE: For detailed operation procedure, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.></p>	<p>Is the measured value 2.1 — 3.4 g/s (0.28 — 0.45 lb/m)?</p>	<p>Go to step 6.</p>	<p>Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4SO)-28, Mass Air Flow and Intake Air Temperature Sensor.></p>
<p>6</p> <p>CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.</p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).</p> <p>2) Place the shift lever in neutral position.</p> <p>3) Turn the A/C switch to OFF.</p> <p>4) Turn all the accessory switches to OFF.</p> <p>5) Open the front hood.</p> <p>6) Measure the ambient temperature.</p> <p>7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedure, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the “General Scan Tool Instruction Manual”.</p>	<p>Subtract the ambient temperature from intake air temperature. Is the obtained value -10 — 50°C (-18 — 90°F)?</p>	<p>Replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).></p>	<p>Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4SO)-28, Mass Air Flow and Intake Air Temperature Sensor.></p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AL:DTC P0181 FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE

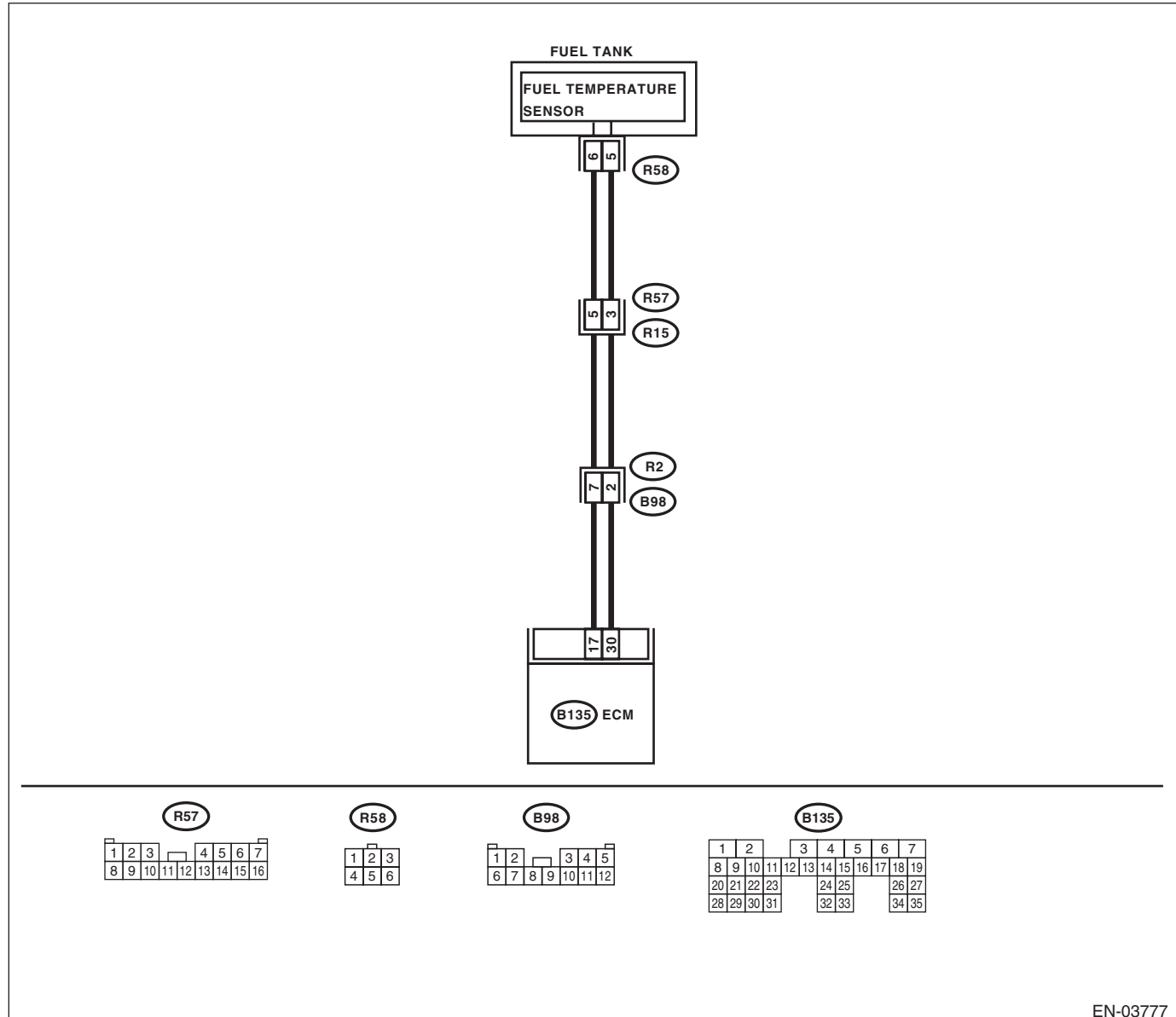
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-81, DTC P0181 FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0181.	Replace the fuel temperature sensor. <Ref. to EC(H4SO)-9, Fuel Temperature Sensor.>

AM:DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT

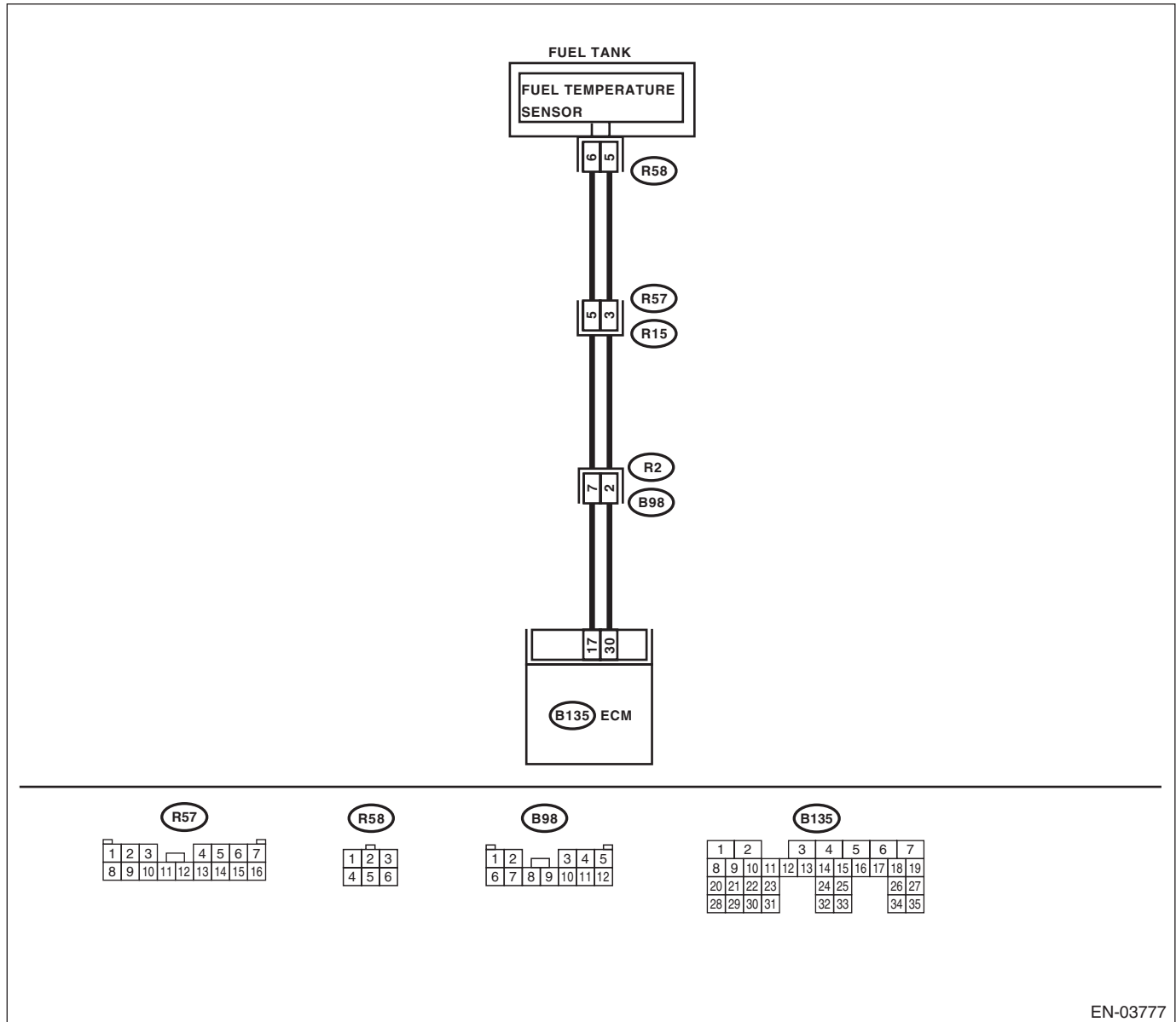
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-84, DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK CURRENT DATA.</p> <p>1) Start the engine.</p> <p>2) Read the data of fuel temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> Subaru Select Monitor <p>For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.></p> <ul style="list-style-type: none"> General scan tool <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	Is the fuel temperature above 150°C (302°F) ?	Go to step 2.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.
2	<p>CHECK CURRENT DATA.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Remove the access hole lid.</p> <p>3) Disconnect the connector from fuel pump.</p> <p>4) Turn the ignition switch to ON.</p> <p>5) Read the data of fuel temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> Subaru Select Monitor <p>For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.></p> <ul style="list-style-type: none"> General scan tool <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	Is the fuel temperature less than -40°C (-40°F) ?	Replace the fuel temperature sensor. <Ref. to EC(H4SO)-9, Fuel Temperature Sensor.>	Repair the ground short circuit of the harness between fuel pump and ECM connector.

AN:DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT

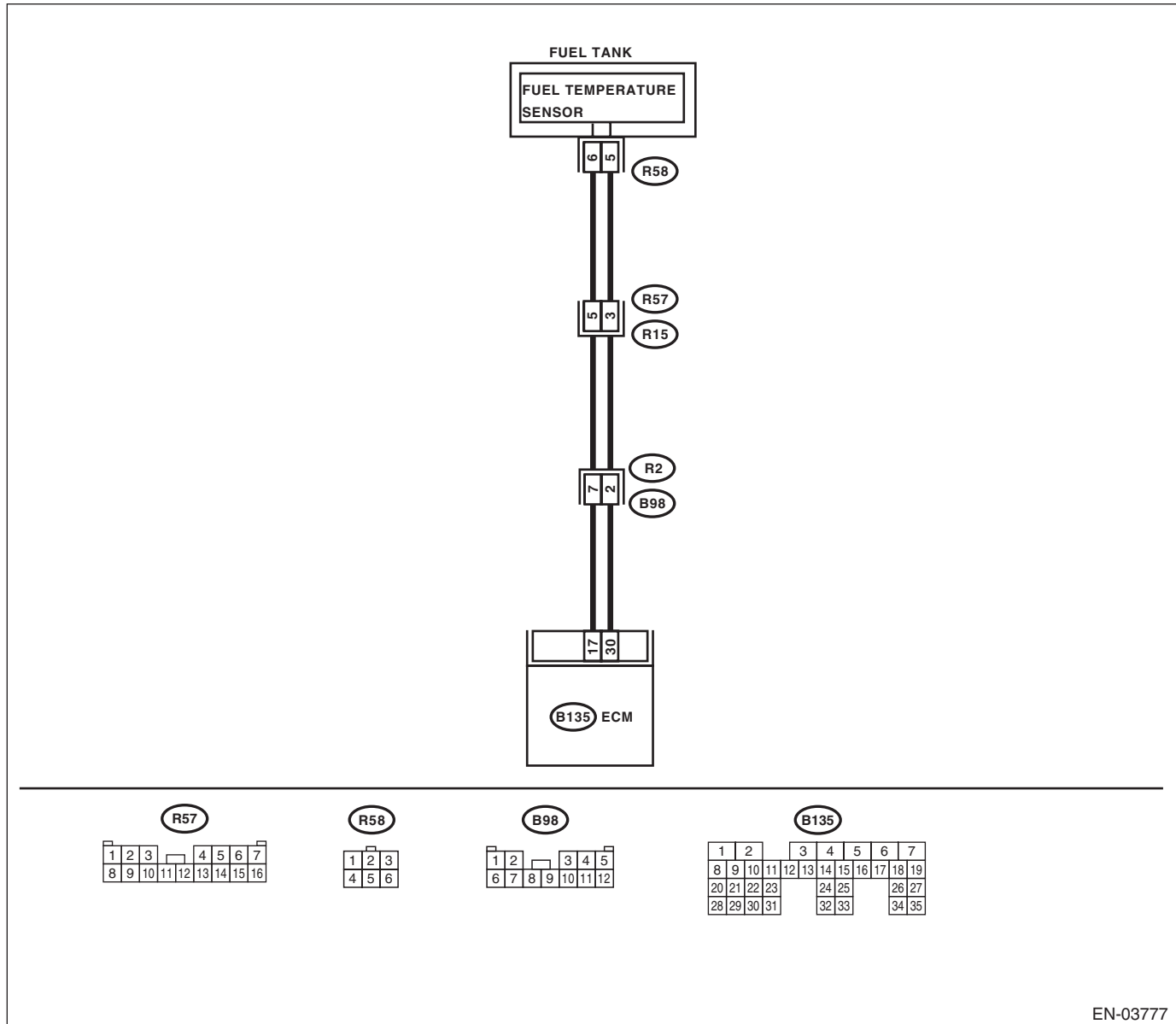
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-86, DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK CURRENT DATA.</p> <p>1) Start the engine.</p> <p>2) Read the data of fuel temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • General scan tool <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Is the fuel temperature less than -40°C (-40°F) ?</p>	<p>Go to step 2.</p>	<p>Repair the poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following item:</p> <ul style="list-style-type: none"> • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
<p>2</p> <p>CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Remove the access hole lid.</p> <p>3) Disconnect the connector from fuel pump.</p> <p>4) Measure the voltage between fuel pump connector and chassis ground.</p> <p>Connector & terminal (R58) No. 6 (+) — Chassis ground (-):</p>	<p>Is the voltage 10 V or more?</p>	<p>Repair the battery short circuit of harness between ECM and fuel pump connector.</p>	<p>Go to step 3.</p>
<p>3</p> <p>CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between fuel pump connector and chassis ground.</p> <p>Connector & terminal (R58) No. 6 (+) — Chassis ground (-):</p>	<p>Is the voltage 10 V or more?</p>	<p>Repair the battery short circuit of harness between ECM and fuel pump connector.</p>	<p>Go to step 4.</p>
<p>4</p> <p>CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>Measure the voltage between fuel pump connector and chassis ground.</p> <p>Connector & terminal (R58) No. 6 (+) — Chassis ground (-):</p>	<p>Is the voltage 4 V or more?</p>	<p>Go to step 5.</p>	<p>Repair the harness and connector.</p> <p>NOTE:</p> <p>In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and fuel pump connector • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>5</p> <p>CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between fuel pump connector and ECM.</p> <p>Connector & terminal (R58) No. 5 — (B135) No. 30:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Replace the fuel temperature sensor. <Ref. to EC(H4SO)-9, Fuel Temperature Sensor.></p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and fuel pump connector • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AO:DTC P0196 ENGINE OIL TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-88, DTC P0196 ENGINE OIL TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

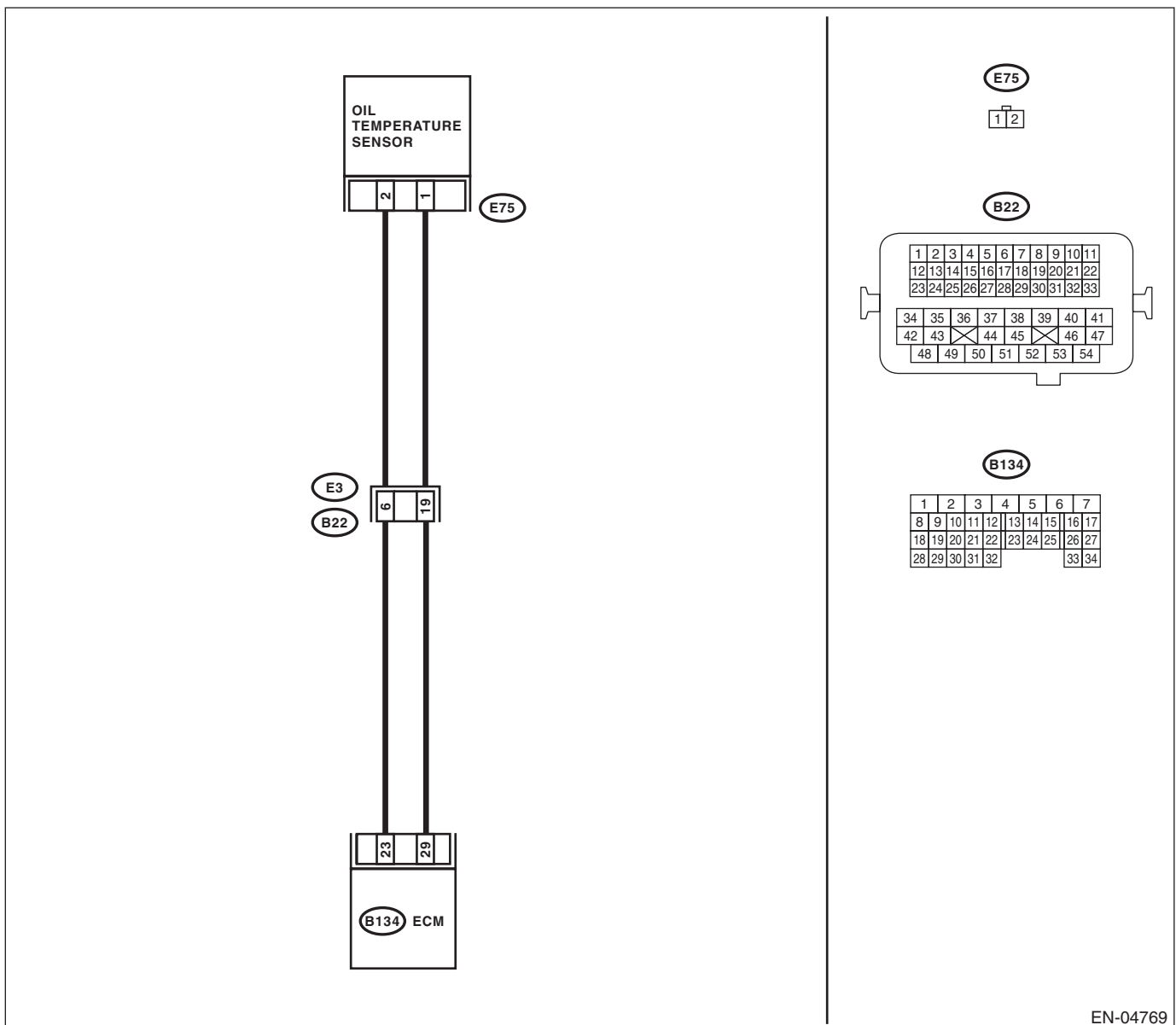
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04769

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0196.	Replace the engine oil temperature sensor. <Ref. to FU(H4SO)-35, Oil Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AP:DTC P0197 ENGINE OIL TEMPERATURE SENSOR LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-90, DTC P0197 ENGINE OIL TEMPERATURE SENSOR LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

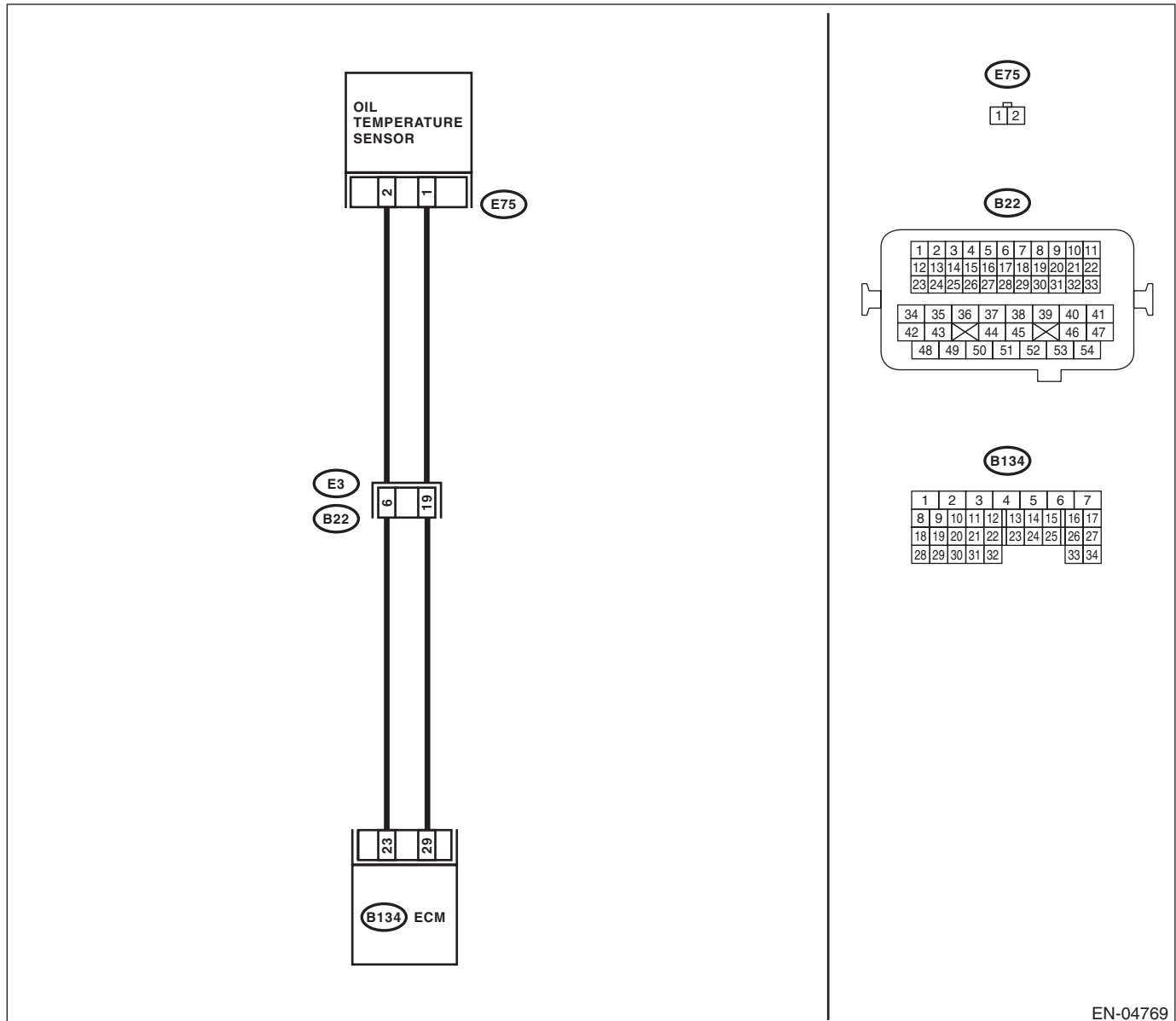
TRUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04769

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK HARNESS BETWEEN ENGINE OIL TEMPERATURE SENSOR AND ECM CONNECTOR. 1) Disconnect the connector from ECM and engine oil temperature sensor. 2) Measure the resistance of harness between engine oil temperature sensor connector and engine ground. Connector & terminal (B134) No. 23 — Engine ground: (B134) No. 29 — Engine ground:	Is the resistance 1 MΩ or more?	Go to step 2.	Repair the ground short circuit between ECM and engine oil temperature sensor connector.
2	CHECK POOR CONTACT. Check poor contact of engine oil temperature sensor connector.	Is there poor contact in engine oil temperature sensor connector?	Repair the poor contact.	Replace the engine oil temperature sensor. <Ref. to FU(H4SO)-35, Oil Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AQ:DTC P0198 ENGINE OIL TEMPERATURE SENSOR HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-91, DTC P0198 ENGINE OIL TEMPERATURE SENSOR HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

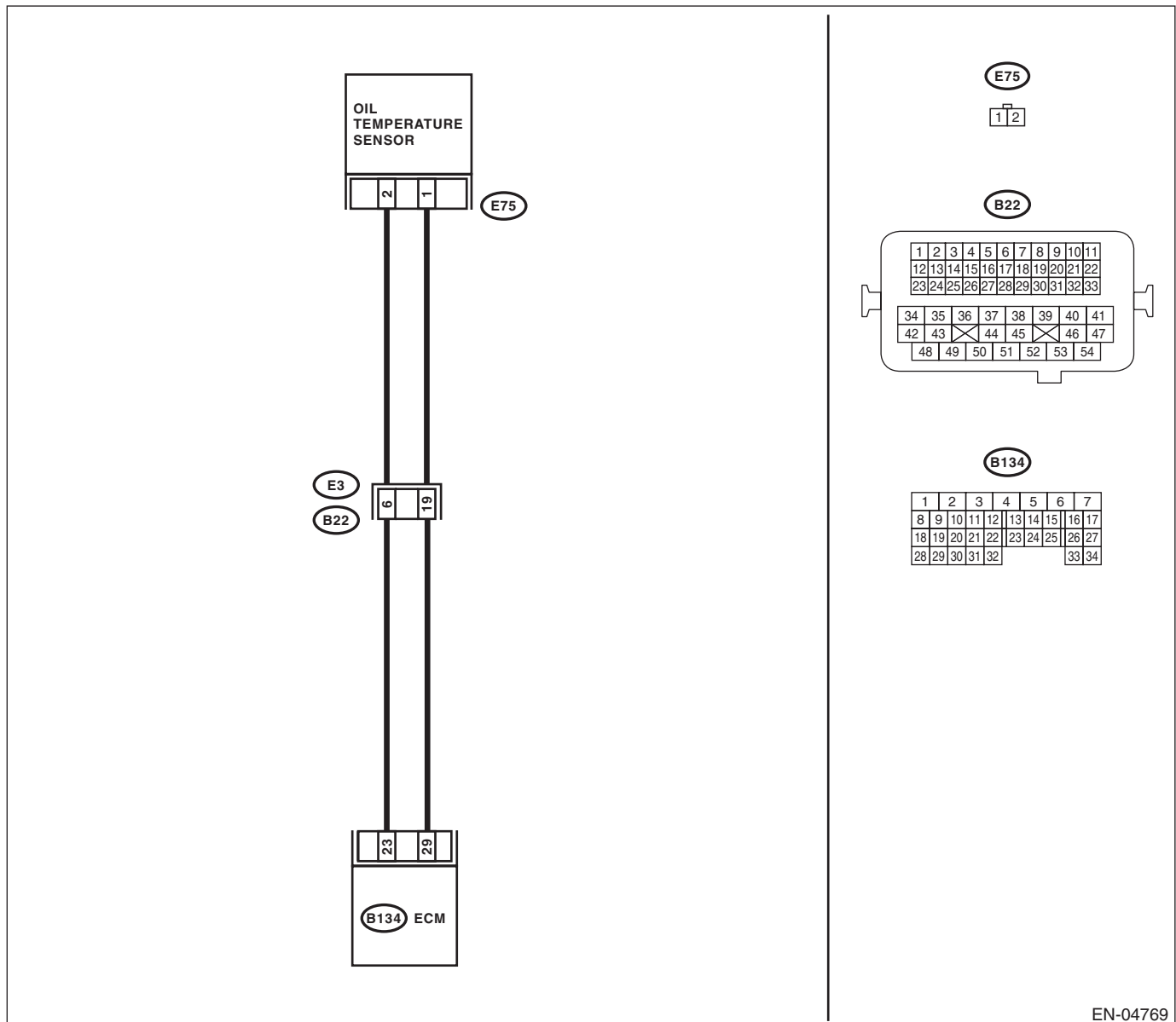
TROUBLE SYMPTOM:

- Hard to start
- Erroneous idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04769

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK HARNESS BETWEEN ENGINE OIL TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from the oil temperature sensor. 3) Measure the voltage between the engine oil temperature sensor connector and engine ground.</p> <p>Connector & terminal (E75) No. 2 (+) — Engine ground (-):</p>	Is the voltage 10 V or more?	Repair battery short circuit of harness between ECM and engine oil temperature connector.	Go to step 2.
<p>2</p> <p>CHECK HARNESS BETWEEN ENGINE OIL TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to ON. 2) Measure the voltage between the engine oil temperature sensor connector and engine ground.</p> <p>Connector & terminal (E75) No. 2 (+) — Engine ground (-):</p>	Is the voltage 10 V or more?	Repair battery short circuit of harness between ECM and engine oil temperature connector.	Go to step 3.
<p>3</p> <p>CHECK HARNESS BETWEEN ENGINE OIL TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>Measure the voltage between the engine oil temperature sensor connector and engine ground.</p> <p>Connector & terminal (E75) No. 2 (+) — Engine ground (-):</p>	Is the voltage 4 V or more?	Go to step 4.	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and engine oil temperature connector • Poor contact in engine oil temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector
<p>4</p> <p>CHECK HARNESS BETWEEN ENGINE OIL TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between engine oil temperature sensor connector and engine ground.</p> <p>Connector & terminal (E75) No. 1 — Engine ground:</p>	Is the resistance less than 5 Ω?	Replace the engine oil temperature sensor. <Ref. to FU(H4SO)-35, Oil Temperature Sensor.>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and engine oil temperature connector • Poor contact in engine oil temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AR:DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-92, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

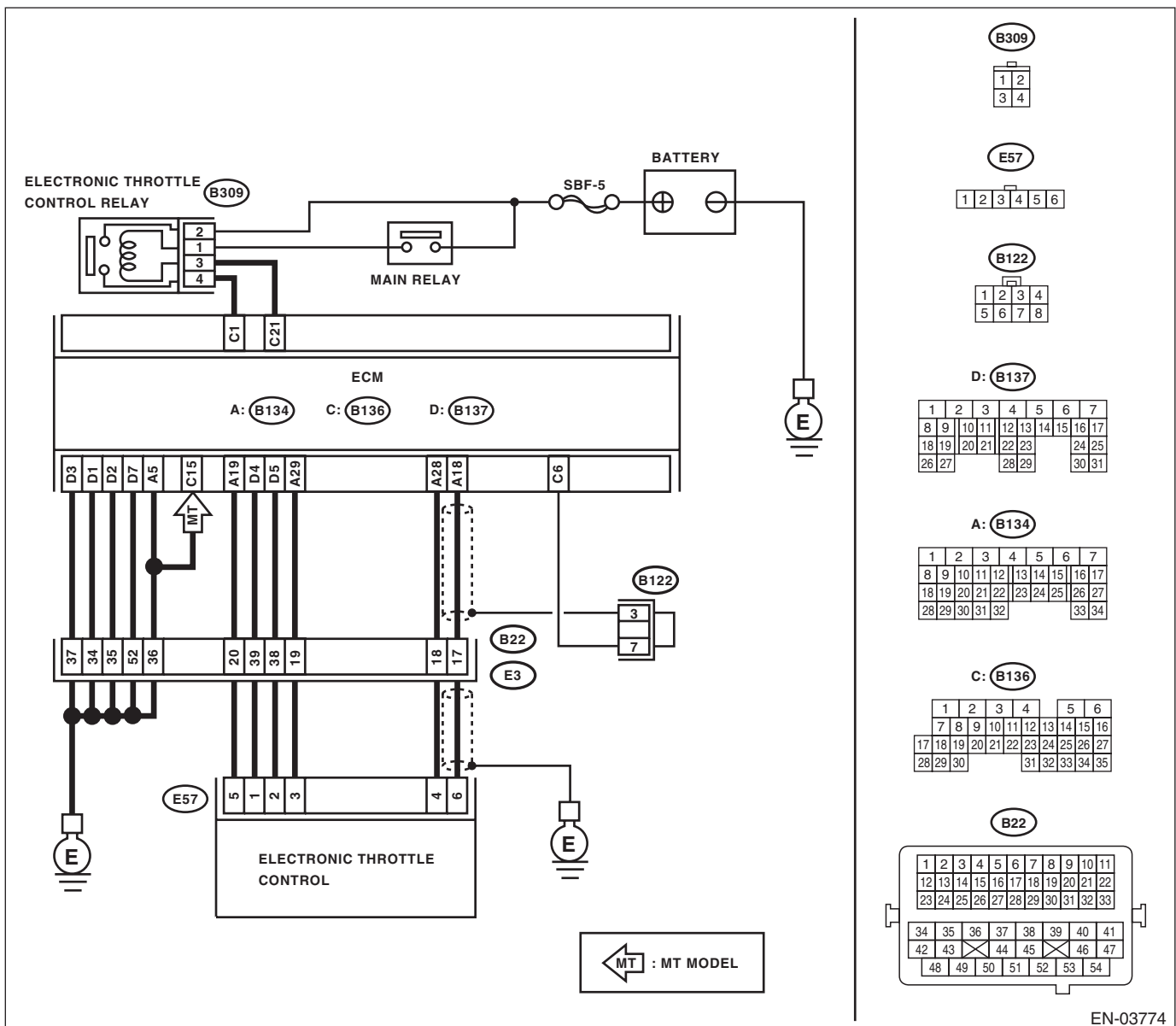
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03774

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK SENSOR OUTPUT. 1) Turn the ignition switch to ON. 2) Read the data of sub throttle sensor signal using Subaru Select Monitor.	Is the voltage 0.8 V or more?	Go to step 2.	Go to step 3.
2	CHECK POOR CONTACT. Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. <i>Connector & terminal</i> <i>(B134) No. 28 — (E57) No. 4:</i>	Is the resistance less than 1 Ω?	Go to step 4.	Repair the open circuit of harness connector.
4	CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. Measure the resistance between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 28 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 5.	Repair the chassis short circuit of harness.
5	CHECK SENSOR POWER SUPPLY. 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. <i>Connector & terminal</i> <i>(E57) No. 5 (+) — Engine ground (-):</i>	Is the voltage 4.5 — 5.5 V?	Go to step 6.	Repair poor contact in ECM connector.
6	CHECK SHORT CIRCUIT INSIDE THE ECM. 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. <i>Connector & terminal</i> <i>(E57) No. 4 — Engine ground:</i>	Is the resistance 10 Ω or more?	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective.	Repair poor contact in ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AS:DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-93, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

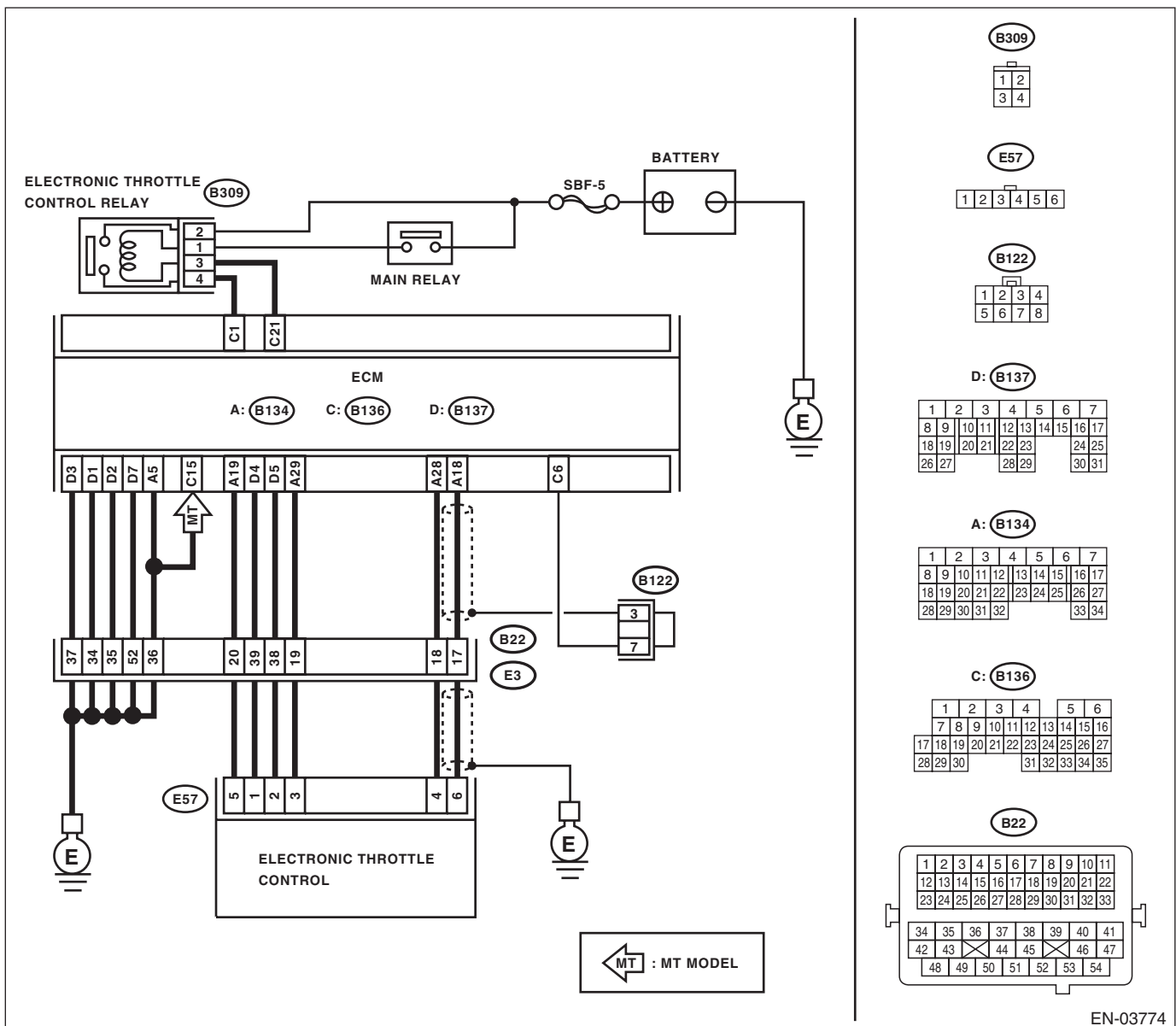
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03774

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SENSOR OUTPUT. 1) Turn the ignition switch to ON. 2) Read the data of sub throttle sensor signal using Subaru Select Monitor.	Is the voltage less than 4.73 V?	Go to step 2.	Go to step 3.
2 CHECK POOR CONTACT. Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact in connector between ECM and electronic throttle control?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. <i>Connector & terminal</i> <i>(B134) No. 28 — (E57) No. 4:</i>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit of harness connector.
4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM connector. 2) Measure the resistance between electronic throttle control connector and engine ground. <i>Connector & terminal</i> <i>(E57) No. 3 — Engine ground:</i>	Is the resistance less than 5 Ω ?	Go to step 5.	Repair poor contact in ECM connector.
5 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. <i>Connector & terminal</i> <i>(E57) No. 5 (+) — Engine ground (-):</i>	Is the voltage 10 V or more?	Go to step 6.	Repair the battery short circuit of harness between ECM connector and electronic throttle control connector.
6 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. Measure the voltage between electronic throttle control connector and engine ground. <i>Connector & terminal</i> <i>(E57) No. 4 (+) — Engine ground (-):</i>	Is the voltage less than 10 V?	Go to step 7.	Repair the battery short circuit of harness between ECM connector and electronic throttle control connector.
7 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between connector terminals. <i>Connector & terminal</i> <i>(B134) No. 28 — (B134) No. 19:</i>	Is the resistance 1 M Ω or more?	Repair the poor contact. Replace the electronic throttle control.	Sensor power supply circuit may be shorted.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AT:DTC P0301 CYLINDER 1 MISFIRE DETECTED

NOTE:

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4SO)(diag)-173, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AU:DTC P0302 CYLINDER 2 MISFIRE DETECTED

NOTE:

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4SO)(diag)-173, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AV:DTC P0303 CYLINDER 3 MISFIRE DETECTED

NOTE:

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4SO)(diag)-173, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AW:DTC P0304 CYLINDER 4 MISFIRE DETECTED

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- Immediately at fault recognition (A misfire which could damage catalyst occurs.)
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-99, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

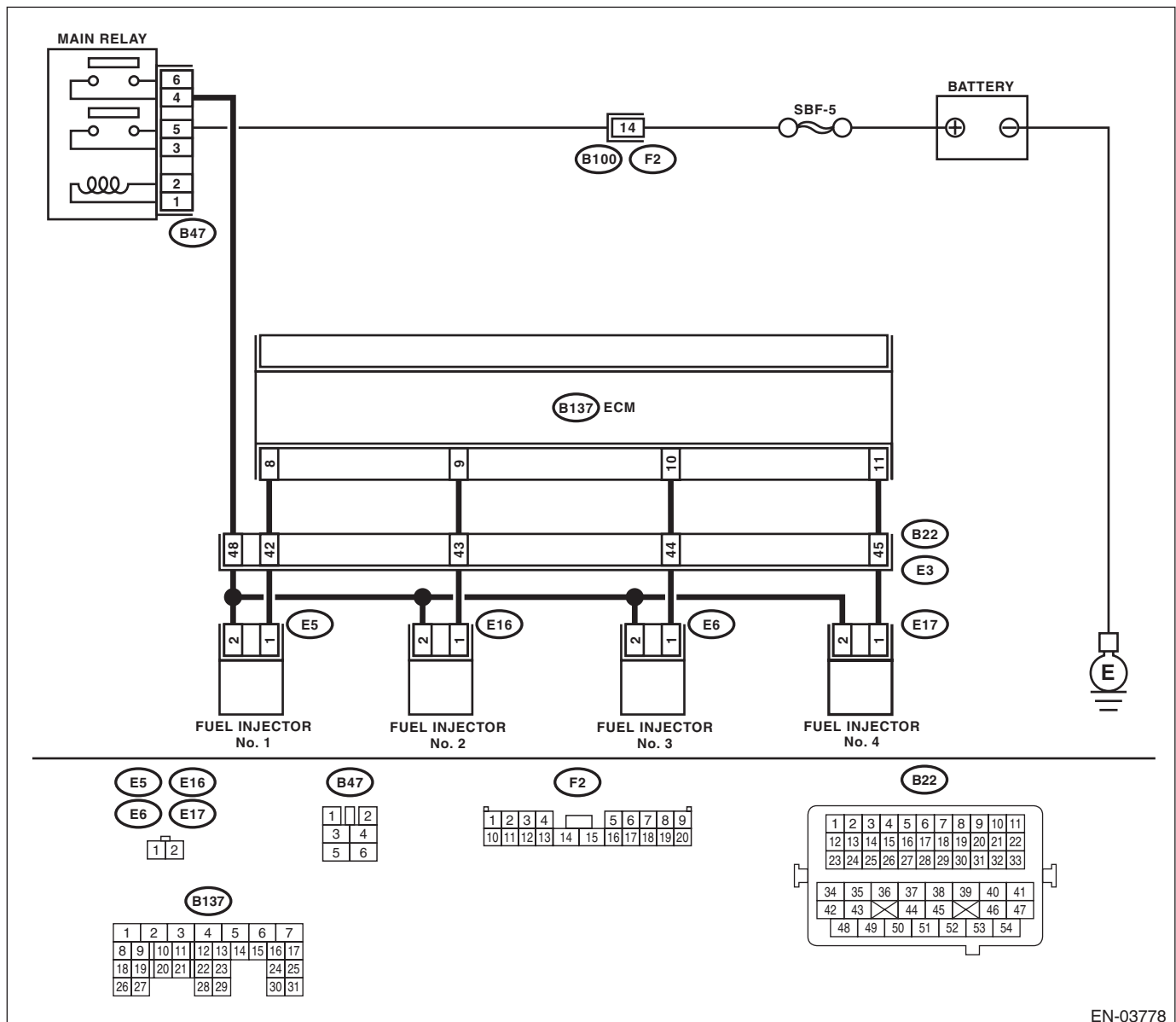
TROUBLE SYMPTOM:

- Engine stalls.
- Erroneous idling
- Rough driving

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03778

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0301, P0302, P0303 and P0304.	Go to step 2.
2 CHECK OUTPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground on faulty cylinders. Connector & terminal <i>#1 (B137) No. 8 (+) — Chassis ground (-):</i> <i>#2 (B137) No. 9 (+) — Chassis ground (-):</i> <i>#3 (B137) No. 10 (+) — Chassis ground (-):</i> <i>#4 (B137) No. 11 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Go to step 7.	Go to step 3.
3 CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Measure the resistance between ECM connector and engine ground on faulty cylinders. Connector & terminal <i>#1 (E5) No. 1 — Engine ground:</i> <i>#2 (E16) No. 1 — Engine ground:</i> <i>#3 (E6) No. 1 — Engine ground:</i> <i>#4 (E17) No. 1 — Engine ground:</i>	Is the resistance 1 MΩ or more?	Go to step 4.	Repair the ground short circuit of harness between fuel injector and ECM connector.
4 CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR. Measure the resistance of harness connector between ECM connector and fuel injector on faulty cylinders. Connector & terminal <i>#1 (B137) No. 8 — (E5) No. 1:</i> <i>#2 (B137) No. 9 — (E16) No. 1:</i> <i>#3 (B137) No. 10 — (E6) No. 1:</i> <i>#4 (B137) No. 11 — (E17) No. 1:</i>	Is the resistance less than 1 Ω?	Go to step 5.	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
5 CHECK FUEL INJECTOR. Measure the resistance between fuel injector terminals on faulty cylinder. Terminals <i>No. 1 — No. 2:</i>	Is the resistance between 5 and 20 Ω?	Go to step 6.	Replace the faulty fuel injector. <Ref. to FU(H4SO)-30, Fuel Injector.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>6</p> <p>CHECK POWER SUPPLY LINE. 1) Turn the ignition switch to ON. 2) Measure the voltage between fuel injector and engine ground on faulty cylinders.</p> <p>Connector & terminal #1 (E5) No. 2 (+) — Engine ground (-): #2 (E16) No. 2 (+) — Engine ground (-): #3 (E6) No. 2 (+) — Engine ground (-): #4 (E17) No. 2 (+) — Engine ground (-):</p>	Is the voltage 10 V or more?	Repair the poor contact of all connectors in fuel injector circuit.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between main relay and fuel injector connector on faulty cylinders • Poor contact in coupling connector • Poor contact in main relay connector • Poor contact in fuel injector connector on faulty cylinders
<p>7</p> <p>CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground on faulty cylinders.</p> <p>Connector & terminal #1 (B137) No. 8 (+) — Chassis ground (-): #2 (B137) No. 9 (+) — Chassis ground (-): #3 (B137) No. 10 (+) — Chassis ground (-): #4 (B137) No. 11 (+) — Chassis ground (-):</p>	Is the voltage 10 V or more?	Repair the battery short circuit of harness between ECM and fuel injector. After repair, replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>	Go to step 8.
<p>8</p> <p>CHECK FUEL INJECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between fuel injector terminals on faulty cylinder.</p> <p>Terminals No. 1 — No. 2:</p>	Is the resistance less than 1 Ω?	Replace the faulty fuel injector <Ref. to FU(H4SO)-30, Fuel Injector.> and ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>	Go to step 9.
<p>9</p> <p>CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.</p>	Is the camshaft position sensor or crankshaft position sensor loosely installed?	Tighten the camshaft position sensor or crankshaft position sensor.	Go to step 10.
<p>10</p> <p>CHECK CRANK SPROCKET. Remove the timing belt cover.</p>	Is the crank sprocket rusted or does it have broken teeth?	Replace the crank sprocket. <Ref. to ME(H4SO)-50, Crank Sprocket.>	Go to step 11.
<p>11</p> <p>CHECK INSTALLATION CONDITION OF TIMING BELT. Turn the crankshaft using ST, and align the alignment mark on crank sprocket with alignment mark on cylinder block. ST 499987500 CRANKSHAFT SOCKET</p>	Is the timing belt dislocated from its proper position?	Repair the installation condition of timing belt. <Ref. to ME(H4SO)-44, Timing Belt.>	Go to step 12.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
12 CHECK FUEL LEVEL.	Is the fuel meter indication higher than the "Lower" level?	Go to step 13 .	Replenish the fuel so that fuel meter indication is higher than the "Lower" level. After filling fuel, Go to step 13 .
13 CHECK STATUS OF MALFUNCTION INDICATOR LIGHT. 1) Clear the memory using Subaru Select Monitor. <Ref. to EN(H4SO)(diag)-44, Clear Memory Mode.> 2) Start the engine, and drive the vehicle more than 10 minutes.	Does the malfunction indicator light illuminate or blink?	Go to step 15 .	Go to step 14 .
14 CHECK CAUSE OF MISFIRE.	Was the cause of misfire identified when the engine is running? Ex. Disconnection of spark plug cord.	Finish diagnostics operation, if the engine has no abnormality.	Repair the poor contact of the connector. NOTE: In this case, repair the following items. • Poor contact of the ignition coil connector • Poor contact of the fuel injector connector of the faulty cylinder • Poor contact of ECM connector • Poor contact of the coupling connector
15 CHECK AIR INTAKE SYSTEM.	Is there any fault in air intake system?	Repair the air intake system. NOTE: Check the following items. • Are there air leaks or air suction caused by loose or dislocated nuts and bolts? • Are there cracks or any disconnection of hoses?	Go to step 16 .
16 CHECK MISFIRE SYMPTOM. 1) Turn the ignition switch to ON. 2) Read the DTC. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Does the Subaru Select Monitor or general scan tool display only one DTC?	Go to step 21 .	Go to step 17 .
17 CHECK DTC ON DISPLAY.	Are DTC P0301 and P0302 displayed?	Go to step 22 .	Go to step 18 .

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No	
18	CHECK DTC ON DISPLAY.	Are DTC P0303 and P0304 displayed?	Go to step 23 .	Go to step 19 .
19	CHECK DTC ON DISPLAY.	Are DTC P0301 and P0303 displayed?	Go to step 24 .	Go to step 20 .
20	CHECK DTC ON DISPLAY.	Are DTC P0302 and P0304 displayed?	Go to step 25 .	Go to step 26 .
21	ONLY ONE CYLINDER.	Is there any fault in the cylinder?	Repair or replace faulty parts. NOTE: Check the following items. <ul style="list-style-type: none"> • Spark plug • Spark plug cord • Fuel injector • Compression ratio 	Go to DTC P0171. <Ref. to EN(H4SO)(diag)-152, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
22	GROUP OF #1 AND #2 CYLINDERS.	Are there any faults in #1 and #2 cylinders?	Repair or replace faulty parts. NOTE: <ul style="list-style-type: none"> • Check the following items. <ul style="list-style-type: none"> • Spark plug • Fuel injector • Ignition coil • Compression ratio • If any fault are not found, check the "IGNITION CONTROL SYSTEM" of #1 and #2 cylinders side. <Ref. to EN(H4SO)(diag)-59, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.> 	Go to DTC P0171. <Ref. to EN(H4SO)(diag)-152, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
23	GROUP OF #3 AND #4 CYLINDERS.	Are there any faults in #3 and #4 cylinders?	Repair or replace faulty parts. NOTE: <ul style="list-style-type: none"> • Check the following items. <ul style="list-style-type: none"> • Spark plug • Fuel injector • Ignition coil • If any fault are not found, check the "IGNITION CONTROL SYSTEM" of #3 and #4 cylinders side. <Ref. to EN(H4SO)(diag)-59, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.> 	Go to DTC P0171. <Ref. to EN(H4SO)(diag)-152, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
24 GROUP OF #1 AND #3 CYLINDERS.	Are there any faults in #1 and #3 cylinders?	Repair or replace faulty parts. NOTE: Check the following items. <ul style="list-style-type: none"> • Spark plug • Fuel injector • Skipping timing belt teeth 	Go to DTC P0171. <Ref. to EN(H4SO)(diag)-152, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
25 GROUP OF #2 AND #4 CYLINDERS.	Are there any faults in #2 and #4 cylinders?	Repair or replace faulty parts. NOTE: Check the following items. <ul style="list-style-type: none"> • Spark plug • Fuel injector • Compression ratio • Skipping timing belt teeth 	Go to DTC P0171. <Ref. to EN(H4SO)(diag)-152, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
26 CYLINDER AT RANDOM.	Is the engine idle rough?	Go to DTC P0171. <Ref. to EN(H4SO)(diag)-152, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Repair or replace faulty parts. NOTE: Check the following items. <ul style="list-style-type: none"> • Spark plug • Fuel injector • Compression ratio

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AX:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-100, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

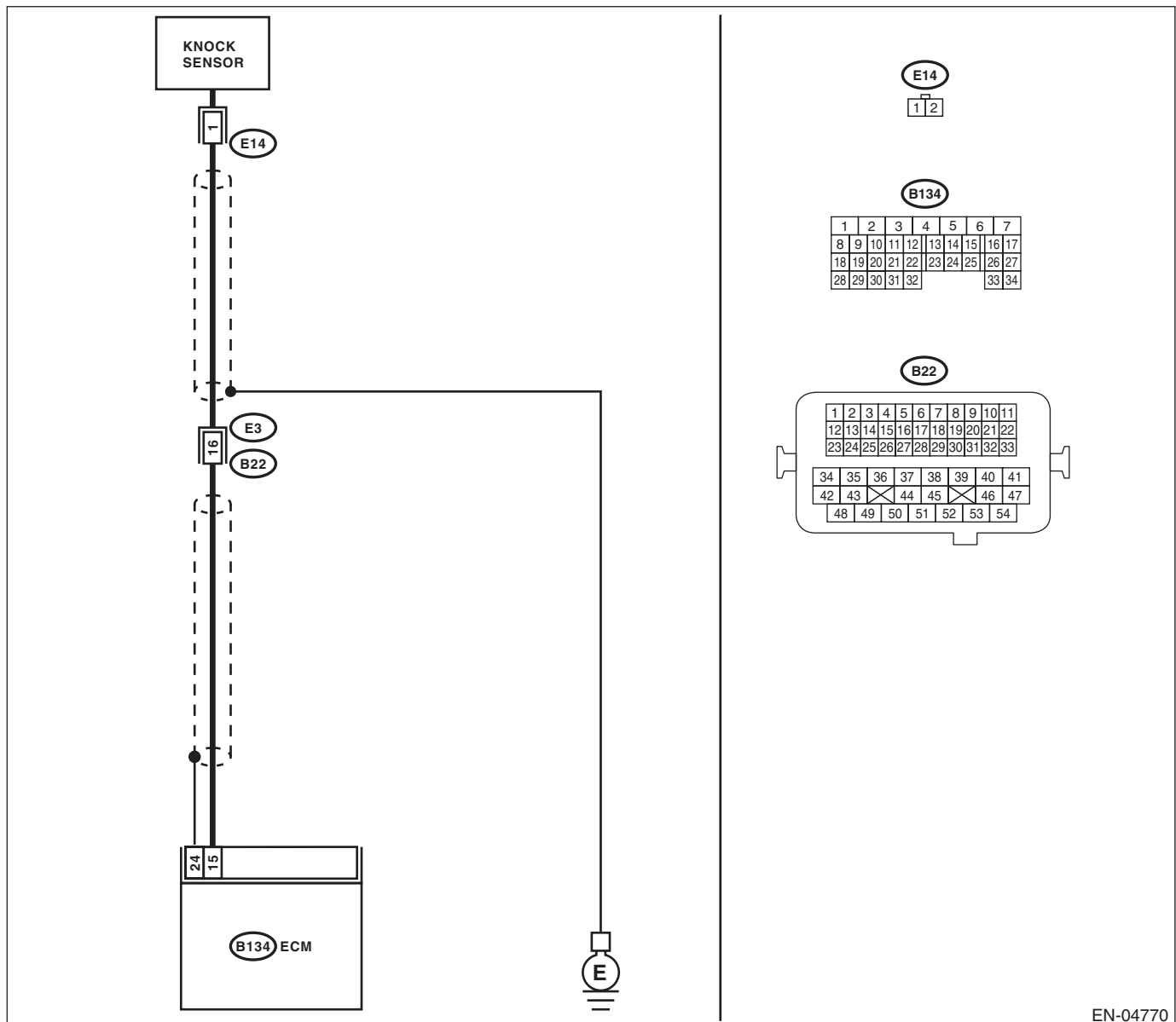
TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04770

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM harness connector and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 15 — Chassis ground:</i>	Is the resistance 700 kΩ or more?	Go to step 2.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between knock sensor and ECM connector • Poor contact in knock sensor connector • Poor contact in coupling connector
2 CHECK KNOCK SENSOR. 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground. <i>Terminals</i> <i>No. 1 — Engine ground:</i>	Is the resistance 700 kΩ or more?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following item: • Poor contact in knock sensor connector
3 CHECK INSTALLATION CONDITION OF KNOCK SENSOR.	Is the knock sensor installation bolt tightened securely?	Replace the knock sensor. <Ref. to FU(H4SO)-25, Knock Sensor.>	Tighten the knock sensor installation bolt securely.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AY:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-102, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

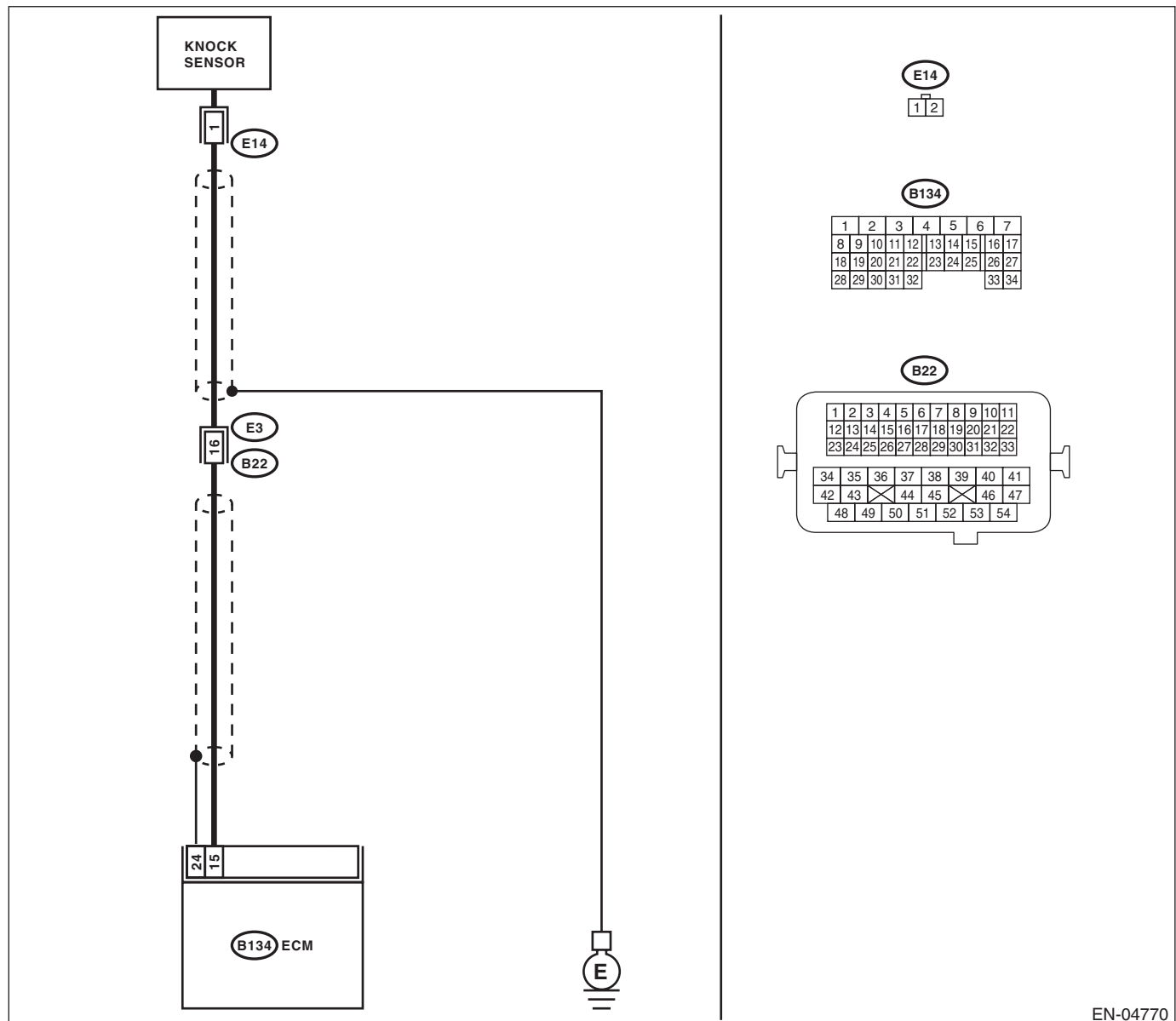
TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04770

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR. Measure the resistance of harness between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 15 — Chassis ground:</i>	Is the resistance less than 400 kΩ?	Go to step 2.	Go to step 3.
2 CHECK KNOCK SENSOR. 1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground. <i>Terminals</i> <i>No. 1 — Engine ground:</i>	Is the resistance less than 400 kΩ?	Replace the knock sensor. <Ref. to FU(H4SO)-25, Knock Sensor.>	Repair the ground short circuit of harness between knock sensor connector and ECM connector. NOTE: The harness between both connectors are shielded. Remove the shield and repair the short circuit of harness.
3 CHECK INPUT SIGNAL OF ECM. 1) Connect the connectors to ECM and knock sensor. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 15 (+) — Chassis ground (-):</i>	Is the voltage 2 V or more?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Poor contact in knock sensor connector • Poor contact in ECM connector • Poor contact in coupling connector 	Repair poor contact in ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AZ:DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-104, DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

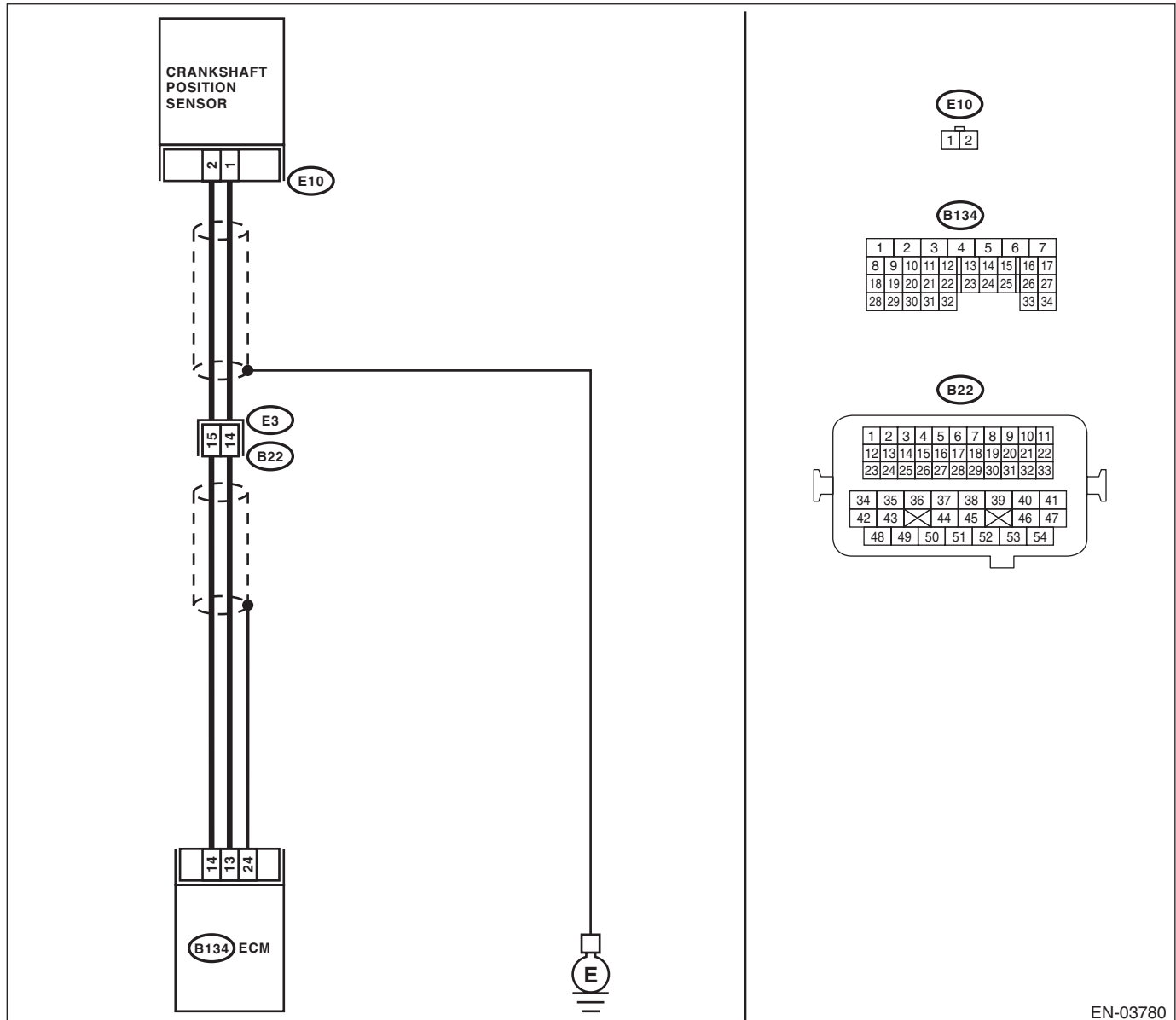
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03780

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from crankshaft position sensor. 3) Measure the resistance of harness between crankshaft position sensor connector and engine ground. <i>Connector & terminal</i> <i>(E10) No. 1 — Engine ground:</i>	Is the resistance 100 kΩ or more?	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector 	Go to step 2.
2 CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR. Measure the resistance of harness between crankshaft position sensor connector and engine ground. <i>Connector & terminal</i> <i>(E10) No. 1 — Engine ground:</i>	Is the resistance less than 10 Ω?	Repair the ground short circuit of harness between crankshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair the ground short circuit of harness with shield.	Go to step 3.
3 CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR. Measure the resistance of harness between crankshaft position sensor connector and engine ground. <i>Connector & terminal</i> <i>(E10) No. 2 — Engine ground:</i>	Is the resistance less than 5 Ω?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
4 CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.	Is the crankshaft position sensor installation bolt tightened securely?	Go to step 5.	Tighten the crankshaft position sensor installation bolt securely.
5 CHECK CRANKSHAFT POSITION SENSOR. 1) Remove the crankshaft position sensor. 2) Measure the resistance between connector terminals of crankshaft position sensor. <i>Terminals</i> <i>No. 1 — No. 2:</i>	Is the resistance between 1 and 4 kΩ?	Repair the poor contact of crankshaft position sensor connector.	Replace the crankshaft position sensor. <Ref. to FU(H4SO)-23, Crankshaft Position Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BA:DTC P0336 CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-106, DTC P0336 CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

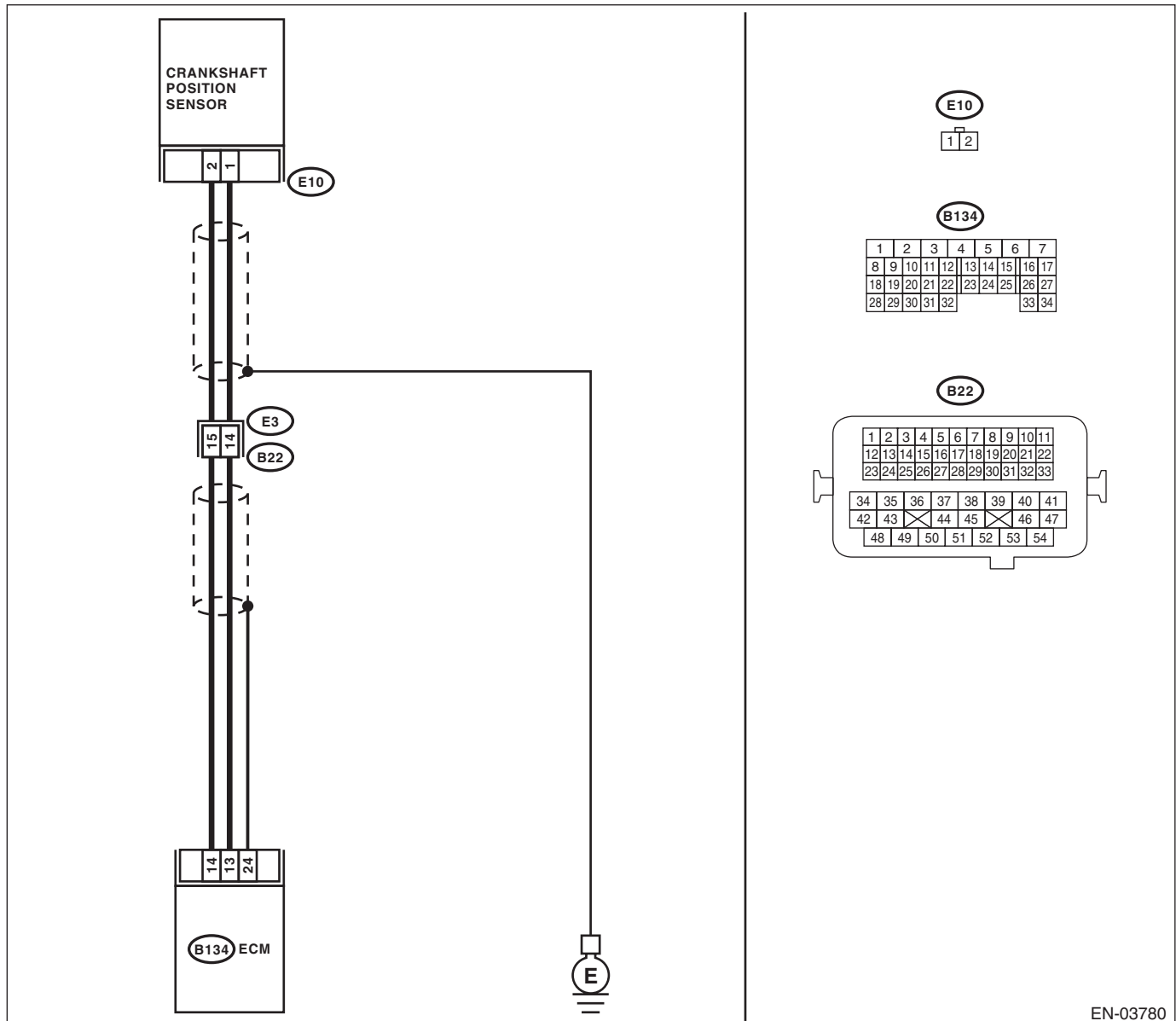
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03780

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK CONDITION OF CRANKSHAFT POSITION SENSOR. Turn the ignition switch to OFF.	Is the crankshaft position sensor installation bolt tightened securely?	Go to step 3.	Tighten the crankshaft position sensor installation bolt securely.
3 CHECK CRANK SPROCKET. Remove the timing belt cover.	Are crank sprocket teeth cracked or damaged?	Replace the crank sprocket. <Ref. to ME(H4SO)-50, Crank Sprocket.>	Go to step 4.
4 CHECK INSTALLATION CONDITION OF TIMING BELT. Turn the crankshaft using ST, and align the alignment mark on crank sprocket with alignment mark on cylinder block. ST 499987500 CRANKSHAFT SOCKET	Is the timing belt dislocated from its proper position?	Repair the installation condition of timing belt. <Ref. to ME(H4SO)-44, Timing Belt.>	Replace the crankshaft position sensor. <Ref. to FU(H4SO)-23, Crankshaft Position Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BB:DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-108, DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

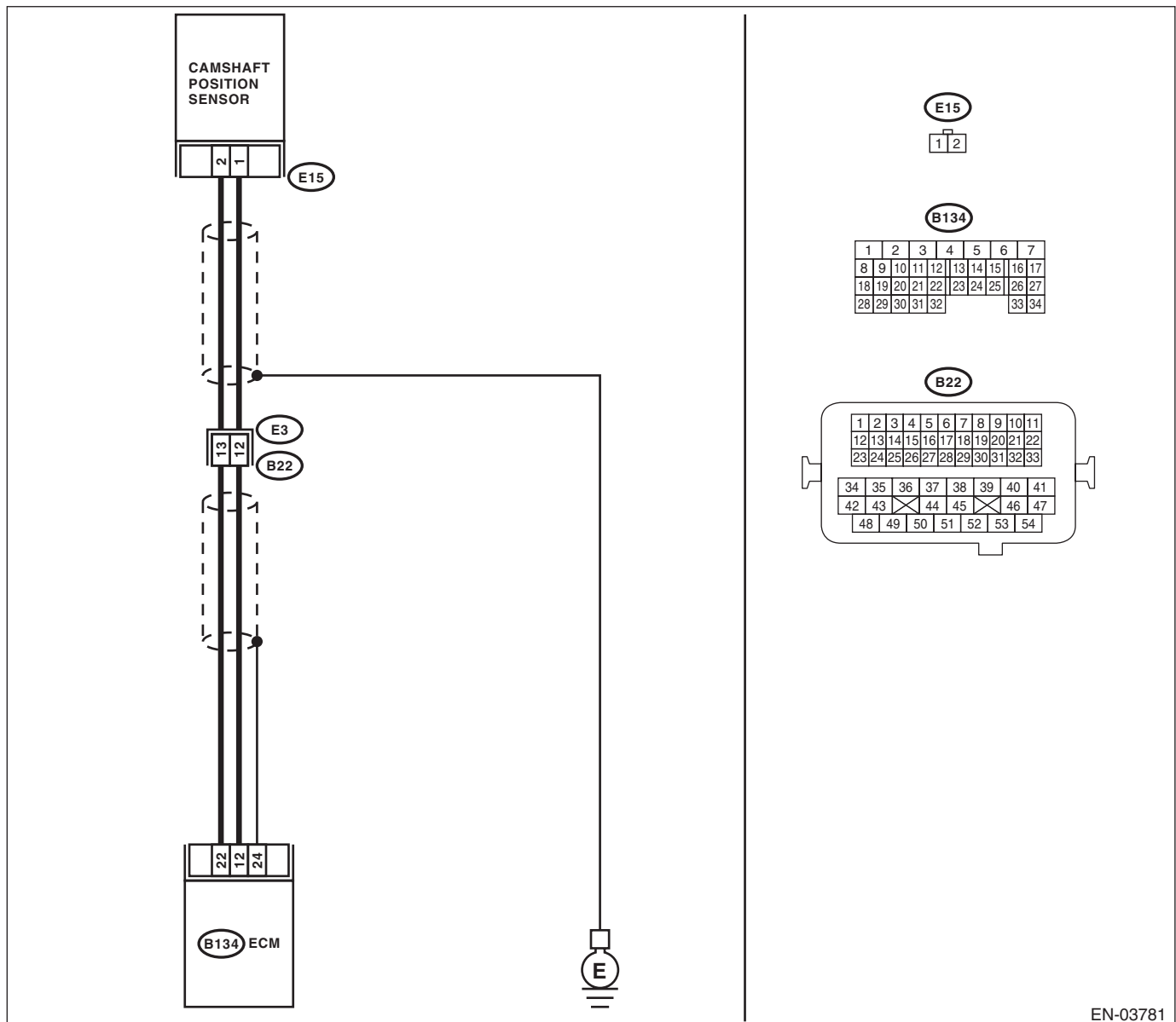
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03781

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the resistance of harness between camshaft position sensor connector and engine ground.</p> <p>Connector & terminal (E15) No. 1 — Engine ground:</p>	<p>Is the resistance 100 kΩ or more?</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector 	<p>Go to step 2.</p>
<p>2</p> <p>CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.</p> <p>Measure the resistance of harness between camshaft position sensor connector and engine ground.</p> <p>Connector & terminal (E15) No. 1 — Engine ground:</p>	<p>Is the resistance less than 10 Ω?</p>	<p>Repair the ground short circuit of harness between camshaft position sensor and ECM connector.</p> <p>NOTE: The harness between both connectors are shielded. Repair the ground short circuit of harness with shield.</p>	<p>Go to step 3.</p>
<p>3</p> <p>CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR.</p> <p>Measure the resistance of harness between camshaft position sensor connector and engine ground.</p> <p>Connector & terminal (E15) No. 2 — Engine ground:</p>	<p>Is the resistance less than 5 Ω?</p>	<p>Go to step 4.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
<p>4</p> <p>CHECK CONDITION OF CAMSHAFT POSITION SENSOR.</p>	<p>Is the camshaft position sensor installation bolt tightened securely?</p>	<p>Go to step 5.</p>	<p>Tighten the camshaft position sensor installation bolt securely.</p>
<p>5</p> <p>CHECK CAMSHAFT POSITION SENSOR.</p> <p>1) Remove the camshaft position sensor. 2) Measure the resistance between connector terminals of camshaft position sensor.</p> <p>Terminals No. 1 — No. 2:</p>	<p>Is the resistance between 1 and 4 kΩ?</p>	<p>Repair the poor contact of camshaft position sensor connector.</p>	<p>Replace the camshaft position sensor. <Ref. to FU(H4SO)-24, Camshaft Position Sensor.></p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BC:DTC P0341 CAMSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-110, DTC P0341 CAMSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

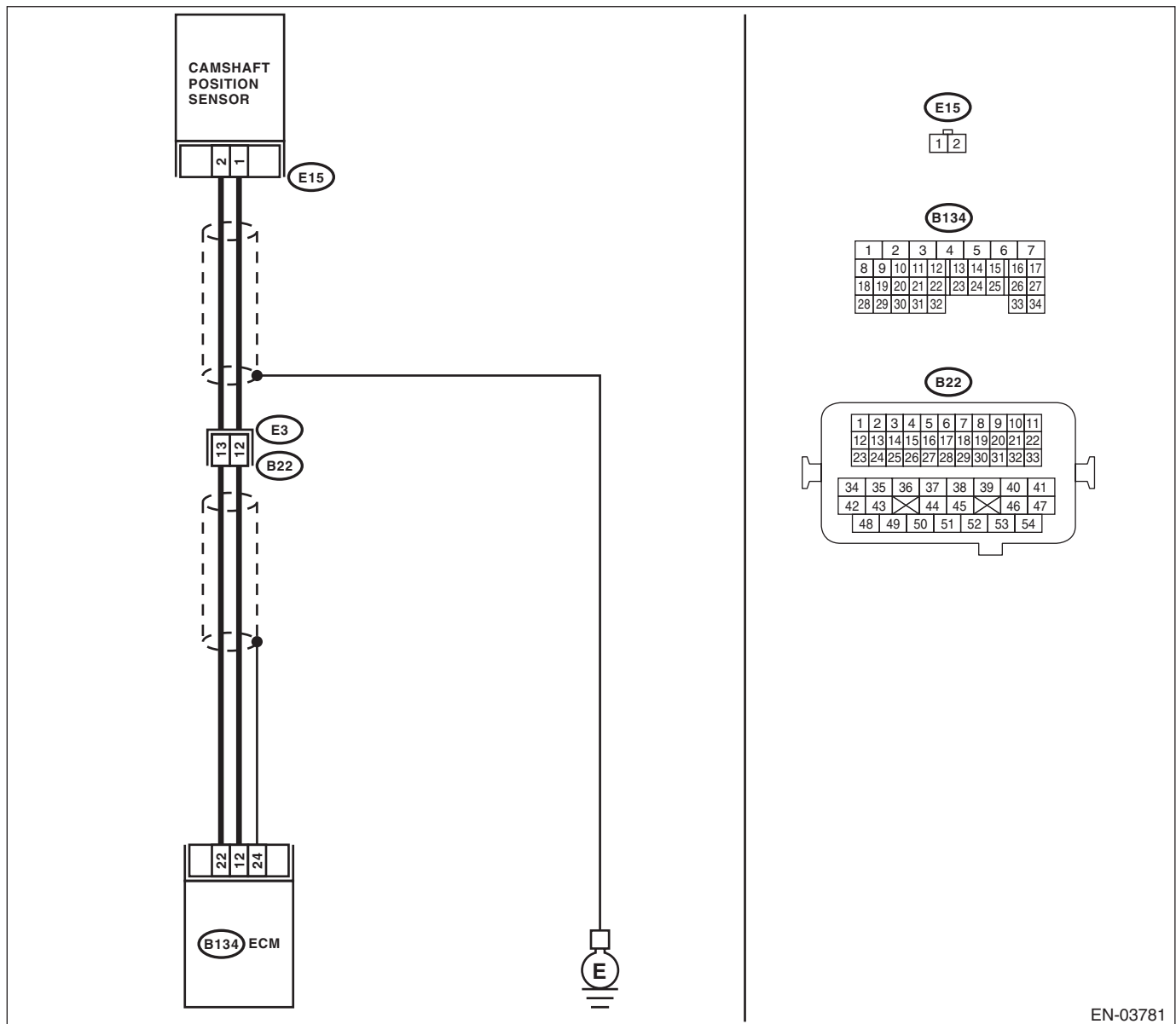
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03781

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the resistance of harness between camshaft position sensor connector and engine ground. <i>Connector & terminal</i> <i>(E15) No. 1 — Engine ground:</i>	Is the resistance 100 kΩ or more?	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector 	Go to step 3.
3 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR. Measure the resistance of harness between camshaft position sensor connector and engine ground. <i>Connector & terminal</i> <i>(E15) No. 1 — Engine ground:</i>	Is the resistance less than 10 Ω?	Repair the ground short circuit of harness between camshaft position sensor and ECM connector. NOTE: The harness between both connectors are shielded. Repair the ground short circuit of harness with shield.	Go to step 4.
4 CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM CONNECTOR. Measure the resistance of harness between camshaft position sensor connector and engine ground. <i>Connector & terminal</i> <i>(E15) No. 2 — Engine ground:</i>	Is the resistance less than 5 Ω?	Go to step 5.	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open circuit in harness between camshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
5 CHECK CONDITION OF CAMSHAFT POSITION SENSOR.	Is the camshaft position sensor installation bolt tightened securely?	Go to step 6.	Tighten the camshaft position sensor installation bolt securely.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK CAMSHAFT POSITION SENSOR. 1) Remove the camshaft position sensor. 2) Measure the resistance between connector terminals of camshaft position sensor. Terminals No. 1 — No. 2:	Is the resistance between 1 and 4 kΩ?	Go to step 7.	Replace the camshaft position sensor. <Ref. to FU(H4SO)-24, Camshaft Position Sensor.>
7 CHECK CONDITION OF CAMSHAFT POSITION SENSOR. Turn the ignition switch to OFF.	Is the camshaft position sensor installation bolt tightened securely?	Go to step 8.	Tighten the camshaft position sensor installation bolt securely.
8 CHECK CAM SPROCKET. Remove the timing belt cover. <Ref. to ME(H4SO)-43, Timing Belt Cover.>	Are cam sprocket teeth cracked or damaged?	Replace the cam sprocket. <Ref. to ME(H4SO)-49, Cam Sprocket.>	Go to step 9.
9 CHECK INSTALLATION CONDITION OF TIMING BELT. Turn the crankshaft using ST, and align alignment mark on cam sprocket with alignment mark on timing belt cover LH. ST 499987500 CRANKSHAFT SOCKET	Is the timing belt dislocated from its proper position?	Repair the installation condition of timing belt. <Ref. to ME(H4SO)-44, Timing Belt.>	Replace the camshaft position sensor. <Ref. to FU(H4SO)-24, Camshaft Position Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BD:DTC P0400 EXHAUST GAS RECIRCULATION FLOW

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-112, DTC P0400 EXHAUST GAS RECIRCULATION FLOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

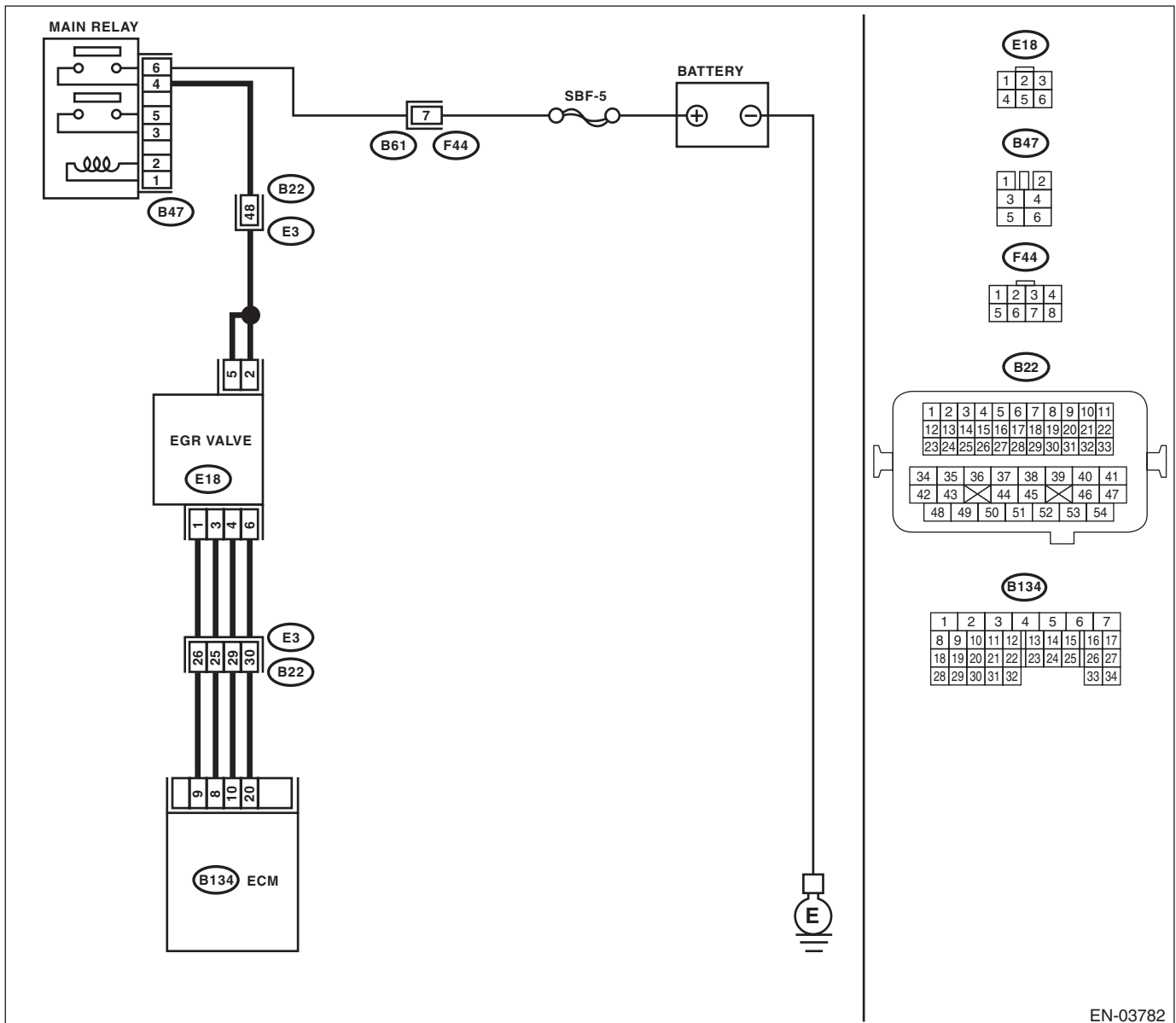
TROUBLE SYMPTOM:

- Movement performance problem when engine is low speed.
- Erroneous idling
- Movement performance problem

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03782

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK CURRENT DATA. 1) Start the engine. 2) Read data of intake manifold absolute pressure signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is the measured value more than 53.3 kPa (400 mmHg, 15.75 inHg)?	Make sure that the EGR valve, manifold absolute pressure sensor and throttle body are installed securely.	Go to step 3.
3	CHECK POWER SUPPLY OF EGR SOLENOID VALVE. 1) Disconnect the connector from EGR solenoid valve. 2) Turn the ignition switch to ON. 3) Measure the voltage between EGR solenoid valve and engine ground. Connector & terminal: (E18) No. 2 — Engine ground: (E18) No. 5 — Engine ground:	Is the voltage 10 V or more?	Go to step 4.	Repair the open circuit of harness between main relay and EGR solenoid valve connector.
4	CHECK EGR SOLENOID VALVE. Measure the resistance between EGR solenoid valve terminals. NOTE: Make sure there is no foreign material between EGR solenoid valve and valve seat. Terminals No. 1 — No. 2: No. 3 — No. 2: No. 4 — No. 5: No. 6 — No. 5:	Is the resistance between 20 and 30 Ω?	Go to step 5.	Replace the EGR solenoid valve. <Ref. to FU(H4SO)-29, EGR Valve.>
5	OUTPUT SIGNAL FROM ECM. 1) Turn the ignition switch to OFF. 2) Connect the connector to ECM and EGR solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal: (B134) No. 10 (+) — Chassis ground (-): (B134) No. 9 (+) — Chassis ground (-): (B134) No. 8 (+) — Chassis ground (-): (B134) No. 20 (+) — Chassis ground (-):	Is the voltage 0 — 10 V?	Repair the poor contact portion of ECM connector.	Go to step 6.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK HARNESS BETWEEN EGR SOLENOID VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from EGR solenoid valve and ECM. 3) Measure the resistance of harness between EGR solenoid valve and ECM connector. Connector & terminal: <i>(B134) No. 10 — (E18) No. 4:</i> <i>(B134) No. 9 — (E18) No. 1:</i> <i>(B134) No. 8 — (E18) No. 3:</i> <i>(B134) No. 20 — (E18) No. 6:</i>	Is the resistance less than 1 Ω?	Go to step 7.	Repair the open circuit of harness between ECM and EGR solenoid valve connector.
7 CHECK HARNESS BETWEEN EGR SOLENOID VALVE AND ECM CONNECTOR. Measure the resistance of harness between EGR solenoid valve and chassis ground. Connector & terminal: <i>(B134) No. 10 — Chassis ground:</i> <i>(B134) No. 9 — Chassis ground:</i> <i>(B134) No. 8 — Chassis ground:</i> <i>(B134) No. 20 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 8.	Repair the short circuit of harness between main relay and EGR solenoid valve connector.
8 CHECK POOR CONTACT. Check poor contact of ECM and EGR solenoid valve connectors.	Is there poor contact in ECM and EGR solenoid valve connectors?	Repair the poor contact of ECM and EGR solenoid valve connectors.	Even if the malfunction indicator light illuminates, the circuit has returned to the specified condition at this time.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BE:DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-116, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

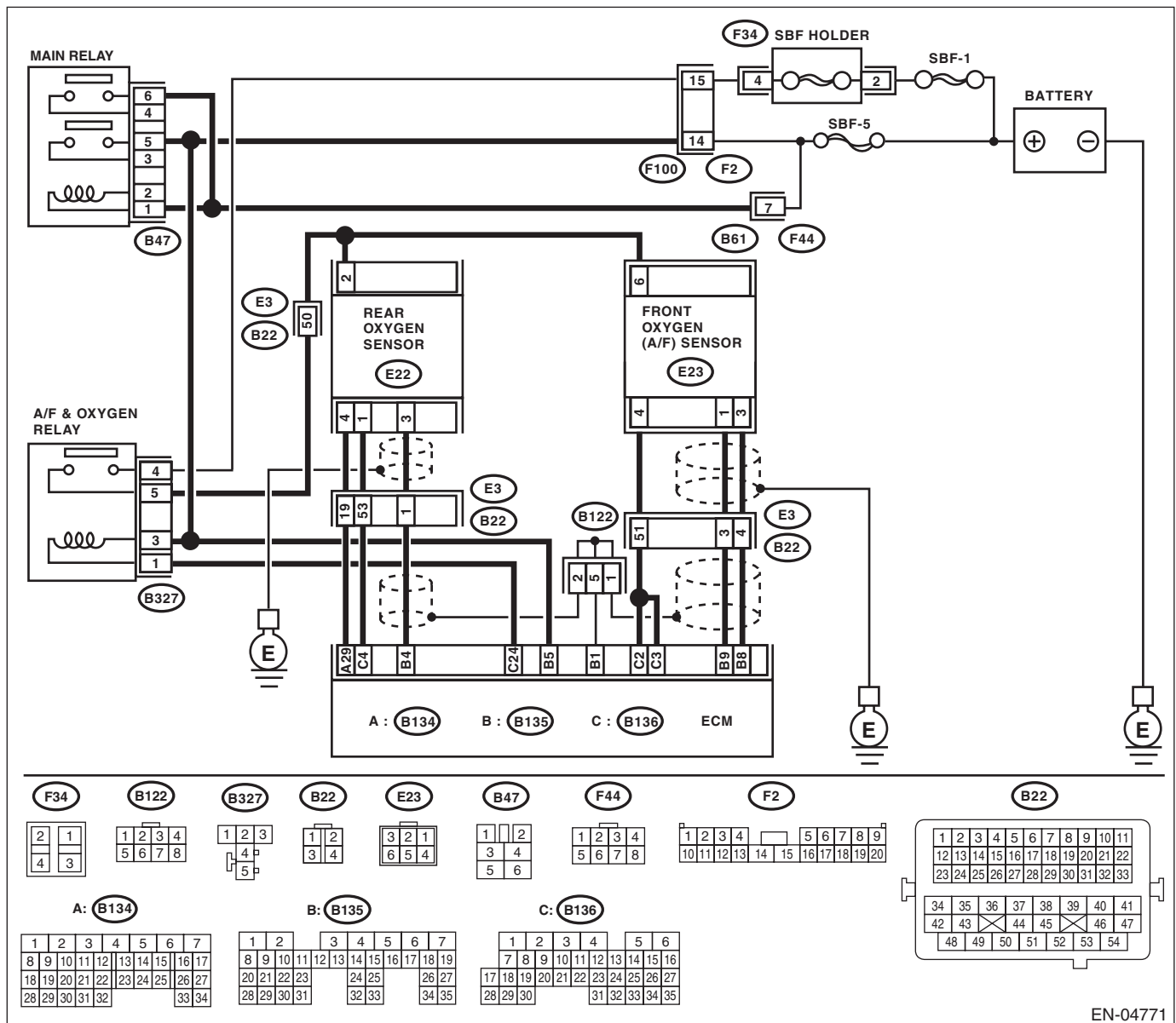
TROUBLE SYMPTOM:

- Engine stalls.
- Idle mixture is out of specifications.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04771

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

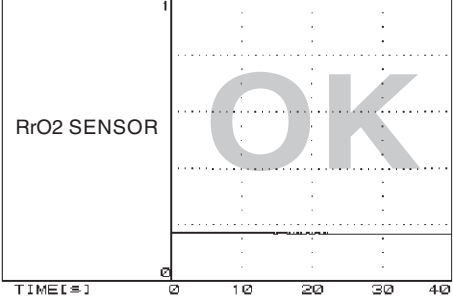
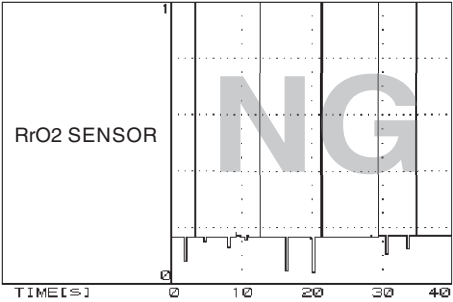
ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK EXHAUST SYSTEM. Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes.</p> <p>NOTE: Check the following positions.</p> <ul style="list-style-type: none"> • Between cylinder head and front exhaust pipe • Between front exhaust pipe and front catalytic converter • Between front catalytic converter and rear catalytic converter • Looseness and improper attachment of front oxygen (A/F) sensor or rear oxygen sensor 	Is there any fault in exhaust system?	Repair or replace the exhaust system. <Ref. to EX (H4SO)-2, General Description.>	Go to step 2.
2	<p>CHECK WAVEFORM DATA ON SUBARU SELECT MONITOR (WHILE DRIVING).</p> <p>1) Drive the vehicle at a constant speed of 80 — 112 km/h (50 — 70 MPH).</p> <p>2) Keep the condition of step 1) for 5 minutes, then read the waveform data in a driving condition using Subaru Select Monitor.</p> <div> <p>The figure contains two waveform graphs. The top graph is labeled 'OK' and shows two traces: 'RrO2 SENSOR' and 'A/F LAMBDA 1'. The RrO2 trace is a steady horizontal line at approximately 1.0. The A/F LAMBDA trace is a steady horizontal line at approximately 1.4. The bottom graph is labeled 'NG' and shows the same two traces. The RrO2 trace is highly oscillatory, fluctuating between approximately 0.8 and 1.2. The A/F LAMBDA trace is also highly oscillatory, fluctuating between approximately 1.2 and 1.6. Both graphs have a vertical axis from 0 to 1 and a horizontal axis labeled 'TIME[sec]' from 0 to 40.</p> </div>	Are normal waveform pattern displayed?	<p>Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the fault and perform the diagnosis again.</p> <p>NOTE: In this case, the probable cause is considered as the temporarily poor contact of connectors.</p>	Go to step 3.

EN-04895

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>3 CHECK WAVEFORM DATA ON SUBARU SELECT MONITOR (WHILE IDLING). 1) Idle the engine. 2) Under the condition of step 1), read the waveform data using Subaru Select Monitor.</p> <div style="display: flex; flex-direction: column; align-items: center;">   <p>EN-04896</p> </div>	<p>Are normal waveform pattern displayed?</p>	<p>Go to step 4.</p>	<p>Go to step 5.</p>
<p>4 CHECK CATALYTIC CONVERTER.</p>	<p>Is the catalytic converter damaged?</p>	<p>Replace the catalytic converter. <Ref. to EC(H4SO)-3, Front Catalytic Converter.></p>	<p>Go to step 5.</p>
<p>5 CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.</p>	<p>Does water enter the connector?</p>	<p>Dry the water thoroughly.</p>	<p>Go to step 6.</p>
<p>6 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. Connector & terminal (B135) No. 4 — (E22) No. 3: (B135) No. 29 — (E22) No. 4:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 7.</p>	<p>Repair the open circuit of harness between ECM and rear oxygen sensor connector.</p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>7</p> <p>CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to ON. 2) Measure the resistance between rear oxygen sensor connector and chassis ground.</p> <p>Connector & terminal (E22) No. 3 (+) — Chassis ground (-):</p>	<p>Is the voltage 0.2 — 0.5 V?</p>	<p>Go to step 8.</p>	<p>Repair the harness and connector.</p> <p>NOTE: Repair the following points.</p> <ul style="list-style-type: none"> • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor and ECM connector • Poor contact in ECM connector
<p>8</p> <p>CHECK REAR OXYGEN SENSOR SHIELD.</p> <p>1) Turn the ignition switch to OFF. 2) Bare the harness sensor shield on the body side of rear oxygen sensor connector. 3) Measure the resistance between sensor shield and chassis ground.</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Replace the rear oxygen sensor. <Ref. to FU(H4SO)-38, Rear Oxygen Sensor.></p>	<p>Repair the open circuit in rear oxygen sensor harness.</p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BF:DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-119, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

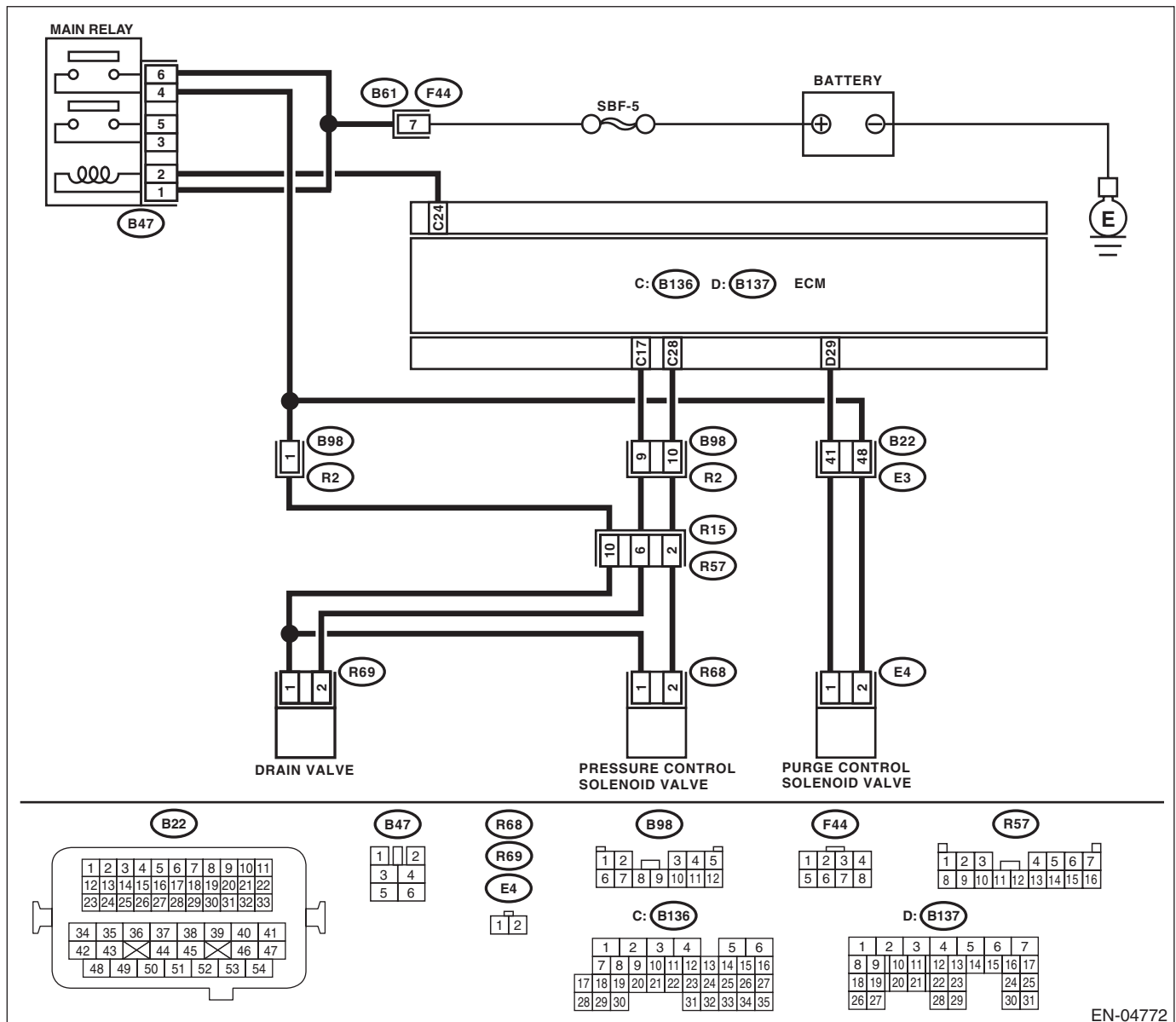
TROUBLE SYMPTOM:

- Fuel odor
- There is a hole of more than 1.0 mm (0.04 in) dia. in evaporation system or fuel tank.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04772

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK FUEL FILLER CAP. 1) Turn the ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step 3.	Securely install the fuel filler cap.
3	CHECK FUEL FILLER CAP.	Is the fuel filler cap SUBARU genuine?	Go to step 4.	Replace with a genuine fuel filler cap.
4	CHECK FUEL FILLER PIPE PACKING.	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4SO)-48, Fuel Filler Pipe.>	Go to step 5.
5	CHECK DRAIN VALVE. 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-45, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step 6.	Replace the drain valve. <Ref. to EC(H4SO)-17, Drain Valve.>
6	CHECK PURGE CONTROL SOLENOID VALVE. Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-45, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step 7.	Replace the purge control solenoid valve. <Ref. to EC(H4SO)-7, Purge Control Solenoid Valve.>
7	CHECK PRESSURE CONTROL SOLENOID VALVE. Operate the pressure control solenoid valve. NOTE: The pressure control solenoid valve operation can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-45, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step 8.	Replace the pressure control solenoid valve. <Ref. to EC(H4SO)-12, Pressure Control Solenoid Valve.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
8	CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE. Turn the ignition switch to OFF.	Is there a hole of more than 1.0 mm (0.04 in) dia. in evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H4SO)-59, Fuel Delivery, Return and Evaporation Lines.>	Go to step 9.
9	CHECK CANISTER.	Is the canister damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace the canister. <Ref. to EC(H4SO)-6, Canister.>	Go to step 10.
10	CHECK FUEL TANK. Remove the fuel tank. <Ref. to FU(H4SO)-45, Fuel Tank.>	Is the fuel tank damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace the fuel tank. <Ref. to FU(H4SO)-45, Fuel Tank.>	Go to step 11.
11	CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.	Are there holes of more than 1.0 mm (0.04 in) dia., cracks, clogging, disconnections or bend of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Repair poor contact in ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BG:DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN

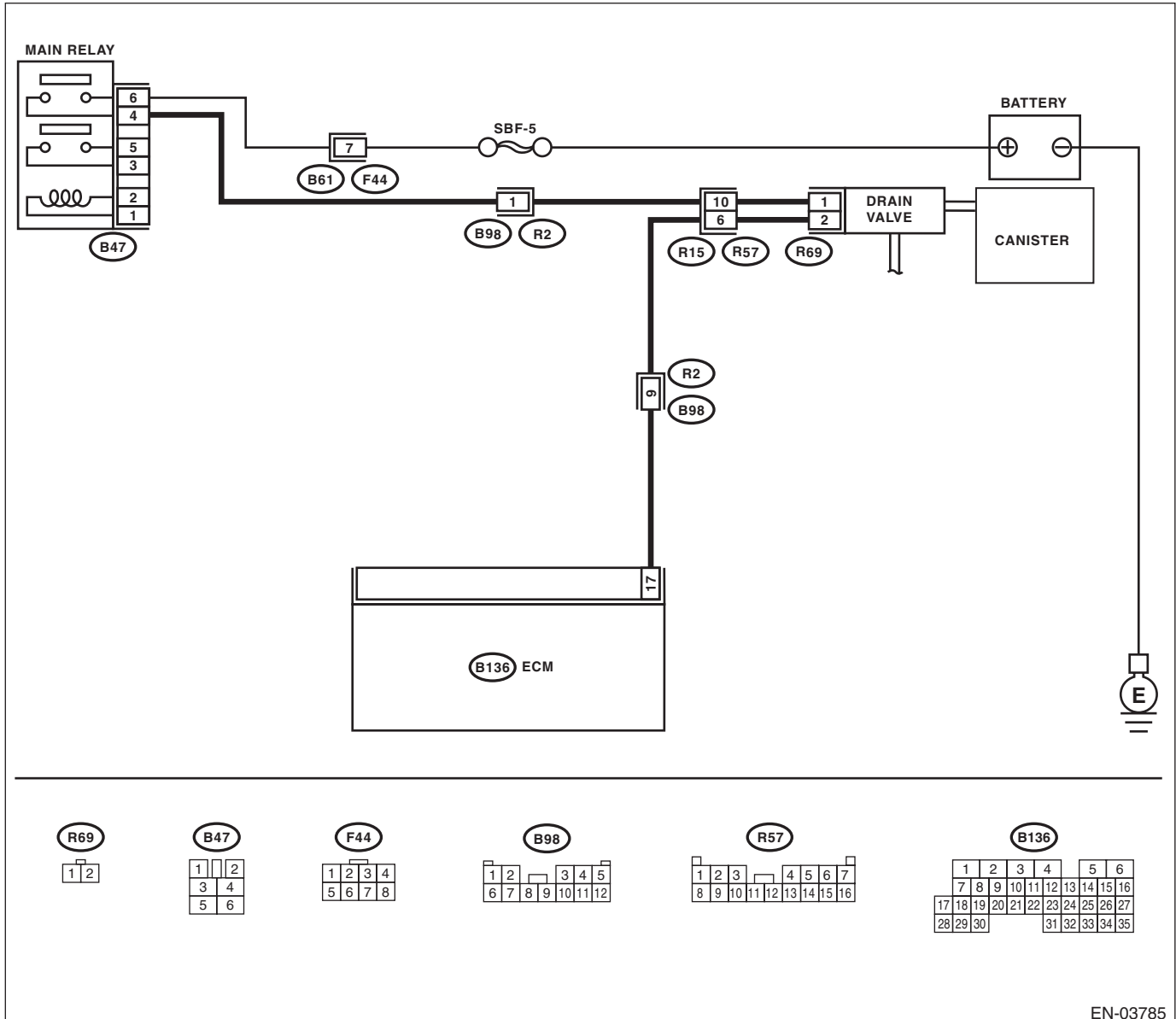
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-133, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03785

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> (B136) No. 17 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair poor contact in ECM connector.	Go to step 2.
2 CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from drain valve and ECM. 3) Measure the resistance of harness between drain valve connector and chassis ground. <i>Connector & terminal</i> (R69) No. 2 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 3.	Repair the ground short circuit of harness between ECM and drain valve connector.
3 CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR. Measure the resistance of harness between ECM and drain valve connector. <i>Connector & terminal</i> (B136) No. 17 — (R69) No. 2:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open circuit in harness between ECM and drain valve connector • Poor contact in coupling connector
4 CHECK DRAIN VALVE. Measure the resistance between drain valve terminals. <i>Terminals</i> No. 1 — No. 2:	Is the resistance between 10 and 100 Ω ?	Go to step 5.	Replace the drain valve. <Ref. to EC(H4SO)-17, Drain Valve.>
5 CHECK POWER SUPPLY TO DRAIN VALVE. 1) Turn the ignition switch to ON. 2) Measure the voltage between drain valve and chassis ground. <i>Connector & terminal</i> (R69) No. 1 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the poor contact of drain valve connector.	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open circuit in harness between main relay and drain valve • Poor contact in coupling connector • Poor contact in main relay connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BH:DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED

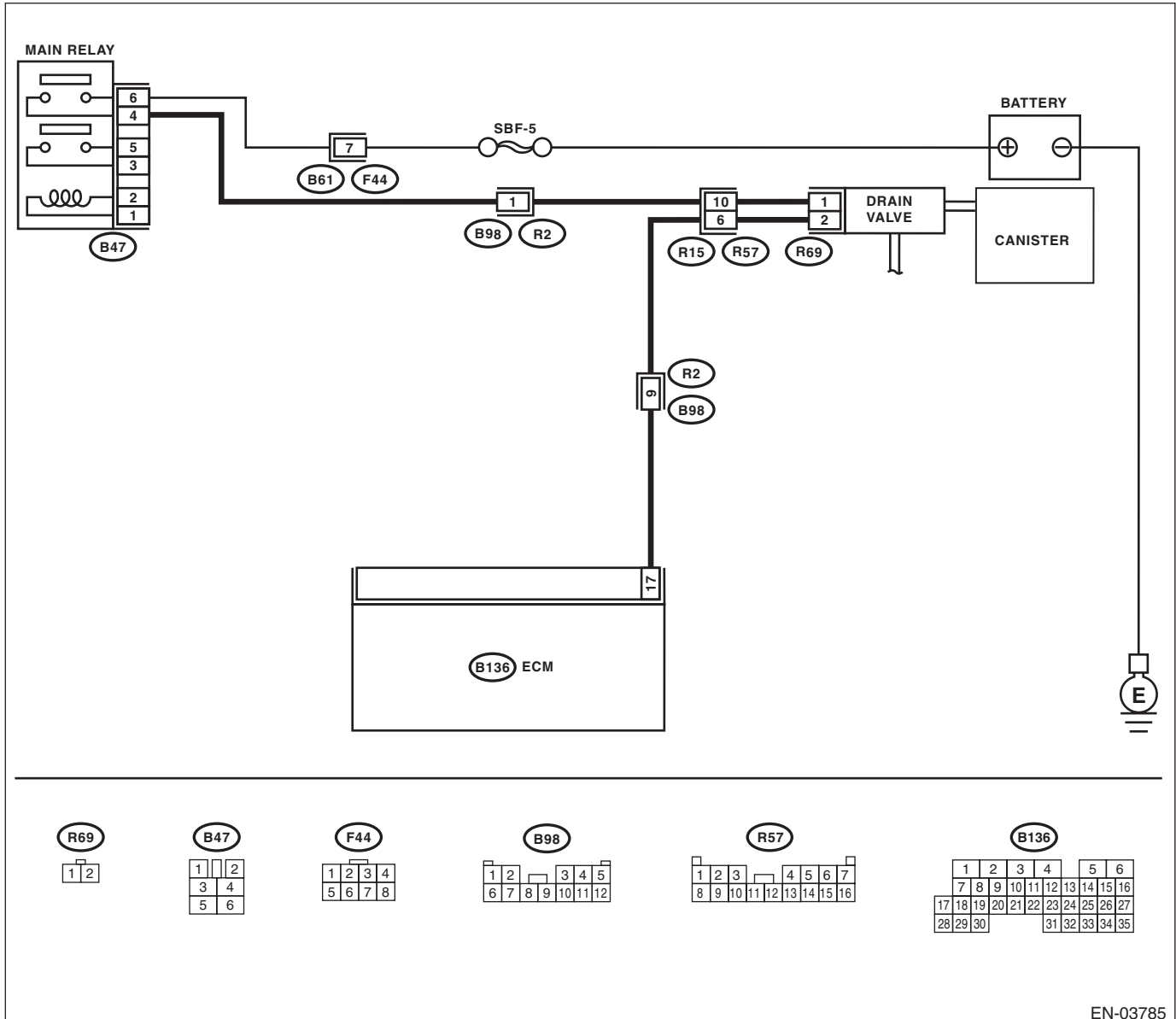
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-135, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03785

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK INPUT SIGNAL OF ECM. 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground while operating the drain valve. NOTE: Drain valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-45, Compulsory Valve Operation Check Mode.> Connector & terminal (B136) No. 17 (+) — Chassis ground (-):	Is the voltage 0 — 10 V?	Go to step 2.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector.
2	CHECK INPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 17 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 4.	Go to step 3.
3	CHECK POOR CONTACT. Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>
4	CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the drain valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 17 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the battery short circuit of harness between ECM and drain valve connector. After repair, replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>	Go to step 5.
5	CHECK DRAIN VALVE. 1) Turn the ignition switch to OFF. 2) Measure the resistance between drain valve terminals. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Replace the drain valve and ECM. <Ref. to EC(H4SO)-17, Drain Valve.> <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>	Go to step 6.
6	CHECK POOR CONTACT. Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BI: DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR

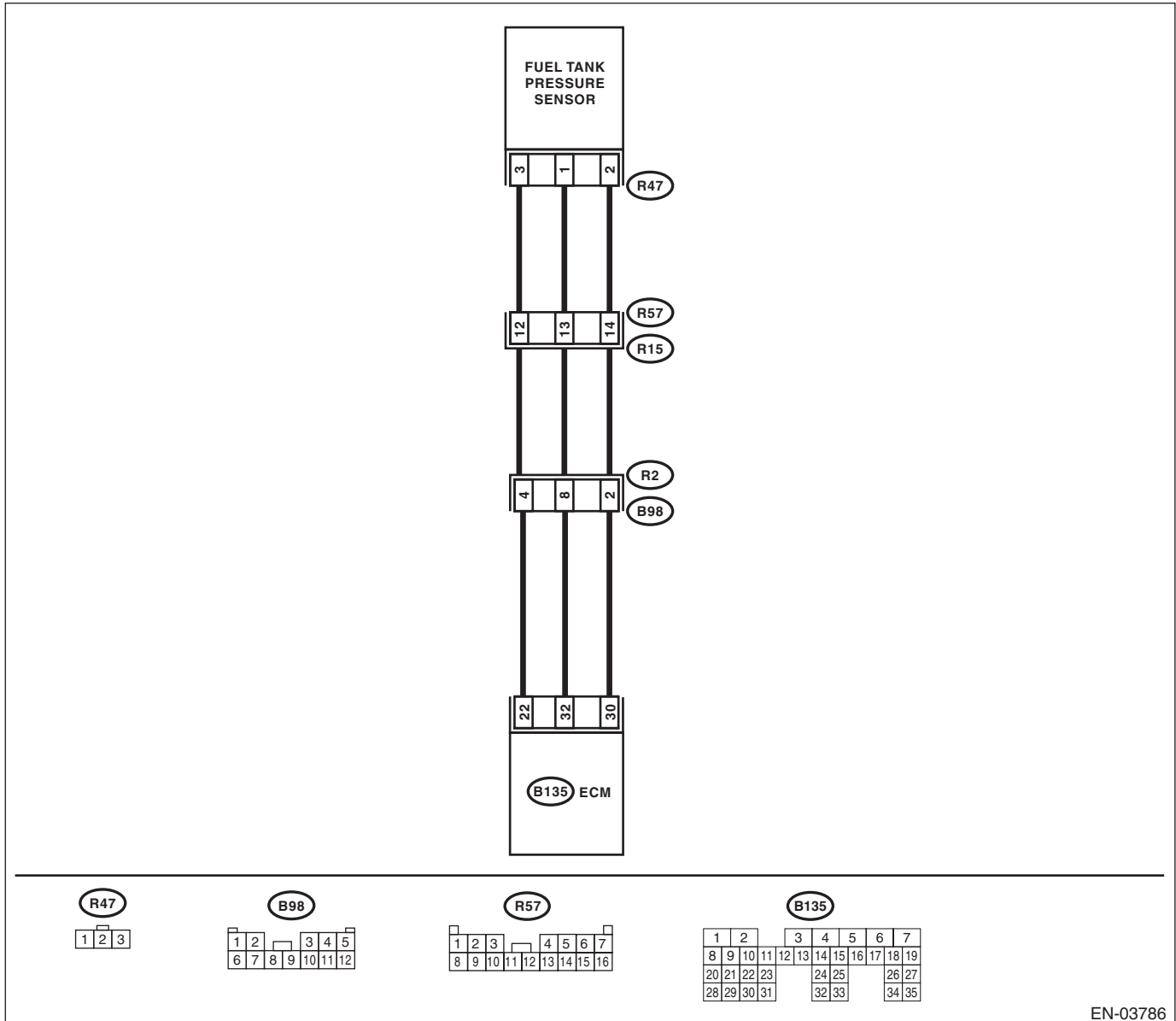
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-137, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03786

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK FUEL FILLER CAP. 1) Turn the ignition switch to OFF. 2) Open the fuel flap.	Is the fuel filler cap tightened securely?	Go to step 3.	Securely install the fuel filler cap.
3	CHECK PRESSURE VACUUM LINE. NOTE: Check the following items. <ul style="list-style-type: none">• Disconnection, leakage and clogging of the vacuum hoses and pipes between fuel tank pressure sensor and fuel tank• Disconnection, leakage and clogging of the air ventilation hoses and pipes between fuel filler pipe and fuel tank	Is there any fault in pressure/vacuum line?	Repair or replace the hoses and pipes.	Replace the fuel tank pressure sensor. <Ref. to EC(H4SO)-11, Fuel Tank Pressure Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BJ:DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT

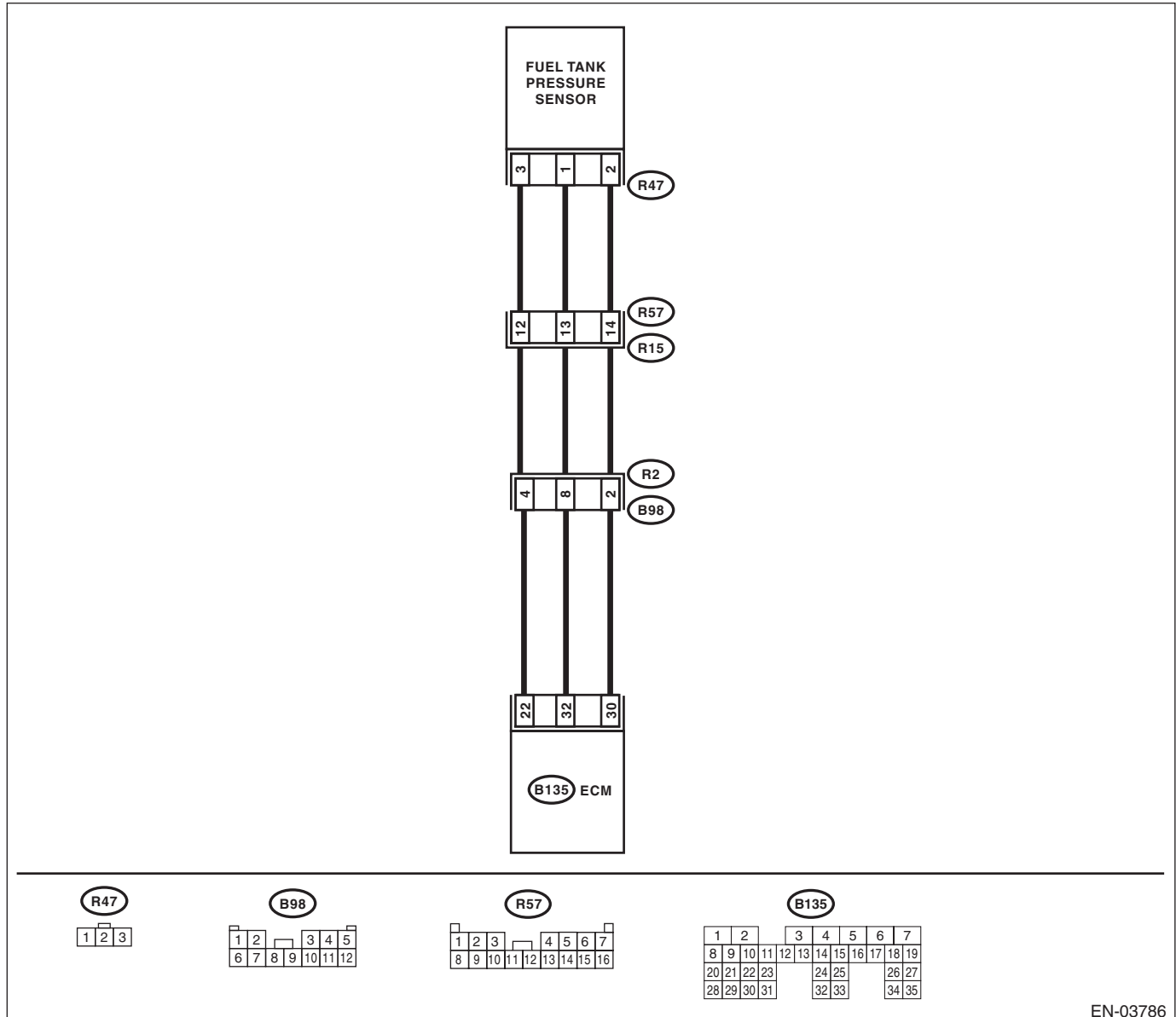
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-139, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03786

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1 CHECK CURRENT DATA.</p> <p>1) Turn the ignition switch to OFF. 2) Remove the fuel filler cap. 3) Install the fuel filler cap. 4) Turn the ignition switch to ON. 5) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Is the measured value less than -2.8 kPa (-21.0 mmHg, -0.827 inHg)?</p>	<p>Go to step 2.</p>	<p>Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.</p>
<p>2 CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.</p> <p>Measure the voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B135) No. 22 (+) — Chassis ground (-):</p>	<p>Is the voltage 4.5 V or more?</p>	<p>Go to step 3.</p>	<p>Repair poor contact in ECM connector.</p>
<p>3 CHECK INPUT SIGNAL OF ECM.</p> <p>Measure the voltage between ECM and chassis ground.</p> <p>Connector & terminal (B135) No. 32 (+) — Chassis ground (-):</p>	<p>Is the voltage less than 0.2 V?</p>	<p>Go to step 5.</p>	<p>Go to step 4.</p>
<p>4 CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR).</p> <p>Read the data of fuel tank pressure sensor signal using Subaru Select Monitor.</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.></p>	<p>Does the measured value change when shaking the ECM harness and connector?</p>	<p>Repair poor contact in ECM connector.</p>	<p>Go to step 5.</p>
<p>5 CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</p> <p>1) Turn the ignition switch to OFF. 2) Remove the rear seat cushion. 3) Separate rear wiring harness and fuel tank cord. 4) Turn the ignition switch to ON. 5) Measure the voltage between rear wiring harness connector and chassis ground.</p> <p>Connector & terminal (R15) No. 12 (+) — Chassis ground (-):</p>	<p>Is the voltage 4.5 V or more?</p>	<p>Go to step 6.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector</p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM and rear wiring harness connector. <i>Connector & terminal</i> <i>(B135) No. 30 — (R15) No. 14:</i>	Is the resistance less than 1 Ω?	Go to step 7.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector • Poor contact in joint connector
7 CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS. Measure the resistance of harness between rear wiring harness connector and chassis ground. <i>Connector & terminal</i> <i>(R15) No. 14 (+) — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 8.	Repair the ground short circuit of harness between ECM and rear wiring harness connector.
8 CHECK FUEL TANK CORD. 1) Disconnect the connector from fuel tank pressure sensor. 2) Measure the resistance of fuel tank cord. <i>Connector & terminal</i> <i>(R57) No. 12 — (R47) No. 3:</i>	Is the resistance less than 1 Ω?	Go to step 9.	Repair the open circuit in fuel tank cord.
9 CHECK FUEL TANK CORD. Measure the resistance of fuel tank cord. <i>Connector & terminal</i> <i>(R57) No. 14 — (R47) No. 2:</i>	Is the resistance less than 1 Ω?	Go to step 10.	Repair the open circuit in fuel tank cord.
10 CHECK FUEL TANK CORD. Measure the resistance of harness between fuel tank pressure sensor connector and engine ground. <i>Connector & terminal</i> <i>(R47) No. 1 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 11.	Repair the ground short circuit of fuel tank cord.
11 CHECK POOR CONTACT. Check poor contact in fuel tank pressure sensor connector.	Is there poor contact in fuel tank pressure sensor connector?	Repair the poor contact in fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H4SO)-11, Fuel Tank Pressure Sensor.>

BK:DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT

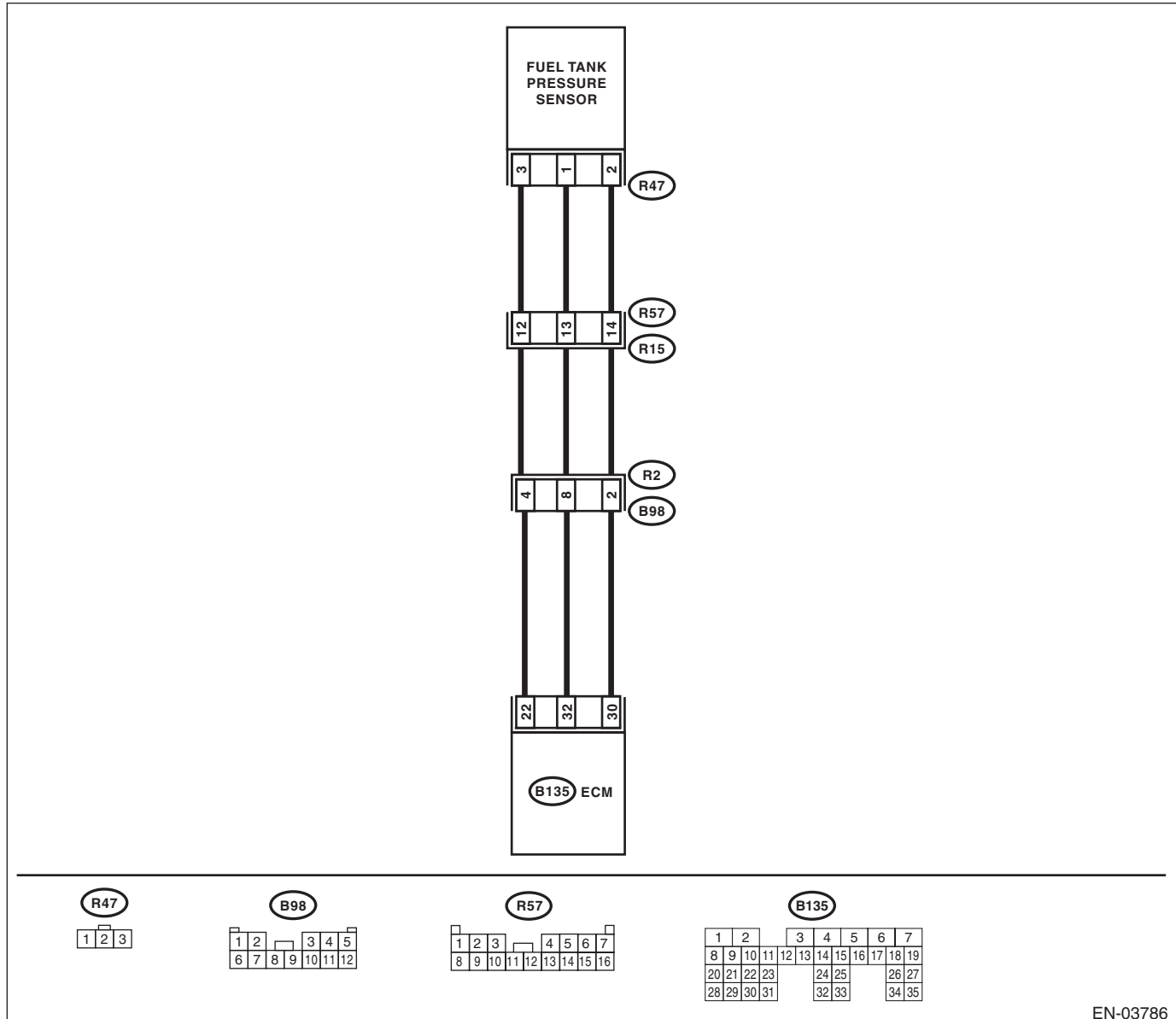
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-141, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03786

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CURRENT DATA. 1) Turn the ignition switch to OFF. 2) Remove the fuel filler cap. 3) Install the fuel filler cap. 4) Turn the ignition switch to ON. 5) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is the measured value 2.8 kPa (21.0 mmHg, 0.827 inHg) or more?	Go to step 11.	Go to step 2.
2 CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR. Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 22 (+) — Chassis ground (-):</i>	Is the voltage 4.5 V or more?	Go to step 4.	Go to step 3.
3 CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR. Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 22 (+) — Chassis ground (-):</i>	Does the voltage change when shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>
4 CHECK INPUT SIGNAL OF ECM. Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 32 (+) — Chassis ground (-):</i>	Is the voltage less than 0.2 V?	Go to step 6.	Go to step 5.
5 CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR). Read the data of fuel tank pressure sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.>	Does the measured value change when shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Go to step 6.
6 CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS. 1) Turn the ignition switch to OFF. 2) Remove the rear seat cushion. 3) Separate rear wiring harness and fuel tank cord. 4) Turn the ignition switch to ON. 5) Measure the voltage between rear wiring harness connector and chassis ground. <i>Connector & terminal</i> <i>(R15) No. 12 (+) — Chassis ground (-):</i>	Is the voltage 4.5 V or more?	Go to step 7.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>7 CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM and rear wiring harness connector.</p> <p>Connector & terminal (B135) No. 32 — (R15) No. 13: (B135) No. 30 — (R15) No. 14:</p>	Is the resistance less than 1 Ω?	Go to step 8.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector
<p>8 CHECK FUEL TANK CORD.</p> <p>1) Disconnect the connector from the fuel tank pressure sensor. 2) Measure the resistance of fuel tank cord.</p> <p>Connector & terminal (R57) No. 13 — (R47) No. 1:</p>	Is the resistance less than 1 Ω?	Go to step 9.	Repair the open circuit in fuel tank cord.
<p>9 CHECK FUEL TANK CORD.</p> <p>Measure the resistance of fuel tank cord.</p> <p>Connector & terminal (R57) No. 14 — (R47) No. 2:</p>	Is the resistance less than 1 Ω?	Go to step 10.	Repair the open circuit in fuel tank cord.
<p>10 CHECK POOR CONTACT.</p> <p>Check poor contact in fuel tank pressure sensor connector.</p>	Is there poor contact in fuel tank pressure sensor connector?	Repair the poor contact in fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H4SO)-11, Fuel Tank Pressure Sensor.>
<p>11 CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel tank pressure sensor. 3) Turn the ignition switch to ON. 4) Read the data of fuel tank pressure sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	Is the measured value 2.8 kPa (21.0 mmHg, 0.827 inHg) or more?	Repair battery short circuit of harness between ECM and fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC(H4SO)-11, Fuel Tank Pressure Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BL:DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-143, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

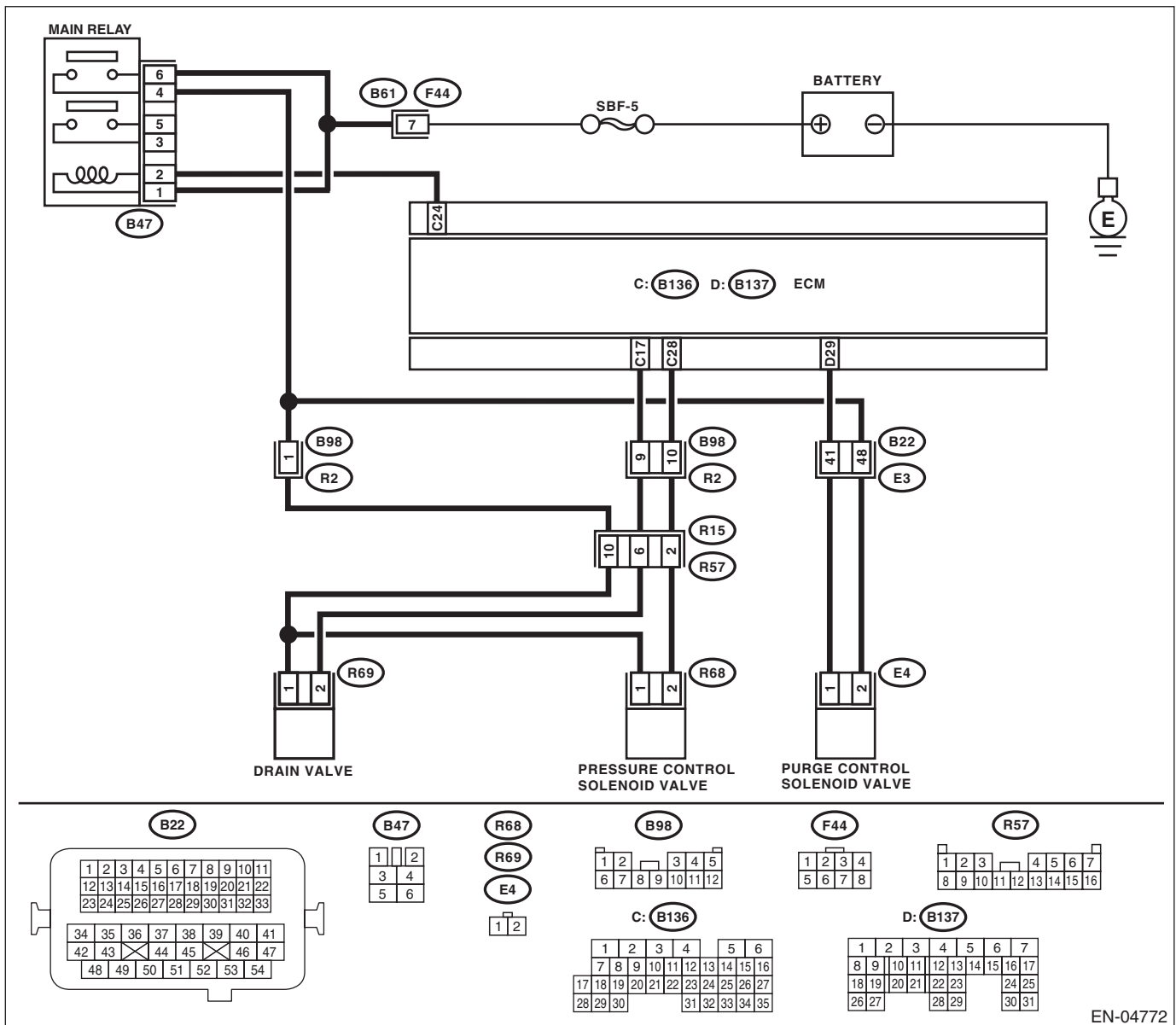
TROUBLE SYMPTOM:

- Fuel odor
- There is a hole of more than 0.5 mm (0.020 in) dia. in evaporation system or fuel tank.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04772

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK FUEL FILLER CAP. 1) Turn the ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step 3.	Securely install the fuel filler cap.
3	CHECK FUEL FILLER CAP.	Is the fuel filler cap SUBARU genuine?	Go to step 4.	Replace with a genuine fuel filler cap.
4	CHECK FUEL FILLER PIPE PACKING.	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4SO)-48, Fuel Filler Pipe.>	Go to step 5.
5	CHECK DRAIN VALVE. 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-45, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step 6.	Replace the drain valve. <Ref. to EC(H4SO)-17, Drain Valve.>
6	CHECK PURGE CONTROL SOLENOID VALVE. Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-45, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step 7.	Replace the purge control solenoid valve. <Ref. to EC(H4SO)-7, Purge Control Solenoid Valve.>
7	CHECK PRESSURE CONTROL SOLENOID VALVE. Operate the pressure control solenoid valve. NOTE: The pressure control solenoid valve operation can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-45, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step 8.	Replace the pressure control solenoid valve. <Ref. to EC(H4SO)-12, Pressure Control Solenoid Valve.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
8	CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE. Turn the ignition switch to OFF.	Is there a hole of more than 0.5 mm (0.020 in) dia. in evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H4SO)-59, Fuel Delivery, Return and Evaporation Lines.>	Go to step 9.
9	CHECK CANISTER.	Is the canister damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace the canister. <Ref. to EC(H4SO)-6, Canister.>	Go to step 10.
10	CHECK FUEL TANK. Remove the fuel tank. <Ref. to FU(H4SO)-45, Fuel Tank.>	Is the fuel tank damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace the fuel tank. <Ref. to FU(H4SO)-45, Fuel Tank.>	Go to step 11.
11	CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.	Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging, disconnections or bend of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Repair poor contact in ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BM:DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-119, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

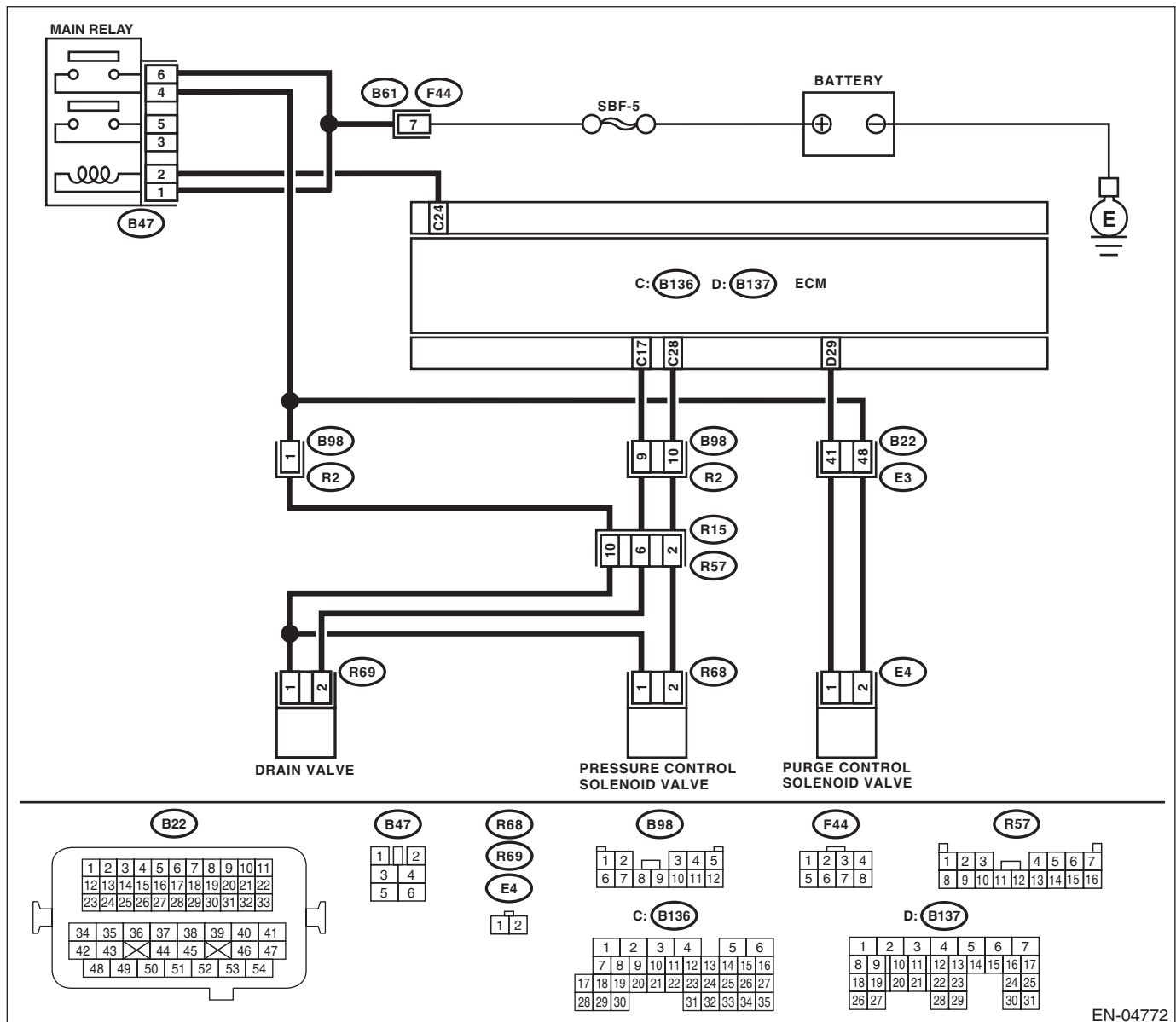
TROUBLE SYMPTOM:

- Fuel odor
- Fuel filler cap is loose or not installed.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04772

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK FUEL FILLER CAP. 1) Turn the ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step 3.	Securely install the fuel filler cap.
3	CHECK FUEL FILLER CAP.	Is the fuel filler cap SUBARU genuine?	Go to step 4.	Replace with a genuine fuel filler cap.
4	CHECK FUEL FILLER PIPE PACKING.	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4SO)-48, Fuel Filler Pipe.>	Go to step 5.
5	CHECK DRAIN VALVE. 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-45, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step 6.	Replace the drain valve. <Ref. to EC(H4SO)-17, Drain Valve.>
6	CHECK PURGE CONTROL SOLENOID VALVE. Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-45, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step 7.	Replace the purge control solenoid valve. <Ref. to EC(H4SO)-7, Purge Control Solenoid Valve.>
7	CHECK PRESSURE CONTROL SOLENOID VALVE. Operate the pressure control solenoid valve. NOTE: The pressure control solenoid valve operation can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-45, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step 8.	Replace the pressure control solenoid valve. <Ref. to EC(H4SO)-12, Pressure Control Solenoid Valve.>
8	CHECK CANISTER.	Is the canister damaged?	Repair or replace the canister. <Ref. to EC(H4SO)-6, Canister.>	Go to step 9.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
9	CHECK FUEL TANK. Remove the fuel tank. <Ref. to FU(H4SO)-45, Fuel Tank.>	Is the fuel tank damaged?	Repair or replace the fuel tank. <Ref. to FU(H4SO)-45, Fuel Tank.>	Go to step 10 .
10	CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.	Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging or disconnections of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Repair poor contact in ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BN:DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-144, DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

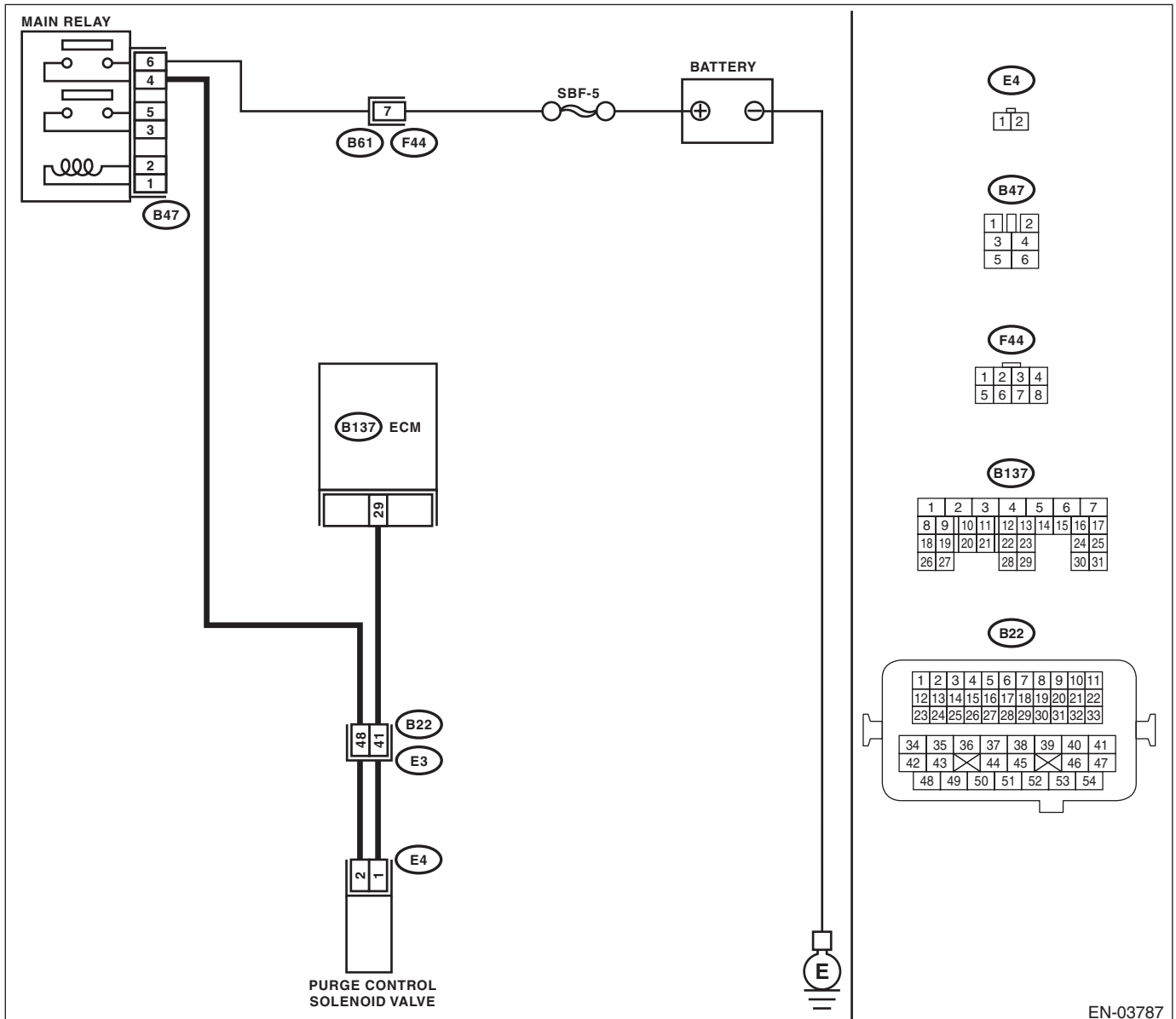
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B137) No. 29 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Repair poor contact in ECM connector.	Go to step 2.
2 CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from purge control solenoid valve and ECM. 3) Measure the resistance of harness between purge control solenoid valve connector and engine ground. <i>Connector & terminal</i> <i>(E4) No. 2 — Engine ground:</i>	Is the resistance 1 M Ω or more?	Go to step 3.	Repair the ground short circuit of harness between ECM and purge control solenoid valve connector.
3 CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR. Measure the resistance of harness between ECM and purge control solenoid valve. <i>Connector & terminal</i> <i>(B137) No. 29 — (E4) No. 1:</i>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit of harness between ECM and purge control solenoid valve connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and purge control solenoid valve connector • Poor contact in coupling connector
4 CHECK PURGE CONTROL SOLENOID VALVE. 1) Remove the purge control solenoid valve. 2) Measure the resistance between purge control solenoid valve terminals. <i>Terminals</i> <i>No. 1 — No. 2:</i>	Is the resistance between 10 and 100 Ω ?	Go to step 5.	Replace the purge control solenoid valve. <Ref. to EC(H4SO)-7, Purge Control Solenoid Valve.>
5 CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to ON. 2) Measure the voltage between purge control solenoid valve and engine ground. <i>Connector & terminal</i> <i>(E4) No. 2 (+) — Engine ground (-):</i>	Is the voltage 10 V or more?	Repair the poor contact of the purge control solenoid valve connector.	Repair the harness and connector. NOTE: In this case, repair the following items. • Open circuit of harness between main relay and purge control solenoid valve connector • Poor contact of the coupling connector • Poor contact of the main relay connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BO:DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-146, DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

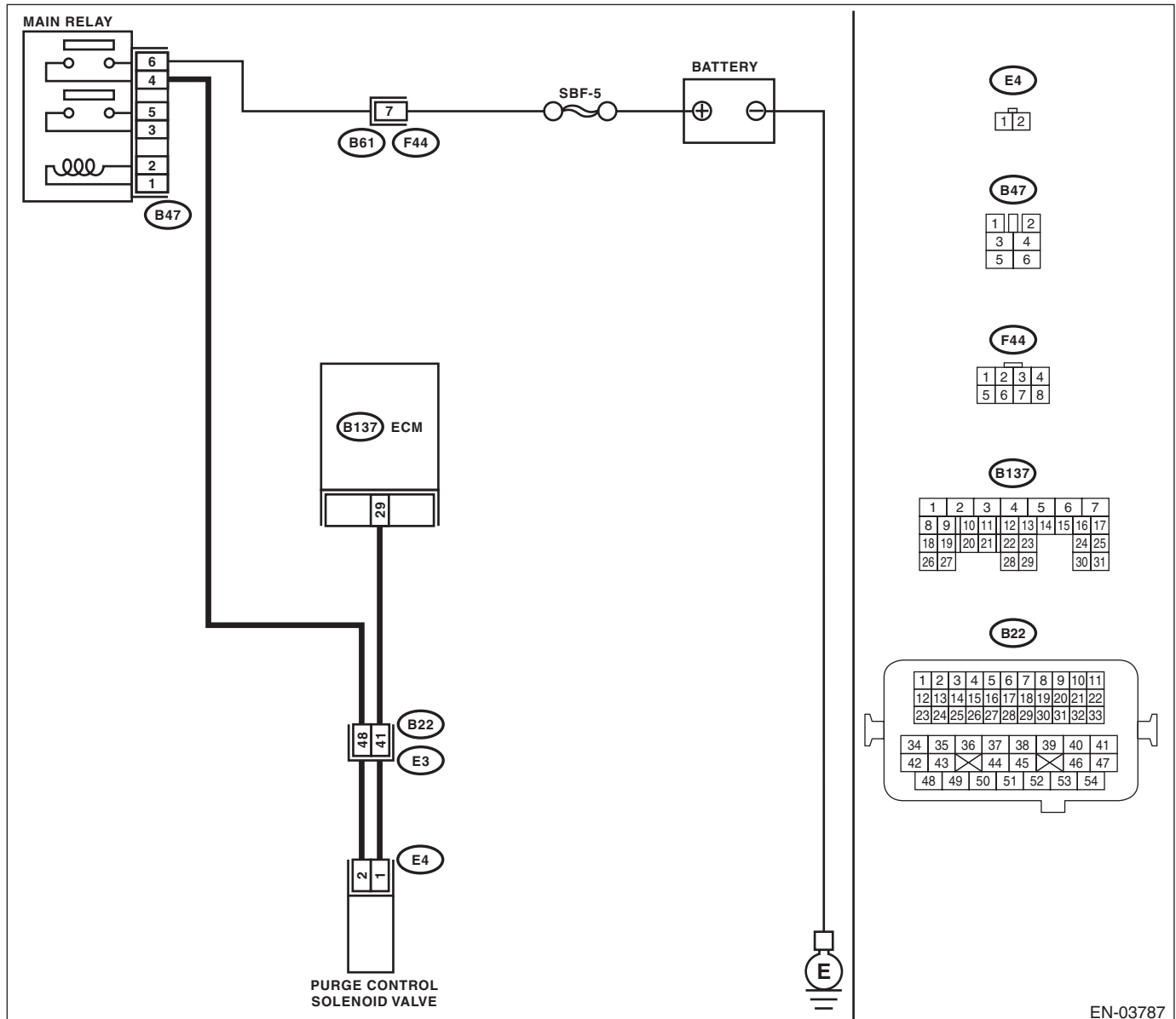
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL OF ECM. 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground while operating the purge control solenoid valve. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-45, Compulsory Valve Operation Check Mode.> Connector & terminal (B137) No. 29 (+) — Chassis ground (-):	Is the voltage 0 — 10 V?	Go to step 2.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector.
2 CHECK OUTPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 29 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 4.	Go to step 3.
3 CHECK POOR CONTACT. Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>
4 CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from purge control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 29 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the battery short circuit of harness between ECM and purge control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>	Go to step 5.
5 CHECK PURGE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Measure the resistance between purge control solenoid valve terminals. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω?	Replace the purge control solenoid valve <Ref. to EC(H4SO)-7, Purge Control Solenoid Valve.> and ECM <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>.	Go to step 6.
6 CHECK POOR CONTACT. Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BP:DTC P0461 FUEL LEVEL SENSOR "A" CIRCUIT RANGE/PERFORMANCE

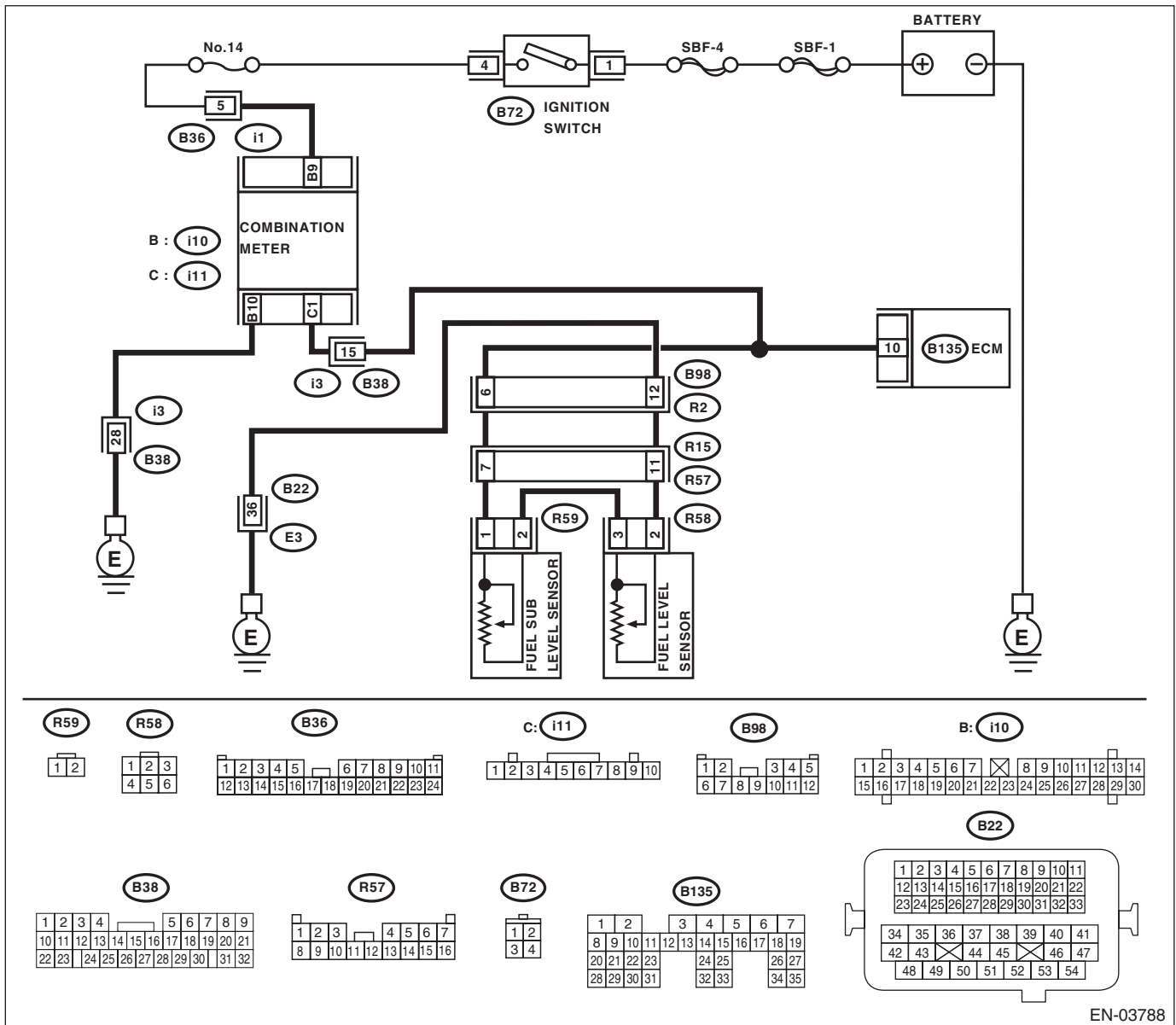
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-148, DTC P0461 FUEL LEVEL SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03788

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect this trouble.	Replace the fuel level sensor <Ref. to FU(H4SO)-54, Fuel Level Sensor.> and fuel sub level sensor. <Ref. to FU(H4SO)-55, Fuel Sub Level Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BQ:DTC P0462 FUEL LEVEL SENSOR "A" CIRCUIT LOW

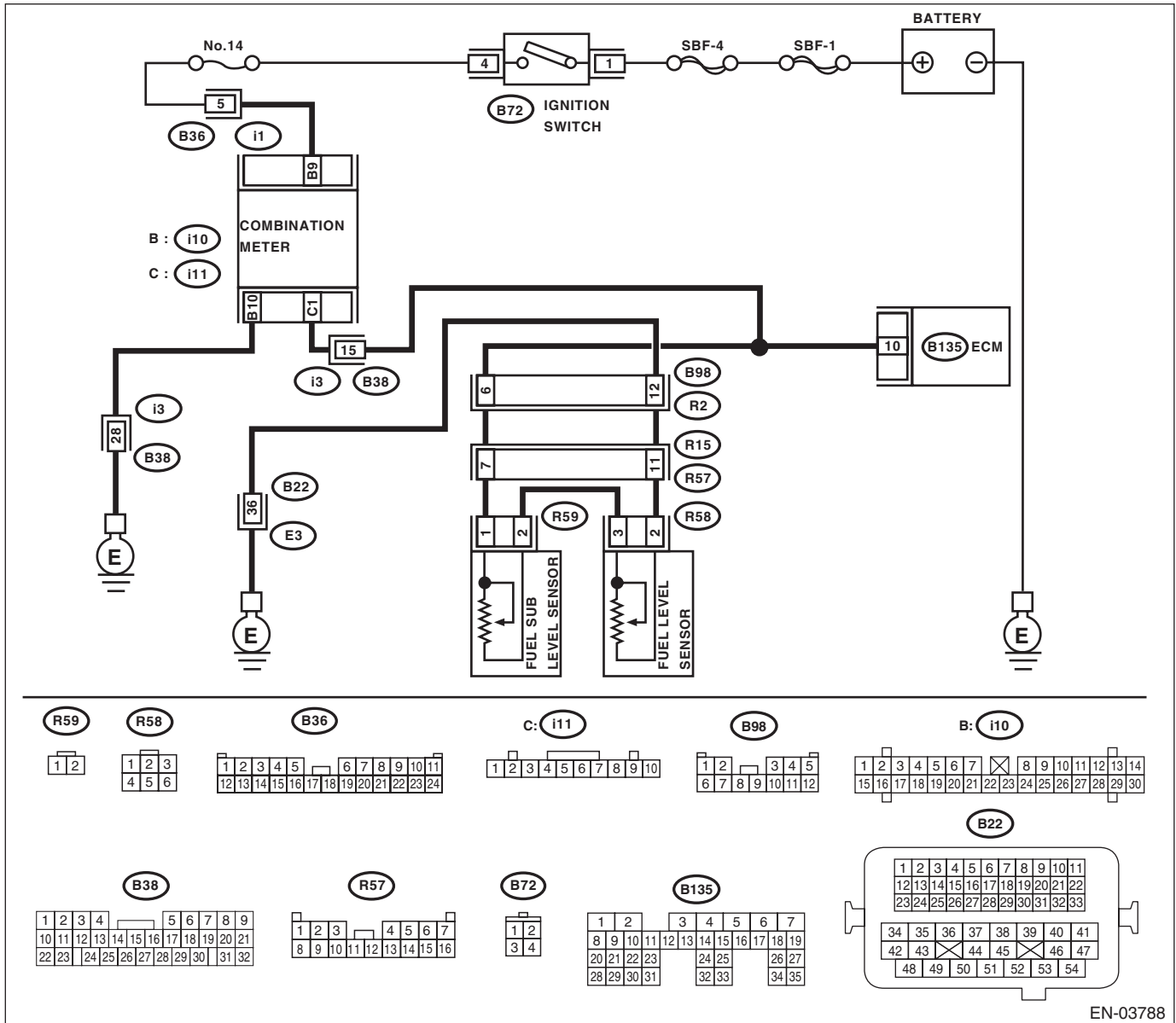
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-150, DTC P0462 FUEL LEVEL SENSOR "A" CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03788

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.	Does the speedometer and tachometer operate normally?	Go to step 2.	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>
2 CHECK INPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 10 (+) — Chassis ground (-):	Is the voltage less than 0.12 V?	Go to step 4.	Go to step 3.
3 CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR). Read the data of fuel level sensor signal using Subaru Select Monitor. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.>	Is the voltage less than 0.12 V by shaking the harness and connector of ECM?	Repair poor contact in ECM connector.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following item: • Poor contact in combination meter connector • Poor contact in ECM connector • Poor contact in coupling connector
4 CHECK INPUT VOLTAGE OF ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between ECM connector and chassis ground. Connector & terminal (B135) No. 10 (+) — Chassis ground (-):	Is the voltage 0.12 V or more?	Go to step 5.	Go to step 6.
5 CHECK HARNESS BETWEEN ECM AND COMBINATION METER. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from connector (i12) and ECM connector. 3) Measure the resistance between ECM and chassis ground. Connector & terminal (B135) No. 10 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 7.	Repair the ground short circuit of harness between ECM and combination meter connector.
6 CHECK HARNESS BETWEEN ECM AND COMBINATION METER. Measure the resistance between ECM and combination meter connector. Connector & terminal (B135) No. 10 — (i11) No. 1:	Is the resistance less than 10 Ω?	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>	Repair the open circuit between ECM and combination meter connector. NOTE: In this case, repair the following item: Poor contact in coupling connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK FUEL TANK CORD. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the fuel sub level sensor. 3) Measure the resistance between fuel sub level sensor and chassis ground. Connector & terminal (R59) No. 1 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 8.	Repair the ground short circuit of fuel tank cord.
8 CHECK FUEL TANK CORD. 1) Disconnect the connector from fuel pump assembly. 2) Measure the resistance between fuel pump assembly and chassis ground. Connector & terminal (R59) No. 2 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 9.	Repair the ground short circuit of fuel tank cord.
9 CHECK FUEL LEVEL SENSOR. 1) Remove the fuel pump assembly. <Ref. to FU(H4SO)-52, Fuel Pump.> 2) Measure the resistance between fuel level sensor and terminals with its float set to the full position. Terminals No. 3 — No. 2:	Is the resistance between 0.5 and 2.5 Ω ?	Go to step 10.	Replace the fuel level sensor.
10 CHECK FUEL SUB LEVEL SENSOR. 1) Remove the fuel sub level sensor. <Ref. to FU(H4SO)-55, Fuel Sub Level Sensor.> 2) Measure the resistance between fuel sub level sensor and terminals with its float set to the full position. Terminals No. 1 — No. 2:	Is the resistance between 0.5 and 2.5 Ω ?	Repair the poor contact in harness between ECM and combination meter connector.	Replace the fuel sub level sensor.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BR:DTC P0463 FUEL LEVEL SENSOR "A" CIRCUIT HIGH

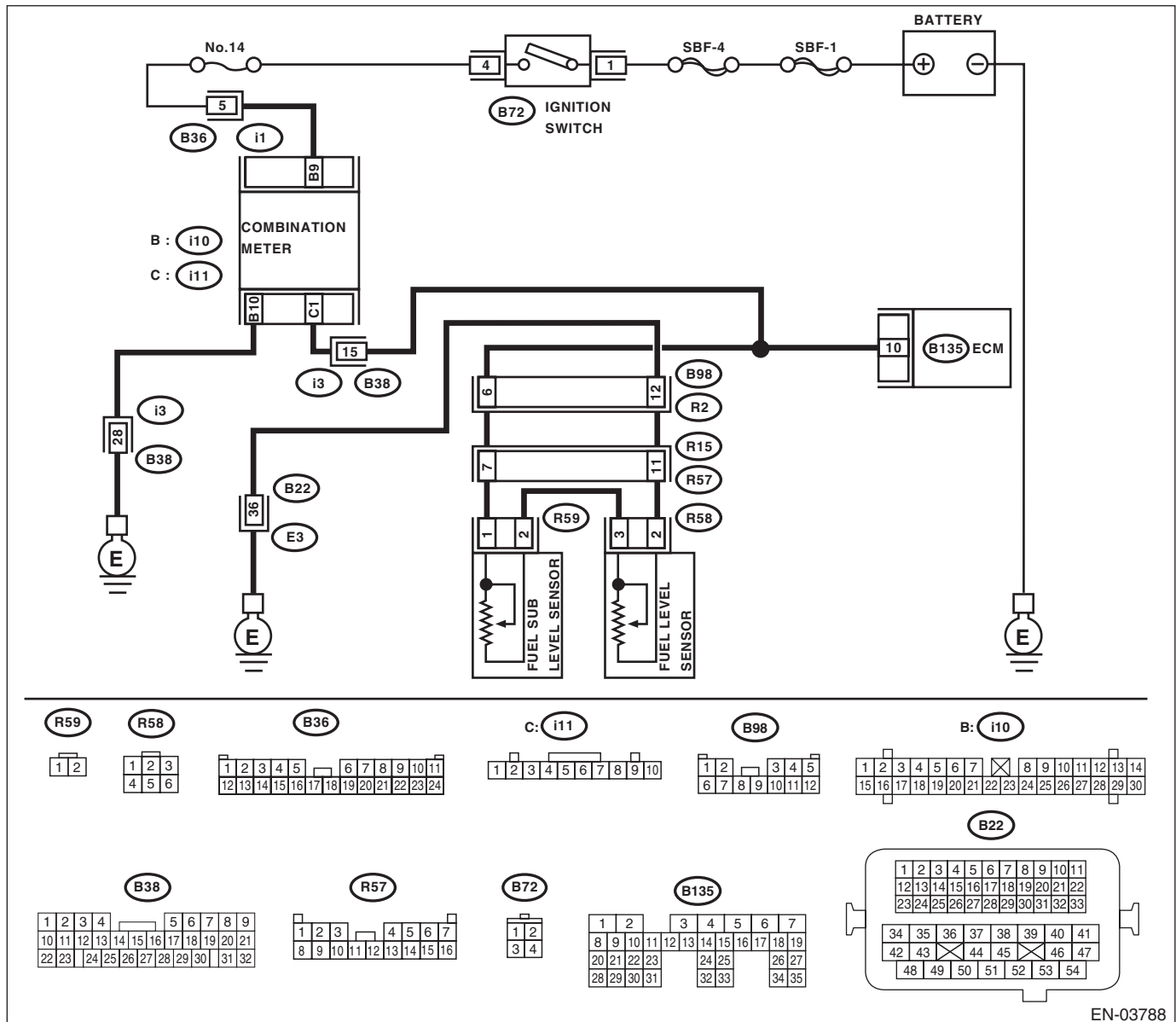
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-152, DTC P0463 FUEL LEVEL SENSOR "A" CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03788

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.	Does the speedometer and tachometer operate normally?	Go to step 2.	Repair or replace the combination meter. <Ref. to IDI-3, Combination Meter System.>
2 CHECK INPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 10 (+) — Chassis ground (-):	Is the voltage 4.75 V or more?	Go to step 3.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following item: • Poor contact in fuel pump connector • Poor contact in coupling connector
3 CHECK INPUT VOLTAGE OF ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the combination meter connector (i12) and ECM connector. 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between ECM and chassis ground. Connector & terminal (B135) No. 10 (+) — Chassis ground (-):	Is the voltage 4.75 V or more?	Go to step 4.	Repair the battery short circuit between ECM and combination meter connector.
4 CHECK HARNESS BETWEEN ECM AND FUEL TANK CORD. 1) Turn the ignition switch to OFF. 2) Disconnect the fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Measure the resistance between ECM and fuel tank cord. Connector & terminal (B135) No. 10 — (R15) No. 7:	Is the resistance less than 5 Ω ?	Go to step 5.	Repair the open circuit between ECM and fuel tank cord.
5 CHECK HARNESS BETWEEN FUEL TANK CORD AND CHASSIS GROUND. Measure the resistance between fuel tank cord and chassis ground. Connector & terminal (R15) No. 11 — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 6.	Repair the open circuit between fuel tank cord and chassis ground. NOTE: In this case, repair the following item: Poor contact in coupling connector
6 CHECK FUEL TANK CORD. 1) Disconnect the connector from the fuel level sensor. 2) Measure the resistance between fuel level sensor and coupling connector. Connector & terminal (R57) No. 11 — (R58) No. 2:	Is the resistance less than 10 Ω ?	Go to step 7.	Repair the open circuit between coupling connector and fuel level sensor.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK FUEL TANK CORD. 1) Disconnect the connector from the fuel sub level sensor. 2) Measure the resistance between fuel level sensor and fuel sub level sensor. <i>Connector & terminal</i> <i>(R58) No. 3 — (R59) No. 2:</i>	Is the resistance less than 10 Ω ?	Go to step 8 .	Repair the open circuit between fuel level sensor and fuel sub level sensor.
8 CHECK FUEL TANK CORD. Measure the resistance between fuel level sensor and coupling connector. <i>Connector & terminal</i> <i>(R57) No. 7 — (R59) No. 1:</i>	Is the resistance less than 10 Ω ?	Go to step 9 .	Repair the open circuit between coupling connector and fuel level sensor.
9 CHECK FUEL LEVEL SENSOR. 1) Remove the fuel pump assembly. <Ref. to FU(H4SO)-52, Fuel Pump.> 2) While moving the fuel level sensor float up and down, measure resistance between fuel level sensor terminals. <i>Terminals</i> <i>No. 3 — No. 2:</i>	Is the resistance 54.5 Ω or more?	Replace the fuel level sensor. <Ref. to FU(H4SO)-54, Fuel Level Sensor.>	Go to step 10 .
10 CHECK FUEL SUB LEVEL SENSOR. 1) Remove the fuel sub level sensor. <Ref. to FU(H4SO)-55, Fuel Sub Level Sensor.> 2) While moving the fuel sub level sensor float up and down, measure resistance between fuel sub level sensor terminals. <i>Terminals</i> <i>No. 1 — No. 2:</i>	Is the resistance 41.5 Ω or more?	Replace the fuel sub level sensor. <Ref. to FU(H4SO)-55, Fuel Sub Level Sensor.>	Replace the combination meter. <Ref. to IDI-10, Combination Meter.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BS:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT

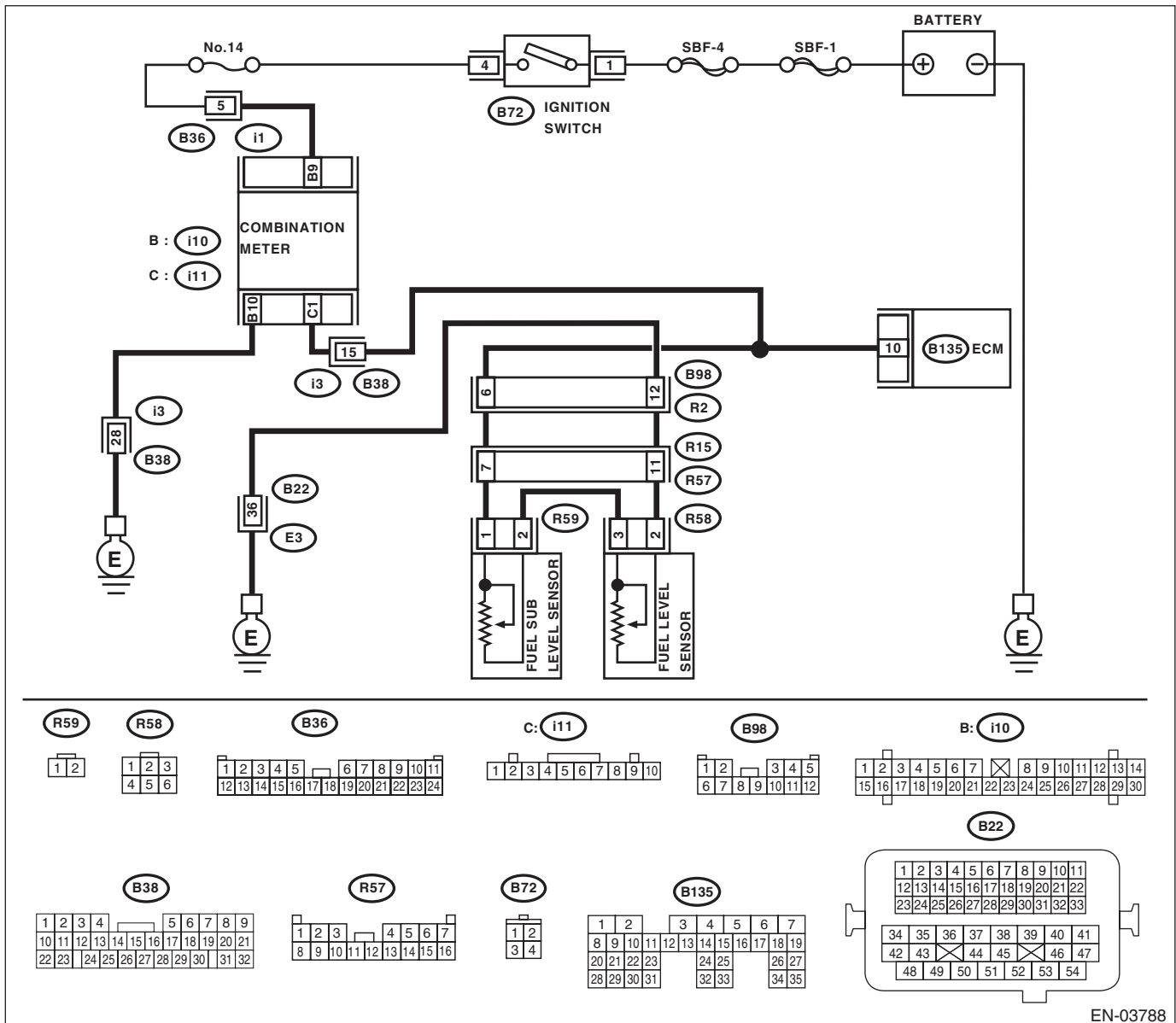
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-154, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03788

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK FUEL LEVEL SENSOR. 1) Remove the fuel pump assembly. <Ref. to FU(H4SO)-52, Fuel Pump.> 2) While moving the fuel level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. <i>Terminals</i> No. 3 — No. 2:	Does the resistance change smoothly?	Go to step 3.	Replace the fuel level sensor. <Ref. to FU(H4SO)-54, Fuel Level Sensor.>
3 CHECK FUEL SUB LEVEL SENSOR. 1) Remove the fuel sub level sensor. <Ref. to FU(H4SO)-55, Fuel Sub Level Sensor.> 2) While moving the fuel sub level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. <i>Terminals</i> No. 1 — No. 2:	Does the resistance change smoothly?	Repair poor contact in ECM, combination meter and coupling connectors.	Replace the fuel sub level sensor. <Ref. to FU(H4SO)-55, Fuel Sub Level Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BT:DTC P0483 FAN RATIONALITY CHECK

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-157, DTC P0483 FAN RATIONALITY CHECK, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Occurrence of noise
- Overheating

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

NOTE:

If the vehicle, with the engine idling, is placed very close to a wall or another vehicle, preventing normal cooling function, the OBD system may detect malfunction.

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).>	Check the radiator fan and fan motor. <Ref. to CO(H4SO)-34, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4SO)-41, Radiator Sub Fan and Fan Motor.>

BU:DTC P0502 VEHICLE SPEED SENSOR "A" CIRCUIT LOW INPUT

NOTE:

For the diagnostic procedure, refer to DTC P0503. <Ref. to EN(H4SO)(diag)-235, DTC P0503 VEHICLE SPEED SENSOR "A" INTERMITTENT/ERRATIC/HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BV:DTC P0503 VEHICLE SPEED SENSOR "A" INTERMITTENT/ERRATIC/HIGH

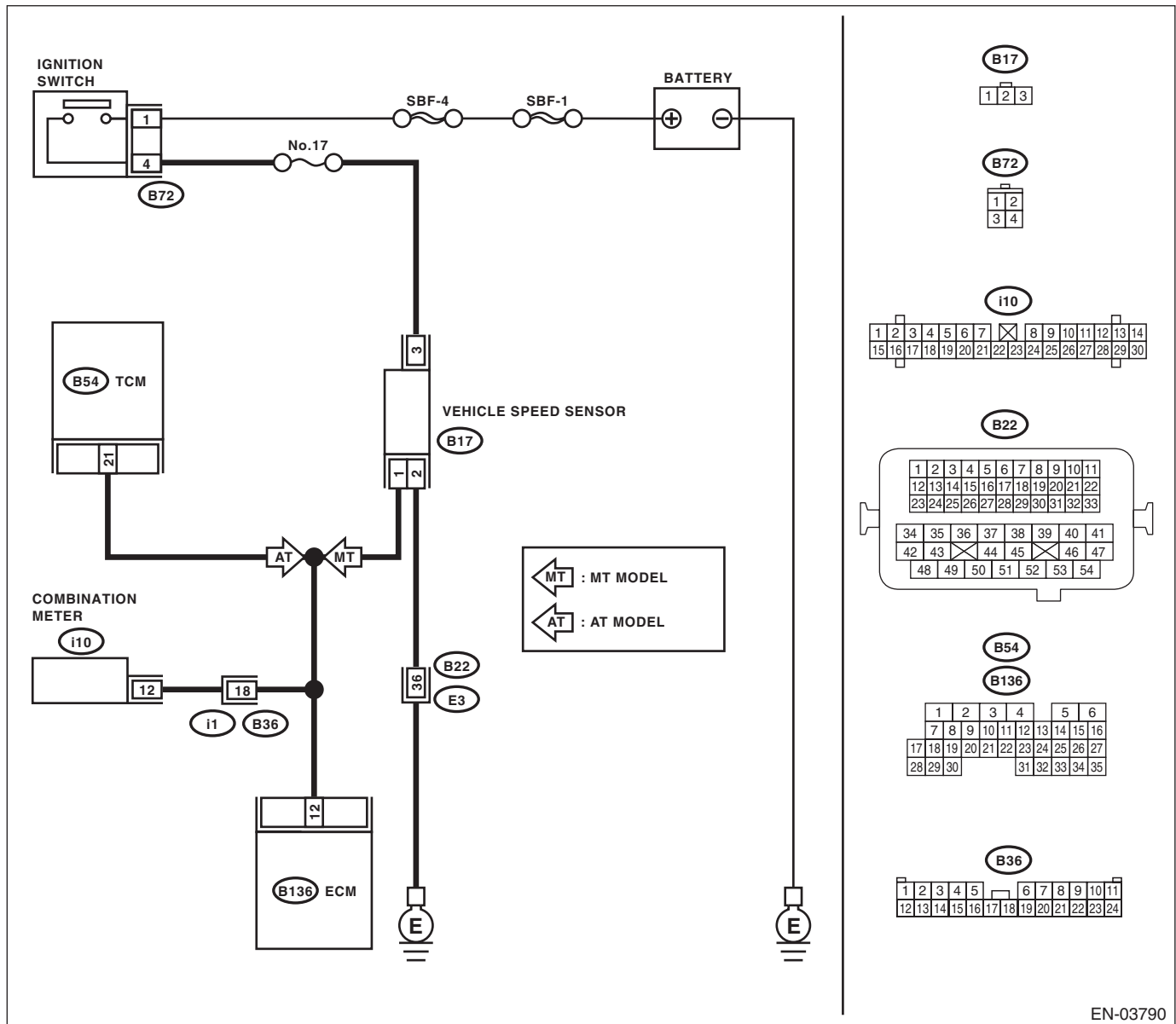
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-158, DTC P0502 VEHICLE SPEED SENSOR "A" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H4SO)-159, DTC P0503 VEHICLE SPEED SENSOR "A" INTERMITTENT/ERRATIC/HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03790

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No	
1	CHECK TRANSMISSION TYPE.	Is the transmission type AT?	Go to step 2.	Go to step 3.
2	CHECK DTC P0720 ON DISPLAY.	Does the Subaru Select Monitor or general scan tool indicate DTC P0720?	Check the front vehicle speed sensor signal circuit. <Ref. to 4AT(D)(diag)-49, DTC P0720 OUTPUT SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Go to step 3.
3	CHECK SPEEDOMETER OPERATION IN COMBINATION METER.	Does the speedometer operate normally?	Go to step 4.	Check the speedometer and vehicle speed sensor. <Ref. to IDI-12, Speedometer.> <Ref. to 4AT-51, Front Vehicle Speed Sensor.> <Ref. to 4AT-54, Rear Vehicle Speed Sensor.> <Ref. to 4AT-55, Torque Converter Turbine Speed Sensor.>
4	CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the combination meter. 3) Measure resistance between ECM and combination meter. Connector & terminal (B136) No. 12 — (i10) No. 12:	Is the resistance less than 10 Ω?	Repair poor contact in ECM connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and combination meter connector • Poor contact in ECM connector • Poor contact in combination meter connector • Poor contact in coupling connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BW:DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-160, DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

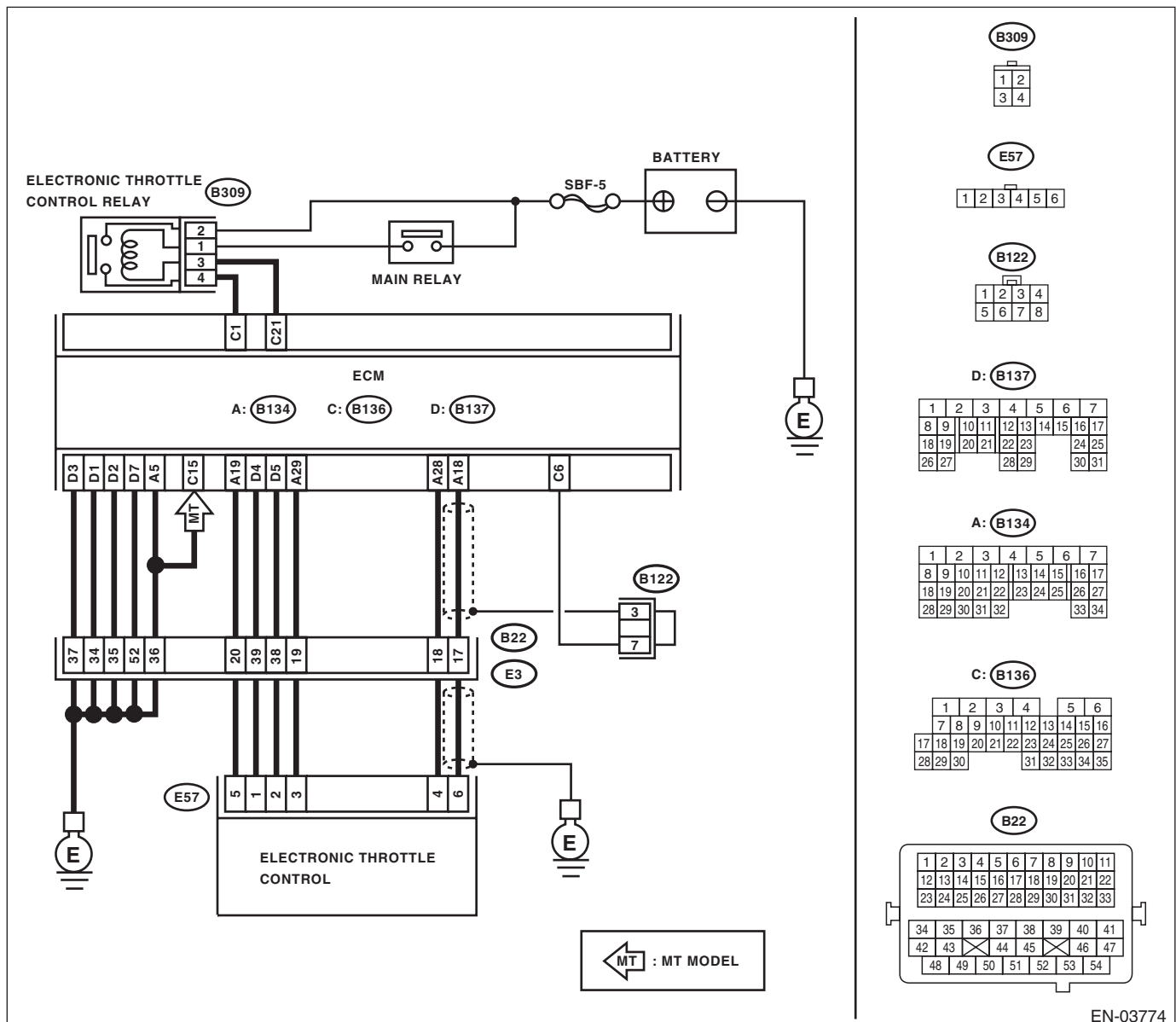
TROUBLE SYMPTOM:

- Engine is difficult to start.
- Engine does not start.
- Erroneous idling
- Engine stalls.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



B309

1	2
3	4

E57

1	2	3	4	5	6	7
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B122

1	2	3	4
5	6	7	8

D: B137

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32	33	34	35

A: B134

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32	33	34	35

C: B136

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

B22

1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33
34	35	36	37	38	39	40	41	42	43	44
45	46	47	48	49	50	51	52	53	54	55

EN-03774

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0506.	Go to step 2.
2	CHECK AIR CLEANER ELEMENT. 1) Turn the ignition switch to OFF. 2) Check the air cleaner element.	Is there excessive clogging on air cleaner element?	Replace the air cleaner element. <Ref. to IN (H4SO)-4, Air Cleaner Element.>	Go to step 3.
3	CHECK ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control. 3) Check the electronic throttle control.	Are foreign matter found inside electronic throttle control?	Remove foreign matter from electronic throttle control.	Perform the diagnosis of DTC P2101.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BX:DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-162, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

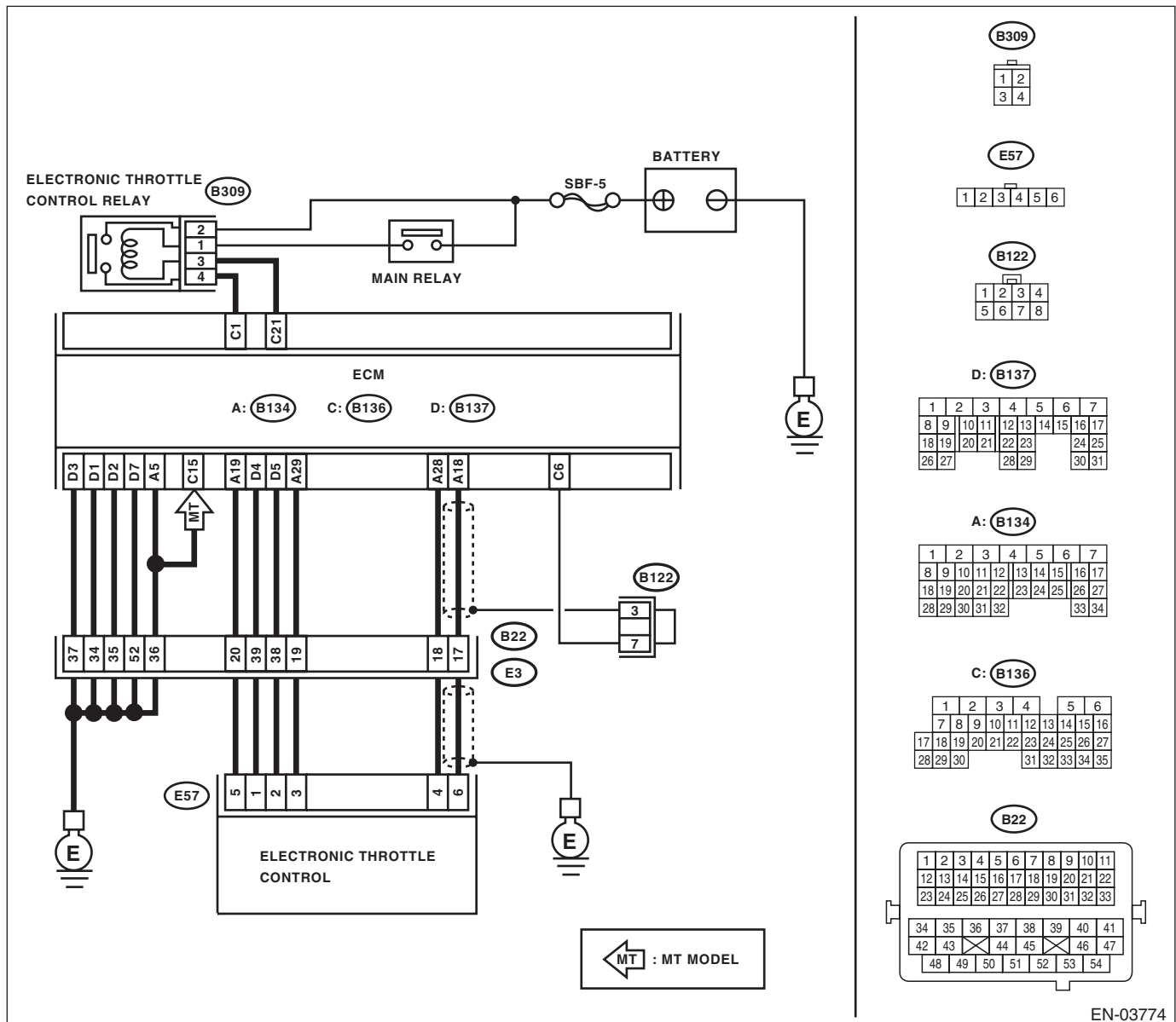
TROUBLE SYMPTOM:

Engine keeps running at higher speed than specified idle speed.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03774

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0507.	Go to step 2.
2 CHECK AIR INTAKE SYSTEM. 1) Turn the ignition switch to ON. 2) Start and idle the engine. 3) Check the following items. <ul style="list-style-type: none"> • Loose installation of intake manifold and throttle body • Cracks of intake manifold gasket and throttle body gasket • Disconnection of vacuum hoses 	Is there any fault in air intake system?	Repair air suction and leaks.	Go to step 3.
3 CHECK ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control. 3) Check the electronic throttle control.	Are foreign matter found inside electronic throttle control?	Remove foreign matter from electronic throttle control.	Perform the diagnosis of DTC P2101.

BY:DTC P0512 STARTER REQUEST CIRCUIT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-164, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Failure of engine to start

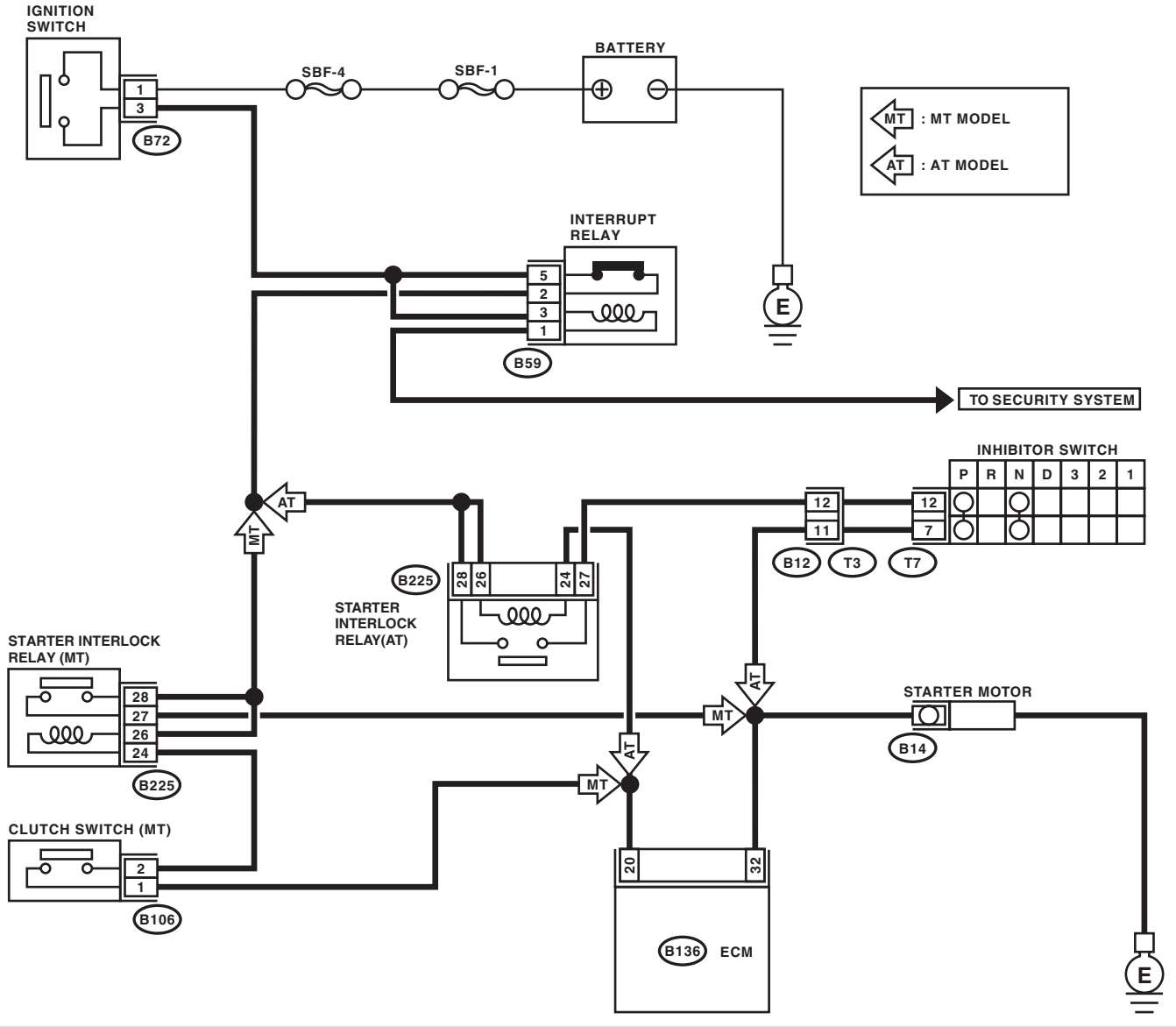
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



B106

1	2
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B225

1	2												
3	4	9	14	15	16	19	24	25	26	29	34	35	36
5	6	10	17	20	27	30				37			
7	8	11	12	13	18	21	22	23	28	31	32	33	38

B72

1	2
3	4

B59

1	2	3
4	5	6

B12

1	2	3	4
5	6	7	8
9	10	11	12

B136

1	2	3	4	5	6					
7	8	9	10	11	12	13	14	15	16	
17	18	19	20	21	22	23	24	25	26	27
28	29	30								
				31	32	33	34	35		

T7

1	2	3	4	5	6
7	8	9	10	11	12

EN-04767

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK OPERATION OF STARTER MOTOR. Turn the ignition switch to ON. NOTE: Place the inhibitor switch in each position. (AT model) Depress or release the clutch pedal. (MT model)	Does the starter motor operate?	Repair the battery short circuit in starter motor circuit.	Check the starter motor circuit. <Ref. to EN(H4SO)(diag)-54, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BZ:DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-165, DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

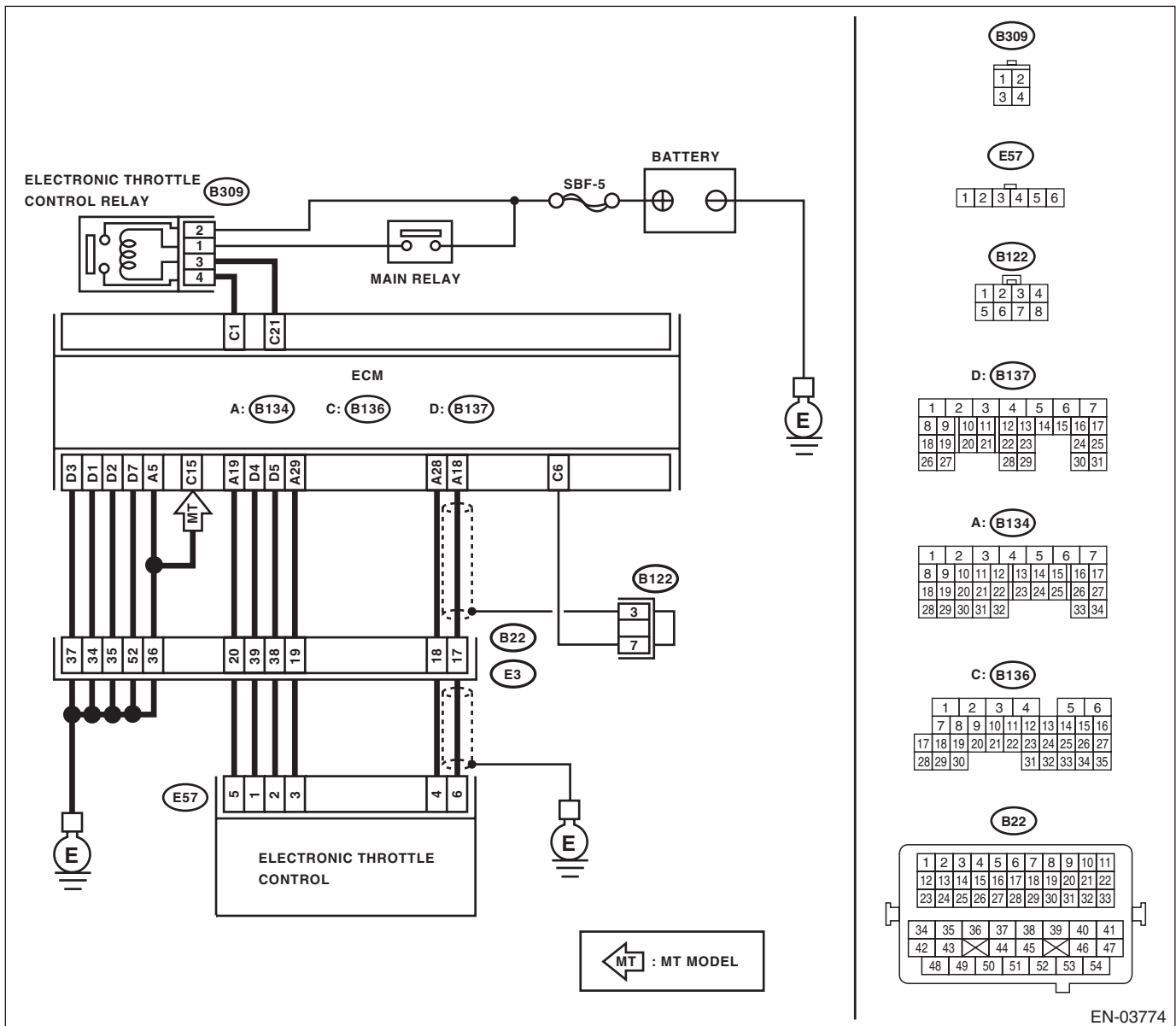
TROUBLE SYMPTOM:

Engine keeps running at higher speed than specified idle speed.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0519.	Go to step 2.
2	CHECK AIR INTAKE SYSTEM. 1) Turn the ignition switch to ON. 2) Start and idle the engine. 3) Check the following items. <ul style="list-style-type: none">• Loose installation of intake manifold and throttle body• Cracks of intake manifold gasket and throttle body gasket• Disconnection of vacuum hoses	Is there any fault in air intake system?	Repair air suction and leaks.	Go to step 3.
3	CHECK ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control. 3) Check the electronic throttle control.	Are foreign matter found inside electronic throttle control?	Remove foreign matter from electronic throttle control.	Perform the diagnosis of DTC P2101.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CA:DTC P0600 SERIAL COMMUNICATION LINK

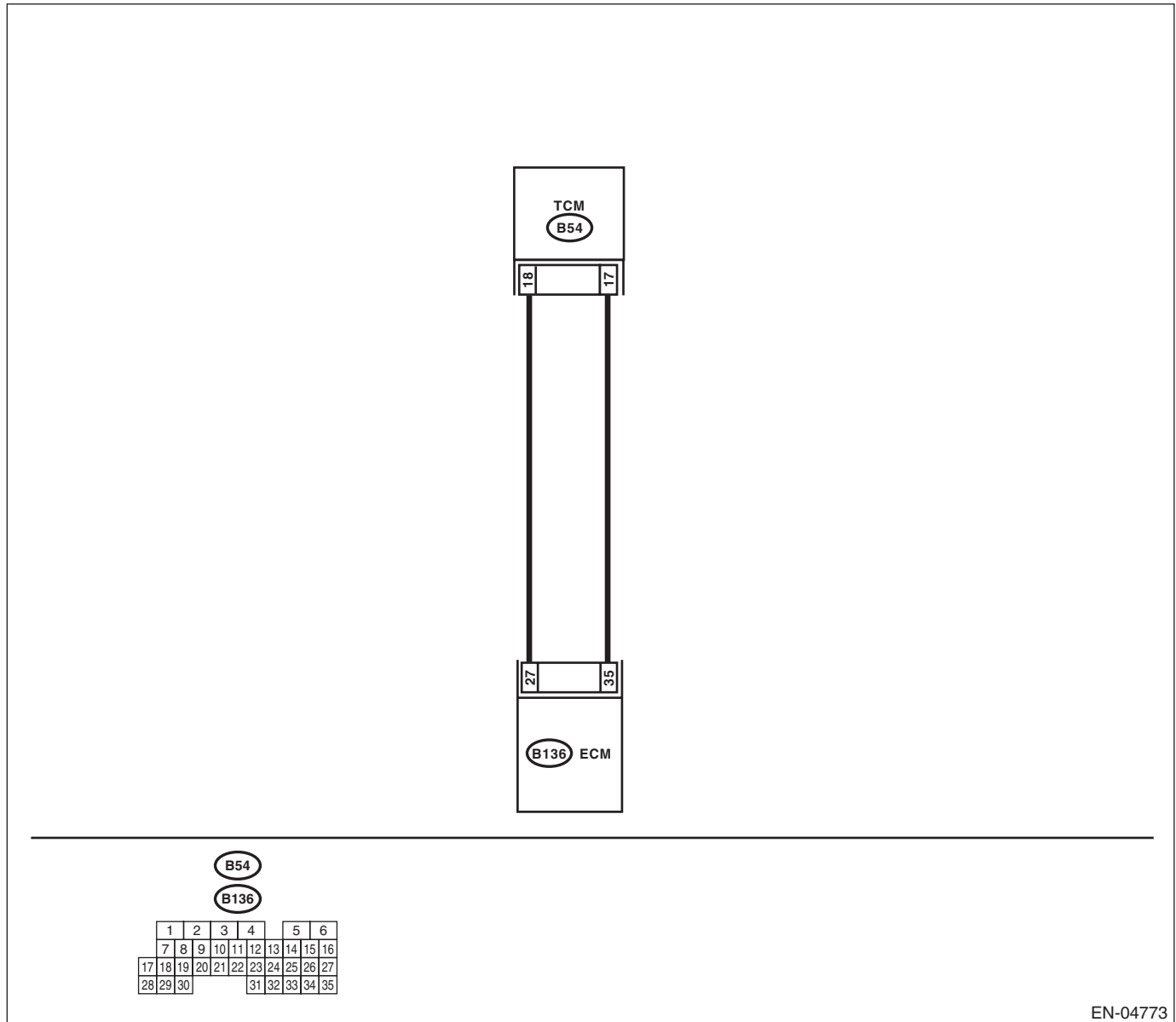
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-166, DTC P0600 SERIAL COMMUNICATION LINK, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04773

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK HARNESS BETWEEN ECM AND TCM.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connector from TCM. 4) Measure the resistance between the ECM and TCM connectors.</p> <p>Connector & terminal (B136) No. 27 — (B54) No. 18: (B136) No. 35 — (B54) No. 17:</p>	Is the resistance less than 1 Ω?	Go to step 2.	Repair the harness or connector.
2	<p>CHECK HARNESS BETWEEN ECM AND TCM.</p> <p>Measure the resistance between ECM connector and chassis ground.</p> <p>Connector & terminal (B136) No. 27 — Chassis ground: (B136) No. 35 — Chassis ground:</p>	Is the resistance 1 MΩ or more?	Go to step 3.	Repair the harness or connector.
3	<p>CHECK HARNESS BETWEEN ECM AND TCM.</p> <p>Check the resistance between ECM connectors.</p> <p>Connector & terminal (B136) No. 27 — (B136) No. 35:</p>	Is the resistance 1 MΩ or more?	Go to step 4.	Repair the harness or connector.
4	<p>CHECK THE STATUS OF THE AT SYSTEM.</p> <p>Diagnose the AT using the Subaru Select Monitor. Check that trouble code 86 is displayed.</p>	Is trouble code 86 displayed?	Check the AT system.	Replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CB:DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-167, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

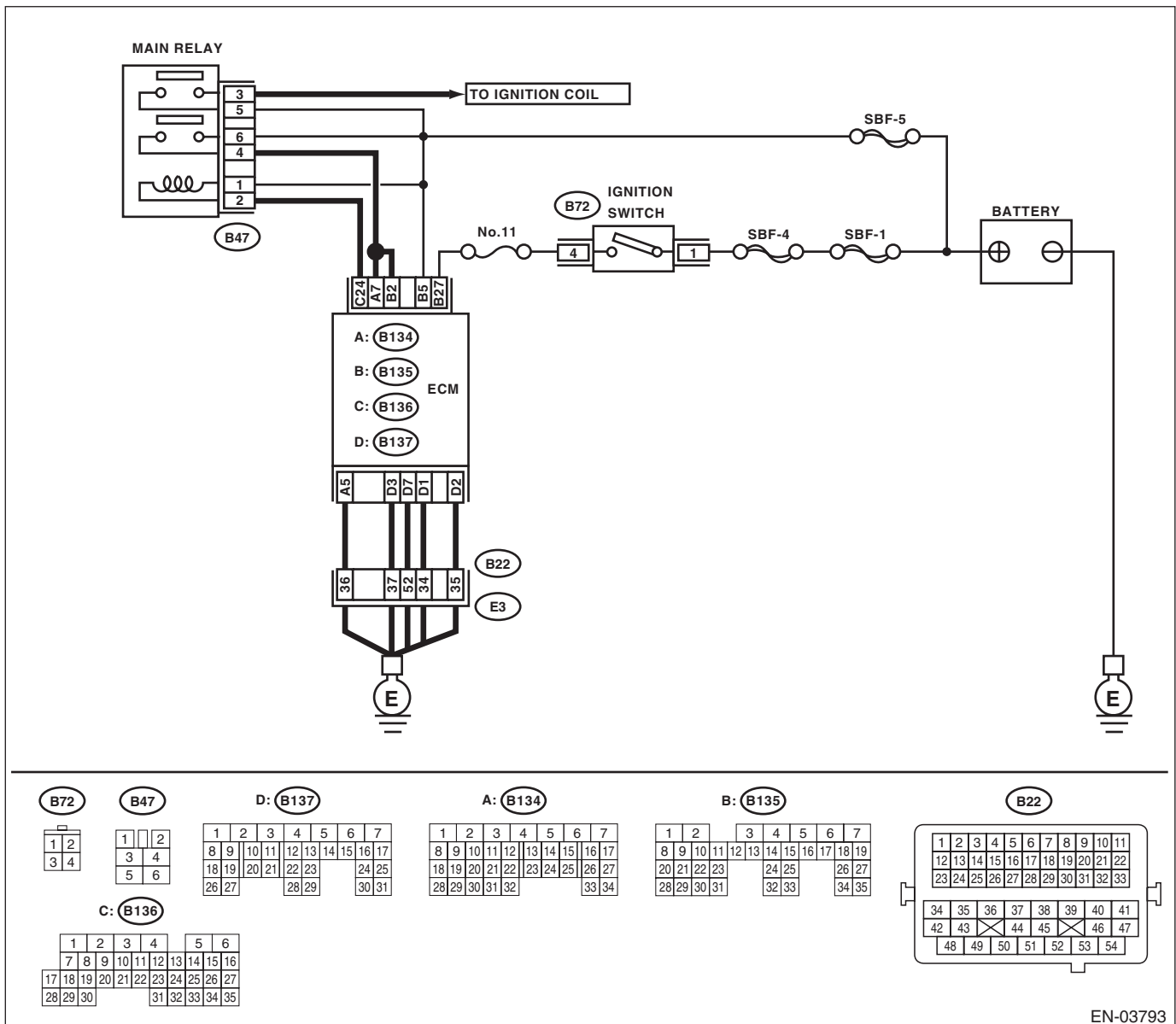
TROUBLE SYMPTOM:

- Engine does not start.
- Engine stalls.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03793

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

CC:DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR

NOTE:

For the diagnostic procedure, refer to DTC P0607. <Ref. to EN(H4SO)(diag)-250, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CD:DTC P0607 CONTROL MODULE PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-169, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.> and <Ref. to GD(H4SO)-170, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

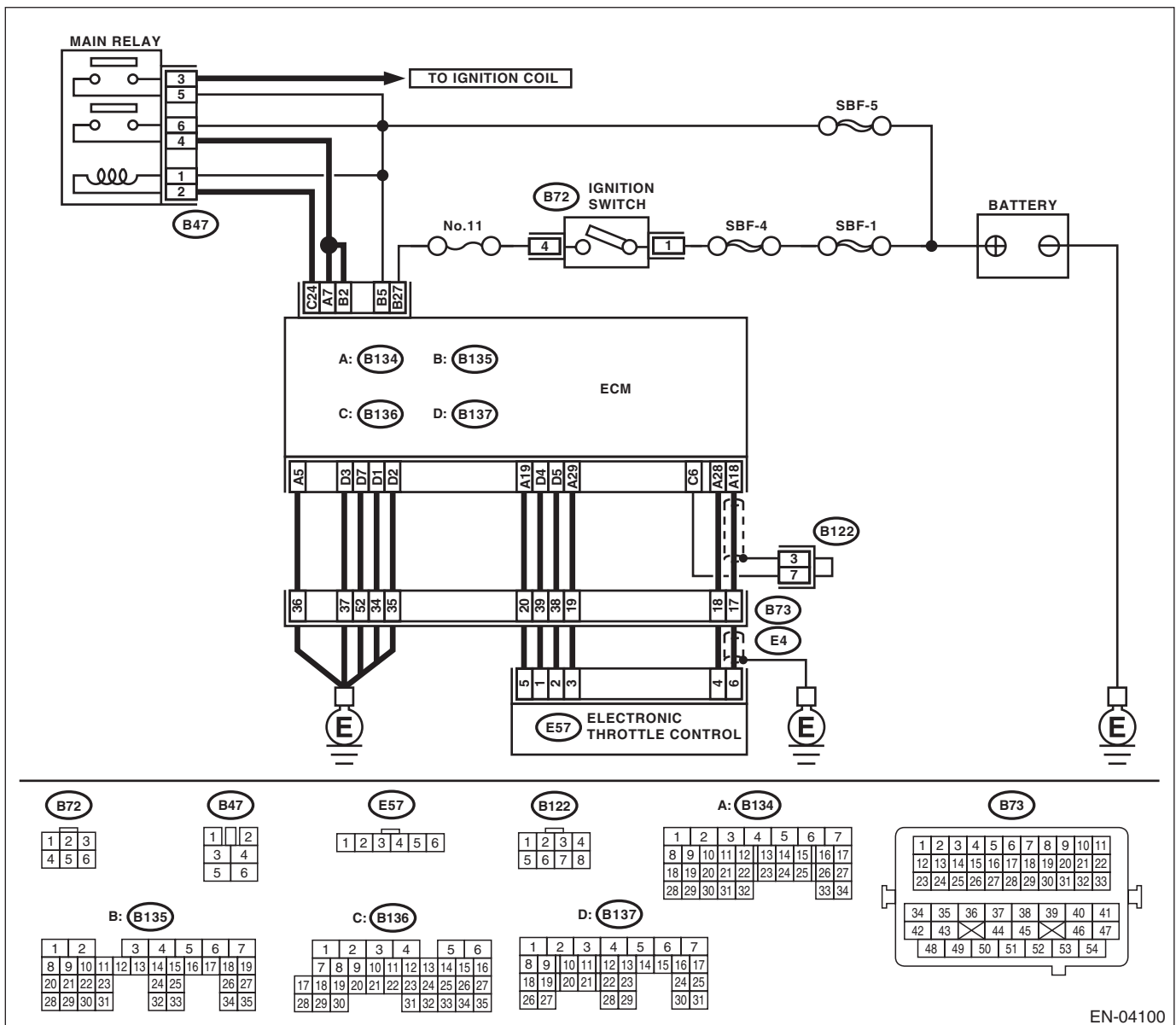
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04100

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK INPUT VOLTAGE OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 7 (+) — Chassis ground (-): (B135) No. 2 (+) — Chassis ground (-):	Is the voltage 10 — 13 V?	Go to step 2.	Repair the open or ground short circuit of power supply circuit.
2	CHECK INPUT VOLTAGE OF ECM. 1) Start the engine. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 7 (+) — Chassis ground (-): (B135) No. 2 (+) — Chassis ground (-):	Is the voltage 13 — 15 V?	Go to step 3.	Repair the open or ground short circuit of power supply circuit.
3	CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and electronic throttle control. 3) Measure the resistance of harness between ECM and electronic throttle control connector. Connector & terminal (E57) No. 5 — (B134) No. 19: (E57) No. 3 — (B134) No. 29:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit of harness between ECM and electronic throttle control connector.
4	CHECK ECM GROUND HARNESS. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B134) No. 5 (+) — Chassis ground (-): (B137) No. 7 (+) — Chassis ground (-): (B137) No. 1 (+) — Chassis ground (-): (B137) No. 2 (+) — Chassis ground (-): (B137) No. 3 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>	Repair the following item. <ul style="list-style-type: none"> • Further tighten the engine ground terminal. • Poor contact in ECM connector • Poor contact in coupling connector

CE:DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1)

NOTE:

For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4SO)(diag)-311, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CF:DTC P0691 FAN 1 CONTROL CIRCUIT LOW

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-175, DTC P0691 FAN 1 CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Radiator fan does not operate properly.
- Overheating

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is DTC P0691 displayed?	Check the radiator fan system. <Ref. to CO(H4SO)-12, Radiator Fan System.>	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CG:DTC P0692 FAN 1 CONTROL CIRCUIT HIGH

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-176, DTC P0692 FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Radiator fan does not operate properly.
- Overheating

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is DTC P0692 displayed?	Check the radiator fan system. <Ref. to CO(H4SO)-12, Radiator Fan System.>	Temporary poor contact occurs.

CH:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

GENERAL DESCRIPTION <Ref. to GD(H4SO)-177, DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST), Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:

For the diagnostic procedure, refer to AT section. <Ref. to 4AT(D)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CI: DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-178, DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

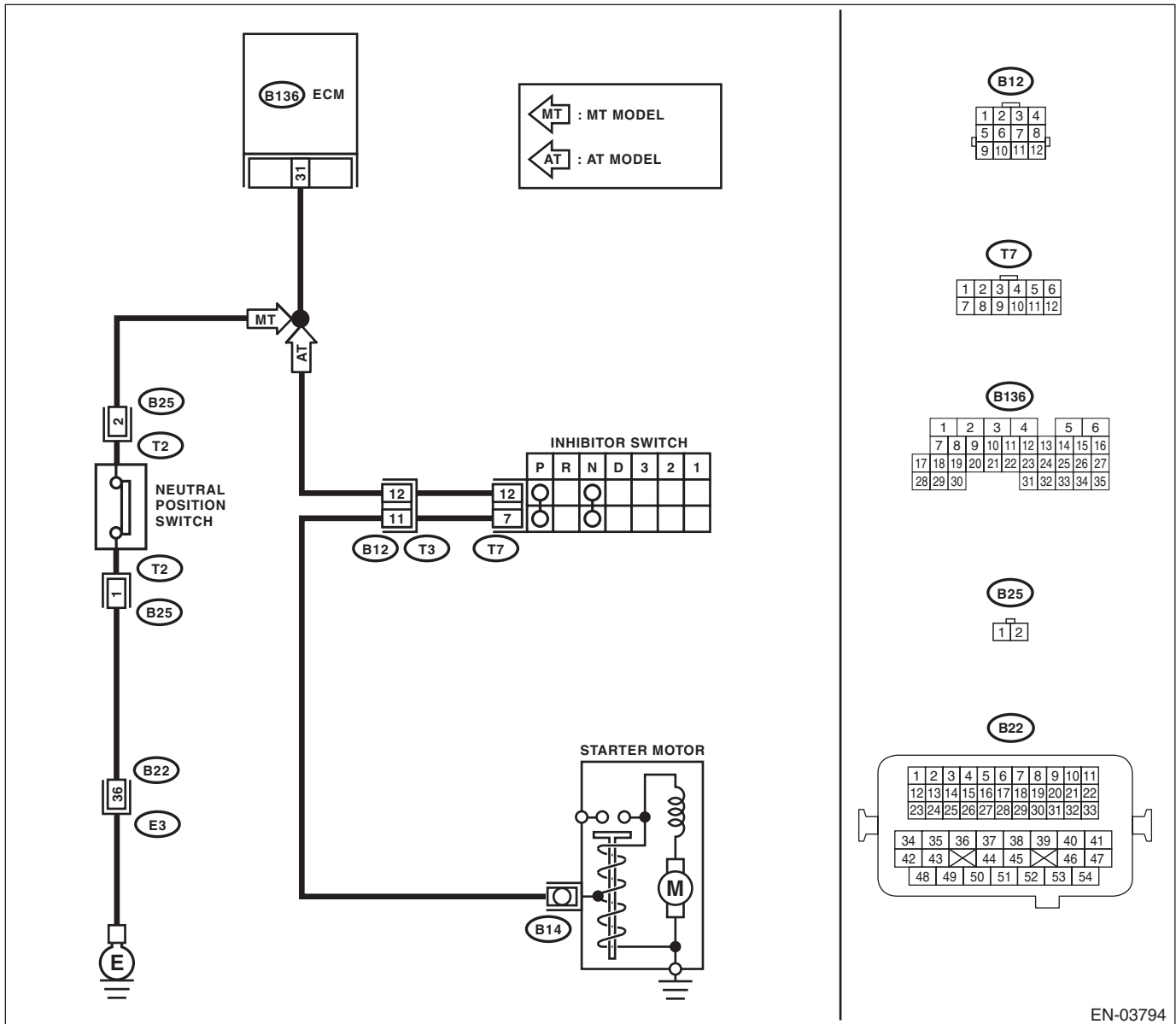
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03794

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK SELECT CABLE.	Is there any fault in the select cable?	Repair or adjust the selector cable connection. <Ref. to CS-25, Select Cable.>	Go to step 2.
2	CHECK INPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Place the select lever other than "N" and "P" range. 3) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 31 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair poor contact in ECM connector.	Go to step 3.
3	CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and transmission harness connector (T3). 3) Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B136) No. 31 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 4.	Repair the ground short circuit of harness between ECM and transmission harness connector.
4	CHECK TRANSMISSION HARNESS CONNECTOR. 1) Disconnect the connector from inhibitor switch. 2) Measure the resistance of harness between transmission harness connector and engine ground. Connector & terminal (T3) No. 12 — Engine ground:	Is the resistance 1 MΩ or more?	Replace the inhibitor switch. <Ref. to 4AT-47, Inhibitor Switch.>	Repair the ground short circuit of harness between transmission harness connector and inhibitor switch connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CJ:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-179, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

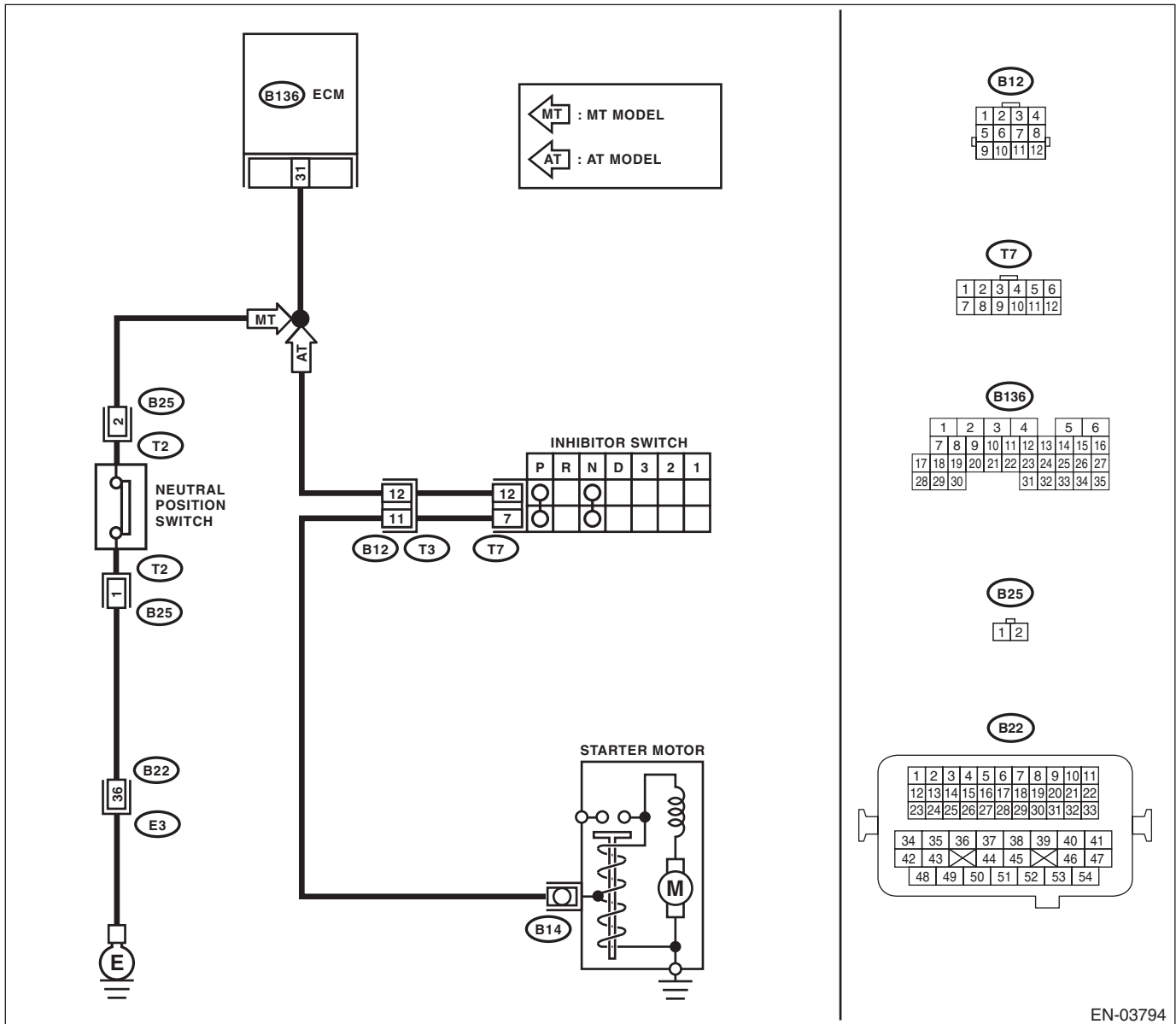
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03794

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK INPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Place the shift lever in neutral. 3) Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B136) No. 31 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 2.	Go to step 3.
2	CHECK INPUT SIGNAL OF ECM. 1) Place the shift lever in a position other than neutral. 2) Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B136) No. 31 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Repair poor contact in ECM connector.	Go to step 3.
3	CHECK NEUTRAL POSITION SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the transmission harness. 3) Place the shift lever in neutral. 4) Measure the resistance between transmission harness and connector terminals. <i>Connector & terminal</i> <i>(T2) No. 1 — No. 2:</i>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the short circuit in transmission harness, or replace the neutral position switch.
4	CHECK NEUTRAL POSITION SWITCH. 1) Place the shift lever in a position other than neutral. 2) Measure the resistance between transmission harness connector terminals. <i>Connector & terminal</i> <i>(T2) No. 1 — No. 2:</i>	Is the resistance 1 M Ω or more?	Go to step 5.	Repair the short circuit in transmission harness, or replace the neutral position switch.
5	CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR. Measure the resistance between ECM and chassis ground. <i>Connector & terminal</i> <i>(B136) No. 31 — Chassis ground:</i>	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the ground short circuit of harness between ECM and transmission harness connector.
6	CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR. 1) Disconnect the connectors from ECM. 2) Measure the resistance of harness between ECM and transmission harness connector. <i>Connector & terminal</i> <i>(B136) No. 31 — (B25) No. 2:</i>	Is the resistance 1 M Ω or more?	Go to step 7.	Repair the open circuit of harness between ECM and transmission harness connector.
7	CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR. Measure the resistance of harness between transmission harness connector and engine ground. <i>Connector & terminal</i> <i>(B25) No. 1 — Engine ground:</i>	Is the resistance less than 5 Ω ?	Repair the poor contact of transmission harness connector.	Repair the open circuit between transmission harness connector and engine ground terminal.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CK:DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-180, DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

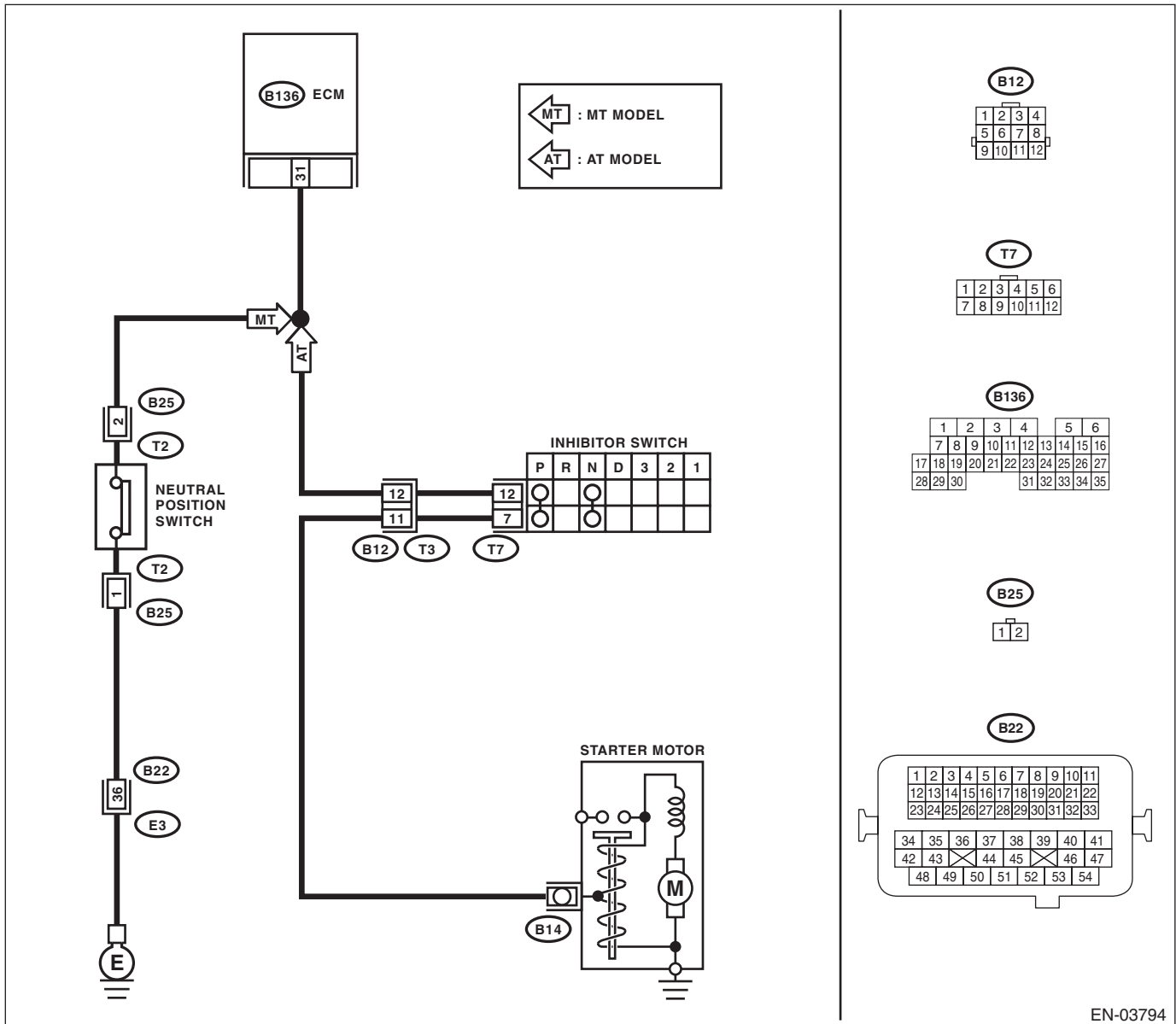
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03794

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SELECT CABLE.	Is there any fault in the select cable?	Repair or adjust the selector cable connection. <Ref. to CS-25, Select Cable.>	Go to step 2.
2 CHECK INPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground with select lever at "N" and "P" range. Connector & terminal (B136) No. 31 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 3.	Go to step 4.
3 CHECK INPUT SIGNAL OF ECM. Measure the voltage between ECM and chassis ground with select lever at other than "N" and "P" range. Connector & terminal (B136) No. 31 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair poor contact in ECM connector.	Go to step 4.
4 CHECK INPUT SIGNAL OF ECM. Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 31 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the battery short circuit of harness between ECM and inhibitor switch connector.	Go to step 5.
5 CHECK HARNESS BETWEEN ECM AND INHIBITOR SWITCH CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and inhibitor switch. 3) Measure the resistance of harness between ECM and inhibitor switch connector. Connector & terminal (B136) No. 31 — (T7) No. 12:	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open circuit in harness between ECM and inhibitor switch connector • Poor contact in coupling connector • Poor contact of inhibitor switch connector • Poor contact in ECM connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK INHIBITOR SWITCH GROUND LINE. Measure the resistance of harness between inhibitor switch connector and engine ground. <i>Connector & terminal</i> <i>(T7) No. 12 — Engine ground:</i>	Is the resistance less than 5 Ω ?	Replace the inhibitor switch. <Ref. to 4AT-47, Inhibitor Switch.>	Repair open circuit of harness between inhibitor switch connector and starter motor ground line. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open circuit in harness between inhibitor switch connector and starter motor ground line • Poor contact in starter motor connector • Poor contact in starter motor ground • Starter motor

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CL:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-181, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

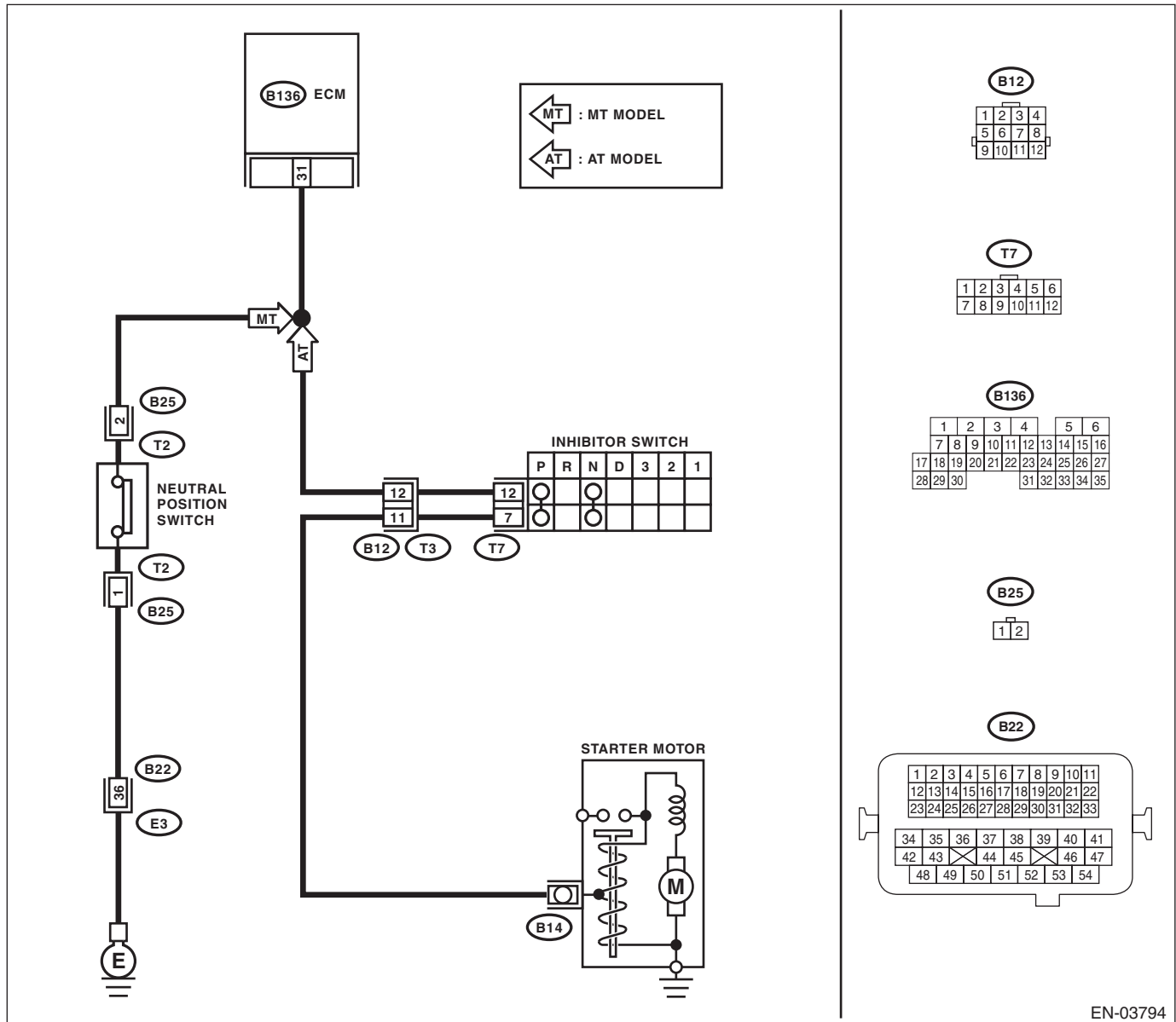
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03794

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Place the shift lever in neutral. 3) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 31 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 2.	Go to step 3.
2 CHECK INPUT SIGNAL OF ECM. 1) Place the shift lever in a position other than neutral. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 31 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Repair poor contact in ECM connector.	Go to step 4.
3 CHECK NEUTRAL SWITCH. 1) Place the shift lever in a position other than neutral. 2) Measure the resistance between transmission harness connector terminals. Connector & terminal (T2) No. 1 — No. 2:	Is the resistance 1 M Ω or more?	Go to step 4.	Repair the open circuit in transmission harness or replace neutral switch.
4 CHECK HARNESS BETWEEN ECM AND NEUTRAL SWITCH CONNECTOR. 1) Disconnect the connector from ECM. 2) Measure the resistance of harness between ECM and transmission harness connector. Connector & terminal (B136) No. 31 — (B25) No. 2:	Is the resistance less than 1 Ω ?	Go to step 5.	Repair open circuit of harness between ECM and transmission harness connector.
5 CHECK HARNESS BETWEEN ECM AND NEUTRAL SWITCH CONNECTOR. Measure the resistance of harness between transmission harness connector and engine ground. Connector & terminal (B25) No. 1 — Engine ground:	Is the resistance less than 5 Ω ?	Repair the poor contact in transmission harness connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between transmission harness connector and engine ground • Poor contact in coupling connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CM:DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1)

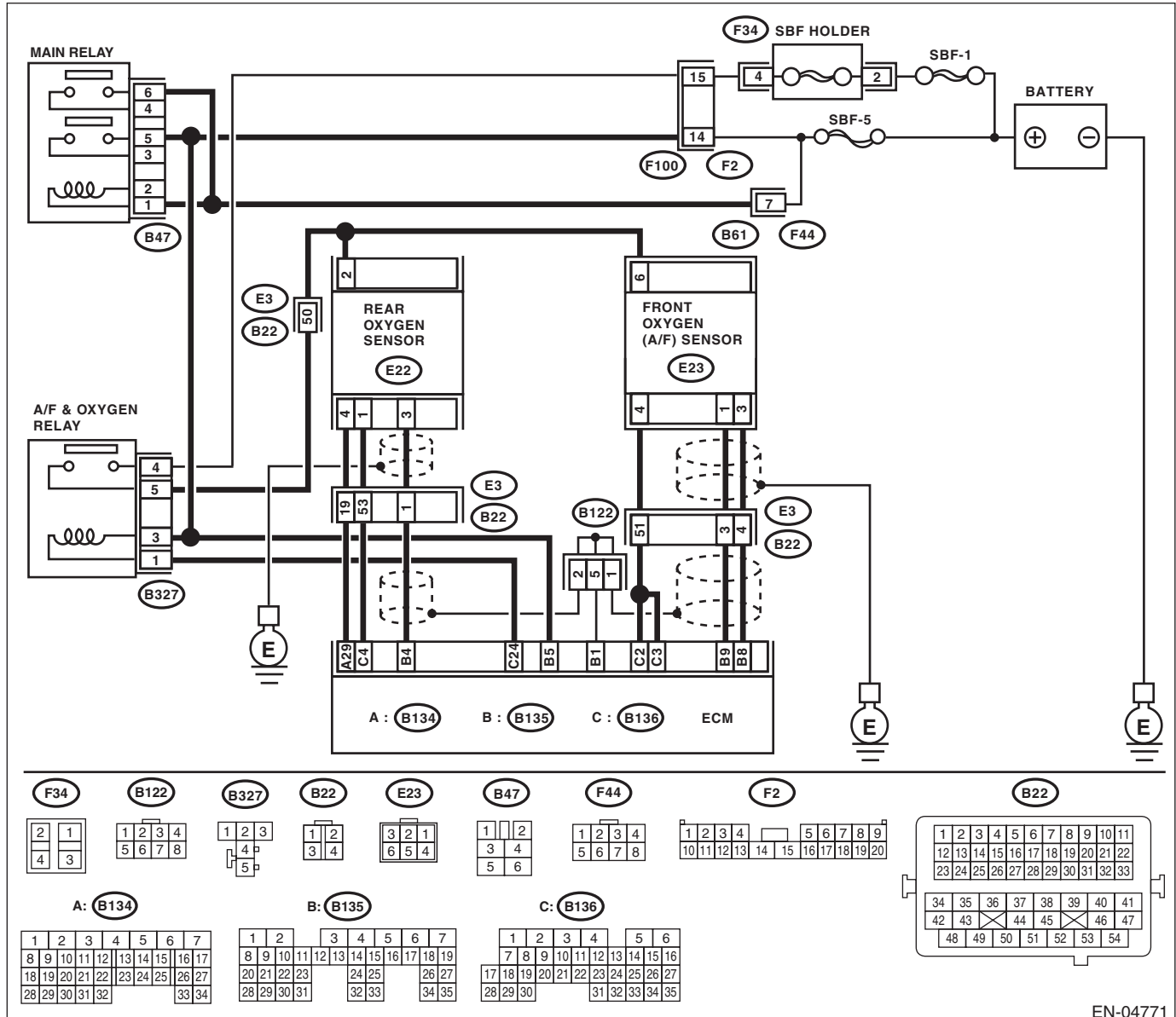
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-182, DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04771

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.	Does water enter the connector?	Dry the water thoroughly.	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. <i>Connector & terminal</i> <i>(B135) No. 9 — (E23) No. 1:</i> <i>(B135) No. 8 — (E23) No. 3:</i>	Is the resistance less than 1 Ω?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
3 CHECK POOR CONTACT. Check poor contact of front oxygen (A/F) sensor connector.	Is there poor contact in front oxygen (A/F) sensor connector?	Repair the poor contact in front oxygen (A/F) sensor connector.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-36, Front Oxygen (A/F) Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CN:DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1)

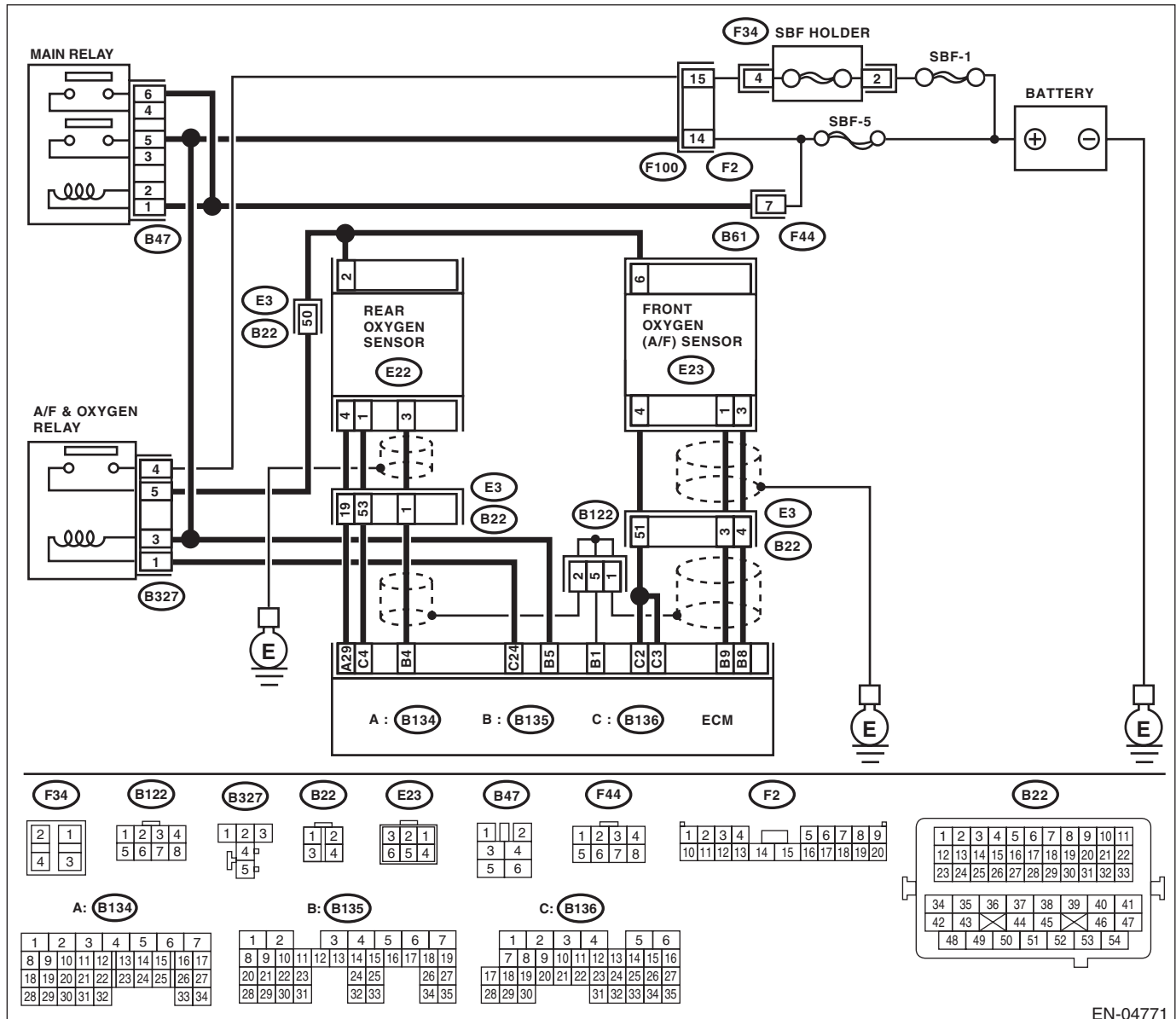
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-184, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04771

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.	Does water enter the connector?	Dry the water thoroughly.	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 9 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. Measure the resistance of harness between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 8 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.	Go to step 4.
4 CHECK OUTPUT SIGNAL FOR ECM. 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 9 (+) — Chassis ground (-):</i>	Is the voltage 4.5 V or more?	Go to step 5.	Go to step 6.
5 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 9 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>	Repair poor contact in ECM connector.
6 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 8 (+) — Chassis ground (-):</i>	Is the voltage 4.95 V or more?	Go to step 7.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-36, Front Oxygen (A/F) Sensor.>
7 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 8 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>	Repair poor contact in ECM connector.

CO:DTC P1160 RETURN SPRING FAILURE

NOTE:

For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4SO)(diag)-311, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CP:DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW

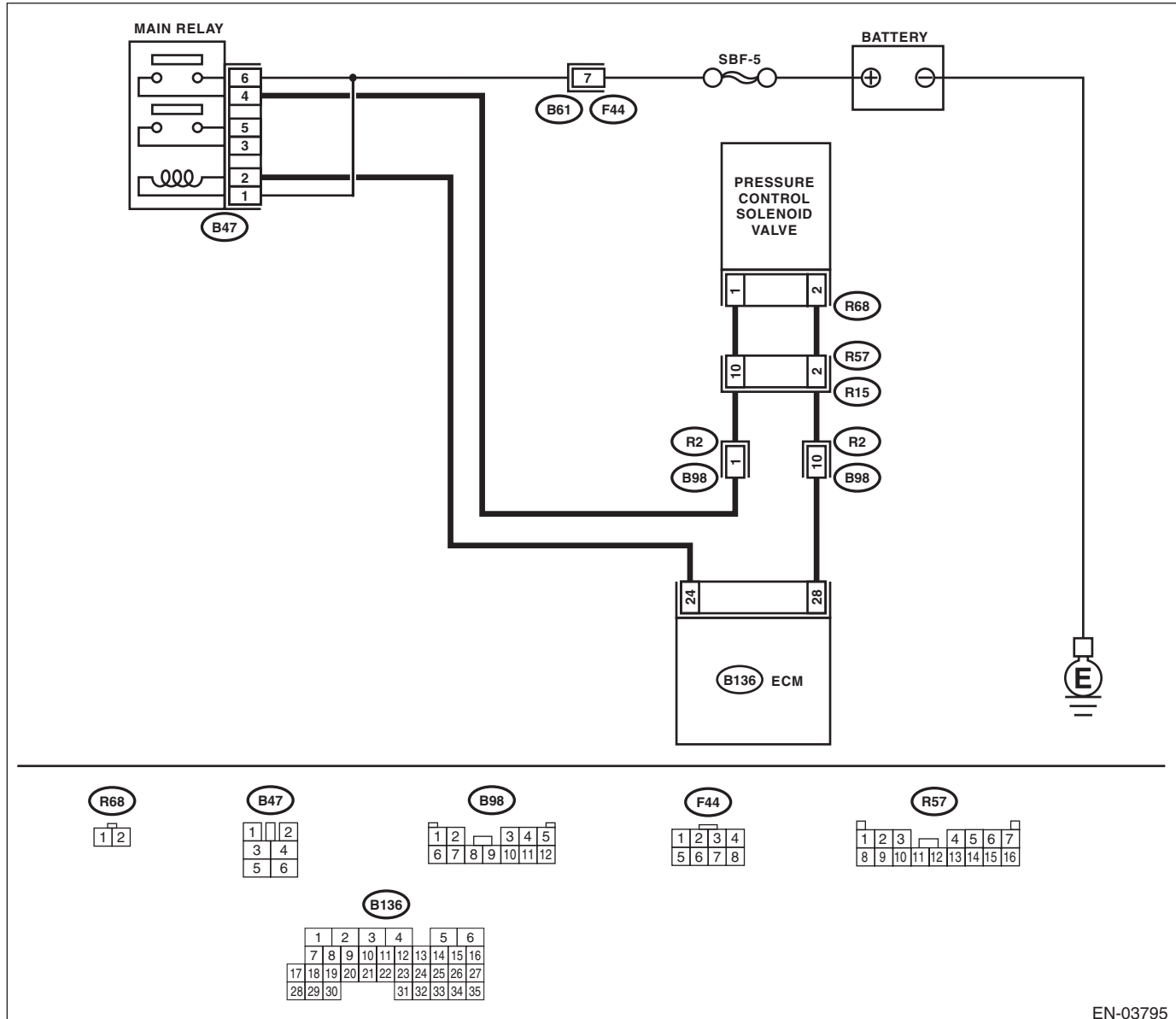
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-188, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03795

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK OUTPUT SIGNAL OF ECM.</p> <p>1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground.</p> <p>Connector & terminal (B136) No. 28 (+) — Chassis ground (-):</p>	Is the voltage 10 V or more?	Repair poor contact in ECM connector.	Go to step 2.
2	<p>CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the pressure control solenoid valve and ECM. 3) Measure the resistance of harness between pressure control solenoid valve connector and chassis ground.</p> <p>Connector & terminal (R68) No. 2 — Chassis ground:</p>	Is the resistance less than 10 Ω ?	Repair the ground short circuit of harness between ECM and pressure control solenoid valve connector.	Go to step 3.
3	<p>CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR.</p> <p>Measure the resistance of harness between ECM and pressure control solenoid valve connector.</p> <p>Connector & terminal (B136) No. 28 — (R68) No. 2:</p>	Is the resistance less than 1 Ω ?	Go to step 4.	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and pressure control solenoid valve connector • Poor contact in coupling connector
4	<p>CHECK PRESSURE CONTROL SOLENOID VALVE.</p> <p>Measure the resistance between pressure control solenoid valve terminals.</p> <p>Terminals No. 1 — No. 2:</p>	Is the resistance between 10 and 100 Ω ?	Go to step 5.	Replace the pressure control solenoid valve. <Ref. to EC(H4SO)-12, Pressure Control Solenoid Valve.>
5	<p>CHECK POWER SUPPLY TO THE PRESSURE CONTROL SOLENOID VALVE.</p> <p>1) Turn the ignition switch to ON. 2) Measure the voltage between pressure control solenoid valve and chassis ground.</p> <p>Connector & terminal (R68) No. 1 (+) — Chassis ground (-):</p>	Is the voltage 10 V or more?	Repair the poor contact in the pressure control solenoid valve connector.	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit in harness between main relay and pressure control solenoid valve connector • Poor contact in coupling connector • Poor contact in main relay connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CQ:DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH

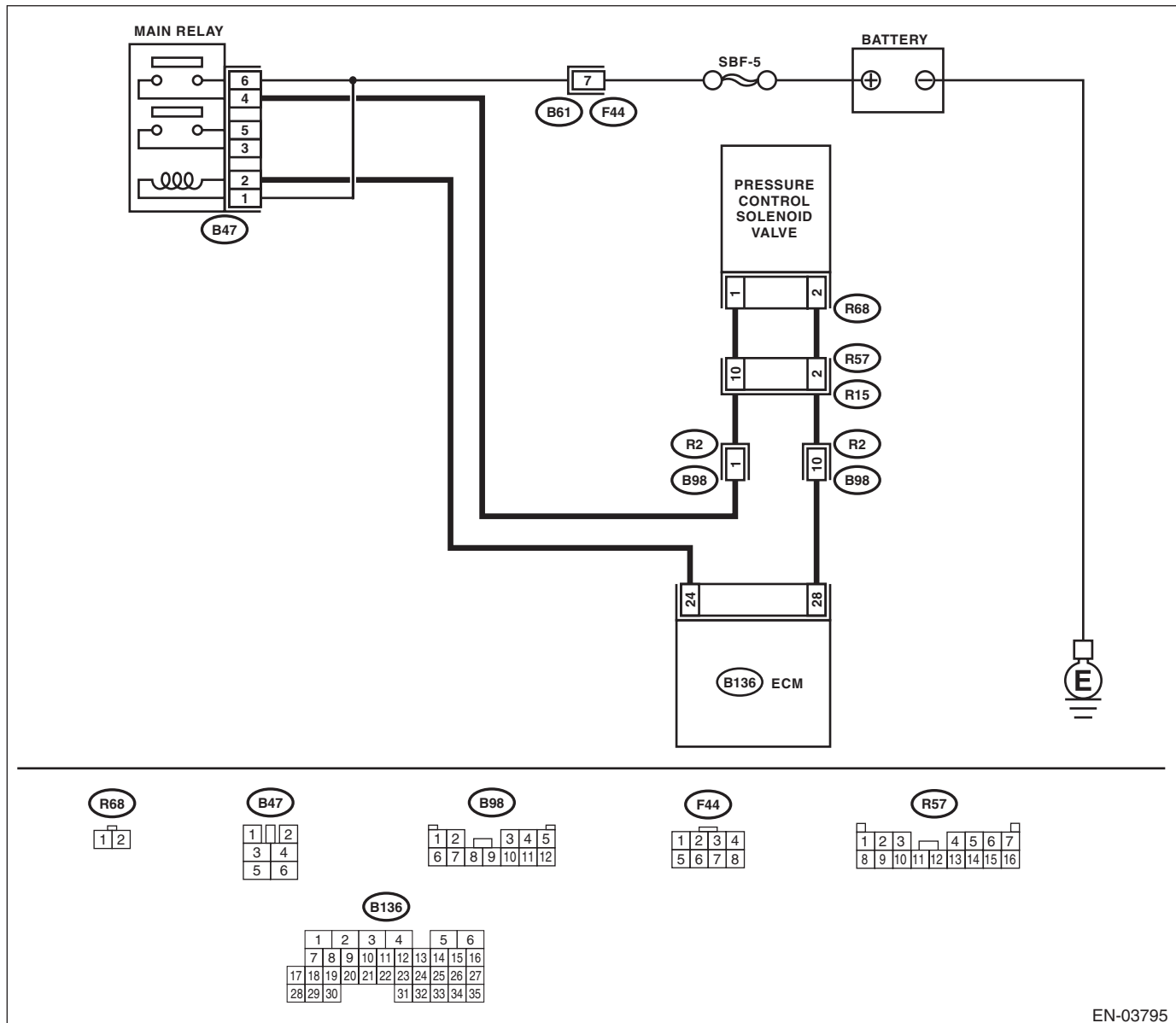
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-190, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03795

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT SIGNAL OF ECM. 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground while operating the pressure control solenoid valve. NOTE: The pressure control solenoid valve operation can be executed using the Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-45, Compulsory Valve Operation Check Mode.> Connector & terminal (B136) No. 28 (+) — Chassis ground (-):	Is the voltage 0 — 10 V?	Go to step 2.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector.
2 CHECK INPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 28 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 4.	Go to step 3.
3 CHECK POOR CONTACT. Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>
4 CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the pressure control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 28 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the battery short circuit of harness between ECM and pressure control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>	Go to step 5.
5 CHECK PRESSURE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Measure the resistance between pressure control solenoid valve terminals. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Replace the pressure control solenoid valve <Ref. to EC(H4SO)-12, Pressure Control Solenoid Valve.> and ECM <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>.	Go to step 6.
6 CHECK POOR CONTACT. Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CR:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-192, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

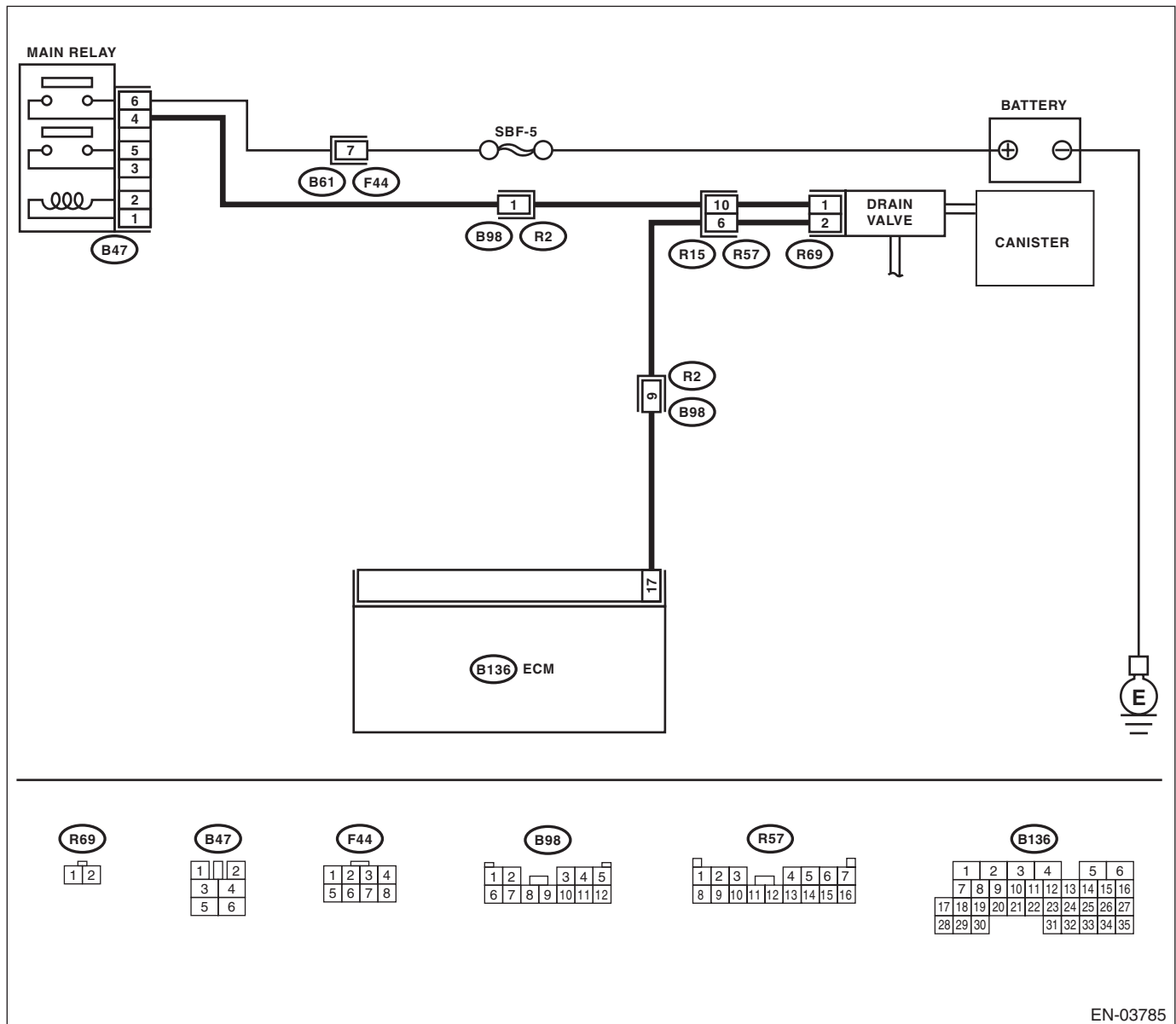
TROUBLE SYMPTOM:

Improper fuel supply

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03785

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the relevant DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK VENT LINE HOSES. Check the following items. <ul style="list-style-type: none"> • Clogging of vent hoses between canister and drain valve • Clogging of vent hose between drain valve and air filter • Clogging of drain filter 	Is there any fault in the vent line?	Repair or replace faulty parts.	Go to step 3.
3	CHECK DRAIN VALVE OPERATION. 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn the ignition switch to ON. 4) Operate the drain valve. NOTE: Drain valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4SO)(diag)-45, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Repair poor contact in ECM connector.	Replace the drain valve. <Ref. to EC(H4SO)-17, Drain Valve.>

CS:DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-194, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

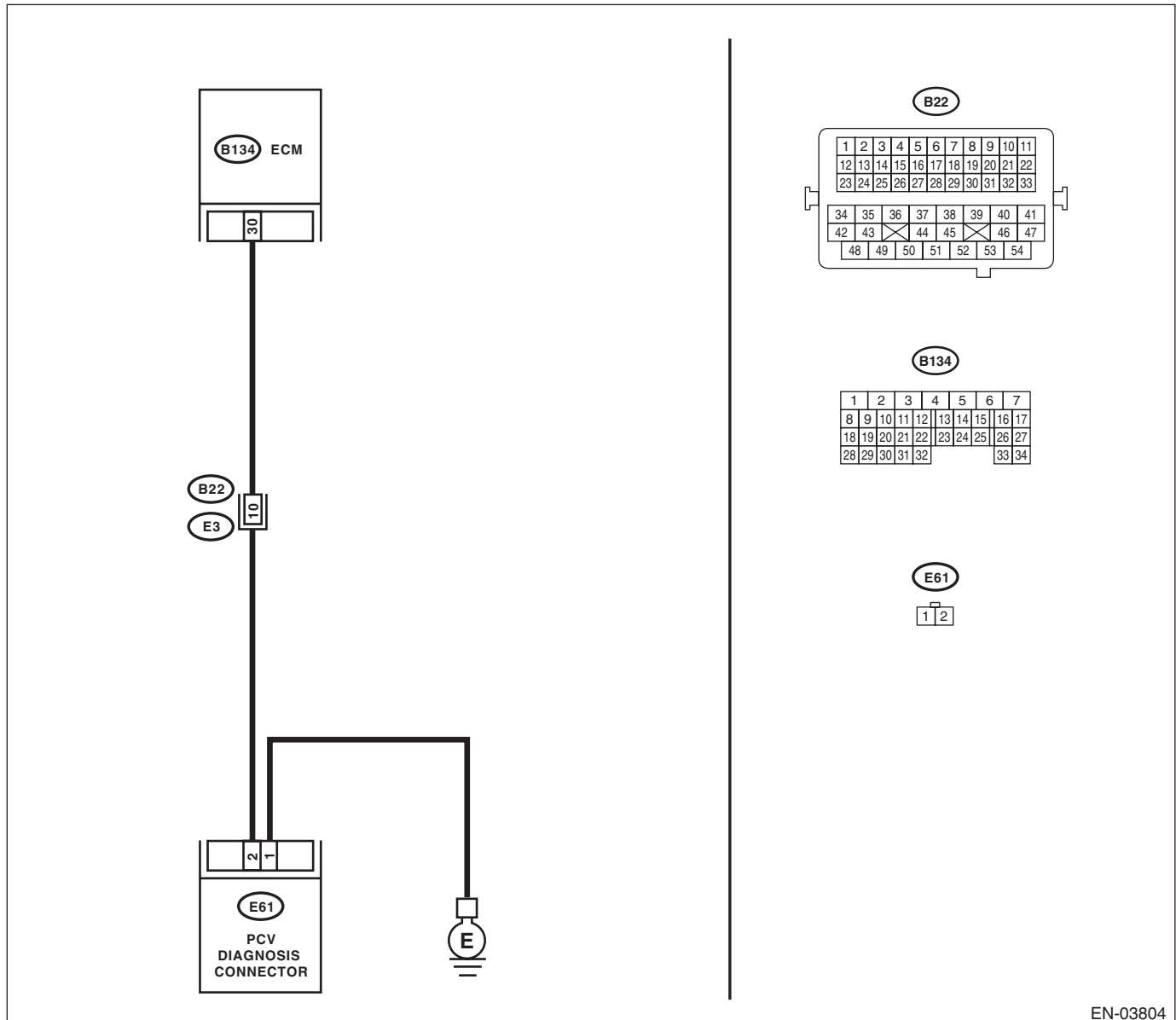
TROUBLE SYMPTOM:

Erroneous idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03804

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK BLOW-BY HOSE. Check the blow-by hose condition.	Is there any disconnection or crack in blow-by hose?	Replace or repair the blow-by hose.	Go to step 2.
2 CHECK HARNESS BETWEEN PCV DIAGNOSIS CONNECTOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the PCV diagnosis connector and ECM. 3) Measure the resistance of harness between PCV diagnosis connector and ECM connector. Connector & terminal (B134) No. 30 — (E61) No. 2:	Is the resistance less than 1 Ω ?	Go to step 3.	Repair the open circuit of harness between PCV diagnosis connector and ECM connector.
3 CHECK HARNESS BETWEEN PCV DIAGNOSIS CONNECTOR AND ECM CONNECTOR. Measure the resistance of harness between PCV diagnosis connector and chassis ground. Connector & terminal (B134) No. 30 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 4.	Repair the ground short circuit of harness between PCV diagnosis connector and ECM connector.
4 CHECK GROUND CIRCUIT OF PCV DIAGNOSIS CONNECTOR. Measure the resistance of harness between PCV diagnosis connector and engine ground. Connector & terminal (E61) No. 1 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 5.	Repair the ground circuit of PCV diagnosis connector.
5 CHECK PCV DIAGNOSIS CONNECTOR. Measure the resistance between PCV diagnosis connector terminals. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Repair the poor contact in ECM connector and PCV diagnosis connector.	Replace the PCV diagnosis connector.

CT:DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT)

NOTE:

For the diagnostic procedure, refer to DTC P1498. <Ref. to EN(H4SO)(diag)-276, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CU:DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT)

NOTE:

For the diagnostic procedure, refer to DTC P1499. <Ref. to EN(H4SO)(diag)-279, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CV:DTC P1494 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT)

NOTE:

For the diagnostic procedure, refer to DTC P1498. <Ref. to EN(H4SO)(diag)-276, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CW:DTC P1495 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT)

NOTE:

For the diagnostic procedure, refer to DTC P1499. <Ref. to EN(H4SO)(diag)-279, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CX:DTC P1496 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT)

NOTE:

For the diagnostic procedure, refer to DTC P1498. <Ref. to EN(H4SO)(diag)-276, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CY:DTC P1497 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT)

NOTE:

For the diagnostic procedure, refer to DTC P1499. <Ref. to EN(H4SO)(diag)-279, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CZ:DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-196, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H4SO)-200, DTC P1494 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H4SO)-200, DTC P1496 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H4SO)-200, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine breathing

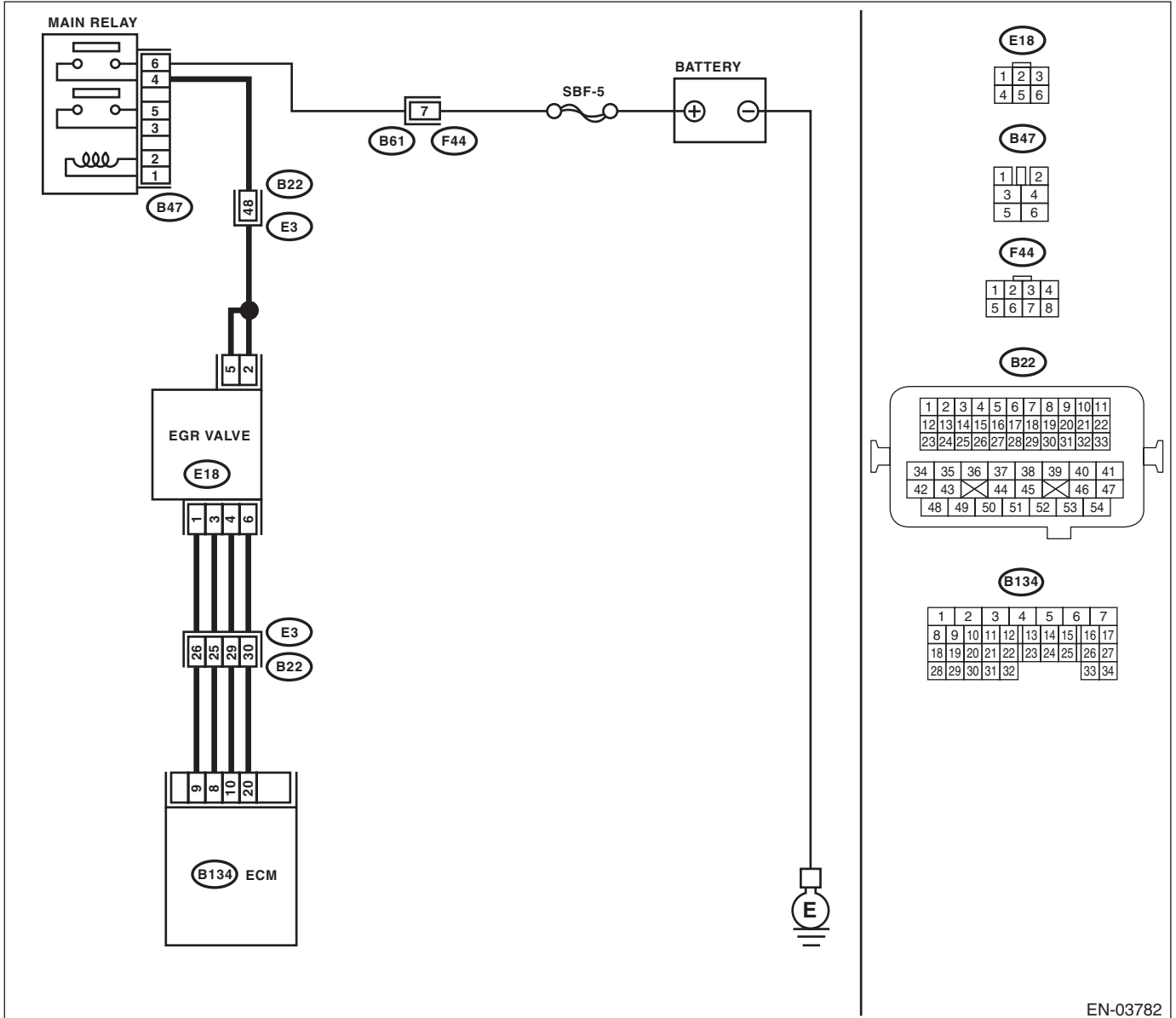
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-03782

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POWER SUPPLY TO EGR SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from EGR valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between EGR solenoid valve connector and engine ground. Connector & terminal (E18) No. 2 (+) — Engine ground (-): (E18) No. 5 (+) — Engine ground (-):	Is the voltage 10 V or more?	Go to step 2.	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open circuit in harness between EGR solenoid valve and main relay connector • Poor contact in coupling connector
2 CHECK HARNESS BETWEEN ECM AND EGR SOLENOID VALVE CONNECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between ECM and EGR solenoid valve connector. Connector & terminal DTC P1492; (B134) No. 10 — (E18) No. 4: DTC P1494; (B134) No. 9 — (E18) No. 1: DTC P1496; (B134) No. 8 — (E18) No. 3: DTC P1498; (B134) No. 20 — (E18) No. 6:	Is the resistance less than 1 Ω?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open circuit in harness between ECM and EGR solenoid valve connector • Poor contact in coupling connector
3 CHECK HARNESS BETWEEN ECM AND EGR SOLENOID VALVE CONNECTOR. 1) Disconnect the connectors from ECM. 2) Measure the resistance between ECM connector and chassis ground. Connector & terminal DTC P1492; (B134) No. 10 — Chassis ground: DTC P1494; (B134) No. 9 — Chassis ground: DTC P1496; (B134) No. 8 — Chassis ground: DTC P1498; (B134) No. 20 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 4.	Repair the ground short in harness between ECM and EGR solenoid valve connector.
4 CHECK POOR CONTACT. Check poor contact in ECM connector and EGR solenoid valve connector.	Is there poor contact in ECM connector or EGR solenoid valve connector?	Repair the poor contact in ECM connector or EGR solenoid valve connector.	Replace the EGR solenoid valve. <Ref. to FU(H4SO)-29, EGR Valve.>

DA:DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-198, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H4SO)-200, DTC P1495 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H4SO)-200, DTC P1497 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H4SO)-200, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine breathing

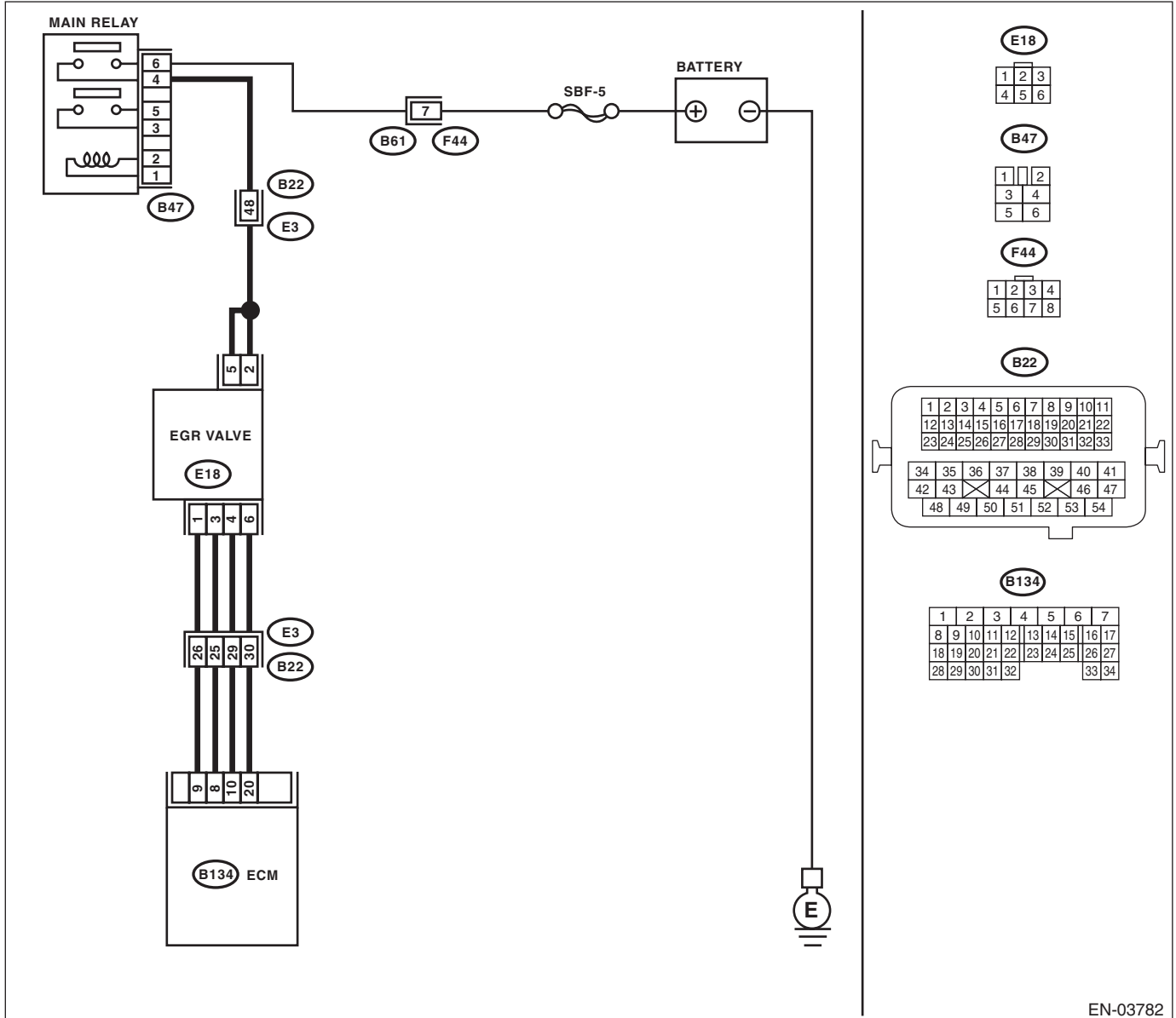
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-03782

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK HARNESS BETWEEN ECM AND EGR SOLENOID VALVE CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from EGR valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground. Connector & terminal DTC P1493; (B134) No. 10 — Chassis ground (-): DTC P1495; (B134) No. 9 — Chassis ground (-): DTC P1497; (B134) No. 8 — Chassis ground (-): DTC P1499; (B134) No. 20 — Chassis ground (-):	Is the voltage 10 V or more?	Repair the battery short in harness between ECM and EGR solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>	Replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DB:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-201, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Failure of engine to start

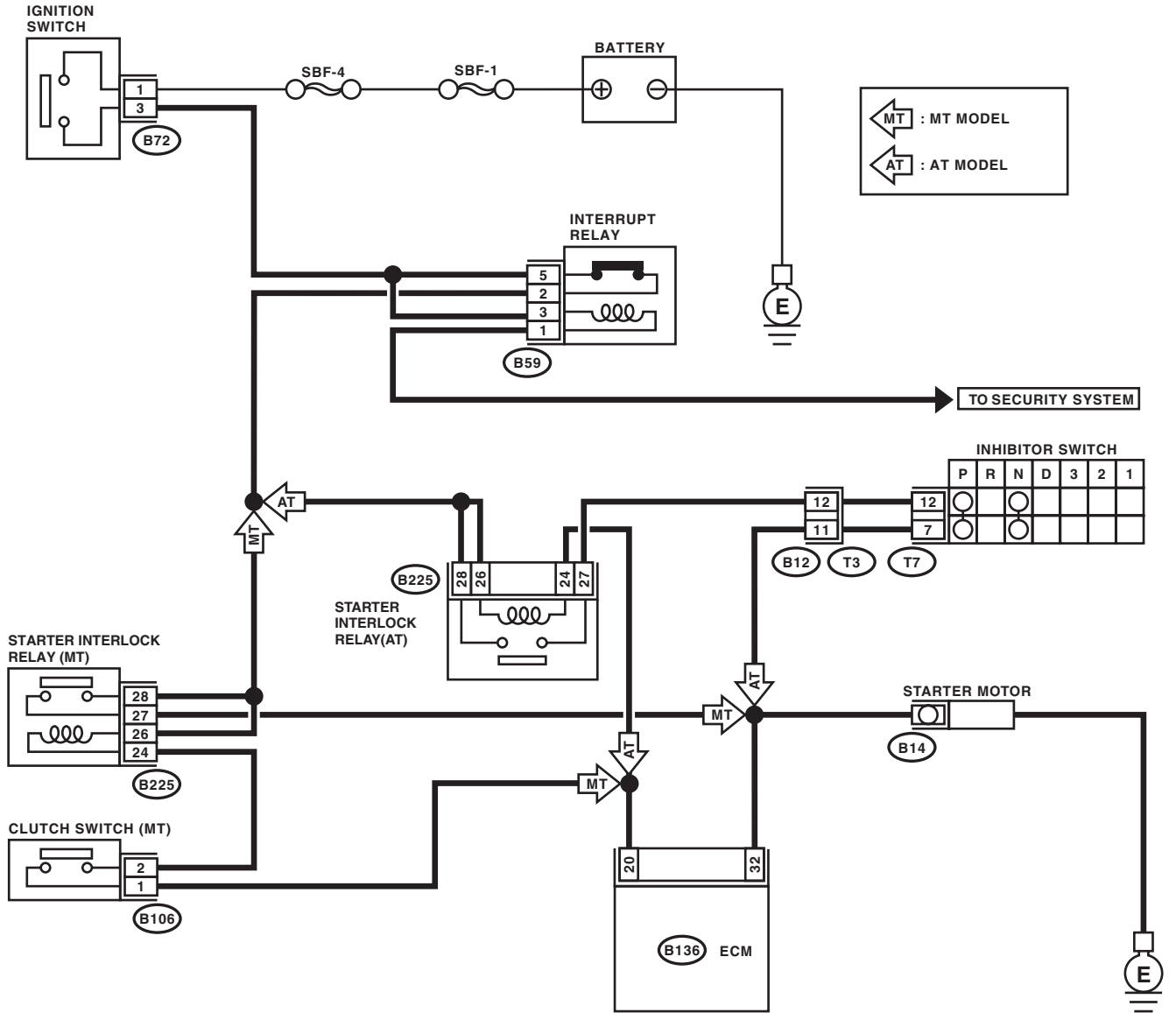
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

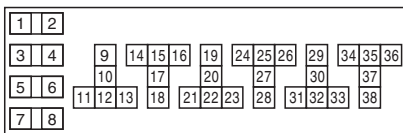
WIRING DIAGRAM:



B106



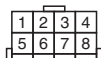
B225



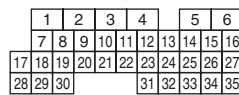
B59



B12



B136



T7



EN-04767

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK OPERATION OF STARTER MOTOR. Place the inhibitor switch in "P" or "N" range. (AT model) Depress the clutch pedal. (MT model)	Does the starter motor operate when ignition switch is turned to "ST"?	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none">• Open or ground short circuit of harness between ECM and starter motor connector• Poor contact in ECM connector	Check the starter motor circuit. <Ref. to EN(H4SO)(diag)-54, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DC:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

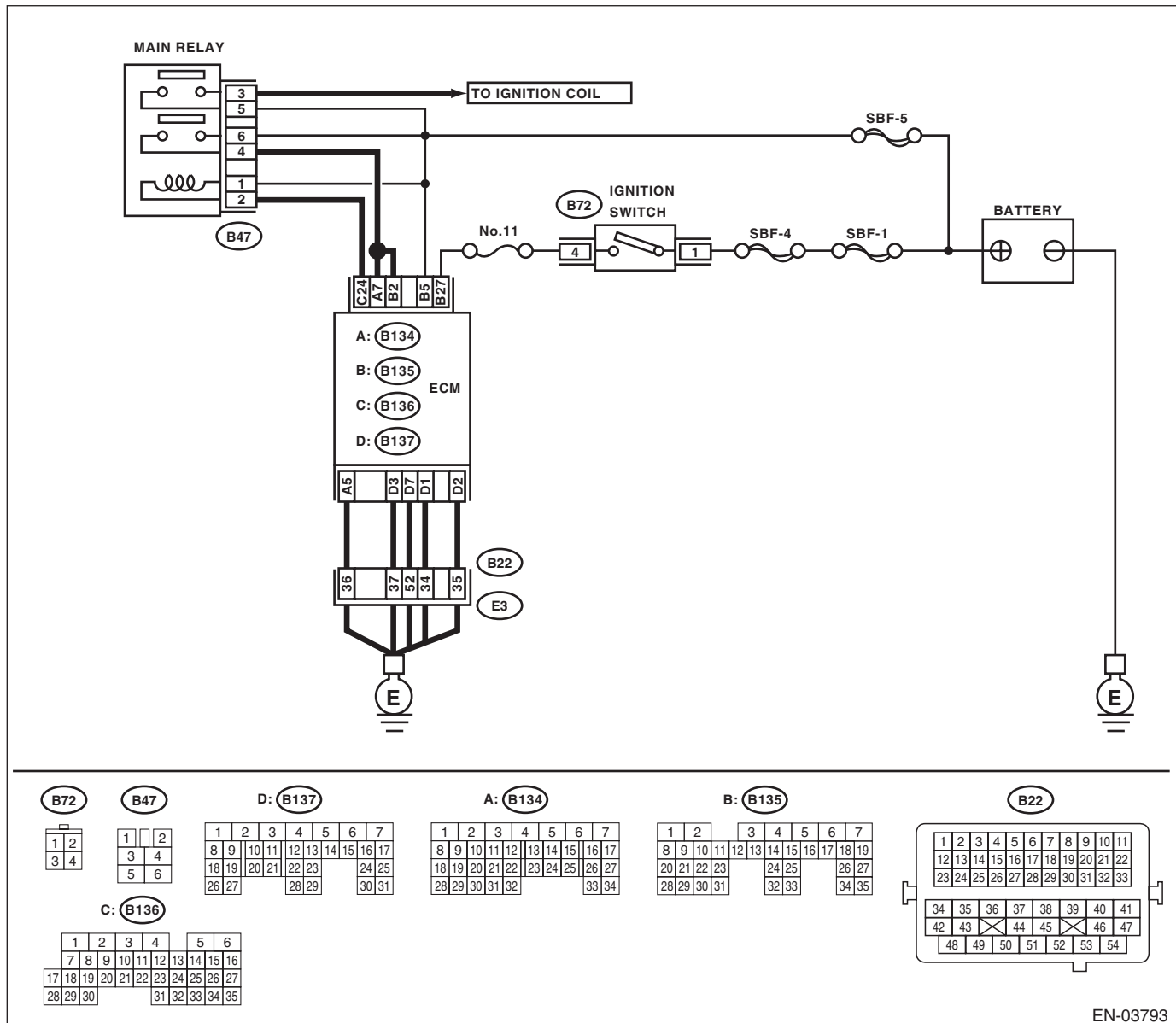
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-202, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>

WIRING DIAGRAM:



EN-03793

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK INPUT SIGNAL OF ECM. 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 5 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Repair poor contact in ECM connector.	Go to step 2.
2	CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR. 1) Disconnect the connectors from ECM. 2) Measure the resistance of harness between ECM and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 5 — Chassis ground:</i>	Is the resistance less than 10 Ω ?	Repair the ground short circuit of harness between ECM connector and battery terminal.	Go to step 3.
3	CHECK FUSE SBF-5.	Is the fuse blown out?	Replace the fuse.	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open circuit in harness between ECM and battery • Poor contact in ECM connector • Poor contact in battery terminal

DD:DTC P1602 CONTROL MODULE PROGRAMMING ERROR

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-203, DTC P1602 CONTROL MODULE PROGRAMMING ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine keeps running at higher speed than specified idle speed.
- Engine keeps running at lower speed than specified idle speed.
- Engine stalls.

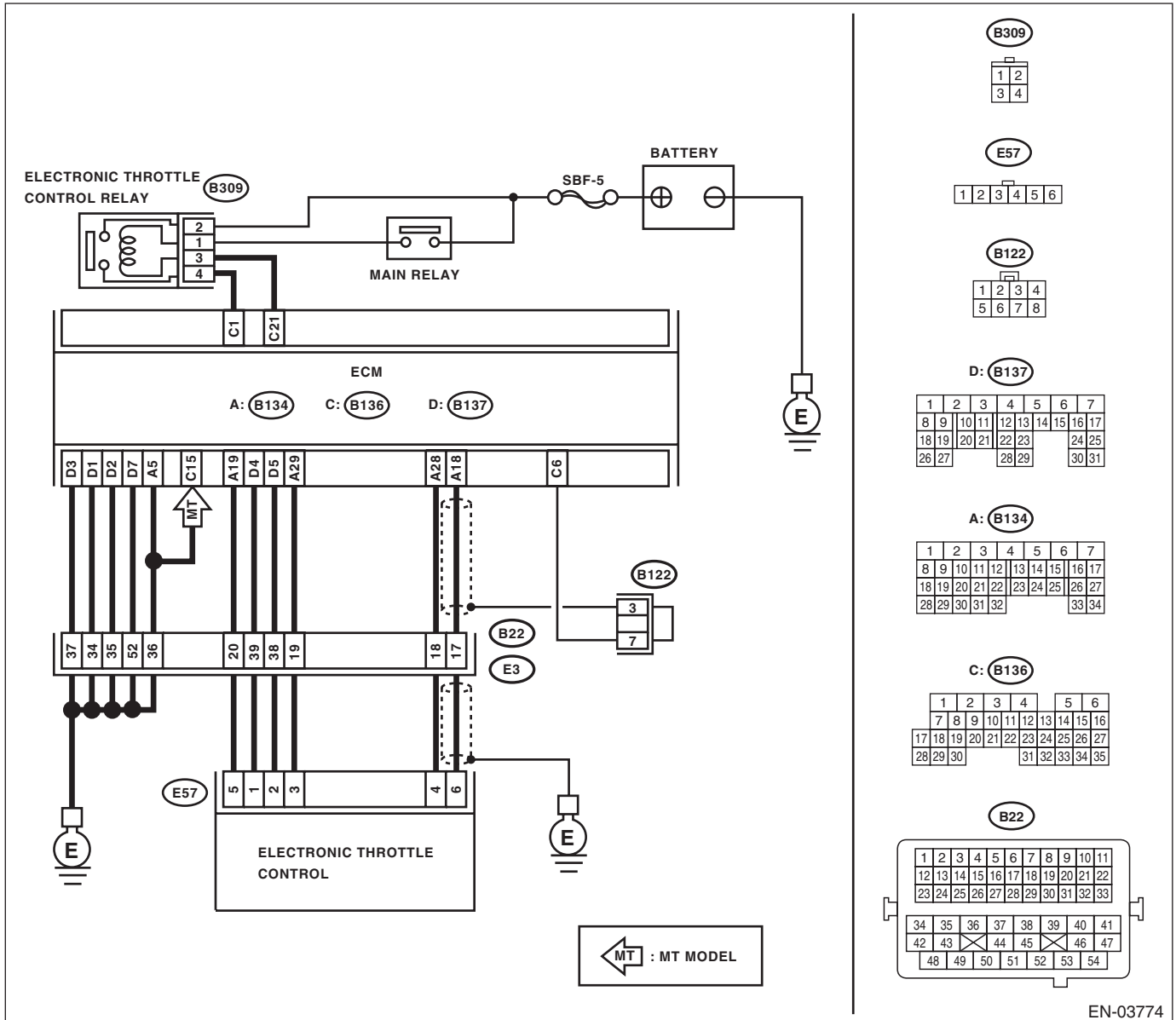
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

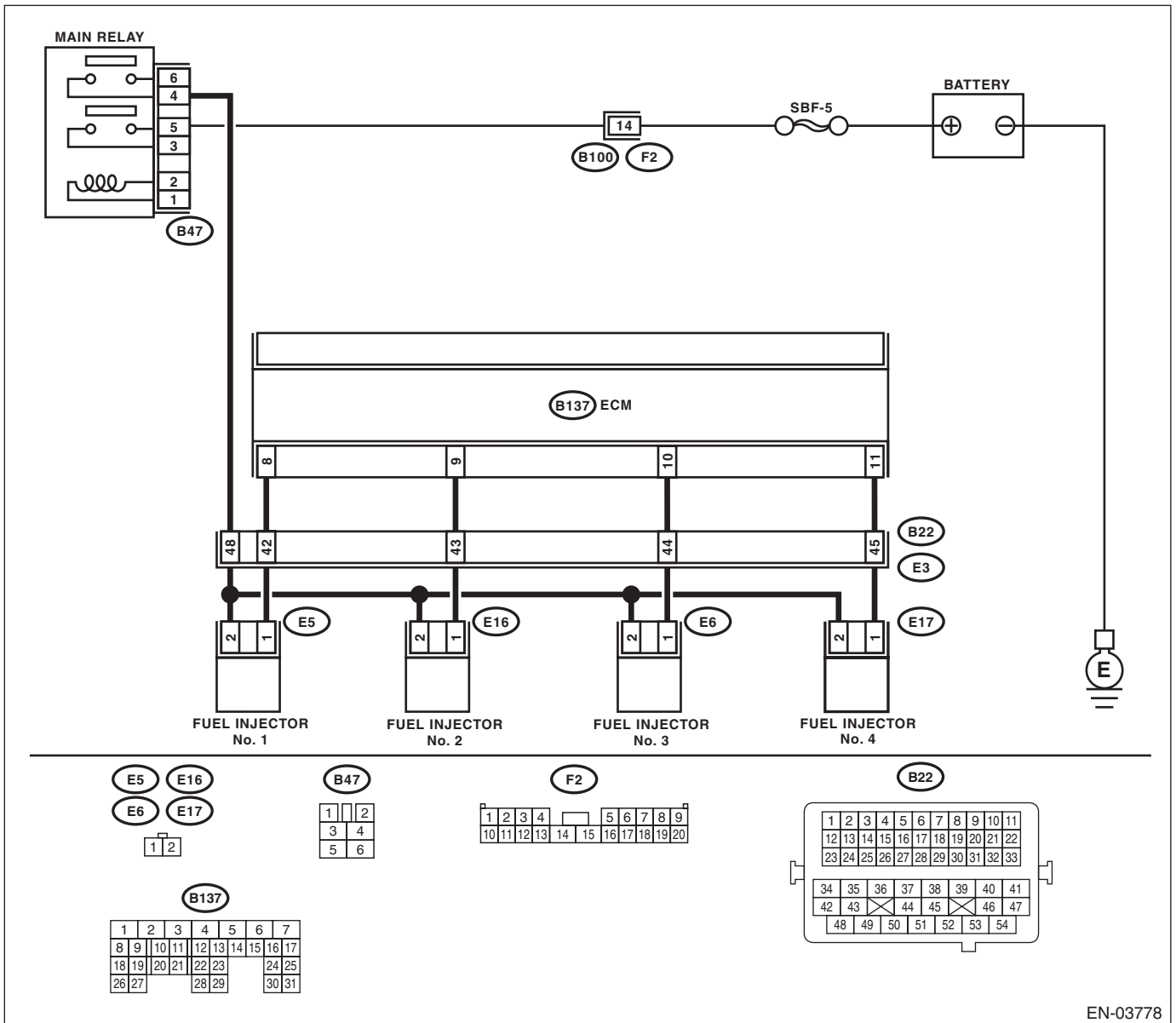
WIRING DIAGRAM:



EN-03774

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)



EN-03778

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK ENGINE OIL.	Is the engine oil filled to the specified amount?	Go to step 3.	Replace the engine oil. <Ref. to LU (H4SO)-10, REPLACEMENT, Engine Oil.>
3	CHECK EXHAUST SYSTEM.	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step 4.
4	CHECK AIR INTAKE SYSTEM.	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step 5.
5	CHECK FUEL PRESSURE. WARNING: • Place "NO FIRE" signs near the working area. • Be careful not to spill fuel. Measure the fuel pressure. <Ref. to ME(H4SO)-29, INSPECTION, Fuel Pressure.> WARNING: Release fuel pressure before removing the fuel pressure gauge.	Is the fuel pressure 339.5 — 360.5 kPa (3.5 — 3.7 kgf/cm ² , 49 — 52 psi)?	Go to step 6.	Repair the following item. Fuel pressure is too high: • Clogged fuel line or bent hose Fuel pressure is too low: • Improper fuel pump discharge • Clogged fuel line
6	CHECK ENGINE COOLANT TEMPERATURE SENSOR. 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is the engine coolant temperature above 60°C (140°F) ?	Go to step 7.	Replace the engine coolant temperature sensor. <Ref. to FU(H4SO)-22, Engine Coolant Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>7</p> <p>CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.</p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).</p> <p>2) Place the select lever in “N” or “P” position.</p> <p>3) Turn the A/C switch to OFF.</p> <p>4) Turn all the accessory switches to OFF.</p> <p>5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedure, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • General scan tool <p>For detailed operation procedures, refer to the “General Scan Tool Instruction Manual”.</p>	<p>Is the measured value 2.1 — 3.4 g/s (0.28 — 0.45 lb/m)</p>	<p>Go to step 8.</p>	<p>Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4SO)-28, Mass Air Flow and Intake Air Temperature Sensor.></p>
<p>8</p> <p>CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.</p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).</p> <p>2) Place the shift lever in neutral position.</p> <p>3) Turn the A/C switch to OFF.</p> <p>4) Turn all the accessory switches to OFF.</p> <p>5) Open the front hood.</p> <p>6) Measure the ambient temperature.</p> <p>7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedure, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • General scan tool <p>For detailed operation procedures, refer to the “General Scan Tool Instruction Manual”.</p>	<p>Subtract the ambient temperature from intake air temperature. Is the obtained value –10 — 50°C (–18 — 90°F)?</p>	<p>Go to step 9.</p>	<p>Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4SO)-28, Mass Air Flow and Intake Air Temperature Sensor.></p>
<p>9</p> <p>CHECK OUTPUT SIGNAL OF ECM.</p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between ECM connector and chassis ground.</p> <p>Connector & terminal</p> <p>#1 (B137) No. 8 (+) — Chassis ground (–):</p> <p>#2 (B137) No. 9 (+) — Chassis ground (–):</p> <p>#3 (B137) No. 10 (+) — Chassis ground (–):</p> <p>#4 (B137) No. 11 (+) — Chassis ground (–):</p>	<p>Is the voltage 10 V or more?</p>	<p>Go to step 14.</p>	<p>Go to step 10.</p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
10 CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Measure the resistance between ECM connector and engine ground on faulty cylinders. Connector & terminal #1 (E5) No. 1 — Engine ground: #2 (E16) No. 1 — Engine ground: #3 (E6) No. 1 — Engine ground: #4 (E17) No. 1 — Engine ground:	Is the resistance 1 MΩ or more?	Go to step 11.	Repair the ground short circuit of harness between fuel injector and ECM connector.
11 CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR. Measure the resistance of harness connector between ECM connector and fuel injector on faulty cylinders. Connector & terminal #1 (B137) No. 8 — (E5) No. 1: #2 (B137) No. 9 — (E16) No. 1: #3 (B137) No. 10 — (E6) No. 1: #4 (B137) No. 11 — (E17) No. 1:	Is the resistance less than 1 Ω?	Go to step 12.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
12 CHECK FUEL INJECTOR. Measure the resistance between fuel injector terminals on faulty cylinder. Terminals No. 1 — No. 2:	Is the resistance between 5 and 20 Ω?	Go to step 13.	Replace the faulty fuel injector. <Ref. to FU(H4SO)-30, Fuel Injector.>
13 CHECK POWER SUPPLY LINE. 1) Turn the ignition switch to ON. 2) Measure the voltage between fuel injector and engine ground on faulty cylinders. Connector & terminal #1 (E5) No. 2 (+) — Engine ground (-): #2 (E16) No. 2 (+) — Engine ground (-): #3 (E6) No. 2 (+) — Engine ground (-): #4 (E17) No. 2 (+) — Engine ground (-):	Is the voltage 10 V or more?	Repair the poor contact of all connectors in fuel injector circuit.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between main relay and fuel injector connector on faulty cylinders • Poor contact in coupling connector • Poor contact in main relay connector • Poor contact in fuel injector connector on faulty cylinders

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
14 CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground on faulty cylinders. <i>Connector & terminal</i> #1 (B137) No. 8 (+) — Chassis ground (-): #2 (B137) No. 9 (+) — Chassis ground (-): #3 (B137) No. 10 (+) — Chassis ground (-): #4 (B137) No. 11 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the battery short circuit of harness between ECM connector and fuel injector. After repair, replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>	Go to step 15.
15 CHECK FUEL INJECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between fuel injector terminals on faulty cylinder. <i>Terminals</i> No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Replace the faulty fuel injector <Ref. to FU(H4SO)-30, Fuel Injector.> and ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>	Go to step 16.
16 CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.	Is the camshaft position sensor or crankshaft position sensor loosely installed?	Tighten the camshaft position sensor or crankshaft position sensor.	Go to step 17.
17 CHECK CRANK SPROCKET. Remove the timing belt cover.	Is the crank sprocket rusted or does it have broken teeth?	Replace the crank sprocket. <Ref. to ME(H4SO)-50, Crank Sprocket.>	Go to step 18.
18 CHECK INSTALLATION CONDITION OF TIMING BELT. Turn the crankshaft, and align alignment mark on crank sprocket with alignment mark on cylinder block.	Is the timing belt dislocated from its proper position?	Repair the installation condition of timing belt. <Ref. to ME(H4SO)-44, Timing Belt.>	Go to step 19.
19 CHECK ELECTRONIC THROTTLE CONTROL RELAY. 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Connect the battery to terminals No. 5 and No. 6 of electronic throttle control relay. 4) Measure the resistance between electronic throttle control relay terminals. <i>Terminals</i> No. 2 — No. 4:	Is the resistance less than 1 Ω ?	Go to step 20.	Replace the electronic throttle control relay.
20 CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL RELAY. Measure the voltage between electronic throttle control relay connector and chassis ground. <i>Connector & terminal</i> (B309) No. 2 (+) — Chassis ground (-): (B309) No. 1 (+) — Chassis ground (-):	Is the voltage 5 V or more?	Go to step 21.	Repair the open or ground short circuit of power supply circuit.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
21 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY. 1) Disconnect the connectors from ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control relay connector and chassis ground. <i>Connector & terminal</i> <i>(B309) No. 3 (+) — Chassis ground (-):</i>	Is the voltage less than 5 V?	Go to step 22.	Repair the power supply short circuit of harness between ECM and electronic throttle control.
22 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY. 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control relay connector and chassis ground. <i>Connector & terminal</i> <i>(B309) No. 3 — Chassis ground:</i> <i>(B309) No. 4 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 23.	Repair the ground short circuit of harness between ECM and electronic throttle control relay.
23 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY. Measure the resistance between ECM connector and electronic throttle control relay connector. <i>Connector & terminal</i> <i>(B136) No. 21 — (B309) No. 3:</i> <i>(B136) No. 1 — (B309) No. 4:</i>	Is the resistance less than 1 Ω?	Go to step 24.	Repair the open circuit of harness between ECM and electronic throttle control relay.
24 CHECK SENSOR OUTPUT. 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.>	Is the voltage 0.4 V or more?	Go to step 25.	Go to step 27.
25 CHECK SENSOR OUTPUT. 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.>	Is the voltage 0.8 V or more?	Go to step 26.	Go to step 27.
26 CHECK POOR CONTACT. Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Go to step 31.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
27 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. <i>Connector & terminal</i> (B134) No. 18 — (E57) No. 6: (B134) No. 28 — (E57) No. 4: (B134) No. 19 — (E57) No. 5:	Is the resistance less than 1 Ω ?	Go to step 28.	Repair the open circuit of harness connector.
28 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. Measure the resistance between ECM connector and chassis ground. <i>Connector & terminal</i> (B134) No. 18 — Chassis ground: (B134) No. 19 — Chassis ground: (B134) No. 28 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 29.	Repair the ground short circuit of harness.
29 CHECK SENSOR POWER SUPPLY. 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. <i>Connector & terminal</i> (E57) No. 5 (+) — Engine ground (-):	Is the voltage 4.5 — 5.5 V?	Go to step 30.	Repair poor contact in ECM connector
30 CHECK SHORT CIRCUIT IN ECM. 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. <i>Connector & terminal</i> (E57) No. 6 — Engine ground: (E57) No. 4 — Engine ground:	Is the resistance 10 Ω or more?	Go to step 31.	Repair poor contact in ECM connector.
31 CHECK SENSOR OUTPUT. 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.>	Is the voltage less than 4.63 V?	Go to step 32.	Go to step 34.
32 CHECK SENSOR OUTPUT. Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.>	Is the voltage less than 4.73 V?	Go to step 33.	Go to step 34.
33 CHECK POOR CONTACT. Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Go to step 39.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
34 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. <i>Connector & terminal</i> (B134) No. 29 — (E57) No. 3: (B134) No. 18 — (E57) No. 6: (B134) No. 28 — (E57) No. 4:	Is the resistance less than 1 Ω ?	Go to step 35.	Repair the open circuit of harness connector.
35 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM connector. 2) Measure the resistance between electronic throttle control connector and engine ground. <i>Connector & terminal</i> (E57) No. 3 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 36.	Repair poor contact in ECM connector.
36 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control connector and engine ground. <i>Connector & terminal</i> (E57) No. 5 (+) — Engine ground (-):	Is the voltage 10 V or more?	Go to step 37.	Repair the battery short circuit of harness between ECM connector and electronic throttle control connector.
37 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. Measure the voltage between electronic throttle control connector and engine ground. <i>Connector & terminal</i> (E57) No. 6 (+) — Engine ground (-): (E57) No. 4 (+) — Engine ground (-):	Is the voltage less than 10 V?	Go to step 38.	Repair the short circuit of harness between ECM connector and electronic throttle control connector.
38 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Remove the ECM. 3) Measure the resistance between ECM connectors. <i>Connector & terminal</i> (B134) No. 18 — (B134) No. 19: (B134) No. 28 — (B134) No. 19:	Is the resistance 1 M Ω or more?	Go to step 39.	Repair the short circuit to sensor power supply.
39 CHECK SENSOR OUTPUT. 1) Turn the ignition switch to OFF. 2) Connect the connectors except for electric throttle control relay. 3) Turn the ignition switch to ON. 4) Read the data of main throttle sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.>	Is the voltage 0.81 — 0.87 V?	Go to step 40.	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
40 CHECK SENSOR OUTPUT. Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.>	Is the voltage 1.64 — 1.70 V?	Go to step 41.	Repair poor contact in ECM connector. Replace the electronic throttle control if defective.
41 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. Connector & terminal (B137) No. 5 — (E57) No. 2: (B137) No. 4 — (E57) No. 1:	Is the resistance less than 1 Ω?	Go to step 42.	Repair the open circuit of harness connector.
42 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR. 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 2 (+) — Engine ground (-): (E57) No. 1 (+) — Engine ground (-):	Is the voltage less than 5 V?	Go to step 43.	Repair the power supply short circuit of harness between ECM and electronic throttle control.
43 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 2 — Engine ground: (E57) No. 1 — Engine ground:	Is the resistance 1 MΩ or more?	Go to step 44.	Repair the short circuit of harness.
44 CHECK ELECTRONIC THROTTLE CONTROL MOTOR HARNESS. Measure the resistance between electronic throttle control connector terminals. Connector & terminal (E57) No. 2 — (E57) No. 1:	Is the resistance 1 MΩ or more?	Go to step 45.	Repair the short circuit of harness.
45 CHECK ELECTRONIC THROTTLE CONTROL GROUND CIRCUIT. Measure the resistance between ECM connector and chassis ground. Connector & terminal (B134) No. 5 — Chassis ground: (B136) No. 15 — Chassis ground: (B137) No. 1 — Chassis ground: (B137) No. 2 — Chassis ground: (B137) No. 3 — Chassis ground: (B137) No. 7 — Chassis ground:	Is the resistance less than 10 Ω?	Go to step 46.	Repair the open circuit of harness.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
46	CHECK ELECTRONIC THROTTLE CONTROL. Measure the resistance between electronic throttle control terminals. Terminals No. 1 — No. 2:	Is the resistance 50 Ω or less?	Go to step 47.	Replace the electronic throttle control.
47	CHECK ELECTRONIC THROTTLE CONTROL. Move the throttle valve to the fully opened and fully closed positions with fingers. Check that the valve returns to the specified position when releasing fingers.	Does the valve return to the specified position? Standard value: 3 mm (0.12 in) from fully closed position	Repair poor contact in ECM connector.	Replace the electronic throttle control.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DE:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1

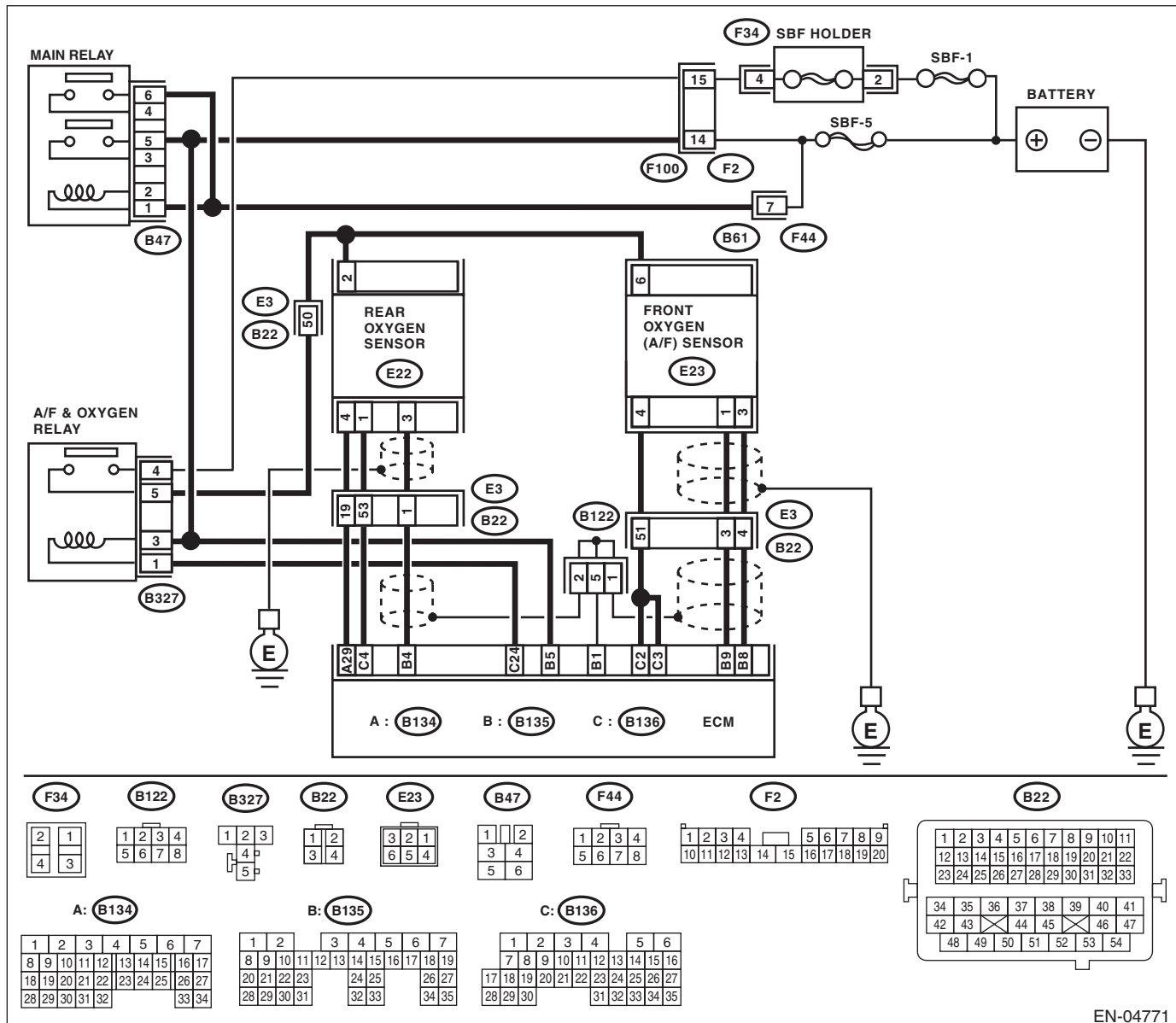
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-205, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04771

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P2096.	Go to step 2.
2 CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.	Does water enter the connector?	Dry the water thoroughly.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. Connector & terminal (B135) No. 9 — (E23) No. 1: (B135) No. 8 — (E23) No. 3:	Is the resistance less than 1 Ω?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
4 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B135) No. 8 — Chassis ground: (B135) No. 9 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 5.	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.
5 CHECK OUTPUT SIGNAL FOR ECM. 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-):	Is the voltage 4.5 V or more?	Go to step 6.	Go to step 7.
6 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>	Repair poor contact in ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 8 (+) — Chassis ground (-):	Is the voltage 4.95 V or more?	Go to step 8 .	Go to step 9 .
8 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 8 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>	Repair poor contact in ECM connector.
9 CHECK EXHAUST SYSTEM.	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step 10 .
10 CHECK AIR INTAKE SYSTEM.	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step 11 .
11 CHECK FUEL PRESSURE. WARNING: <ul style="list-style-type: none"> Place “NO FIRE” signs near the working area. Be careful not to spill fuel. Measure the fuel pressure. <Ref. to ME(H4SO)-29, INSPECTION, Fuel Pressure.> WARNING: Release fuel pressure before removing the fuel pressure gauge.	Is the measured value 339.5 — 360.5 kPa (3.5 — 3.7 kgf/cm ² , 49 — 52 psi)?	Go to step 12 .	Repair the following item. Fuel pressure is too high: <ul style="list-style-type: none"> Clogged fuel line or bent hose Fuel pressure is too low: <ul style="list-style-type: none"> Improper fuel pump discharge Clogged fuel line
12 CHECK ENGINE COOLANT TEMPERATURE SENSOR. 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: <ul style="list-style-type: none"> Subaru Select Monitor For detailed operation procedure, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.> <ul style="list-style-type: none"> General scan tool For detailed operation procedures, refer to the “General Scan Tool Instruction Manual”.	Is the temperature 60°C (140°F) or more?	Go to step 13 .	Replace the engine coolant temperature sensor. <Ref. to FU(H4SO)-22, Engine Coolant Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>13 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.</p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).</p> <p>2) Place the shift lever in neutral position.</p> <p>3) Turn the A/C switch to OFF.</p> <p>4) Turn all the accessory switches to OFF.</p> <p>5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • General scan tool <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Is the measured value 2.1 — 3.4 g/s (0.28 — 0.45 lb/m)</p>	<p>Go to step 14.</p>	<p>Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4SO)-28, Mass Air Flow and Intake Air Temperature Sensor.></p>
<p>14 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.</p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).</p> <p>2) Place the shift lever in neutral position.</p> <p>3) Turn the A/C switch to OFF.</p> <p>4) Turn all the accessory switches to OFF.</p> <p>5) Open the front hood.</p> <p>6) Measure the ambient temperature.</p> <p>7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • General scan tool <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Subtract the ambient temperature from intake air temperature. Is the obtained value -10 — 50°C (-18 — 90°F)?</p>	<p>Go to step 15.</p>	<p>Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4SO)-28, Mass Air Flow and Intake Air Temperature Sensor.></p>
<p>15 CHECK REAR OXYGEN SENSOR DATA.</p> <p>1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (Max. 2 minutes)</p> <p>2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • For MT model, depress the clutch pedal. • Subaru Select Monitor <p>For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • General scan tool <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Is the voltage 490 mV or more?</p>	<p>Go to step 19.</p>	<p>Go to step 16.</p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
16	CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.	Does water enter the connector?	Dry the water thoroughly.	Go to step 17.
17	CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. Connector & terminal (B135) No. 4 — (E22) No. 3: (B134) No. 29 — (E22) No. 4:	Is the resistance 3 Ω or more?	Repair the open circuit of harness between ECM and rear oxygen sensor connector.	Go to step 18.
18	CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. Connector & terminal (E22) No. 3 (+) — Engine ground (-):	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4SO)-38, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector
19	CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: <ul style="list-style-type: none"> • For MT model, depress the clutch pedal. • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.> <ul style="list-style-type: none"> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is the voltage 250 mV or less?	Go to step 20.	Go to step 16.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
20	<p>CHECK THE FRONT OXYGEN (A/F) SENSOR AND REAR OXYGEN SENSOR DATA.</p> <p>1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and leave it unattended for five minutes in idling state.</p> <p>2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none">• Subaru Select Monitor <p>For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.></p> <ul style="list-style-type: none">• General scan tool <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	Does voltage keep to be 0.8 V or more for more than five minutes?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-36, Front Oxygen (A/F) Sensor.>	Go to step 17.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DF:DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1

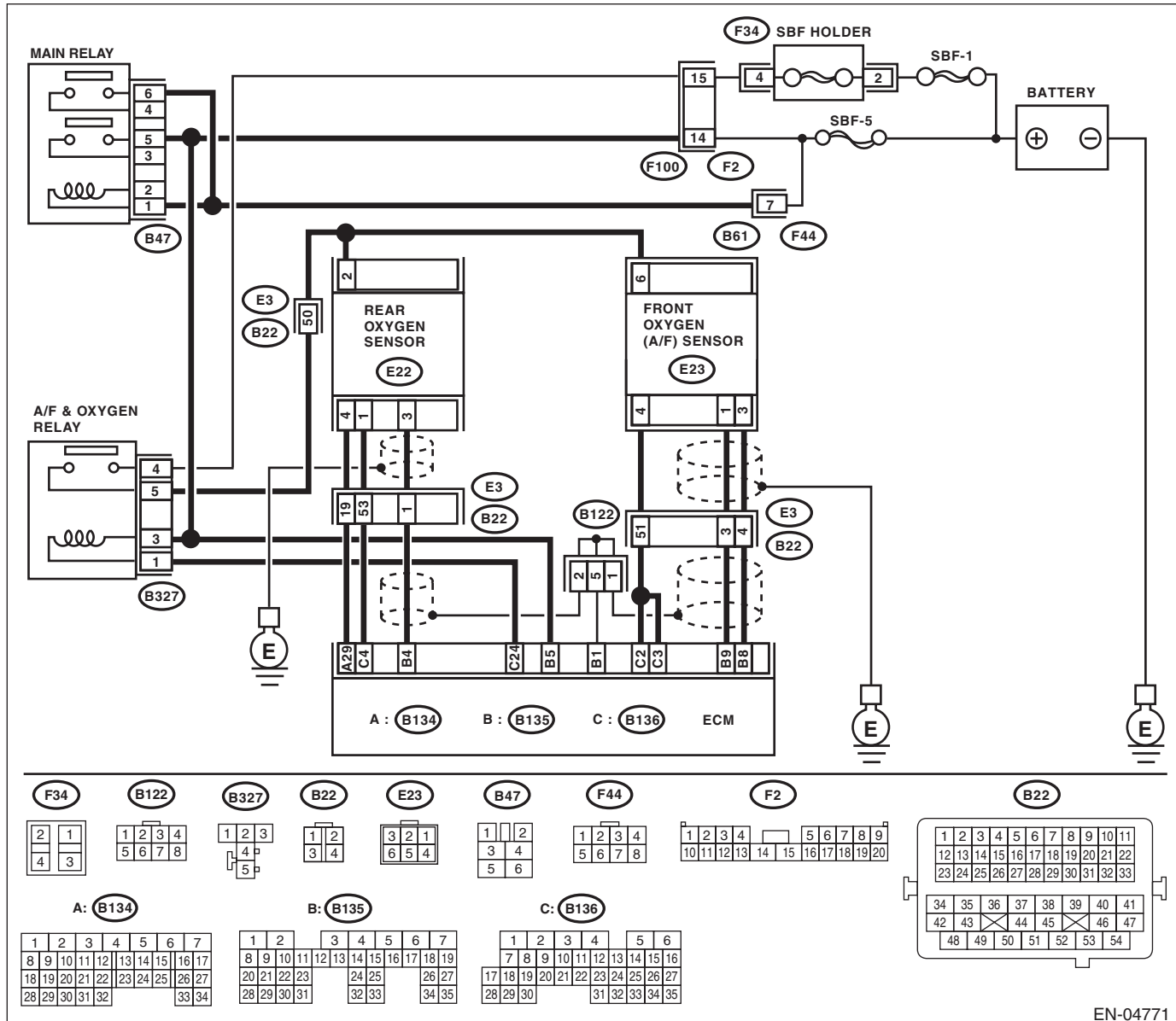
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-207, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04771

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P2097.	Go to step 2.
2 CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.	Does water enter the connector?	Dry the water thoroughly.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. Connector & terminal (B135) No. 9 — (E23) No. 1: (B135) No. 8 — (E23) No. 3:	Is the resistance less than 1 Ω?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
4 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B135) No. 8 — Chassis ground: (B135) No. 9 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 5.	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.
5 CHECK OUTPUT SIGNAL FOR ECM. 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-):	Is the voltage 4.5 V or more?	Go to step 6.	Go to step 7.
6 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>	Repair poor contact in ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 8 (+) — Chassis ground (-):	Is the voltage 4.95 V or more?	Go to step 8 .	Go to step 9 .
8 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 8 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the battery short circuit of harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>	Repair poor contact in ECM connector.
9 CHECK EXHAUST SYSTEM.	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step 10 .
10 CHECK AIR INTAKE SYSTEM.	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step 11 .
11 CHECK FUEL PRESSURE. WARNING: <ul style="list-style-type: none"> Place “NO FIRE” signs near the working area. Be careful not to spill fuel. Measure the fuel pressure. <Ref. to ME(H4SO)-29, INSPECTION, Fuel Pressure.> WARNING: Release fuel pressure before removing the fuel pressure gauge.	Is the measured value 339.5 — 360.5 kPa (3.5 — 3.7 kgf/cm ² , 49 — 52 psi)?	Go to step 12 .	Repair the following item. Fuel pressure is too high: <ul style="list-style-type: none"> Clogged fuel line or bent hose Fuel pressure is too low: <ul style="list-style-type: none"> Improper fuel pump discharge Clogged fuel line
12 CHECK ENGINE COOLANT TEMPERATURE SENSOR. 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: <ul style="list-style-type: none"> Subaru Select Monitor For detailed operation procedure, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.> <ul style="list-style-type: none"> General scan tool For detailed operation procedures, refer to the “General Scan Tool Instruction Manual”.	Is the temperature 60°C (140°F) or more?	Go to step 13 .	Replace the engine coolant temperature sensor. <Ref. to FU(H4SO)-22, Engine Coolant Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>13 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.</p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).</p> <p>2) Place the shift lever in neutral position.</p> <p>3) Turn the A/C switch to OFF.</p> <p>4) Turn all the accessory switches to OFF.</p> <p>5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • General scan tool <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Is the measured value 2.1 — 3.4 g/s (0.28 — 0.45 lb/m)</p>	<p>Go to step 14.</p>	<p>Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4SO)-28, Mass Air Flow and Intake Air Temperature Sensor.></p>
<p>14 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.</p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).</p> <p>2) Place the shift lever in neutral position.</p> <p>3) Turn the A/C switch to OFF.</p> <p>4) Turn all the accessory switches to OFF.</p> <p>5) Open the front hood.</p> <p>6) Measure the ambient temperature.</p> <p>7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • General scan tool <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Subtract the ambient temperature from intake air temperature. Is the obtained value -10 — 50°C (-18 — 90°F)?</p>	<p>Go to step 15.</p>	<p>Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4SO)-28, Mass Air Flow and Intake Air Temperature Sensor.></p>
<p>15 CHECK REAR OXYGEN SENSOR DATA.</p> <p>1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (Max. 2 minutes)</p> <p>2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • For MT model, depress the clutch pedal. • Subaru Select Monitor <p>For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • General scan tool <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Is the voltage 490 mV or more?</p>	<p>Go to step 19.</p>	<p>Go to step 16.</p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
16 CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.	Does water enter the connector?	Dry the water thoroughly.	Go to step 17.
17 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. Connector & terminal (B135) No. 4 — (E22) No. 3: (B134) No. 29 — (E22) No. 4:	Is the resistance 3 Ω or more?	Repair the open circuit of harness between ECM and rear oxygen sensor connector.	Go to step 18.
18 CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground. Connector & terminal (E22) No. 3 (+) — Engine ground (-):	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4SO)-38, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector
19 CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: <ul style="list-style-type: none"> • For MT model, depress the clutch pedal. • Subaru Select Monitor For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.> <ul style="list-style-type: none"> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is the voltage 250 mV or less?	Go to step 20.	Go to step 16.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
20	<p>CHECK FRONT OXYGEN (A/F) SENSOR AND REAR OXYGEN SENSOR.</p> <p>1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and leave it unattended for five minutes in idling state.</p> <p>2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none">• Subaru Select Monitor <p>For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.></p> <ul style="list-style-type: none">• General scan tool <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	Does voltage keep to be 0.8 V or more for more than five minutes?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-36, Front Oxygen (A/F) Sensor.>	Go to step 17.

DG:DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/ PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-172, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H4SO)-186, DTC P1160 RETURN SPRING FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.> or <Ref. to GD(H4SO)-209, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H4SO)-215, DTC P2109 THROTTLE/PEDAL POSITION SENSOR "A" MINIMUM STOP PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

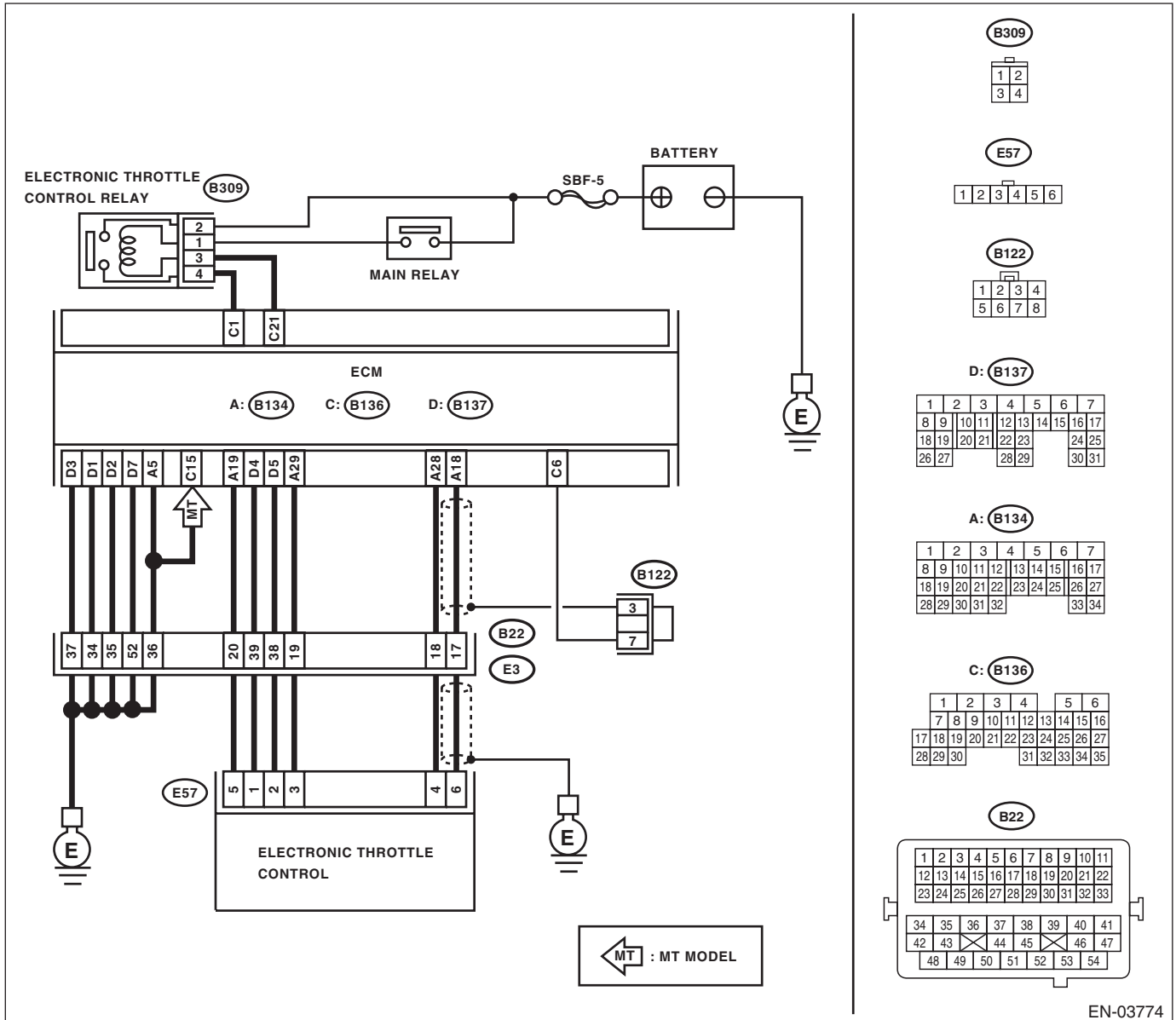
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-03774

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1 CHECK ELECTRONIC THROTTLE CONTROL RELAY.</p> <p>1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Connect the battery to terminals No. 1 and No. 3 of electronic throttle control relay. 4) Measure the resistance between electronic throttle control relay terminals.</p> <p>Terminals No. 2 — No. 4:</p>	Is the resistance less than 1 Ω ?	Go to step 2.	Replace the electronic throttle control relay.
<p>2 CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL RELAY.</p> <p>Measure the voltage between electronic throttle control relay connector and chassis ground.</p> <p>Connector & terminal (B309) No. 1 (+) — Chassis ground (-): (B309) No. 2 (+) — Chassis ground (-):</p>	Is the voltage 5 V or more?	Go to step 3.	Repair the open or ground short circuit of power supply circuit.
<p>3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.</p> <p>1) Disconnect the connectors from ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control relay connector and chassis ground.</p> <p>Connector & terminal (B309) No. 3 (+) — Chassis ground (-):</p>	Is the voltage less than 5 V?	Go to step 4.	Repair the power supply short circuit of harness between ECM and electronic throttle control.
<p>4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.</p> <p>1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control relay connector and chassis ground.</p> <p>Connector & terminal (B309) No. 3 — Chassis ground: (B309) No. 4 — Chassis ground:</p>	Is the resistance 1 M Ω or more?	Go to step 5.	Repair the ground short circuit of harness between ECM and electronic throttle control relay.
<p>5 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.</p> <p>1) Turn the ignition switch to OFF. 2) Measure the resistance between ECM connector and electronic throttle control relay connector.</p> <p>Connector & terminal (B136) No. 21 — (B309) No. 3: (B136) No. 1 — (B309) No. 4:</p>	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the open circuit of harness between ECM and electronic throttle control relay.
<p>6 CHECK SENSOR OUTPUT.</p> <p>1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal using Subaru Select Monitor.</p>	Is the voltage 0.4 V or more?	Go to step 7.	Go to step 9.
<p>7 CHECK SENSOR OUTPUT.</p> <p>1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Read the data of sub throttle sensor signal using Subaru Select Monitor.</p>	Is the voltage 0.8 V or more?	Go to step 8.	Go to step 9.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK POOR CONTACT. Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Go to step 13.
9 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. <i>Connector & terminal</i> <i>(B134) No. 18 — (E57) No. 6:</i> <i>(B134) No. 28 — (E57) No. 4:</i>	Is the resistance less than 1 Ω?	Go to step 10.	Repair the open circuit of harness connector.
10 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. Measure the resistance between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 18 — Chassis ground:</i> <i>(B134) No. 28 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 11.	Repair the ground short circuit of harness.
11 CHECK SENSOR POWER SUPPLY. 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. <i>Connector & terminal</i> <i>(E57) No. 5 (+) — Engine ground (-):</i>	Is the voltage 4.5 — 5.5 V?	Go to step 12.	Repair poor contact in ECM connector.
12 CHECK SHORT CIRCUIT IN ECM. 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. <i>Connector & terminal</i> <i>(E57) No. 6 — Engine ground:</i> <i>(E57) No. 4 — Engine ground:</i>	Is the resistance 10 Ω or more?	Go to step 13.	Repair poor contact in ECM connector.
13 CHECK SENSOR OUTPUT. 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal using Subaru Select Monitor.	Is the voltage less than 4.63 V?	Go to step 14.	Go to step 16.
14 CHECK SENSOR OUTPUT. Read the data of sub throttle sensor signal using Subaru Select Monitor.	Is the voltage less than 4.73 V?	Go to step 15.	Go to step 16.
15 CHECK POOR CONTACT. Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Go to step 21.
16 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. <i>Connector & terminal</i> <i>(B134) No. 18 — (E57) No. 6:</i> <i>(B134) No. 28 — (E57) No. 4:</i>	Is the resistance less than 1 Ω?	Go to step 17.	Repair the open circuit of harness connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
17 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM connector. 2) Measure the resistance between electronic throttle control connector and engine ground. <i>Connector & terminal</i> <i>(E57) No. 3 — Engine ground:</i>	Is the resistance less than 5 Ω ?	Go to step 18.	Repair poor contact in ECM connector.
18 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control connector and engine ground. <i>Connector & terminal</i> <i>(E57) No. 5 (+) — Engine ground (-):</i>	Is the voltage 10 V or more?	Go to step 19.	Repair the battery short circuit of harness between ECM connector and electronic throttle control connector.
19 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. Measure the voltage between electronic throttle control connector and engine ground. <i>Connector & terminal</i> <i>(E57) No. 6 (+) — Engine ground (-):</i> <i>(E57) No. 4 (+) — Engine ground (-):</i>	Is the voltage less than 10 V?	Go to step 20.	Repair the short circuit of harness between ECM connector and electronic throttle control connector.
20 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Remove the ECM. 3) Measure the resistance between ECM connectors. <i>Connector & terminal</i> <i>(B134) No. 18 — (B134) No. 19:</i> <i>(B134) No. 28 — (B134) No. 19:</i>	Is the resistance 1 $M\Omega$ or more?	Go to step 21.	Repair the short circuit to sensor power supply.
21 CHECK SENSOR OUTPUT. 1) Turn the ignition switch to OFF. 2) Connect the connectors except for electric throttle control relay. 3) Turn the ignition switch to ON. 4) Read the data of main throttle sensor signal using Subaru Select Monitor.	Is the voltage 0.81 — 0.87 V?	Go to step 22.	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective.
22 CHECK SENSOR OUTPUT. Read the data of sub throttle sensor signal using Subaru Select Monitor.	Is the voltage 1.64 — 1.70 V?	Go to step 23.	Repair poor contact in ECM connector. Replace the electronic throttle control if defective.
23 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. <i>Connector & terminal</i> <i>(B137) No. 5 — (E57) No. 2:</i> <i>(B137) No. 4 — (E57) No. 1:</i>	Is the resistance less than 1 Ω ?	Go to step 24.	Repair the open circuit of harness connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
24 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR. 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 2 (+) — Engine ground (-): (E57) No. 1 (+) — Engine ground (-):	Is the voltage less than 5 V?	Go to step 25.	Repair the power supply short circuit of harness between ECM and electronic throttle control.
25 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 2 — Engine ground: (E57) No. 1 — Engine ground:	Is the resistance 1 MΩ or more?	Go to step 26.	Repair the short circuit of harness.
26 CHECK ELECTRONIC THROTTLE CONTROL MOTOR HARNESS. Measure the resistance between electronic throttle control connector terminals. Connector & terminal (E57) No. 2 — (E57) No. 1:	Is the resistance 1 MΩ or more?	Go to step 27.	Repair the short circuit of harness.
27 CHECK ELECTRONIC THROTTLE CONTROL GROUND CIRCUIT. Measure the resistance between ECM connector and chassis ground. Connector & terminal (B136) No. 15 — Chassis ground:	Is the resistance less than 10 Ω?	Go to step 28.	Repair the open circuit of harness.
28 CHECK ELECTRONIC THROTTLE CONTROL. Measure the resistance between electronic throttle control terminals. Terminals No. 1 — No. 2:	Is the resistance 50 Ω or less?	Go to step 29.	Replace the electronic throttle control.
29 CHECK ELECTRONIC THROTTLE CONTROL. Move the throttle valve to the fully opened and fully closed positions with fingers. Check that the valve returns to the specified position when releasing fingers.	Does the valve return to the specified position? Standard value: 3 mm (0.12 in) from fully closed position	Repair poor contact in ECM connector.	Replace the electronic throttle control.

DH:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-211, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

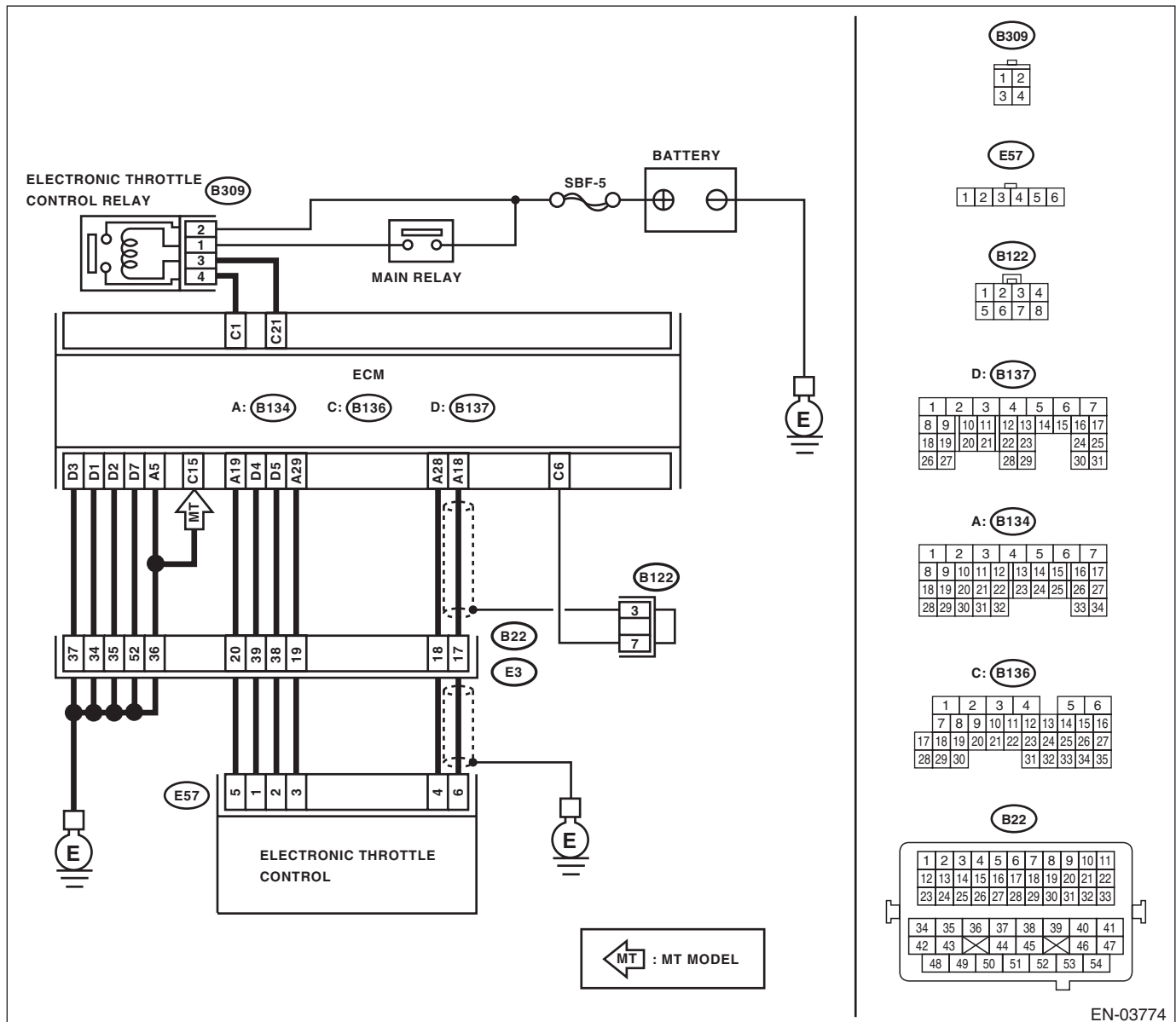
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance
- Engine stalls.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03774

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK ELECTRONIC THROTTLE CONTROL RELAY.</p> <p>1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Connect the battery to terminals No. 1 and No. 3 of electronic throttle control relay. 4) Measure the resistance between electronic throttle control terminals.</p> <p>Terminals No. 2 — No. 4:</p>	Is the resistance less than 1 Ω ?	Go to step 2.	Replace the electronic throttle control relay.
<p>2</p> <p>CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL RELAY.</p> <p>Measure the voltage between electronic throttle control relay connector and chassis ground.</p> <p>Connector & terminal (B309) No. 1 (+) — Chassis ground (-): (B309) No. 2 (+) — Chassis ground (-):</p>	Is the voltage 5 V or more?	Go to step 3.	Repair the open or ground short circuit of power supply circuit.
<p>3</p> <p>CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.</p> <p>1) Disconnect the connectors from ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control relay connector and chassis ground.</p> <p>Connector & terminal (B309) No. 3 (+) — Chassis ground (-):</p>	Is the voltage less than 5 V?	Go to step 4.	Repair the power supply short circuit of harness between ECM and electronic throttle control relay.
<p>4</p> <p>CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.</p> <p>1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control relay connector and chassis ground.</p> <p>Connector & terminal (B309) No. 3 — Chassis ground: (B309) No. 4 — Chassis ground:</p>	Is the resistance 1 M Ω or more?	Go to step 5.	Repair the ground short circuit of harness between ECM and electronic throttle control relay.
<p>5</p> <p>CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.</p> <p>Measure the resistance between ECM connector and electronic throttle control relay connector.</p> <p>Connector & terminal (B136) No. 21 — (B309) No. 3: (B136) No. 1 — (B309) No. 4:</p>	Is the resistance less than 1 Ω ?	Repair poor contact in ECM connector.	Repair the open circuit of harness between ECM and electronic throttle control relay.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DI: DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

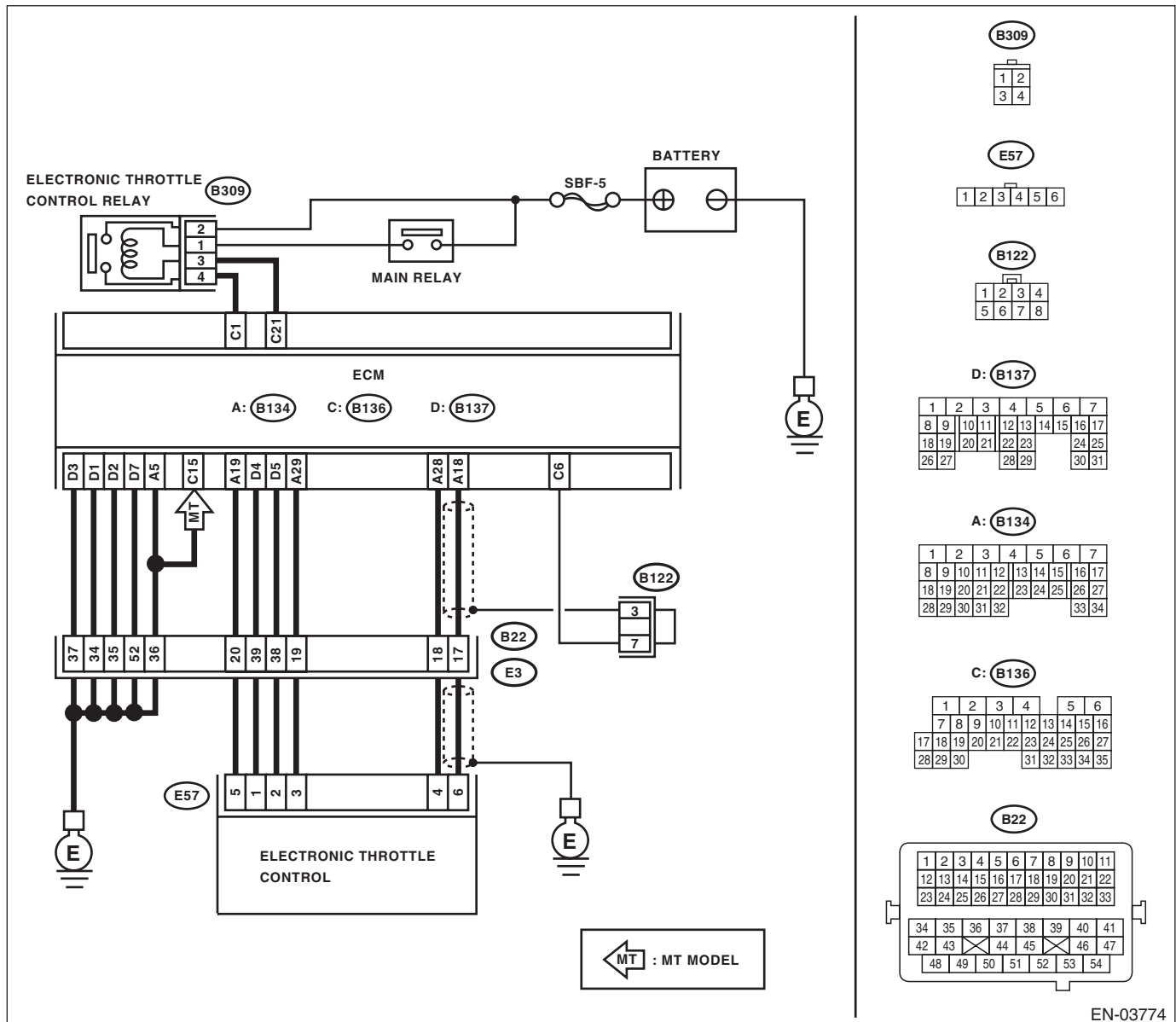
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-213, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03774

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ELECTRONIC THROTTLE CONTROL RELAY. 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Measure the resistance between electronic throttle control relay terminals. <i>Terminals</i> <i>No. 2 — No. 4:</i>	Is the resistance 1 MΩ or more?	Go to step 2.	Replace the electronic throttle control relay.
2 CHECK SHORT CIRCUIT OF ELECTRONIC THROTTLE CONTROL RELAY POWER SUPPLY. 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control relay connector and chassis ground. <i>Connector & terminal</i> <i>(B309) No. 4 (+) — Chassis ground (-):</i>	Is the voltage 5 V or more?	Go to step 3.	Repair the power supply short circuit of harness between ECM and electronic throttle control relay.
3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connector and engine ground. <i>Connector & terminal</i> <i>(B136) No. 21 — Engine ground:</i>	Is the resistance 1 MΩ or more?	Repair poor contact in ECM connector.	Repair the ground short circuit of harness between ECM and electronic throttle control relay.

DJ:DTC P2109 THROTTLE/PEDAL POSITION SENSOR “A” MINIMUM STOP PERFORMANCE

NOTE:

For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4SO)(diag)-311, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

DK:DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-217, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

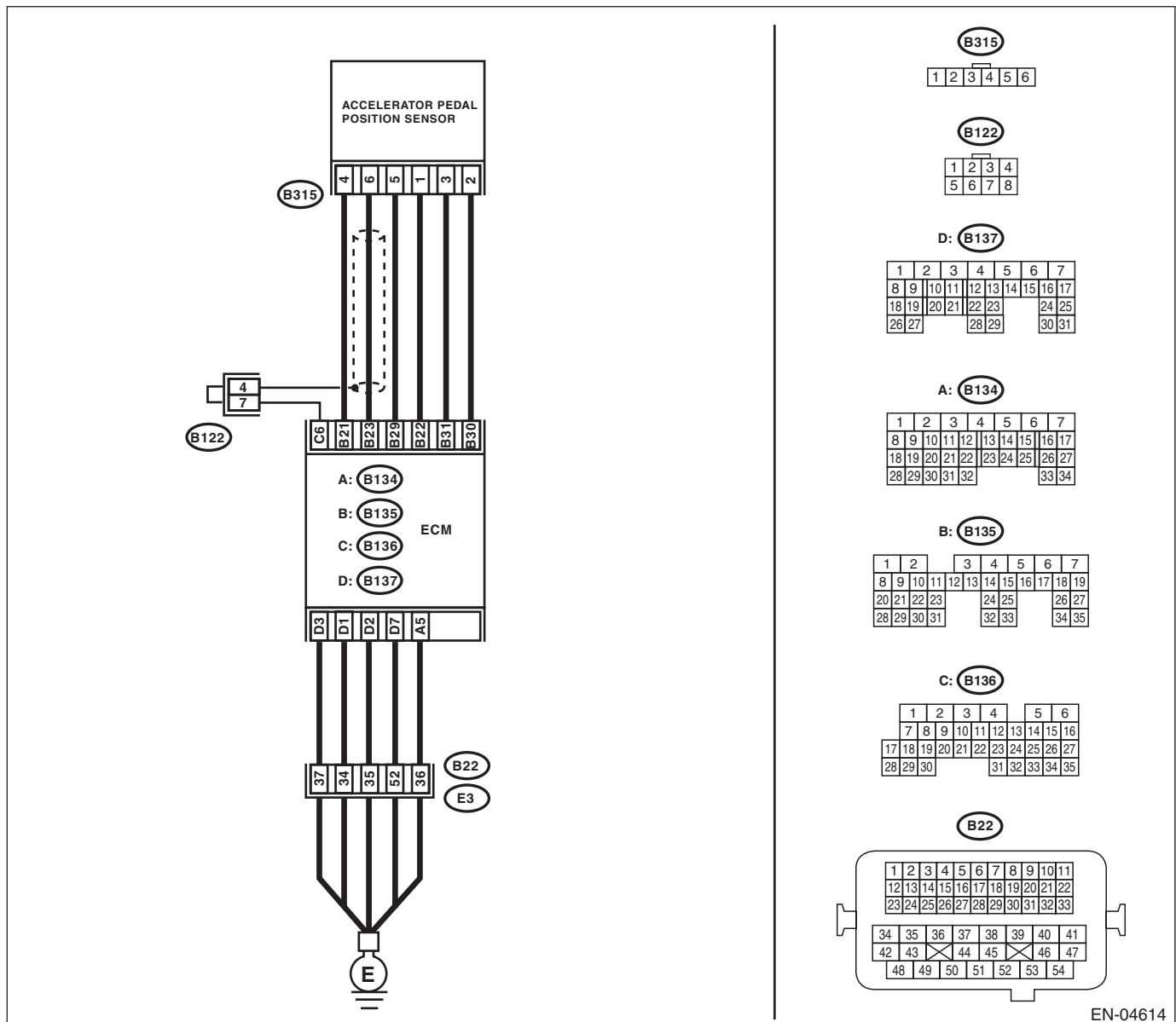
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04614

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT. 1) Turn the ignition switch to ON. 2) Read the data of main accelerator pedal position sensor signal using Subaru Select Monitor. <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.>	Is the voltage 0.4 V or more?	Go to step 2.	Go to step 3.
2 CHECK POOR CONTACT. Check poor contact of connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance of ECM connector and accelerator pedal position sensor connector. <i>Connector & terminal</i> <i>(B135) No. 21 — (B315) No. 4:</i> <i>(B135) No. 23 — (B315) No. 6:</i>	Is the resistance less than 1 Ω?	Go to step 4.	Repair the open circuit of harness connector.
4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. Measure the resistance between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 21 — Chassis ground:</i> <i>(B135) No. 23 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 5.	Repair the chassis short circuit of harness.
5 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Connect the ECM connector. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. <i>Connector & terminal</i> <i>(B315) No. 5 — Chassis ground:</i>	Is the resistance less than 5 Ω?	Go to step 6.	Repair poor contact in ECM connector.
6 CHECK POWER SUPPLY OF ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between accelerator pedal position sensor connector and chassis ground. <i>Connector & terminal</i> <i>(B315) No. 4 (+) — Chassis ground (-):</i>	Is the voltage 4.5 — 5.5 V?	Replace the accelerator pedal position sensor. <Ref. to SP (H4SO)-3, Accelerator Pedal.>	Repair poor contact in ECM connector.

DL:DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-219, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

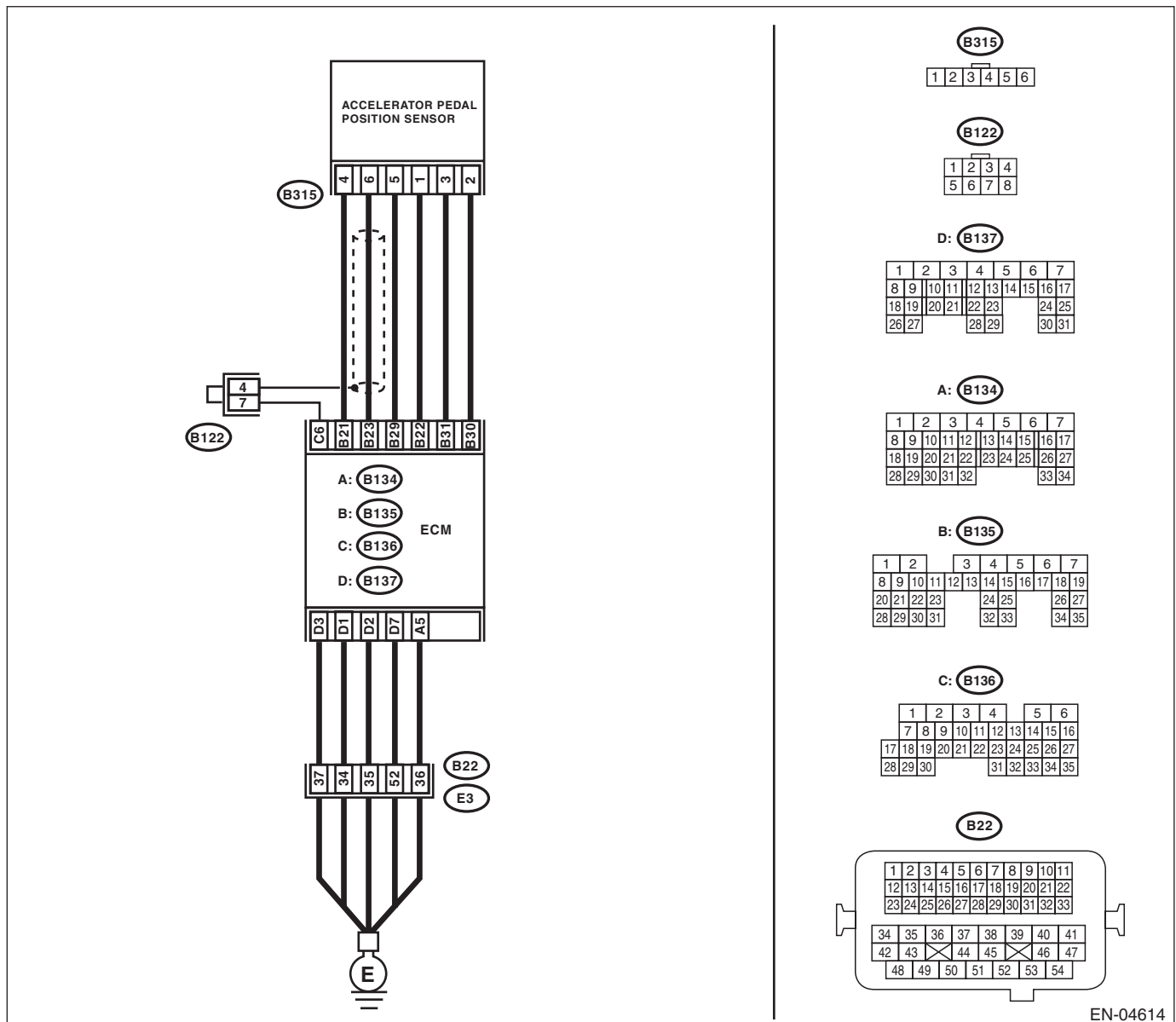
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04614

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT. 1) Turn the ignition switch to ON. 2) Read the data of main accelerator pedal position sensor signal using Subaru Select Monitor. <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.>	Is the voltage less than 4.8 V?	Go to step 2.	Go to step 3.
2 CHECK POOR CONTACT. Check poor contact of connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. <i>Connector & terminal</i> <i>(B135) No. 21 — (B315) No. 4:</i> <i>(B135) No. 29 — (B315) No. 5:</i> <i>(B135) No. 23 — (B315) No. 6:</i>	Is the resistance less than 1 Ω?	Go to step 4.	Repair the open circuit of harness connector.
4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Connect the ECM connector. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. <i>Connector & terminal</i> <i>(B315) No. 5 — Chassis ground:</i>	Is the resistance less than 5 Ω?	Go to step 5.	Repair poor contact in ECM connector.
5 CHECK POWER SUPPLY OF ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between accelerator pedal position sensor connector and chassis ground. <i>Connector & terminal</i> <i>(B315) No. 4 (+) — Chassis ground (-):</i>	Is the voltage 4.5 — 5.5 V?	Go to step 6.	Repair the short circuit of harness between ECM connector and accelerator pedal position sensor connector. Replace the ECM if defective. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>
6 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Connect the accelerator pedal position sensor connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 23 (+) — Chassis ground (-):</i>	Is the voltage less than 4.8 V?	Repair poor contact in ECM connector.	Repair the poor contact of accelerator pedal position sensor connector. Replace the accelerator pedal position sensor if defective. <Ref. to SP (H4SO)-3, Accelerator Pedal.>

DM:DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-221, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

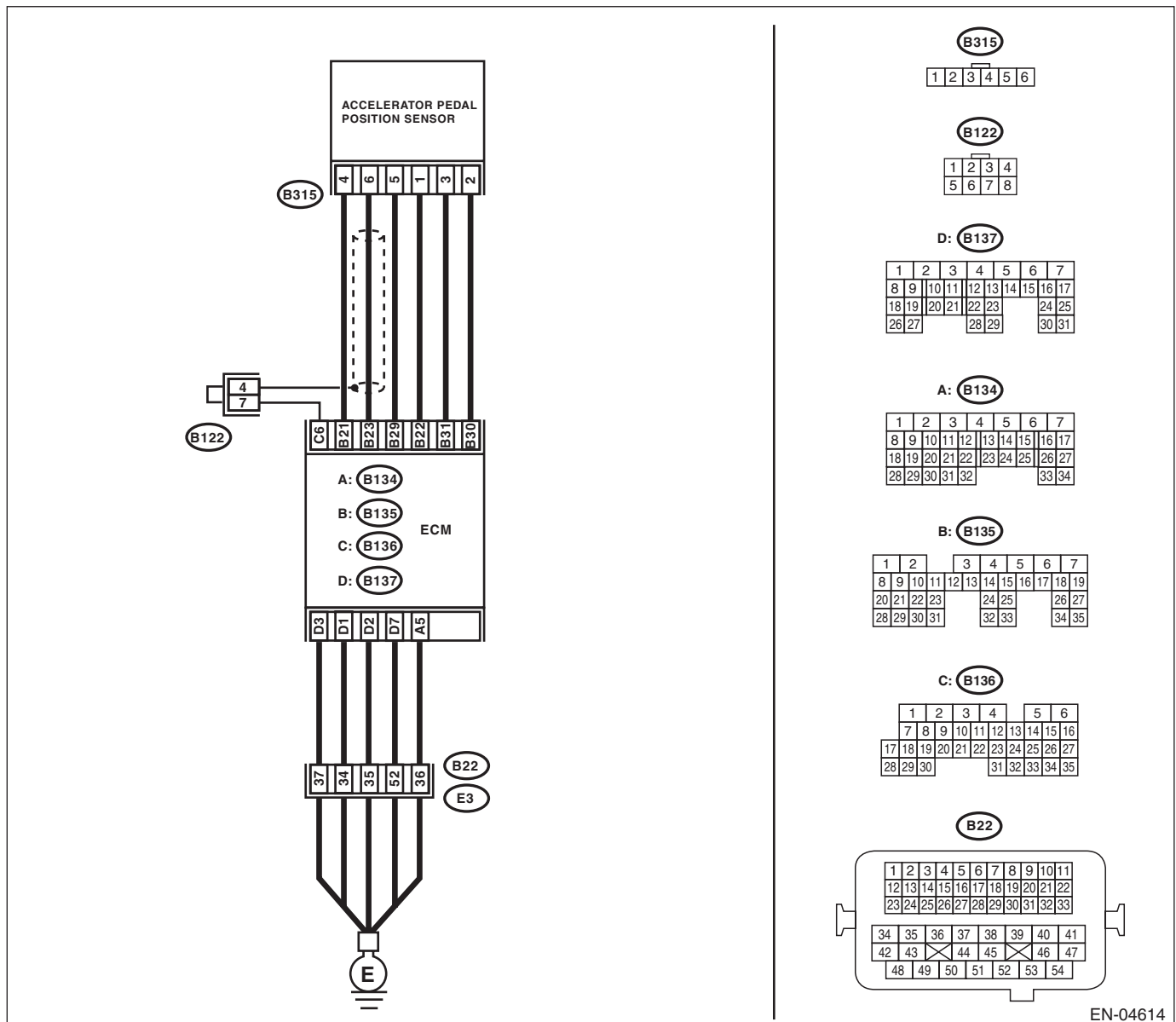
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04614

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT. 1) Turn the ignition switch to ON. 2) Read the data of sub accelerator pedal position sensor signal using Subaru Select Monitor. <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.>	Is the voltage 0.4 V or more?	Go to step 2.	Go to step 3.
2	CHECK POOR CONTACT. Check poor contact of connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. Connector & terminal (B135) No. 22 — (B315) No. 1: (B135) No. 31 — (B315) No. 3:	Is the resistance less than 1 Ω?	Go to step 4.	Repair the open circuit of harness connector.
4	CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. Measure the resistance between ECM connector and chassis ground. Connector & terminal (B135) No. 22 — Chassis ground: (B135) No. 31 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 5.	Repair the chassis short circuit of harness.
5	CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Connect the ECM connector. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. Connector & terminal (B315) No. 2 — Chassis ground:	Is the resistance less than 5 Ω?	Go to step 6.	Repair poor contact in ECM connector.
6	CHECK POWER SUPPLY OF ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between accelerator pedal position sensor connector and chassis ground. Connector & terminal (B315) No. 1 (+) — Chassis ground (-):	Is the voltage 4.5 — 5.5 V?	Replace the accelerator pedal position sensor. <Ref. to SP (H4SO)-3, Accelerator Pedal.>	Repair poor contact in ECM connector.

DN:DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-223, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

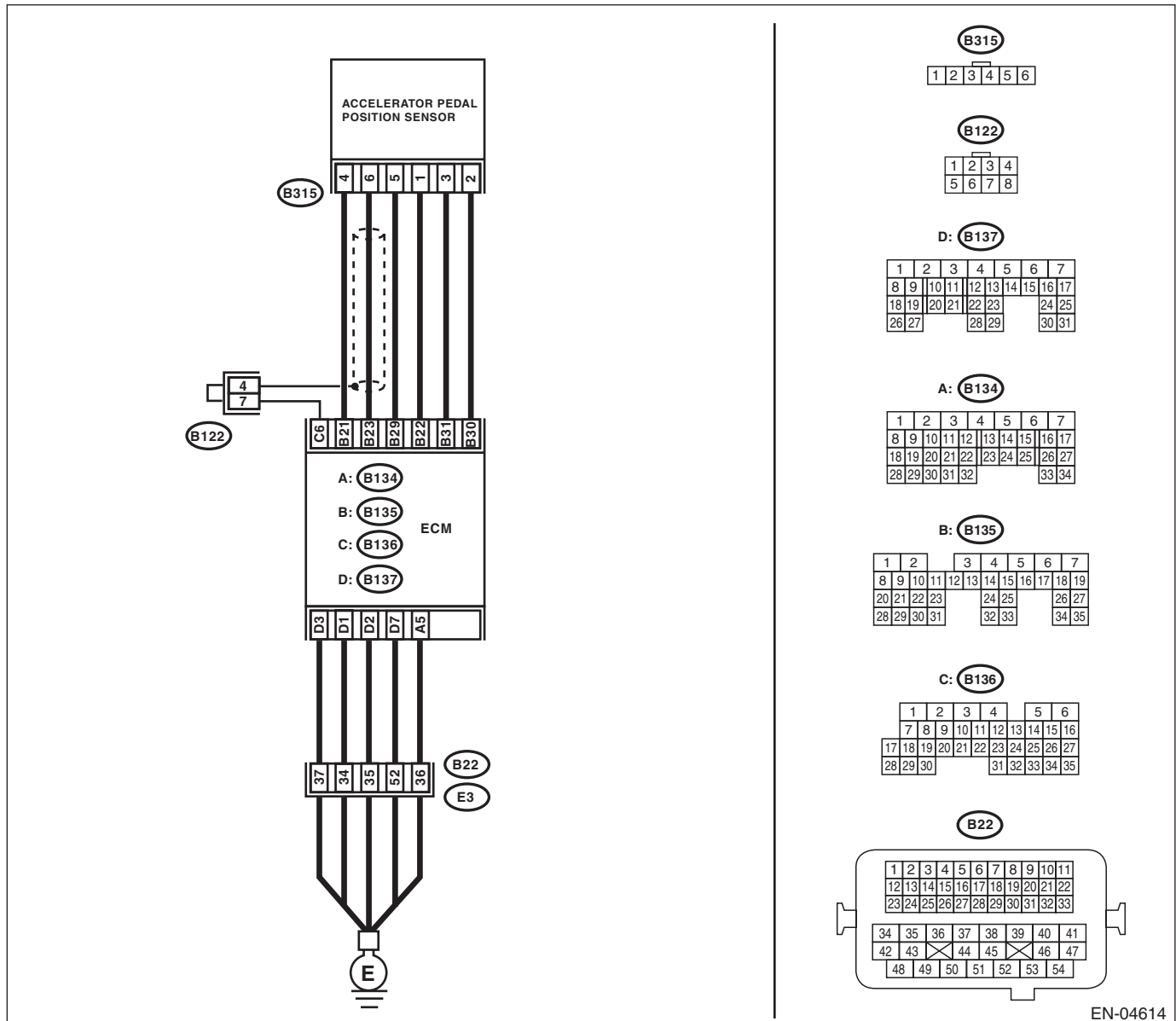
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04614

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT. 1) Turn the ignition switch to ON. 2) Read the data of sub accelerator pedal position sensor signal using Subaru Select Monitor. <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.>	Is the voltage less than 4.8 V?	Go to step 2.	Go to step 3.
2 CHECK POOR CONTACT. Check poor contact of connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. <i>Connector & terminal</i> (B135) No. 22 — (B315) No. 1: (B135) No. 30 — (B315) No. 2: (B135) No. 31 — (B315) No. 3:	Is the resistance less than 1 Ω?	Go to step 4.	Repair the open circuit of harness connector.
4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Connect the ECM connector. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. <i>Connector & terminal</i> (B315) No. 2 — Chassis ground:	Is the resistance less than 5 Ω?	Go to step 5.	Repair poor contact in ECM connector.
5 CHECK POWER SUPPLY OF ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between accelerator pedal position sensor connector and chassis ground. <i>Connector & terminal</i> (B315) No. 1 (+) — Chassis ground (-):	Is the voltage less than 4.5 — 5.5 V?	Go to step 6.	Repair the short circuit of harness between ECM connector and accelerator pedal position sensor connector. Replace the ECM if defective. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>
6 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Connect the accelerator pedal position sensor connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> (B135) No. 31 (+) — Chassis ground (-):	Is the voltage less than 4.8 V?	Repair poor contact in ECM connector.	Repair the poor contact of accelerator pedal position sensor connector. Replace the accelerator pedal position sensor if defective. <Ref. to SP (H4SO)-3, Accelerator Pedal.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DO:DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A"/"B" VOLTAGE CORRELATION

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-225, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A"/"B" VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

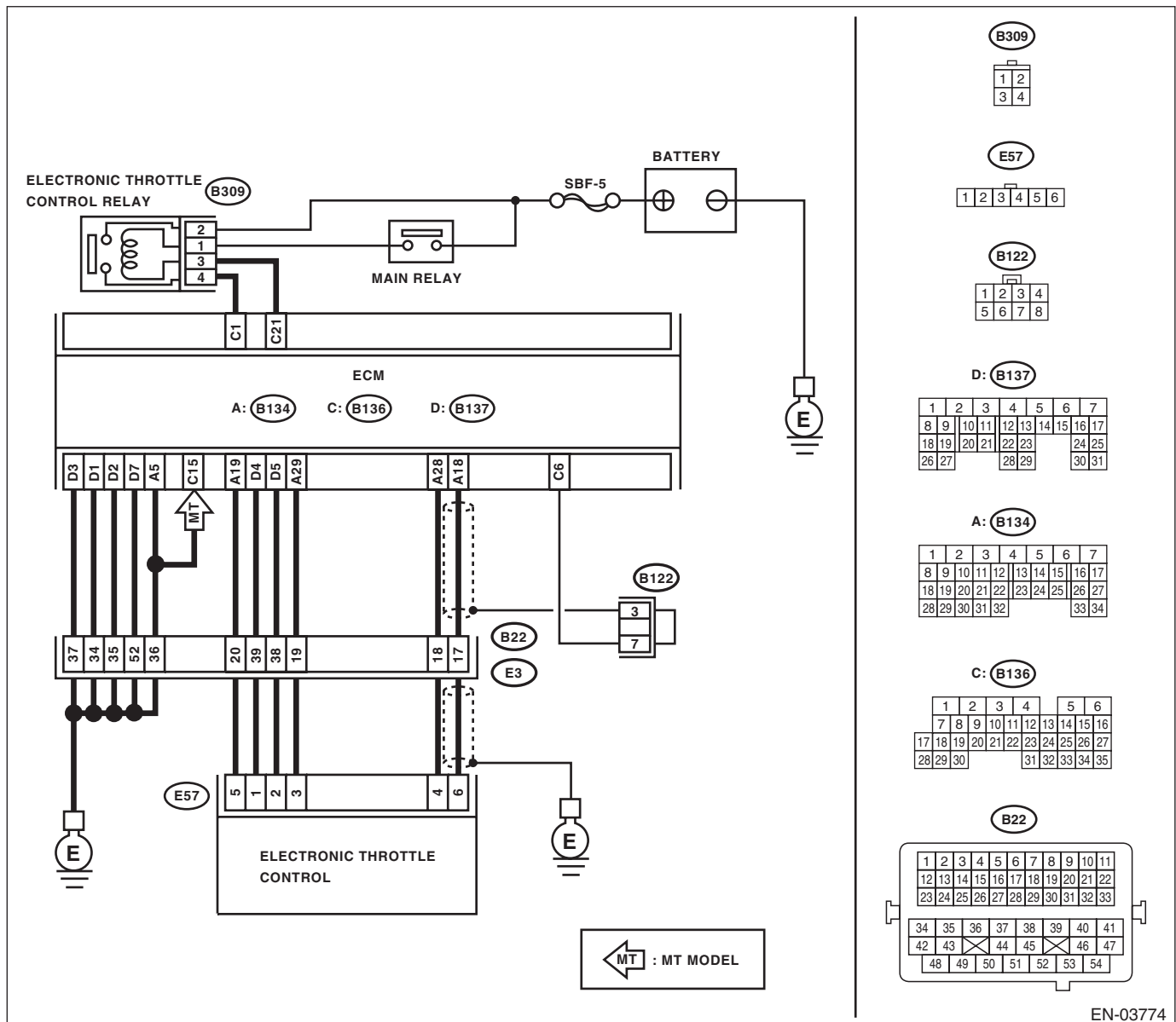
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03774

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK SENSOR OUTPUT. 1) Turn the ignition switch to ON. 2) Read the data of main throttle sensor signal using Subaru Select Monitor.	Is the voltage 0.4 V or more?	Go to step 2.	Go to step 4.
2	CHECK SENSOR OUTPUT. Read the data of sub throttle sensor signal using Subaru Select Monitor.	Is the voltage 0.8 V or more?	Go to step 3.	Go to step 4.
3	CHECK POOR CONTACT. Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Go to step 14.
4	CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. Connector & terminal (B134) No. 18 — (E57) No. 6: (B134) No. 28 — (E57) No. 4:	Is the resistance less than 1 Ω?	Go to step 5.	Repair the open circuit of harness connector.
5	CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. Measure the resistance between ECM connector and chassis ground. Connector & terminal (B134) No. 18 — Chassis ground: (B134) No. 28 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 6.	Repair the ground short circuit of harness.
6	CHECK SENSOR POWER SUPPLY. 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 5 (+) — Engine ground (-):	Is the voltage 4.5 — 5.5 V?	Go to step 7.	Repair poor contact in ECM connector.
7	CHECK SHORT CIRCUIT IN ECM. 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 6 — Engine ground: (E57) No. 4 — Engine ground:	Is the resistance 10 Ω or more?	Go to step 8.	Repair poor contact in ECM connector.
8	CHECK SENSOR OUTPUT. 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal using Subaru Select Monitor.	Is the voltage less than 4.63 V?	Go to step 9.	Go to step 11.
9	CHECK SENSOR OUTPUT. Read the data of sub throttle sensor signal using Subaru Select Monitor.	Is the voltage less than 4.73 V?	Go to step 10.	Go to step 11.
10	CHECK POOR CONTACT. Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
11 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. <i>Connector & terminal</i> (B134) No. 18 — (E57) No. 6: (B134) No. 28 — (E57) No. 4:	Is the resistance less than 1 Ω ?	Go to step 12.	Repair the open circuit of harness connector.
12 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM connector. 2) Measure the resistance between electronic throttle control connector and engine ground. <i>Connector & terminal</i> (E57) No. 3 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 13.	Repair poor contact in ECM connector.
13 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. <i>Connector & terminal</i> (E57) No. 5 (+) — Engine ground (-):	Is the voltage 10 V or more?	Go to step 14.	Repair the battery short circuit of harness between ECM connector and electronic throttle control connector.
14 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. Measure the voltage between electronic throttle control connector and engine ground. <i>Connector & terminal</i> (E57) No. 6 (+) — Engine ground (-): (E57) No. 4 (+) — Engine ground (-):	Is the voltage less than 10 V?	Go to step 15.	Repair the short circuit of harness between ECM connector and electronic throttle control connector.
15 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the ECM connector. 3) Measure the resistance between ECM connectors. <i>Connector & terminal</i> (B134) No. 18 — (B134) No. 19: (B134) No. 28 — (B134) No. 19:	Is the resistance 1 M Ω or more?	Go to step 16.	Repair the short circuit to sensor power supply.
16 CHECK ELECTRONIC THROTTLE CONTROL HARNESS. 1) Disconnect the connectors from ECM. 2) Disconnect the connectors from electronic throttle control. 3) Measure the resistance between electronic throttle control connector terminals. <i>Connector & terminal</i> (E57) No. 6 — (E57) No. 4:	Is the resistance 1 M Ω or more?	Repair poor contact in ECM connector.	Repair the short circuit of harness.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DP:DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-227, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

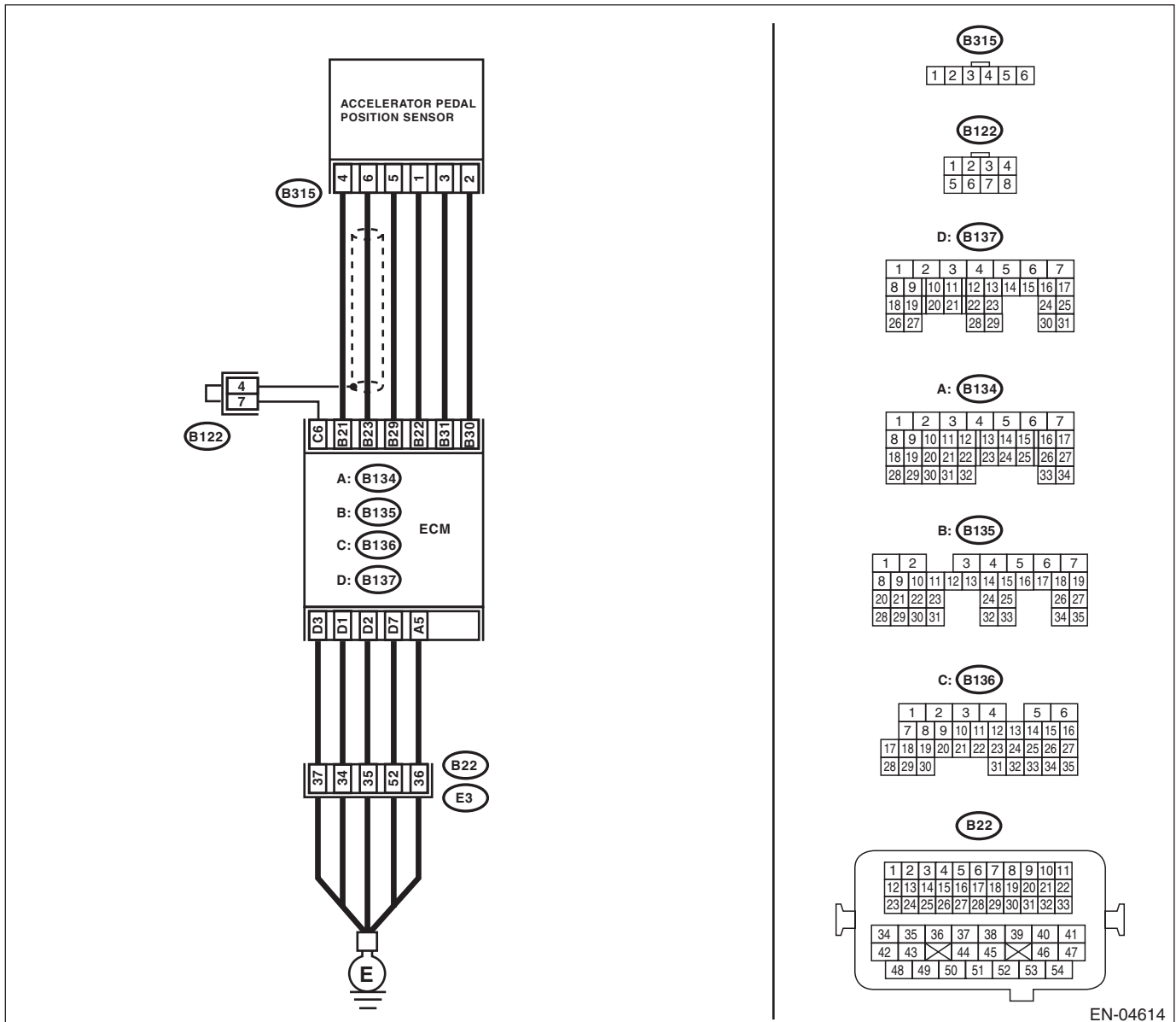
TROUBLE SYMPTOM:

- Erroneous idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04614

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.</p> <p>1) Turn the ignition switch to ON. 2) Read the data of main accelerator pedal position sensor signal and sub accelerator pedal position sensor signal using Subaru Select Monitor.</p> <p>NOTE: For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.></p>	Is the voltage 0.4 V or more?	Go to step 2.	Go to step 4.
2	<p>CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT.</p> <p>1) Turn the ignition switch to ON. 2) Read the data of main accelerator pedal position sensor signal and sub accelerator pedal position sensor signal using Subaru Select Monitor.</p> <p>NOTE: For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4SO)(diag)-27, Subaru Select Monitor.></p>	Is the voltage less than 4.8 V?	Go to step 3.	Go to step 4.
3	<p>CHECK POOR CONTACT.</p> <p>Check poor contact of connector between ECM and accelerator pedal position sensor.</p>	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
4	<p>CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector.</p> <p>Connector & terminal (B135) No. 22 — (B315) No. 1: (B135) No. 30 — (B315) No. 2: (B135) No. 31 — (B315) No. 3: (B135) No. 21 — (B315) No. 4: (B135) No. 29 — (B315) No. 5: (B135) No. 23 — (B315) No. 6:</p>	Is the resistance less than 1 Ω?	Go to step 5.	Repair the open circuit of harness connector.
5	<p>CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</p> <p>Measure the resistance between ECM connector and chassis ground.</p> <p>Connector & terminal (B135) No. 23 — Chassis ground: (B135) No. 21 — Chassis ground: (B135) No. 31 — Chassis ground: (B135) No. 22 — Chassis ground:</p>	Is the resistance 1 MΩ or more?	Go to step 6.	Repair the chassis short circuit of harness.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Connect the ECM connector. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. <i>Connector & terminal</i> <i>(B315) No. 2 — Chassis ground:</i> <i>(B315) No. 5 — Chassis ground:</i>	Is the resistance less than 5 Ω?	Go to step 7.	Repair poor contact in ECM connector.
7 CHECK POWER SUPPLY OF ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between accelerator pedal position sensor connector and chassis ground. <i>Connector & terminal</i> <i>(B315) No. 1 (+) — Chassis ground (-):</i> <i>(B315) No. 4 (+) — Chassis ground (-):</i>	Is the voltage 4.5 — 5.5 V?	Go to step 8.	Repair poor contact in ECM connector.
8 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Connect the accelerator pedal position sensor connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 31 (+) — Engine ground (-):</i> <i>(B135) No. 23 (+) — Engine ground (-):</i>	Is the voltage less than 4.8 V?	Go to step 9.	Repair the poor contact of accelerator pedal position sensor connector. Replace the accelerator pedal position sensor if defective. <Ref. to SP (H4SO)-3, Accelerator Pedal.>
9 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between connector terminals of accelerator pedal position sensor. <i>Connector & terminal</i> <i>(B315) No. 6 — (B315) No. 3:</i>	Is the resistance 1 MΩ or more?	Repair poor contact in ECM connector.	Repair the short circuit of harness between ECM connector and accelerator pedal position sensor connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DQ:DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-229, DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).>	Replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>

DR:DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-230, DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).> NOTE: It is not necessary to inspect DTC P2228.	Replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DS:DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4SO)-231, DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4SO)(diag)-35, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4SO)(diag)-67, List of Diagnostic Trouble Code (DTC).> NOTE: It is not necessary to inspect DTC P2229.	Replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>

20. General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:

Malfunction of parts other than those listed is also possible. <Ref. to ME(H4SO)-91, Engine Trouble in General.>

Symptom	Problem parts
1. Engine stalls during idling.	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Ignition parts (*1) 4) Engine coolant temperature sensor (*2) 5) Crankshaft position sensor (*3) 6) Camshaft position sensor (*3) 7) Fuel injection parts (*4)
2. Rough idling	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Engine coolant temperature sensor (*2) 4) Ignition parts (*1) 5) Air intake system (*5) 6) Fuel injection parts (*4) 7) Electronic throttle control 8) Crankshaft position sensor (*3) 9) Camshaft position sensor (*3) 10) Oxygen sensor 11) Fuel pump and fuel pump relay 12) EGR valve
3. Engine does not return to idle.	1) Engine coolant temperature sensor 2) Throttle position sensor 3) Manifold absolute pressure sensor 4) Mass air flow and intake air temperature sensor 5) EGR valve
4. Poor acceleration	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Electronic throttle control 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay 6) Engine coolant temperature sensor (*2) 7) Crankshaft position sensor (*3) 8) Camshaft position sensor (*3) 9) A/C switch and A/C cut relay 10) Engine torque control signal circuit 11) Ignition parts (*1) 12) EGR valve 13) Tumble generator valve
5. Engine stalls, engine sags or hesitates at acceleration.	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Purge control solenoid valve 7) Fuel injection parts (*4) 8) Electronic throttle control 9) Fuel pump and fuel pump relay 10) EGR valve 11) Tumble generator valve

General Diagnostic Table

ENGINE (DIAGNOSTICS)

Symptom	Problem parts
6. Surging	1) Mass air flow and intake air temperature sensor 2) Manifold absolute pressure sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Fuel injection parts (*4) 7) Electronic throttle control 8) Fuel pump and fuel pump relay 9) EGR valve 10) Tumble generator valve
7. Spark knock	1) Mass air flow and intake air temperature sensor 2) Manifold absolute pressure sensor 3) Engine coolant temperature sensor 4) Knock sensor 5) Fuel injection parts (*4) 6) Fuel pump and fuel pump relay 7) EGR valve 8) Tumble generator valve
8. After-burning in exhaust system	1) Mass air flow and intake air temperature sensor 2) Manifold absolute pressure sensor 3) Engine coolant temperature sensor (*2) 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay

*1: Check ignition coil and ignitor assembly and spark plug.

*2: Indicate the symptom occurring only in cold temperatures.

*3: Make sure the secure installation.

*4: Check fuel injector, fuel pressure regulator and fuel filter.

*5: Inspect air leak in air intake system.

2. AUTOMATIC TRANSMISSION

NOTE:

Check general diagnostics table with non-conformity symptom for automatic transmission. <Ref. to 4AT(D)(diag)-2, Basic Diagnostic Procedure.>

20. General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:

Malfunction of parts other than those listed is also possible. <Ref. to ME(H4SO)-91, Engine Trouble in General.>

Symptom	Problem parts
1. Engine stalls during idling.	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Ignition parts (*1) 4) Engine coolant temperature sensor (*2) 5) Crankshaft position sensor (*3) 6) Camshaft position sensor (*3) 7) Fuel injection parts (*4)
2. Rough idling	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Engine coolant temperature sensor (*2) 4) Ignition parts (*1) 5) Air intake system (*5) 6) Fuel injection parts (*4) 7) Electronic throttle control 8) Crankshaft position sensor (*3) 9) Camshaft position sensor (*3) 10) Oxygen sensor 11) Fuel pump and fuel pump relay 12) EGR valve
3. Engine does not return to idle.	1) Engine coolant temperature sensor 2) Throttle position sensor 3) Manifold absolute pressure sensor 4) Mass air flow and intake air temperature sensor 5) EGR valve
4. Poor acceleration	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Electronic throttle control 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay 6) Engine coolant temperature sensor (*2) 7) Crankshaft position sensor (*3) 8) Camshaft position sensor (*3) 9) A/C switch and A/C cut relay 10) Engine torque control signal circuit 11) Ignition parts (*1) 12) EGR valve 13) Tumble generator valve
5. Engine stalls, engine sags or hesitates at acceleration.	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Purge control solenoid valve 7) Fuel injection parts (*4) 8) Electronic throttle control 9) Fuel pump and fuel pump relay 10) EGR valve 11) Tumble generator valve

General Diagnostic Table

ENGINE (DIAGNOSTICS)

Symptom	Problem parts
6. Surging	1) Mass air flow and intake air temperature sensor 2) Manifold absolute pressure sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Fuel injection parts (*4) 7) Electronic throttle control 8) Fuel pump and fuel pump relay 9) EGR valve 10) Tumble generator valve
7. Spark knock	1) Mass air flow and intake air temperature sensor 2) Manifold absolute pressure sensor 3) Engine coolant temperature sensor 4) Knock sensor 5) Fuel injection parts (*4) 6) Fuel pump and fuel pump relay 7) EGR valve 8) Tumble generator valve
8. After-burning in exhaust system	1) Mass air flow and intake air temperature sensor 2) Manifold absolute pressure sensor 3) Engine coolant temperature sensor (*2) 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay

- *1: Check ignition coil and ignitor assembly and spark plug.
- *2: Indicate the symptom occurring only in cold temperatures.
- *3: Make sure the secure installation.
- *4: Check fuel injector, fuel pressure regulator and fuel filter.
- *5: Inspect air leak in air intake system.

2. AUTOMATIC TRANSMISSION

NOTE:

Check general diagnostics table with non-conformity symptom for automatic transmission. <Ref. to 4AT(D)(diag)-2, Basic Diagnostic Procedure.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

1. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Index
P0026	Intake Valve Control Solenoid Circuit Range/Performance (Bank 1)	<Ref. to GD(H4SO)-8, DTC P0026 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0028	Intake Valve Control Solenoid Circuit Range/Performance (Bank 2)	<Ref. to GD(H4SO)-10, DTC P0028 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to GD(H4SO)-11, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to GD(H4SO)-13, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to GD(H4SO)-15, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to GD(H4SO)-17, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to GD(H4SO)-19, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0068	MAP/MAF - Throttle Position Correlation	<Ref. to GD(H4SO)-21, DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0076	Intake Valve Control Solenoid Circuit Low (Bank 1)	<Ref. to GD(H4SO)-23, DTC P0076 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0077	Intake Valve Control Solenoid Circuit High (Bank 1)	<Ref. to GD(H4SO)-24, DTC P0077 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0082	Intake Valve Control Solenoid Circuit Low (Bank 2)	<Ref. to GD(H4SO)-25, DTC P0082 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0083	Intake Valve Control Solenoid Circuit High (Bank 2)	<Ref. to GD(H4SO)-25, DTC P0083 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0101	Mass or Volume Air Flow Circuit Range/Performance	<Ref. to GD(H4SO)-26, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0102	Mass or Volume Air Flow Circuit Low Input	<Ref. to GD(H4SO)-29, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0103	Mass or Volume Air Flow Circuit High Input	<Ref. to GD(H4SO)-31, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to GD(H4SO)-33, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to GD(H4SO)-35, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0111	Intake Air Temperature Sensor 1 Circuit Range/Performance	<Ref. to GD(H4SO)-37, DTC P0111 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0112	Intake Air Temperature Sensor 1 Circuit Low	<Ref. to GD(H4SO)-39, DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Item	Index
P0113	Intake Air Temperature Sensor 1 Circuit High	<Ref. to GD(H4SO)-41, DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0117	Engine Coolant Temperature Circuit Low	<Ref. to GD(H4SO)-43, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0118	Engine Coolant Temperature Circuit High	<Ref. to GD(H4SO)-45, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0122	Throttle/Pedal Position Sensor/Switch "A" Circuit Low	<Ref. to GD(H4SO)-47, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0123	Throttle/Pedal Position Sensor/Switch "A" Circuit High	<Ref. to GD(H4SO)-49, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0125	Insufficient Coolant Temperature For Closed Loop Fuel Control	<Ref. to GD(H4SO)-51, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0126	Insufficient Engine Coolant Temperature for Stable Operation	<Ref. to GD(H4SO)-53, DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0128	Coolant Thermostat (Engine Coolant Temperature Below Thermostat Regulating Temperature)	<Ref. to GD(H4SO)-55, DTC P0128 COOLANT THERMOSTAT (ENGINE COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0131	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to GD(H4SO)-57, DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0132	O2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to GD(H4SO)-59, DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0133	O2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to GD(H4SO)-61, DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0134	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to GD(H4SO)-64, DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0137	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to GD(H4SO)-66, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0138	O2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to GD(H4SO)-69, DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0139	O2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	<Ref. to GD(H4SO)-70, DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0140	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 2)	<Ref. to GD(H4SO)-75, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0171	System Too Lean (Bank 1)	<Ref. to GD(H4SO)-77, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0172	System Too Rich (Bank 1)	<Ref. to GD(H4SO)-79, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0181	Fuel Temperature Sensor "A" Circuit Range/Performance	<Ref. to GD(H4SO)-81, DTC P0181 FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0182	Fuel Temperature Sensor "A" Circuit Low Input	<Ref. to GD(H4SO)-84, DTC P0182 FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0183	Fuel Temperature Sensor "A" Circuit High Input	<Ref. to GD(H4SO)-86, DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0196	Engine Oil Temperature Sensor Circuit Range/Performance	<Ref. to GD(H4SO)-88, DTC P0196 ENGINE OIL TEMPERATURE SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Item	Index
P0197	Engine Oil Temperature Sensor Low	<Ref. to GD(H4SO)-90, DTC P0197 ENGINE OIL TEMPERATURE SENSOR LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0198	Engine Oil Temperature Sensor High	<Ref. to GD(H4SO)-91, DTC P0198 ENGINE OIL TEMPERATURE SENSOR HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0222	Throttle/Pedal Position Sensor/Switch "B" Circuit Low	<Ref. to GD(H4SO)-92, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0223	Throttle/Pedal Position Sensor/Switch "B" Circuit High	<Ref. to GD(H4SO)-93, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0301	Cylinder 1 Misfire Detected	<Ref. to GD(H4SO)-94, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0302	Cylinder 2 Misfire Detected	<Ref. to GD(H4SO)-99, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0303	Cylinder 3 Misfire Detected	<Ref. to GD(H4SO)-99, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0304	Cylinder 4 Misfire Detected	<Ref. to GD(H4SO)-99, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0327	Knock Sensor 1 Circuit Low (Bank 1 or Single Sensor)	<Ref. to GD(H4SO)-100, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0328	Knock Sensor 1 Circuit High (Bank 1 or Single Sensor)	<Ref. to GD(H4SO)-102, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0335	Crankshaft Position Sensor "A" Circuit	<Ref. to GD(H4SO)-104, DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0336	Crankshaft Position Sensor "A" Circuit Range/Performance	<Ref. to GD(H4SO)-106, DTC P0336 CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0340	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	<Ref. to GD(H4SO)-108, DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0341	Camshaft Position Sensor "A" Circuit Range/Performance (Bank 1 or Single Sensor)	<Ref. to GD(H4SO)-110, DTC P0341 CAMSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0400	Exhaust Gas Recirculation Flow	<Ref. to GD(H4SO)-112, DTC P0400 EXHAUST GAS RECIRCULATION FLOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to GD(H4SO)-116, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0442	Evaporative Emission Control System Leak Detected (Small Leak)	<Ref. to GD(H4SO)-119, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0447	Evaporative Emission Control System Vent Control Circuit Open	<Ref. to GD(H4SO)-133, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	<Ref. to GD(H4SO)-135, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0451	Evaporative Emission Control System Pressure Sensor	<Ref. to GD(H4SO)-137, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0452	Evaporative Emission Control System Pressure Sensor Low Input	<Ref. to GD(H4SO)-139, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Item	Index
P0453	Evaporative Emission Control System Pressure Sensor High Input	<Ref. to GD(H4SO)-141, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)	<Ref. to GD(H4SO)-143, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0457	Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)	<Ref. to GD(H4SO)-143, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0458	Evaporative Emission System Purge Control Valve Circuit Low	<Ref. to GD(H4SO)-144, DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0459	Evaporative Emission System Purge Control Valve Circuit High	<Ref. to GD(H4SO)-146, DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0461	Fuel Level Sensor "A" Circuit Range/Performance	<Ref. to GD(H4SO)-148, DTC P0461 FUEL LEVEL SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0462	Fuel Level Sensor "A" Circuit Low	<Ref. to GD(H4SO)-150, DTC P0462 FUEL LEVEL SENSOR "A" CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0463	Fuel Level Sensor "A" Circuit High	<Ref. to GD(H4SO)-152, DTC P0463 FUEL LEVEL SENSOR "A" CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to GD(H4SO)-154, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0483	Fan Rationality Check	<Ref. to GD(H4SO)-157, DTC P0483 FAN RATIONALITY CHECK, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0502	Vehicle Speed Sensor "A" Circuit Low Input	<Ref. to GD(H4SO)-158, DTC P0502 VEHICLE SPEED SENSOR "A" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0503	Vehicle Speed Sensor "A" Intermittent/Erratic/High	<Ref. to GD(H4SO)-159, DTC P0503 VEHICLE SPEED SENSOR "A" INTERMITTENT/ERRATIC/HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0506	Idle Air Control System RPM Lower Than Expected	<Ref. to GD(H4SO)-160, DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0507	Idle Air Control System RPM Higher Than Expected	<Ref. to GD(H4SO)-162, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0512	Starter Request Circuit	<Ref. to GD(H4SO)-164, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0519	Idle Air Control System Performance	<Ref. to GD(H4SO)-165, DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0600	Serial Communication Link	<Ref. to GD(H4SO)-166, DTC P0600 SERIAL COMMUNICATION LINK, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to GD(H4SO)-167, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0605	Internal Control Module Read Only Memory (ROM) Error	<Ref. to GD(H4SO)-169, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0607	Control Module Performance	<Ref. to GD(H4SO)-170, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<Ref. to GD(H4SO)-172, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0691	Fan 1 Control Circuit Low	<Ref. to GD(H4SO)-175, DTC P0691 FAN 1 CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Item	Index
P0692	Fan 1 Control Circuit High	<Ref. to GD(H4SO)-176, DTC P0692 FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0700	Transmission Control System (MIL Request)	<Ref. to GD(H4SO)-177, DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0851	Park/Neutral Switch Input Circuit Low (AT Model)	<Ref. to GD(H4SO)-178, DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0851	Neutral Switch Input Circuit Low (MT Model)	<Ref. to GD(H4SO)-179, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0852	Park/Neutral Switch Input Circuit High (AT Model)	<Ref. to GD(H4SO)-180, DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0852	Neutral Switch Input Circuit High (MT Model)	<Ref. to GD(H4SO)-181, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1152	O2 Sensor Circuit Range/Performance (Low) (Bank 1 Sensor 1)	<Ref. to GD(H4SO)-182, DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1153	O2 Sensor Circuit Range/Performance (High) (Bank 1 Sensor 1)	<Ref. to GD(H4SO)-184, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1160	Return Spring Failure	<Ref. to GD(H4SO)-186, DTC P1160 RETURN SPRING FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to GD(H4SO)-188, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	<Ref. to GD(H4SO)-190, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1443	Vent Control Solenoid Valve Function Problem	<Ref. to GD(H4SO)-192, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1491	Positive Crankcase Ventilation (Blow-by) Function Problem	<Ref. to GD(H4SO)-194, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1492	EGR Solenoid Valve Signal #1 Circuit Malfunction (Low Input)	<Ref. to GD(H4SO)-196, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1493	EGR Solenoid Valve Signal #1 Circuit Malfunction (High Input)	<Ref. to GD(H4SO)-198, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1494	EGR Solenoid Valve Signal #2 Circuit Malfunction (Low Input)	<Ref. to GD(H4SO)-200, DTC P1494 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1495	EGR Solenoid Valve Signal #2 Circuit Malfunction (High Input)	<Ref. to GD(H4SO)-200, DTC P1495 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1496	EGR Solenoid Valve Signal #3 Circuit Malfunction (Low Input)	<Ref. to GD(H4SO)-200, DTC P1496 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1497	EGR Solenoid Valve Signal #3 Circuit Malfunction (High Input)	<Ref. to GD(H4SO)-200, DTC P1497 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1498	EGR Solenoid Valve Signal #4 Circuit Malfunction (Low Input)	<Ref. to GD(H4SO)-200, DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Item	Index
P1499	EGR Solenoid Valve Signal #4 Circuit Malfunction (High Input)	<Ref. to GD(H4SO)-200, DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1518	Starter Switch Circuit Low Input	<Ref. to GD(H4SO)-201, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1560	Back-Up Voltage Circuit Malfunction	<Ref. to GD(H4SO)-202, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1602	Control Module Programming Error	<Ref. to GD(H4SO)-203, DTC P1602 CONTROL MODULE PROGRAMMING ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	<Ref. to GD(H4SO)-205, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	<Ref. to GD(H4SO)-207, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2101	Throttle Actuator Control Motor Circuit Range/Performance	<Ref. to GD(H4SO)-209, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2102	Throttle Actuator Control Motor Circuit Low	<Ref. to GD(H4SO)-211, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2103	Throttle Actuator Control Motor Circuit High	<Ref. to GD(H4SO)-213, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2109	Throttle/Pedal Position Sensor "A" Minimum Stop Performance	<Ref. to GD(H4SO)-215, DTC P2109 THROTTLE/PEDAL POSITION SENSOR "A" MINIMUM STOP PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2122	Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input	<Ref. to GD(H4SO)-217, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2123	Throttle/Pedal Position Sensor/Switch "D" Circuit High Input	<Ref. to GD(H4SO)-219, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2127	Throttle/Pedal Position Sensor/Switch "E" Circuit Low Input	<Ref. to GD(H4SO)-221, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2128	Throttle/Pedal Position Sensor/Switch "E" Circuit High Input	<Ref. to GD(H4SO)-223, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2135	Throttle/Pedal Position Sensor/Switch "A"/"B" Voltage Correlation	<Ref. to GD(H4SO)-225, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A"/"B" VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2138	Throttle/Pedal Position Sensor/Switch "D"/"E" Voltage Correlation	<Ref. to GD(H4SO)-227, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D"/"E" VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2227	Barometric Pressure Circuit Range/Performance	<Ref. to GD(H4SO)-229, DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2228	Barometric Pressure Circuit Low	<Ref. to GD(H4SO)-230, DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2229	Barometric Pressure Circuit High	<Ref. to GD(H4SO)-231, DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

2. Diagnostic Trouble Code (DTC) Detecting Criteria

A: DTC P0026 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/ PERFORMANCE (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect NG when having either Low NG or High NG.

A variable valve lift diagnosis oil pressure switch is installed for diagnosis. It is possible to determine whether the intake valve is in high mode (increase the amount of lift) or in low mode (suppressing the amount of lift) when the variable valve lift diagnosis oil pressure switch is turned ON or OFF.

• NORMAL

Oil switching solenoid valve duty	Intake valve	Variable valve lift diagnosis oil pressure switch
Large	High mode	ON
Small	Low mode	OFF

• Low NG

When the variable valve lift diagnosis oil pressure switch remains OFF even though the intake valve tried to enter high mode (oil switching solenoid valve duty is large), this is judged as a Low NG.

• High NG

When the variable valve lift diagnosis oil pressure switch remains ON even though the intake valve tried to enter low mode (oil switching solenoid valve duty is small), this is judged as a High NG.

2. COMPONENT DESCRIPTION

The variable valve lift system optimizes the intake valve lift by switching between the low lift cam and the high lift cam according to the engine speed. The amount of intake valve lift is varied by controlling the oil switching solenoid valve duty according to signals from the ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
After engine starting	≥ 6 sec.
Engine oil temperature	≥ 15°C (59°F)
Variable valve lift control	Operation

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously 6 seconds after engine start while variable valve lift is being controlled.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the following conditions is longer than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Low NG Duty ratio Variable valve lift diagnosis oil pressure switch	≥ 62% OFF
High NG Duty ratio Variable valve lift diagnosis oil pressure switch	< 33% ON

Time Needed for Diagnosis:

Low side	0.784 seconds
High side	3.0 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the continuous time when the following conditions are established are more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Low OK Duty ratio Variable valve lift diagnosis oil pressure switch	≥ 62% ON
High OK Duty ratio Variable valve lift diagnosis oil pressure switch	< 33% OFF

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

B: DTC P0028 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/ PERFORMANCE (BANK 2)

NOTE:

For diagnostic procedures, refer to DTC P0026. <Ref. to GD(H4SO)-8, DTC P0026 INTAKE VALVE CONTROL SOLENOID CIRCUIT RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

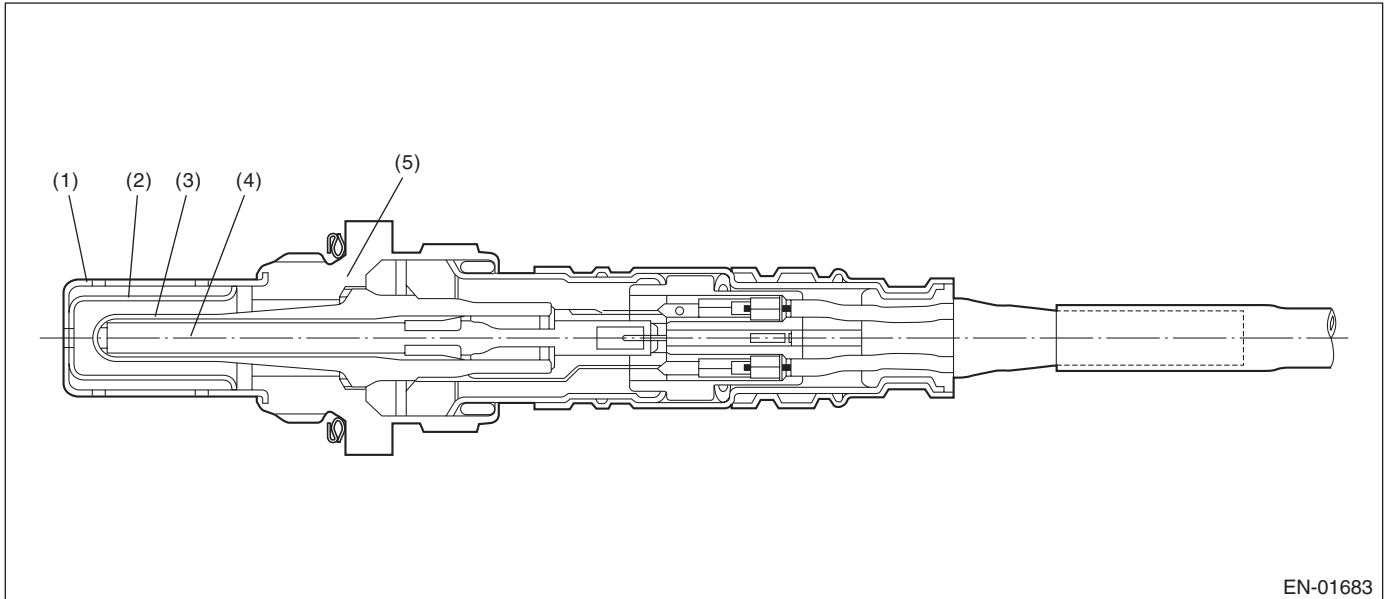
C: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect functional errors of the front oxygen (A/F) sensor heater.

Judge as NG when it is determined that the front oxygen (A/F) sensor impedance is large by referring to the engine condition such as fuel shut-off in deceleration, etc.

2. COMPONENT DESCRIPTION



EN-01683

- | | | |
|---------------------------|--------------------|--------------------|
| (1) Element cover (outer) | (3) Sensor element | (5) Sensor housing |
| (2) Element cover (inner) | (4) Ceramic heater | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Continuous time when all of the following conditions are met	30 seconds or more
Battery voltage	> 10.9 V
After fuel cut	20 seconds or more
Heater current	Operation
Front lambda sensor duty \geq 35%	Experienced

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after 50 seconds or more have passed since the engine started.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds). Judge as OK and clear NG when the continuous time of not completing the malfunction criteria below becomes more than the time needed for diagnosis (10 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Front oxygen (A/F) sensor impedance	> 50 Ω

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate.
- Front oxygen (A/F) sensor sub learning compensation: Not allowed to calculate.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

D: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

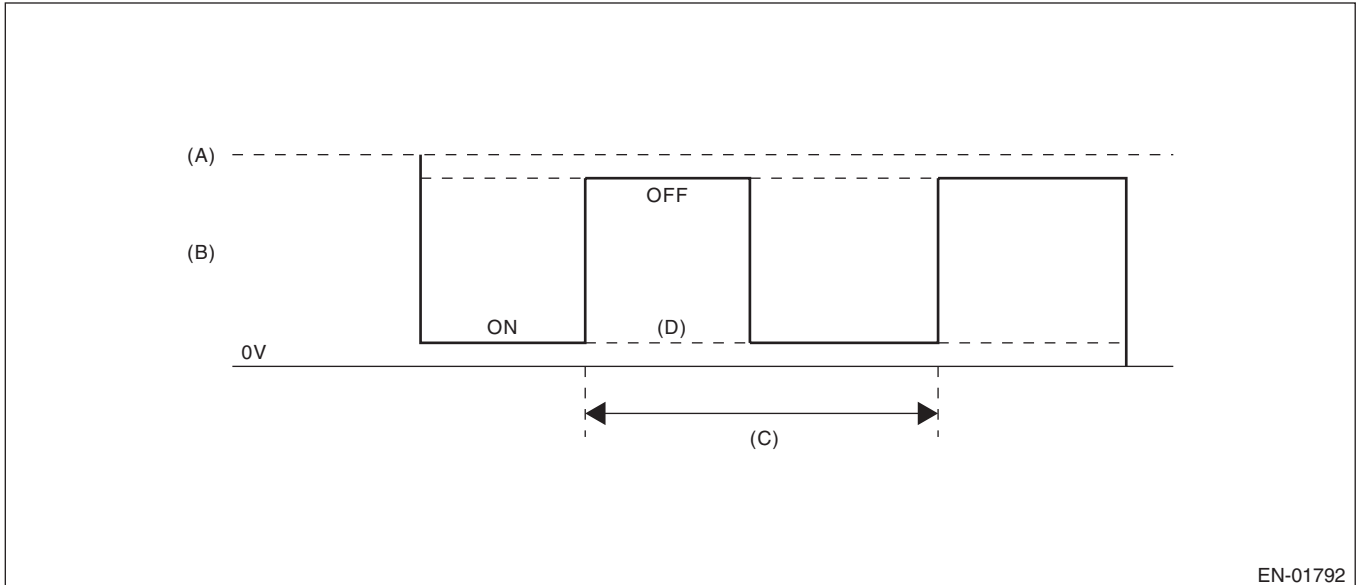
1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of heater.

The heater performs duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.

Judge NG when the terminal voltage remains Low.

2. COMPONENT DESCRIPTION



- (A) Battery voltage (C) 128 milliseconds
(B) Front oxygen (A/F) sensor heater output voltage (D) Low error

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge NG when the continuous time of meeting the malfunction criteria below becomes more than 1 second (8 cycles).

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low
Front oxygen (A/F) sensor heater control duty	< 87.5%

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor heater control: Not allowed to apply current to the heater.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- A/F sub learning: Not allowed to calculate the A/F sub learning compensation factor.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

E: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

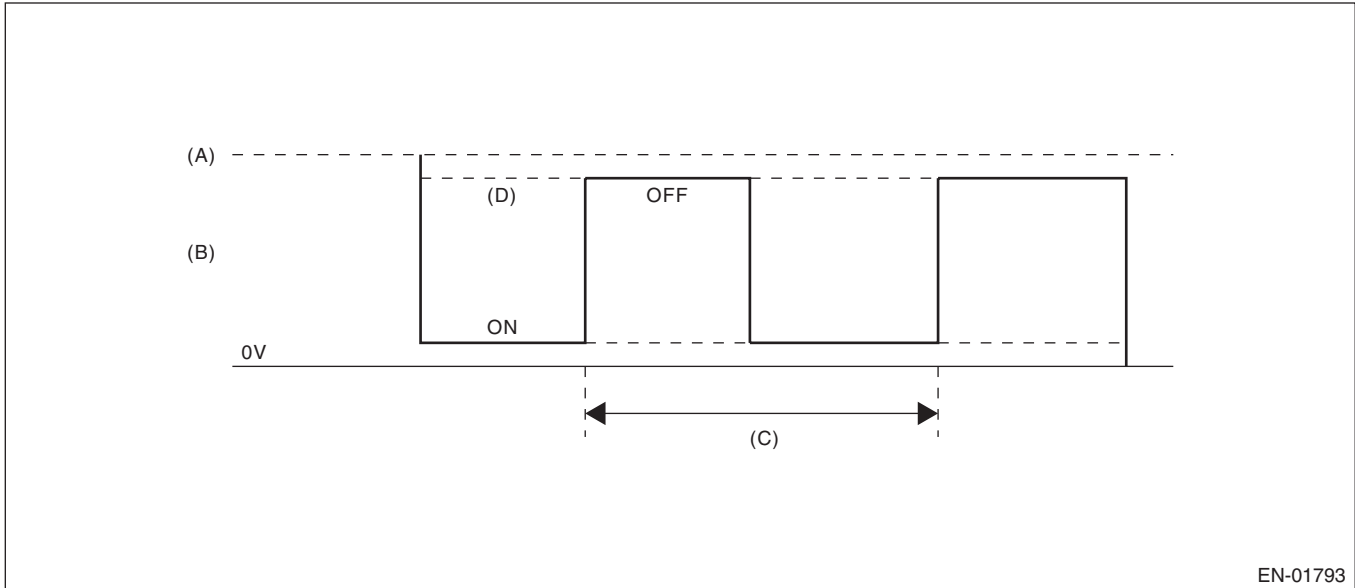
1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of heater.

The heater performs duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.

Judge NG when the terminal voltage remains High.

2. COMPONENT DESCRIPTION



- | | |
|---|-------------------------------------|
| (A) Battery voltage | (C) 128 milliseconds |
| (B) Front oxygen (A/F) sensor heater output voltage | (D) High malfunction output voltage |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge NG when the continuous time of meeting the malfunction criteria below becomes more than 1 second (8 cycles).

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High
Front oxygen (A/F) sensor heater control duty	≥ 12.5%

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor heater control: Not allowed to apply current to the heater.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- A/F sub learning: Not allowed to calculate the A/F sub learning compensation factor.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

F: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

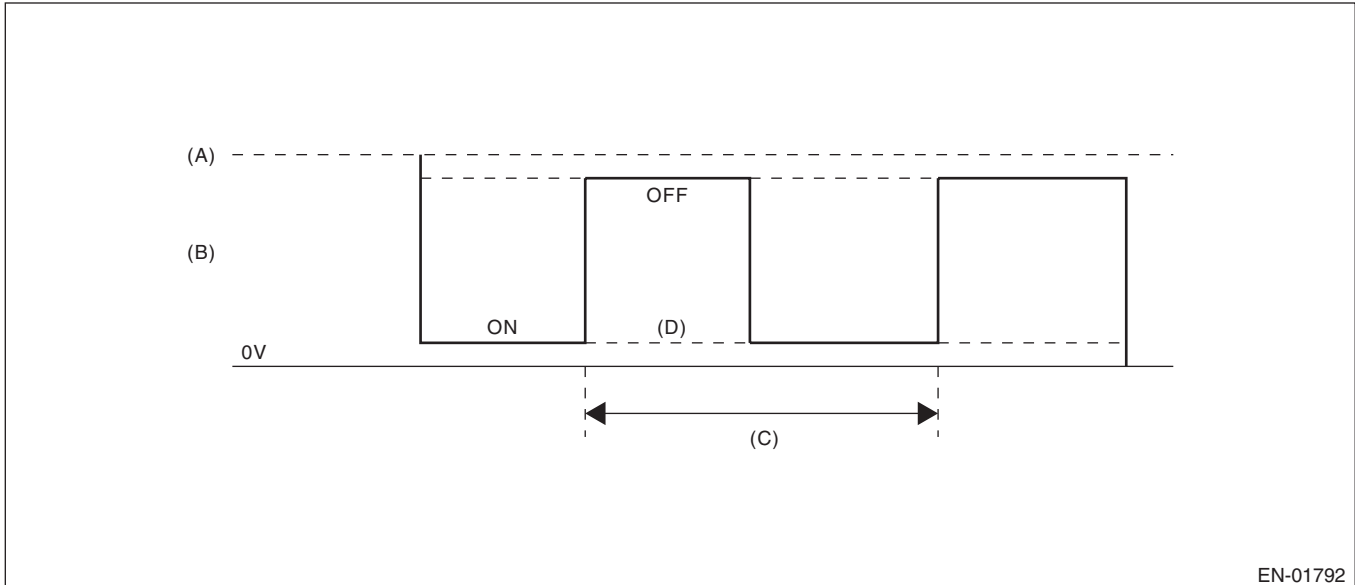
1. OUTLINE OF DIAGNOSIS

Detect the rear oxygen sensor heater open or short circuit.

The rear oxygen sensor heater performs duty control, and the output terminal voltage at ON is 0 V, and the output terminal voltage at OFF is the battery voltage.

Judge NG when the terminal voltage remains Low.

2. COMPONENT DESCRIPTION



(A) Battery voltage

(C) 256 milliseconds (cycles)

(D) Low error

(B) Rear oxygen sensor heater output voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Elapsed time after engine starting	≥ 1 sec.

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time while meeting all of the malfunction criteria below is more than 2560 milliseconds (10 cycles).

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	Low
Rear oxygen sensor heater control duty	< 75%

Time Needed for Diagnosis: 2.56 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Sub feedback control: Not allowed.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

G: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

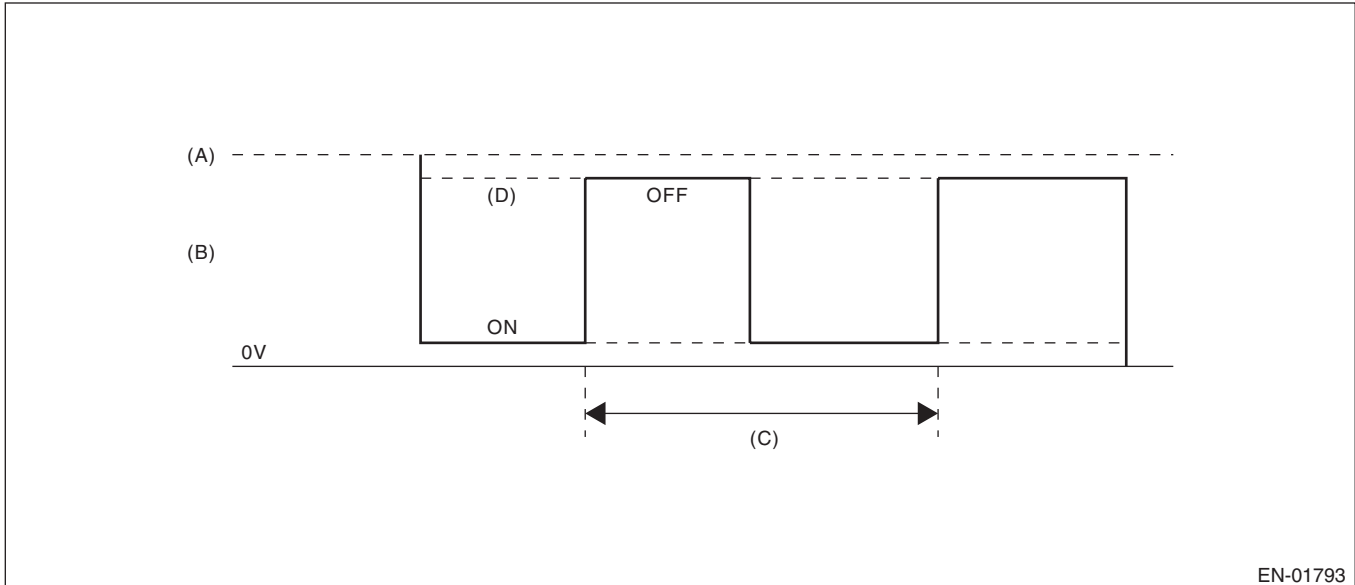
1. OUTLINE OF DIAGNOSIS

Detect the rear oxygen sensor heater open or short circuit.

The rear oxygen sensor heater performs duty control, and the output terminal voltage at ON is 0 V, and the output terminal voltage at OFF is the battery voltage.

Judge NG when the terminal voltage remains High.

2. COMPONENT DESCRIPTION



(A) Battery voltage

(C) 256 milliseconds (cycles)

(D) High malfunction

(B) Rear oxygen sensor heater output voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Elapsed time after engine starting	≥ 1 sec.

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time while meeting all of the malfunction criteria below is more than 2560 milliseconds (10 cycles).

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	High
Rear oxygen sensor heater control duty	≥ 20%

Time Needed for Diagnosis: 2.56 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Sub feedback control: Not allowed.

9. ECM OPERATION AT DTC SETTING

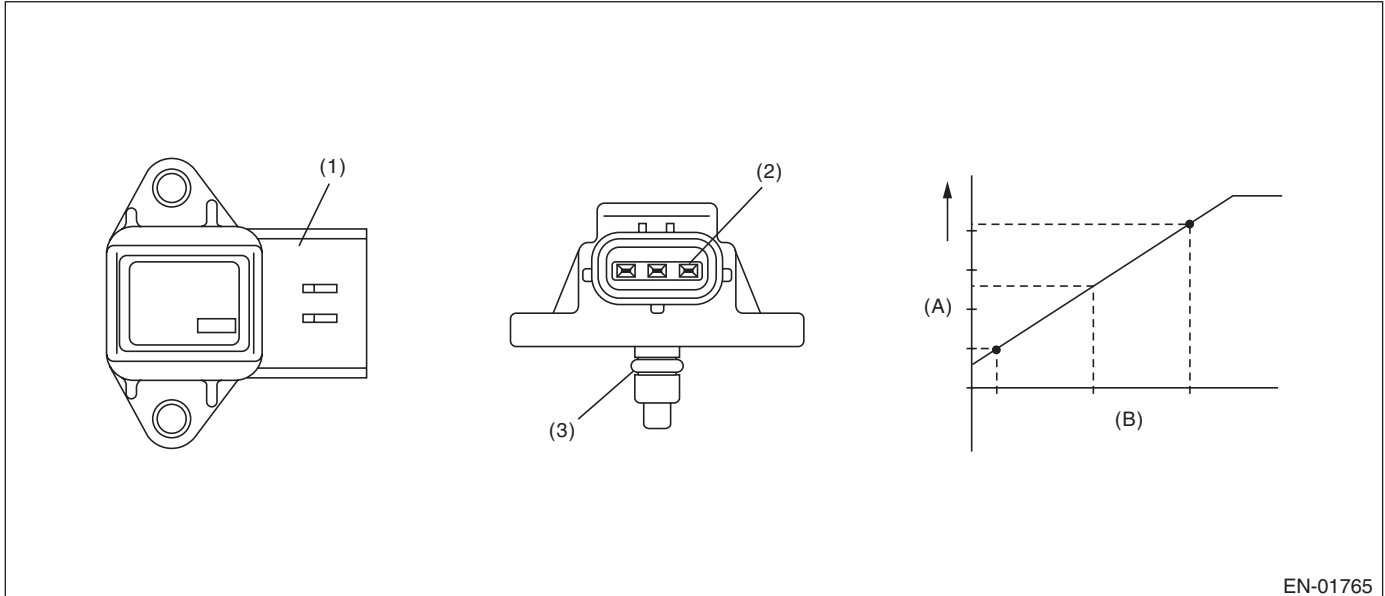
Memorize the freeze frame data. (For test mode \$02)

H: DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake manifold pressure sensor output property. Judge NG when the intake air pressure AD value is Low whereas it seemed to be High from the viewpoint of engine condition, or when it is High whereas it seemed to be Low from the engine condition.

2. COMPONENT DESCRIPTION



EN-01765

- | | |
|---------------|-----------------------|
| (1) Connector | (A) Output voltage |
| (2) Terminals | (B) Absolute pressure |
| (3) O-ring | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 75^{\circ}\text{C}$ (167°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge NG when either Low side or High side becomes NG.

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	< 2500 rpm
Throttle position	$\geq 12^\circ$
Intake air amount every 0.5 engine revs.	$\geq 0.55 \text{ g (0.019 oz)/rev}$
Output voltage	< 1.4 V
High side	
Engine speed	600 — 900 rpm
Throttle position	$\leq 2.44^\circ$
Intake air amount every 0.5 engine revs.	< 0.4 g (0.014 oz)/rev
Output voltage	$\geq 3.4 \text{ V}$

Time Needed for Diagnosis: 3 seconds for low side, 7 seconds for high side

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when both Low side and High side become OK.

Judge as OK when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	< 2500 rpm
Throttle position	$\geq 12^\circ$
Intake air amount every 0.5 engine revs.	$\geq 0.55 \text{ g (0.019 oz)/rev}$
Output voltage	$\geq 1.4 \text{ V}$
High side	
Engine speed	600 — 900 rpm
Throttle position	$\leq 2.44^\circ$
Intake air amount every 0.5 engine revs.	< 0.4 g (0.014 oz)/rev
Output voltage	< 3.4 V

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

I: DTC P0076 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the open circuit of the oil switching solenoid valve.

Judge as NG when the current is small even though the output duty is large.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time when the following conditions are established is more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Duty ratio	$\geq 30\%$
Control current	< 0.026 A

Time Needed for Diagnosis: 2 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the continuous time when the following conditions are established is more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
$ \text{Oil switching solenoid valve target current value} - \text{oil switching solenoid valve current value} $	< 0.08 A
Control current	≥ 0.11 A

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

J: DTC P0077 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect short circuits of the oil switching solenoid valve.

Judge as a short NG when the current is large even though the output duty is small.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time when the following conditions are established is more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Duty ratio	$< 7\%$
Control current	$\geq 0.465 \text{ A}$

Time Needed for Diagnosis: 2 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the continuous time when the following conditions are established is more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Oil switching solenoid valve target current value – oil switching solenoid valve current value	$< 0.08 \text{ A}$

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

K: DTC P0082 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 2)

NOTE:

For the diagnostic procedure, refer to DTC P0076. <Ref. to GD(H4SO)-23, DTC P0076 INTAKE VALVE CONTROL SOLENOID CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

L: DTC P0083 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 2)

NOTE:

For the diagnostic procedure, refer to DTC P0077. <Ref. to GD(H4SO)-24, DTC P0077 INTAKE VALVE CONTROL SOLENOID CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

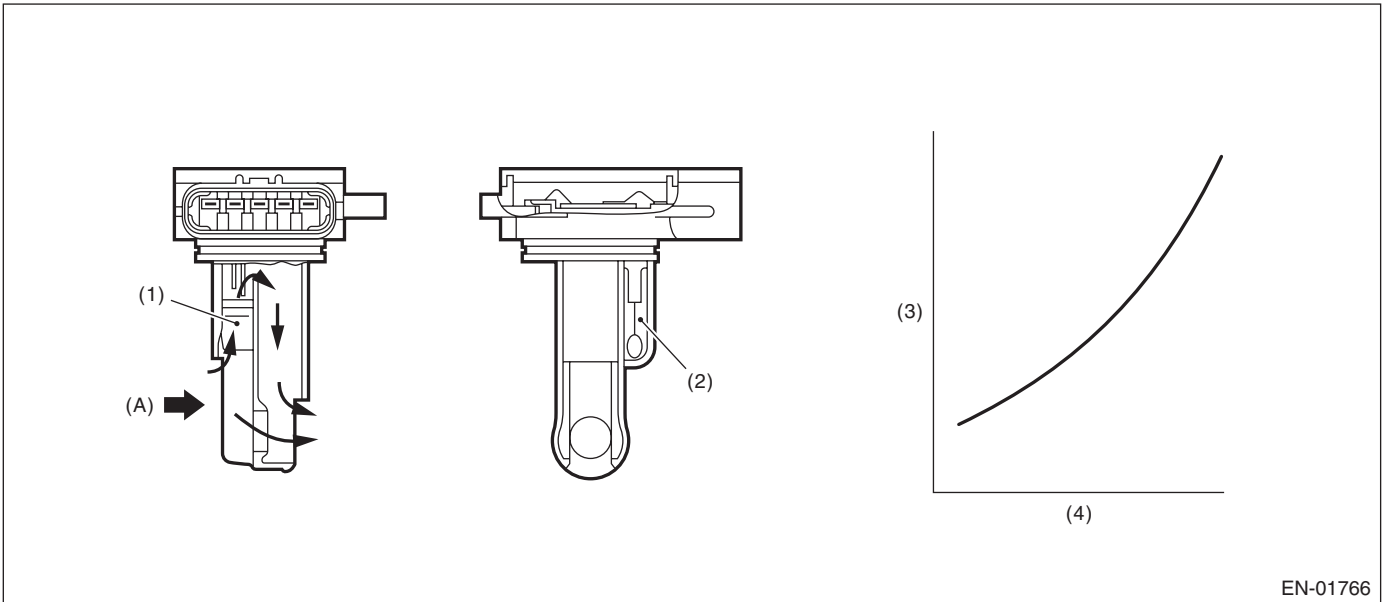
M: DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of air flow sensor output property.

Judge as a low side NG when the air flow voltage indicates a small value regardless of running in a state where the air flow voltage increases. Judge as High side NG when the air flow voltage indicates a large value regardless of running in a state where the air flow voltage decreases. Judge air flow sensor property NG when the Low side or High side becomes NG.

2. COMPONENT DESCRIPTION



EN-01766

(1) Air flow sensor

(2) Intake air temperature sensor

(3) Voltage (V)

(4) Intake air volume (kg/s)

(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 75^{\circ}\text{C}$ (167°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time with the following criteria established exceeds the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
(Low side error) Output voltage Engine speed Throttle opening angle Intake manifold pressure	< 1.2 V ≥ 2000 rpm ≥ 13° ≥ 53.3 kPa (400 mmHg, 15.7 inHg)
(High side error 1) Output voltage Engine speed Throttle opening angle Intake manifold pressure	≥ 2.66 V 600 — 900 rpm < 2.44° < 40.0 kPa (300 mmHg, 11.8 inHg)
(High side error 2) Output voltage Engine speed Throttle opening angle Intake manifold pressure Fuel system diagnosis	≥ 1.45 V 600 — 900 rpm < 2.44° < 40.0 kPa (300 mmHg, 11.8 inHg) Rich side malfunction

Time Needed for Diagnosis:

Low side : 3 seconds

High side: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
(Low side error) Output voltage Engine speed Throttle opening angle Intake manifold pressure	≥ 1.2 V ≥ 2000 rpm ≥ 13° ≥ 53.3 kPa (400 mmHg, 15.7 inHg)
(High side error) Output voltage Engine Speed Throttle opening angle Intake manifold pressure	< 2.66 V 600 — 900 rpm < 2.44° < 40.0 kPa (300 mmHg, 11.8 inHg)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

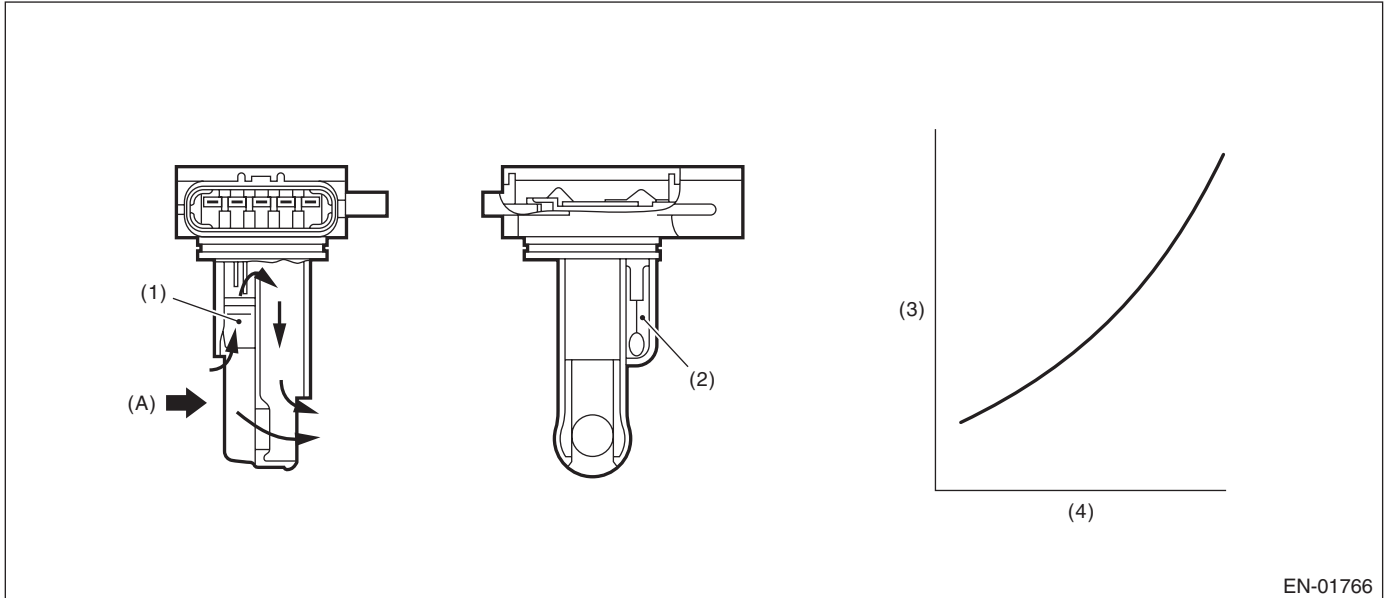
Memorize the freeze frame data. (For test mode \$02)

N: DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect open or short circuits of the air flow sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



- | | | |
|-----------------------------------|------------------------------|---------|
| (1) Air flow sensor | (3) Voltage (V) | (A) Air |
| (2) Intake air temperature sensor | (4) Intake air volume (kg/s) | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\leq 0.2 \text{ V}$

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

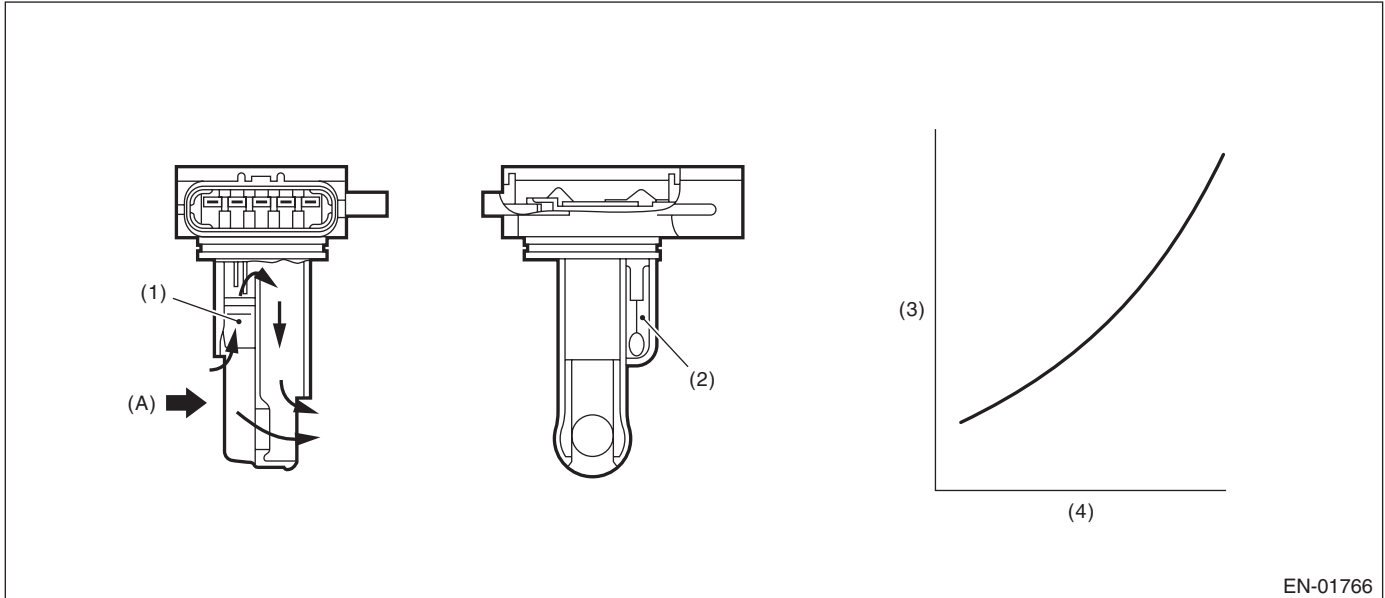
Memorize the freeze frame data. (For test mode \$02)

O: DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect open or short circuits of the air flow sensor.
 Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



EN-01766

- | | | |
|-----------------------------------|------------------------------|---------|
| (1) Air flow sensor | (3) Voltage (V) | (A) Air |
| (2) Intake air temperature sensor | (4) Intake air volume (kg/s) | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge NG when the continuous time of meeting the malfunction criteria below becomes more than 0.5 seconds. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.985 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

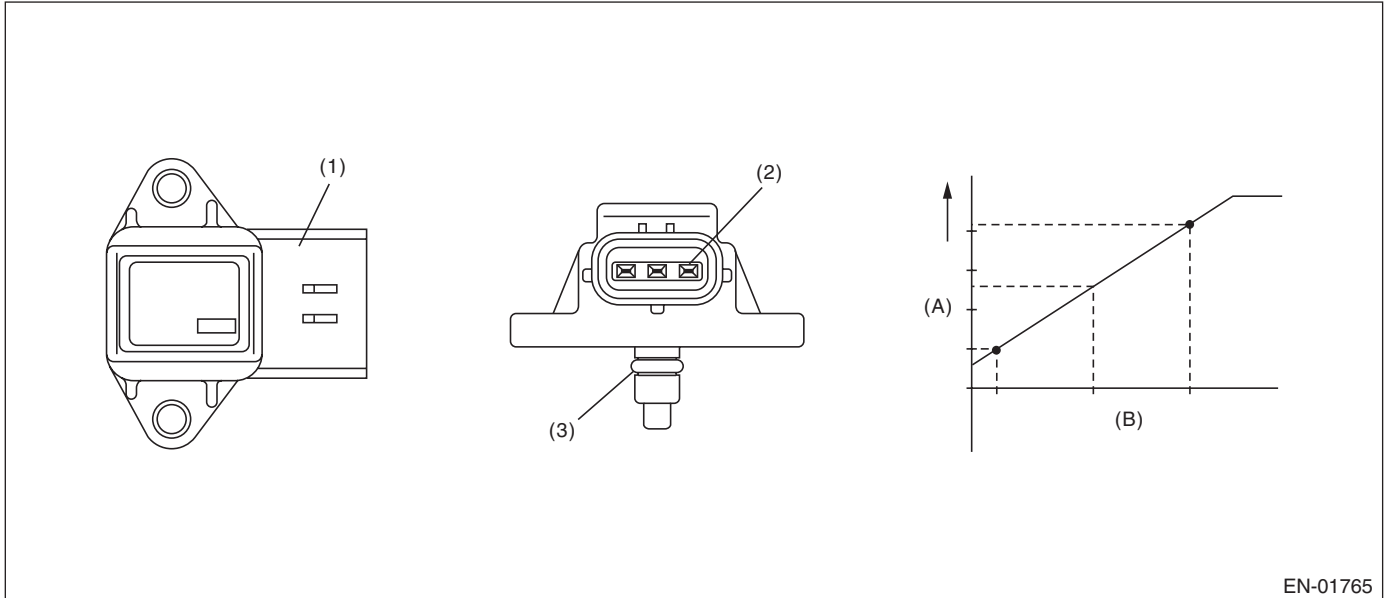
P: DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor.

Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



EN-01765

- | | |
|---------------|-----------------------|
| (1) Connector | (A) Output voltage |
| (2) Terminals | (B) Absolute pressure |
| (3) O-ring | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.568 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

ISC feedback: Not allowed to calculate the amount of feedback.

9. ECM OPERATION AT DTC SETTING

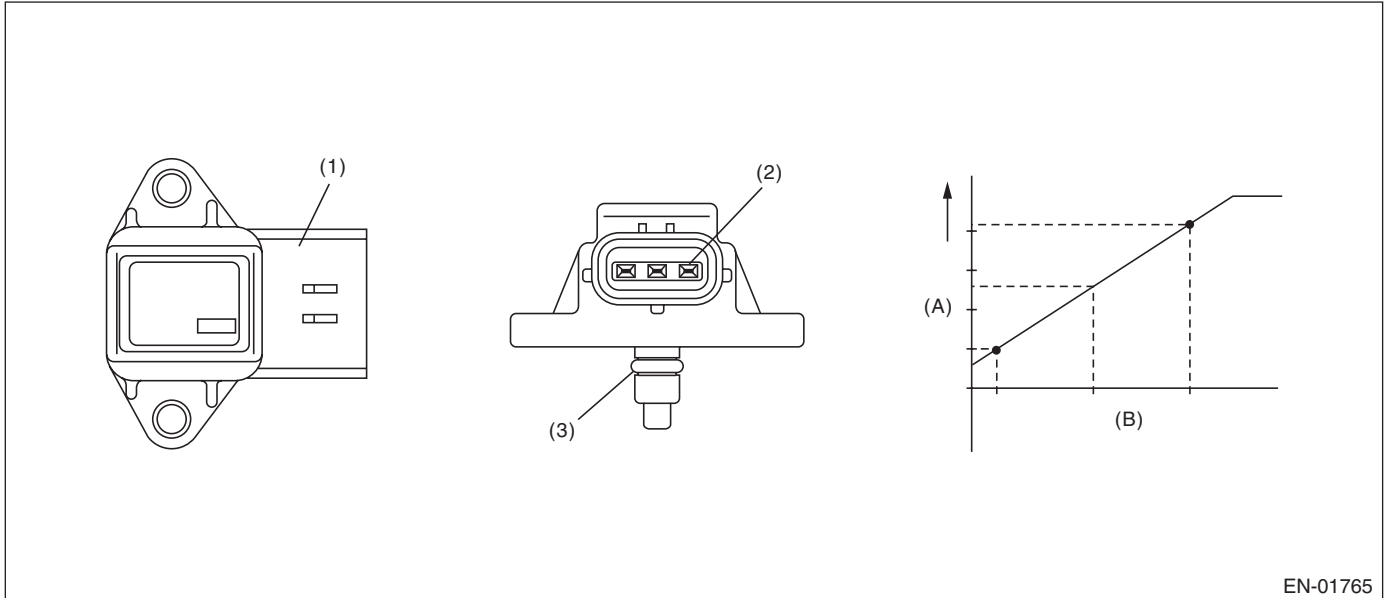
Memorize the freeze frame data. (For test mode \$02)

Q: DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



EN-01765

- | | |
|---------------|-----------------------|
| (1) Connector | (A) Output voltage |
| (2) Terminals | (B) Absolute pressure |
| (3) O-ring | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.921 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

ISC feedback: Not allowed to calculate the amount of feedback.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

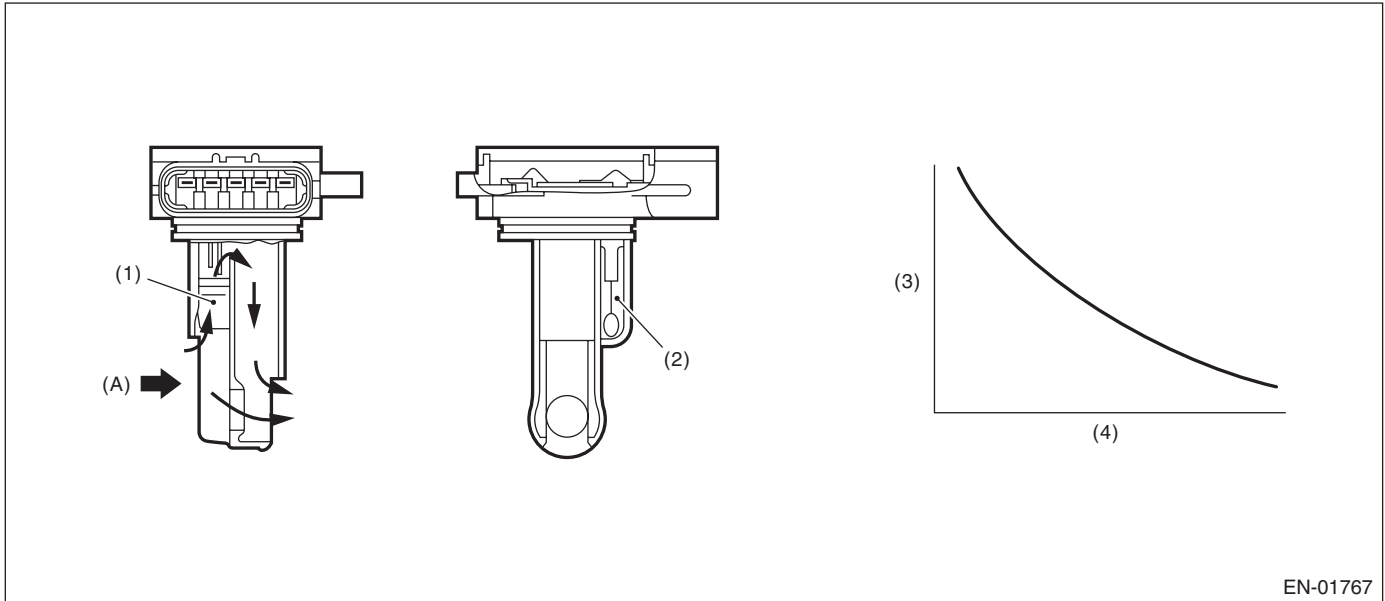
R: DTC P0111 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/ PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake air temperature sensor output property.

Judge as NG when the intake air temperature is not varied whereas it seemed to be varied from the viewpoint of engine condition.

2. COMPONENT DESCRIPTION



EN-01767

- | | | |
|-----------------------------------|--|---------|
| (1) Air flow sensor | (3) Resistance value (Ω) | (A) Air |
| (2) Intake air temperature sensor | (4) Intake air temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$) | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Coolant temp. before engine start	< 30°C (86°F)
Engine coolant temperature	> 100°C (212°F)
Battery voltage	$\geq 10.9\text{ V}$
Continuous time when the vehicle speed is less than 60 km/h (37 MPH)	600 seconds or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis when the vehicle speed condition is completed after starting and idling the cold engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 1 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	< 20 mV (Equivalent to approximately 0.5°C (0.9°F) near 25°C)

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	≥ 20 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATION AT DTC SETTING

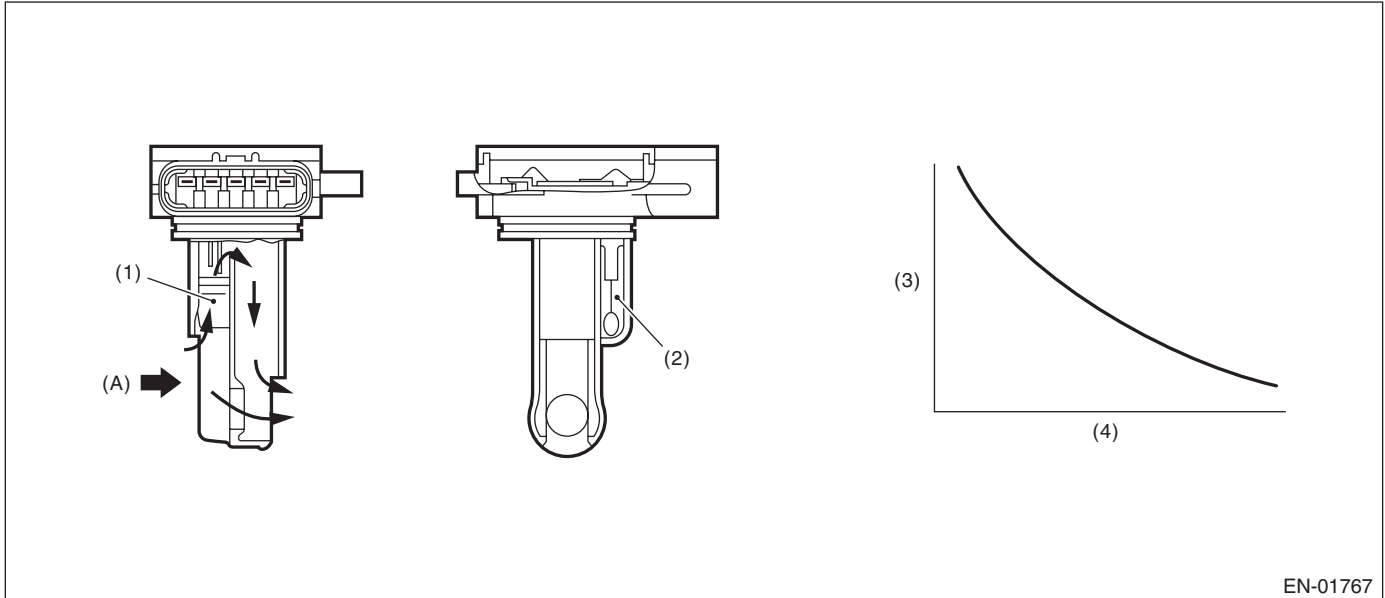
Memorize the freeze frame data. (For test mode \$02)

S: DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the intake air temperature sensor.
 Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



EN-01767

- | | | |
|-----------------------------------|--|---------|
| (1) Air flow sensor | (3) Resistance value (Ω) | (A) Air |
| (2) Intake air temperature sensor | (4) Intake air temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$) | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.166 V
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.166 V
Ignition switch	ON

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATION AT DTC SETTING

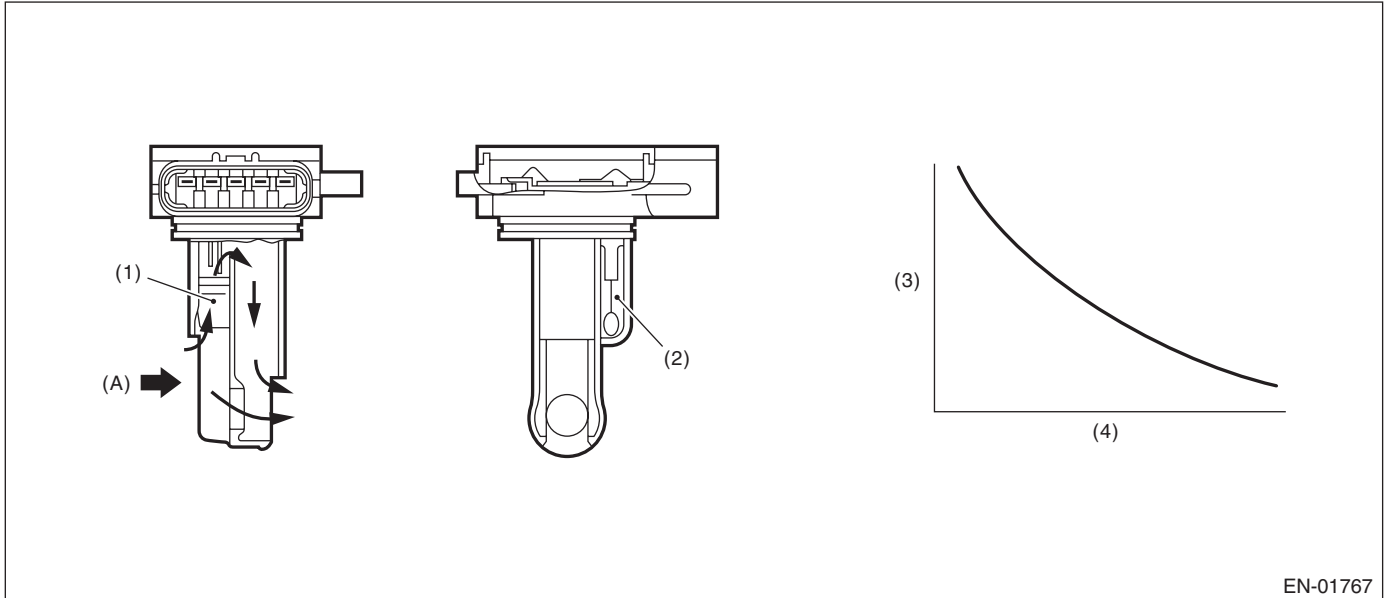
Memorize the freeze frame data. (For test mode \$02)

T: DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the intake air temperature sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



EN-01767

- | | | |
|-----------------------------------|--|---------|
| (1) Air flow sensor | (3) Resistance value (Ω) | (A) Air |
| (2) Intake air temperature sensor | (4) Intake air temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$) | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\geq 4.716 \text{ V}$
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$< 4.716 \text{ V}$
Ignition switch	ON

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATION AT DTC SETTING

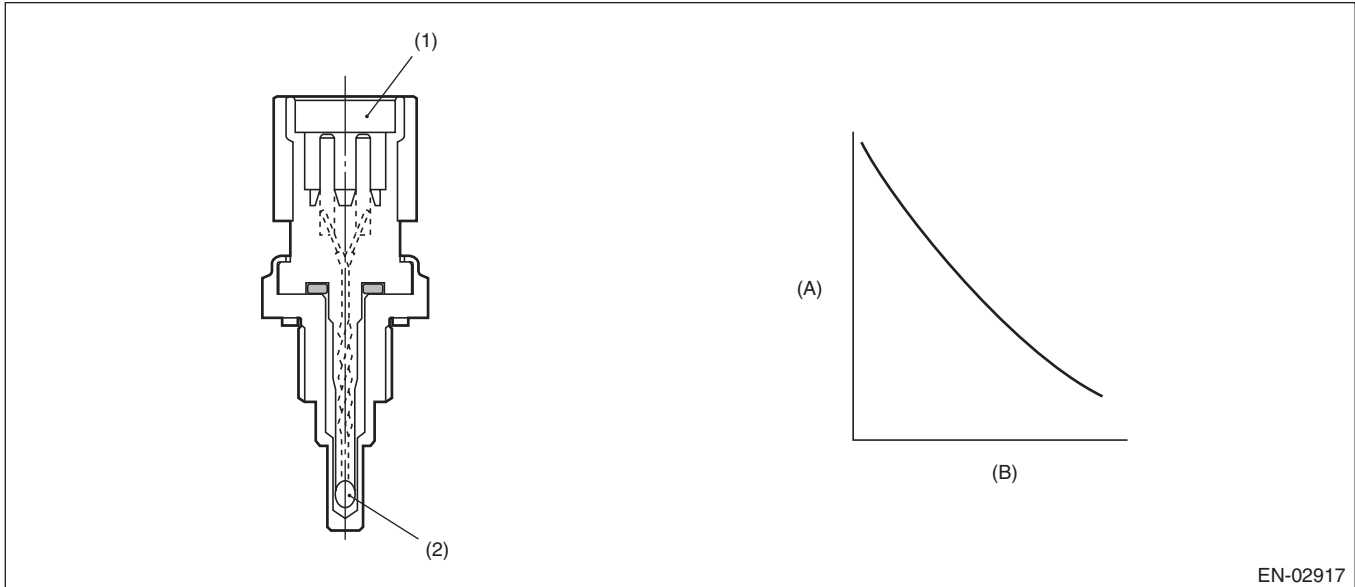
Memorize the freeze frame data. (For test mode \$02)

U: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the engine coolant temperature sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



EN-02917

- | | |
|------------------------|---------------------------|
| (1) Connector | (A) Resistance value (kΩ) |
| (2) Thermistor element | (B) Temperature °C (°F) |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.166 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Engine coolant temperature sensor process: Engine coolant temperature is fixed at 70°C (158°F)
- ISC Feedback: Calculate target engine speed as engine coolant temperature 70°C (158°F).
- ISC learning: Not allowed to learn.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan turn to ON.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATION AT DTC SETTING

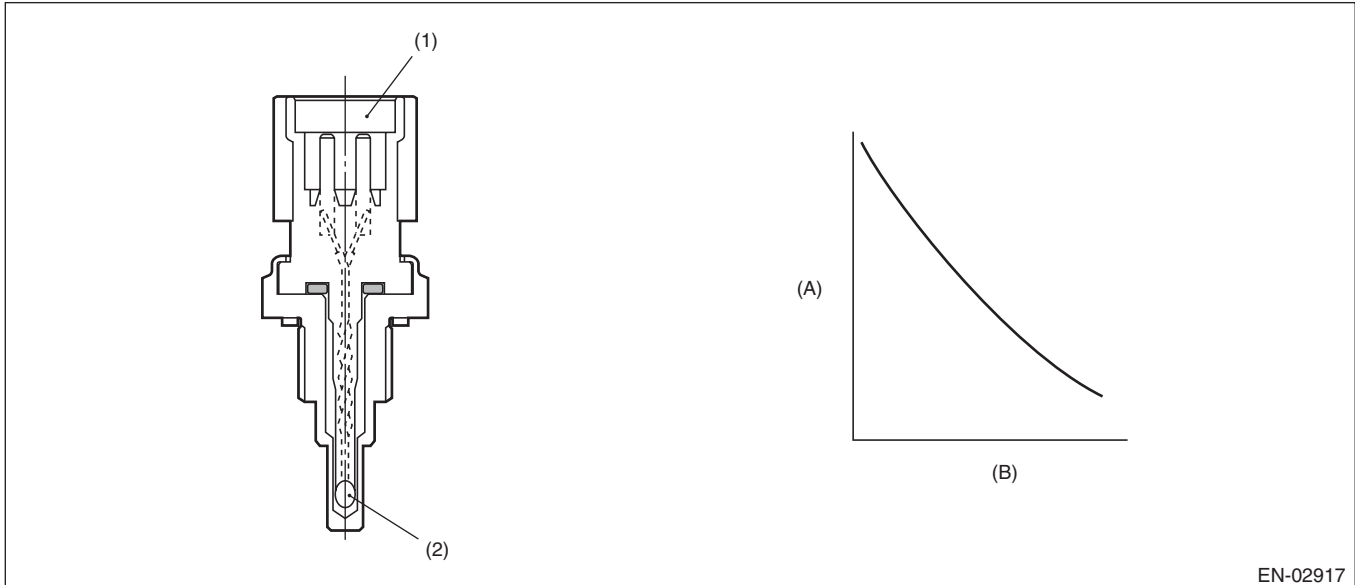
Memorize the freeze frame data. (For test mode \$02)

V: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the engine coolant temperature sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



EN-02917

- | | |
|------------------------|---------------------------|
| (1) Connector | (A) Resistance value (kΩ) |
| (2) Thermistor element | (B) Temperature °C (°F) |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.716 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Engine coolant temperature sensor process: Engine coolant temperature is fixed at 70°C (158°F)
- ISC Feedback: Calculate target engine speed as engine coolant temperature 70°C (158°F).
- ISC learning: Not allowed to learn.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan turn to ON.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATION AT DTC SETTING

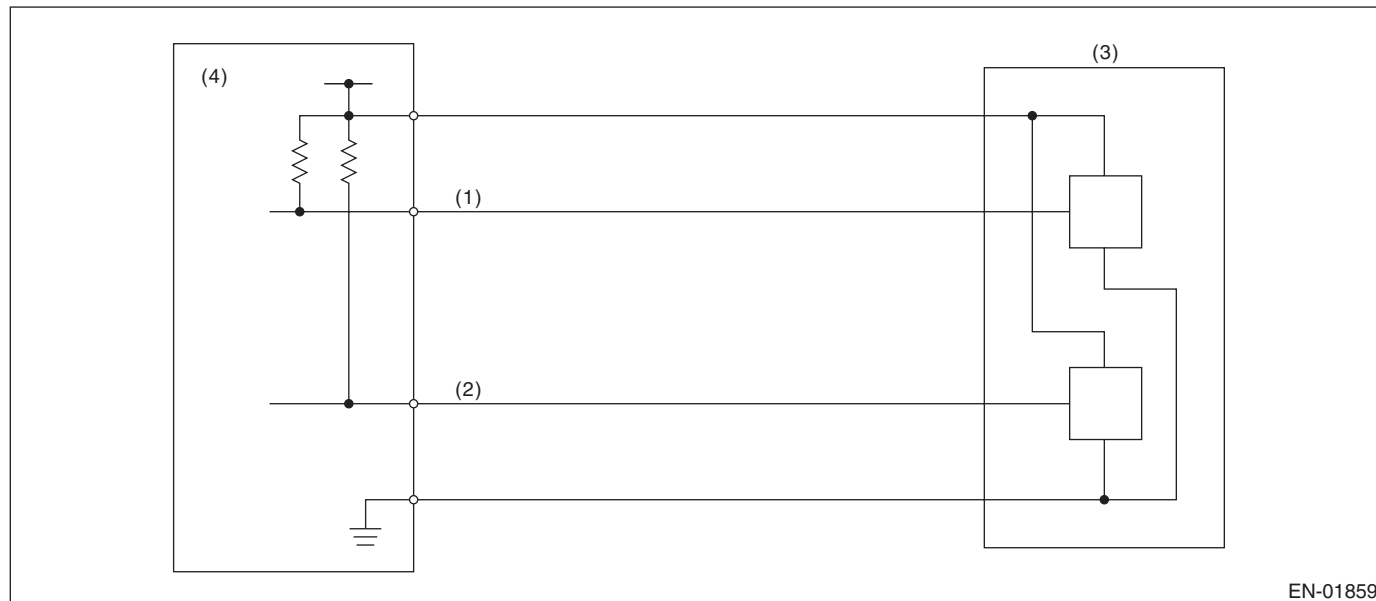
Memorize the freeze frame data. (For test mode \$02)

W: DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



- | | |
|---------------------------------------|---------------------------------|
| (1) Throttle position sensor 1 signal | (3) Throttle position sensor |
| (2) Throttle position sensor 2 signal | (4) Engine control module (ECM) |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 0.309 V

Time Needed for Diagnosis: 24 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

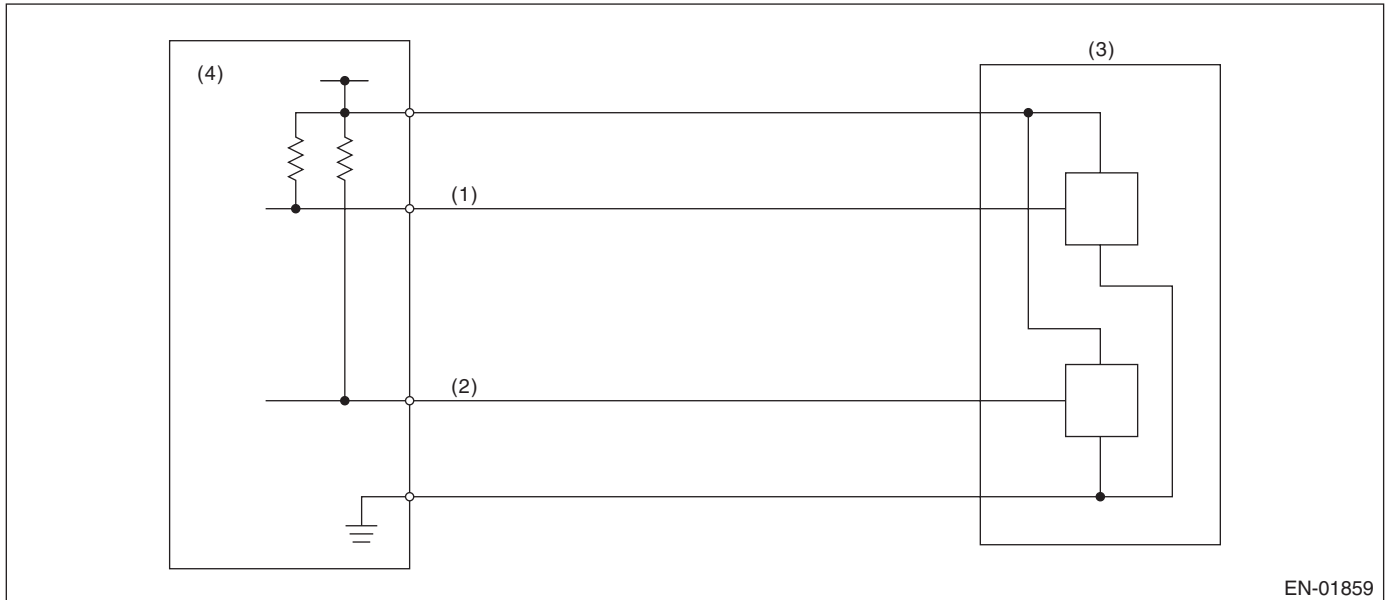
X: DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.

Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



EN-01859

- | | | |
|---------------------------------------|------------------------------|---------------------------------|
| (1) Throttle position sensor 1 signal | (3) Throttle position sensor | (4) Engine control module (ECM) |
| (2) Throttle position sensor 2 signal | | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≤ 4.646 V

Time Needed for Diagnosis: 24 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

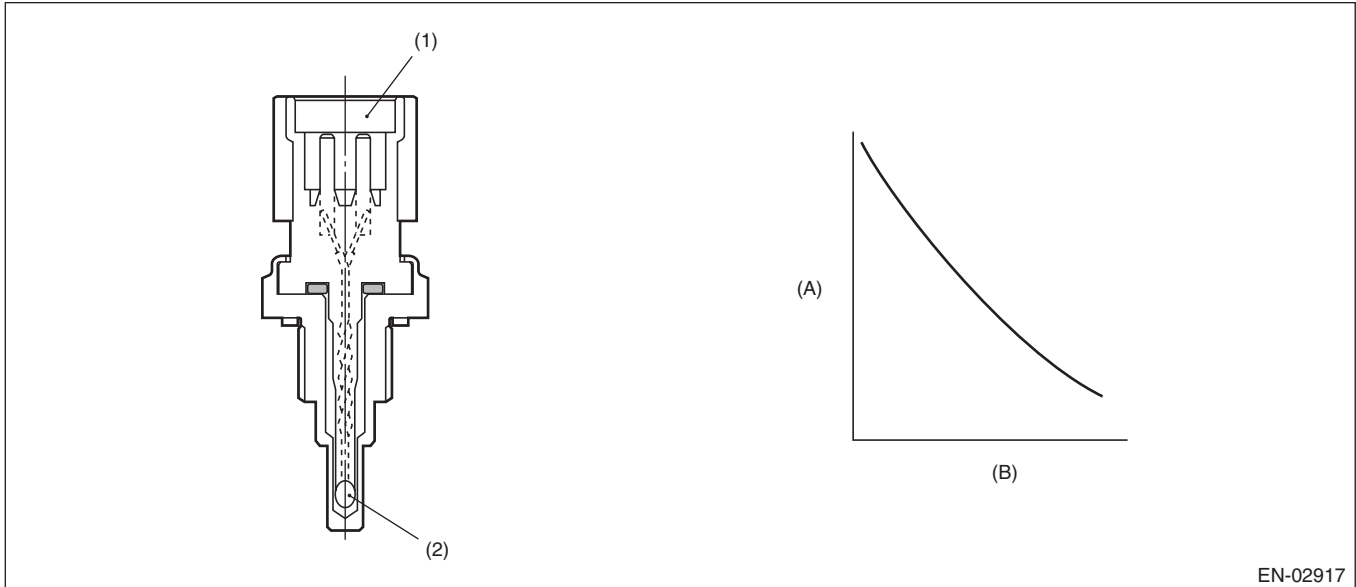
Y: DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of engine coolant temperature output property.

Judge as NG when the engine coolant temperature does not rise in driving conditions where it should.

2. COMPONENT DESCRIPTION



EN-02917

- (1) Connector
- (2) Thermistor element

- (A) Resistance value (kΩ)
- (B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine starting.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	< 20°C (68°F)
Timer for diagnosis after engine starting	≥ Judgment value of timer after engine starting

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Timer for diagnosis after engine starting

- a. Timer stop at fuel cut mode.
- b. During the driving conditions except a) above, timer counts up.
64 milliseconds + TWCNT milliseconds (at the time of 64 milliseconds)

TWCNT is defined as follows.

TWCNT = 0 (at idle switch ON)

TWCNT at idle switch OFF is shown in the following table.

		Vehicle speed km/h (MPH)							
		0 (0)	8 (5)	16 (10)	24 (15)	32 (20)	40 (25)	48 (30)	56 (35)
Temperature °C (°F)	-20 (-4)	0 ms	32.076 ms	39.977 ms	47.879 ms	82.544 ms	117.209 ms	154.214 ms	185.206 ms
	-10 (14)	0 ms	25.704 ms	33.606 ms	41.508 ms	68.520 ms	95.532 ms	125.667 ms	155.802 ms
	0 (32)	0 ms	17.646 ms	25.548 ms	33.450 ms	53.652 ms	73.855 ms	97.120 ms	120.386 ms
	10 (50)	0 ms	7.901 ms	15.802 ms	23.704 ms	37.941 ms	52.177 ms	68.573 ms	82.538 ms

Judgment value of timer after engine starting

$$t = 574 - 33 \times T_i \text{ (seconds)}$$

T_i : The lowest engine coolant temperature after starting the engine

Time Needed for Diagnosis: Undetermined. (It is varied by the lowest engine coolant temperature and engine conditions such as vehicle speed and engine coolant temperature.)

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	$\geq 20^\circ\text{C}$ (68°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Engine coolant temperature sensor process: Engine coolant temperature is fixed at 70°C (158°F)
- ISC Feedback: Calculate target engine speed as engine coolant temperature 70°C (158°F).
- ISC learning: Not allowed to learn.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan turn to ON.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

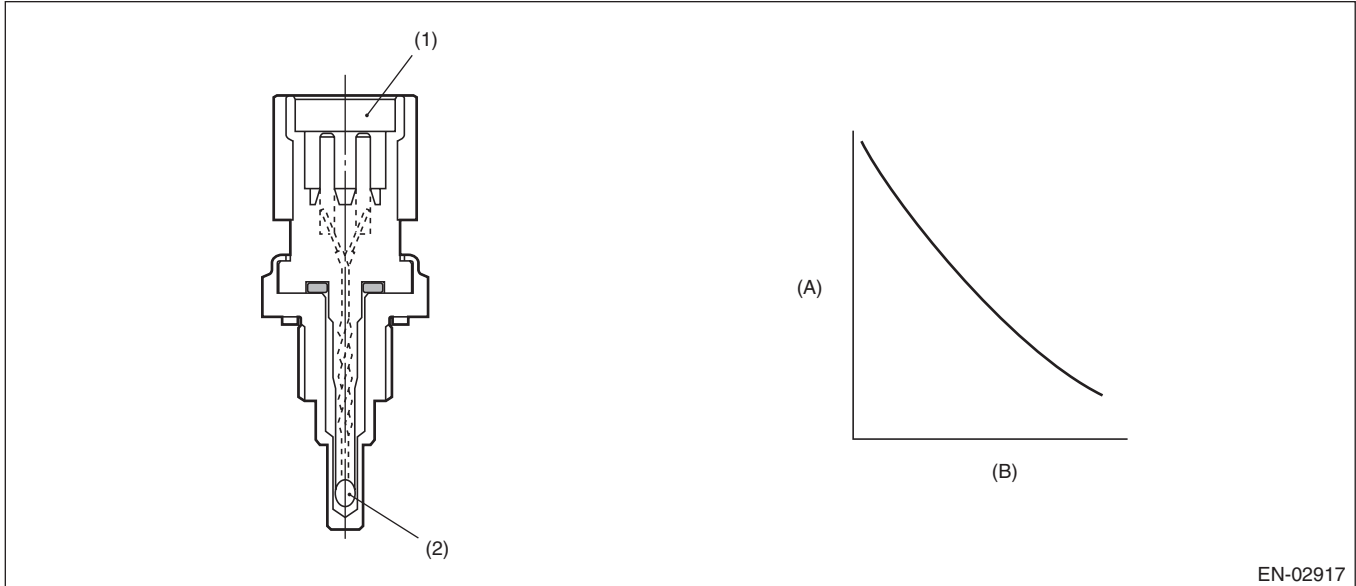
Z: DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of the engine coolant temperature sensor characteristics.

Memorize the engine coolant temperature and fuel temperature at the last engine stop, and use them to judge as NG when the engine coolant temperature does not decrease when it should.

2. COMPONENT DESCRIPTION



EN-02917

- (1) Connector
- (2) Thermistor element

- (A) Resistance value (kΩ)
- (B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Refueling from the last engine stop till the current engine start	None
Fuel level	15.0 ℓ (3.96 US gal, 3.3 Imp gal)
Engine coolant temperature at the last engine stop	≥ 75°C (167°F) and < 100°C (212°F)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after starting the engine.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the continuous time with the following conditions established is more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature at the last engine stop – Minimum engine coolant temperature after the engine start	< 2.5°C (4.5°F)
Fuel temperature at the last engine stop – fuel temperature	5°C (9°F)
Intake air temperature – fuel temperature	2.5°C (4.5°F)
Fuel temperature	35°C (95°F)

Normality Judgment

When the following conditions are established, judged as OK.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature at the last engine stop – Minimum engine coolant temperature after the engine start	≥ 2.5°C (4.5°F)

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

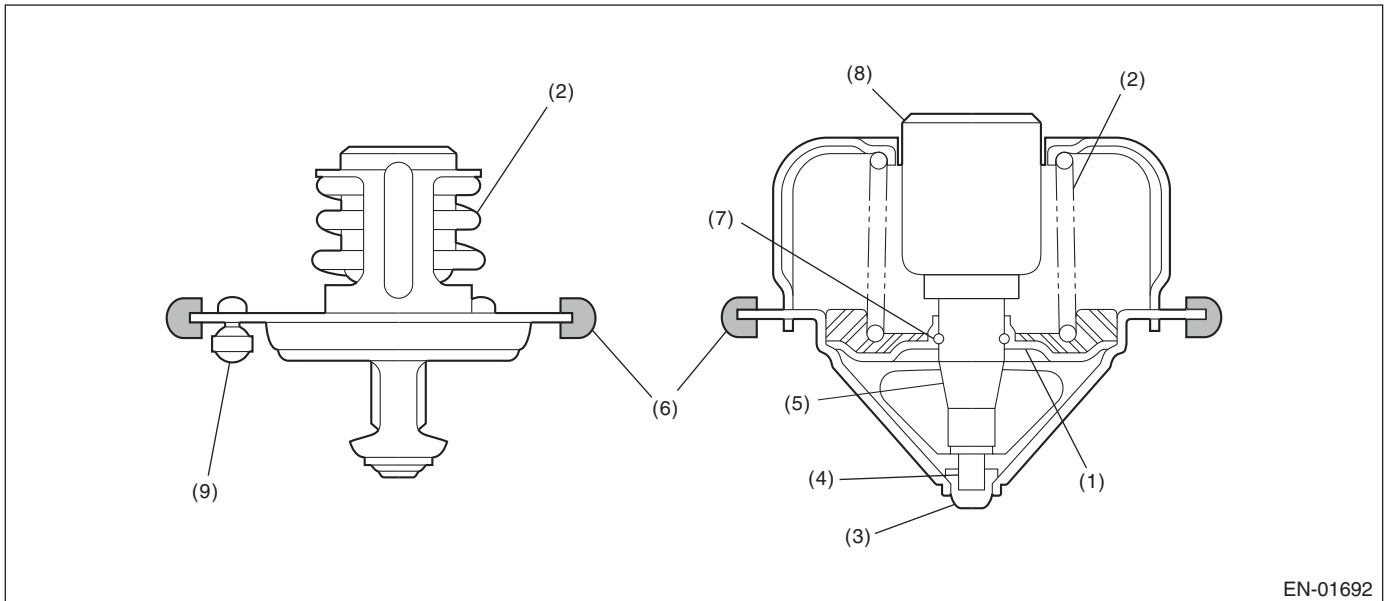
AA:DTC P0128 COOLANT THERMOSTAT (ENGINE COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)

1. OUTLINE OF DIAGNOSIS

Detect malfunctions of the thermostat function.

Judge as NG when the engine coolant temperature is lower than the estimated engine coolant temperature and the difference between them is large. Judge as OK when the engine coolant temperature comes to 70°C (158°F), and the difference is small, before judging NG.

2. COMPONENT DESCRIPTION



EN-01692

- | | | |
|-------------|--------------------|------------------|
| (1) Valve | (4) Piston | (7) Stop ring |
| (2) Spring | (5) Guide | (8) Wax element |
| (3) Stopper | (6) Rubber packing | (9) Jiggle valve |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 30 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Engine coolant temperature at engine starting	$< 55^{\circ}\text{C}$ (131°F)
Engine coolant temperature	$< 75^{\circ}\text{C}$ (167°F)
(Estimated – measured) Engine coolant temperature	$> 30^{\circ}\text{C}$ (54°F)
Vehicle speed	≥ 30 km/h (19 MPH)
Estimated coolant temperature	$\geq 75^{\circ}\text{C}$ (167°F)
Estimate ambient temperature	$\geq -7^{\circ}\text{C}$ (19°F)

Time Needed for Diagnosis: Not fixed

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Engine coolant temperature at engine starting	$< 55^{\circ}\text{C}$ (131°F)
Engine coolant temperature	$\geq 75^{\circ}\text{C}$ (167°F)
(Estimated – measured) Engine coolant temperature	$\leq 30^{\circ}\text{C}$ (54°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

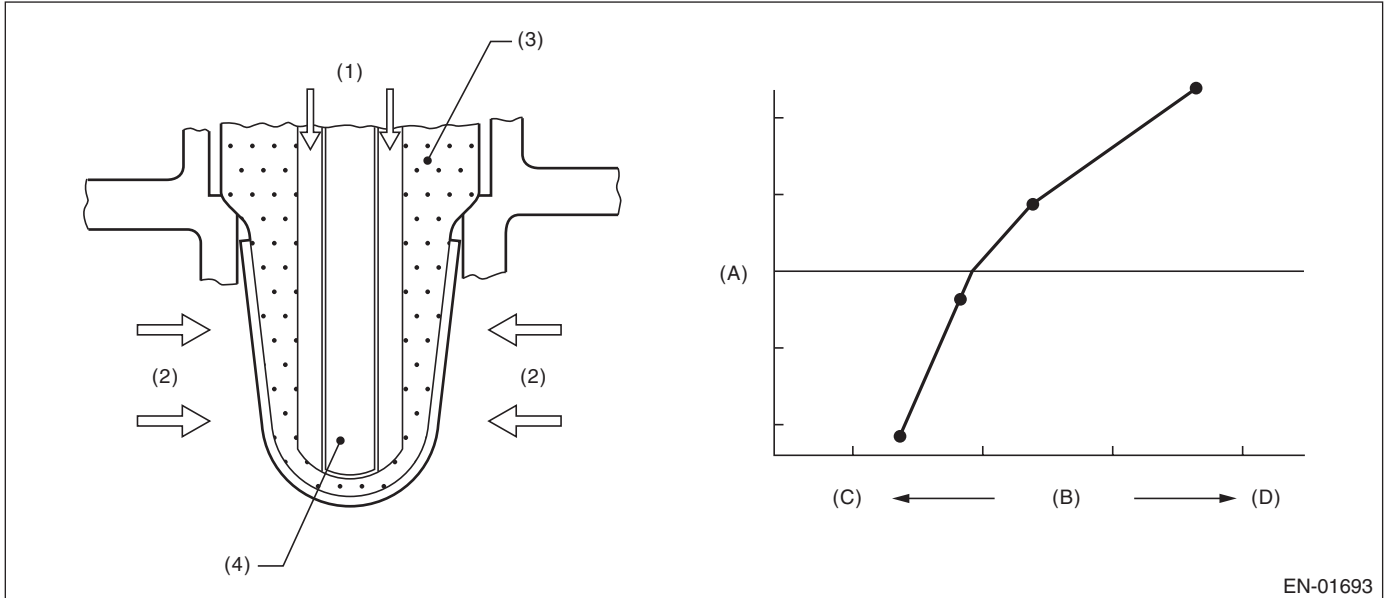
AB:DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.

Judge as NG when the element applied voltage is out of range, or the element current is out of range.

2. COMPONENT DESCRIPTION



EN-01693

- | | |
|----------------------|-------------------------|
| (1) Atmosphere | (A) Electromotive force |
| (2) Exhaust gas | (B) Air fuel ratio |
| (3) ZrO ₂ | (C) Lean |
| (4) Ceramic heater | (D) Rich |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting any one of the malfunction criteria below is more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage	< 1.8 V
Input current	< -0.005 A

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor heater control: Not allowed to apply current to the heater.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- A/F sub learning: Not allowed to calculate the A/F sub learning compensation factor.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

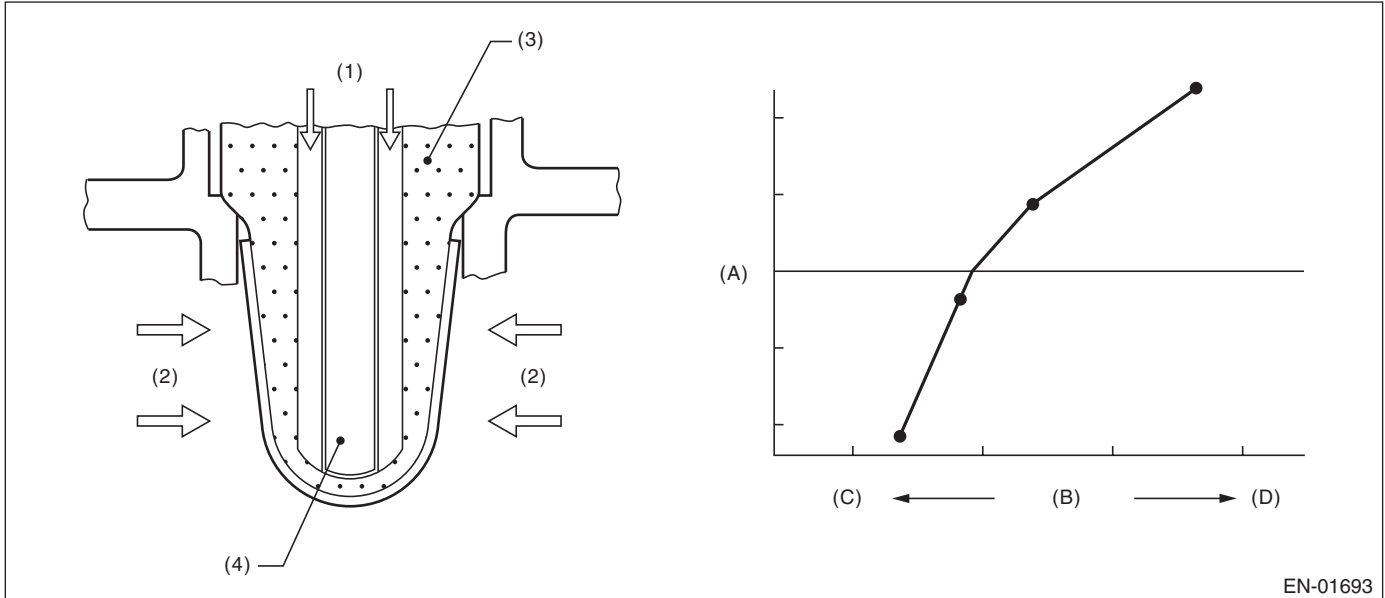
AC:DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.

Judge as NG when the element applied voltage is out of range, or the element current is out of range.

2. COMPONENT DESCRIPTION



EN-01693

- | | |
|----------------------|-------------------------|
| (1) Atmosphere | (A) Electromotive force |
| (2) Exhaust gas | (B) Air fuel ratio |
| (3) ZrO ₂ | (C) Lean |
| (4) Ceramic heater | (D) Rich |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting any one of the malfunction criteria below is more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage	≥ 3.8 V
Input current	≥ 0.005 A

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor heater control: Not allowed to apply current to the heater.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- A/F sub learning: Not allowed to calculate the A/F sub learning compensation factor.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

AD:DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

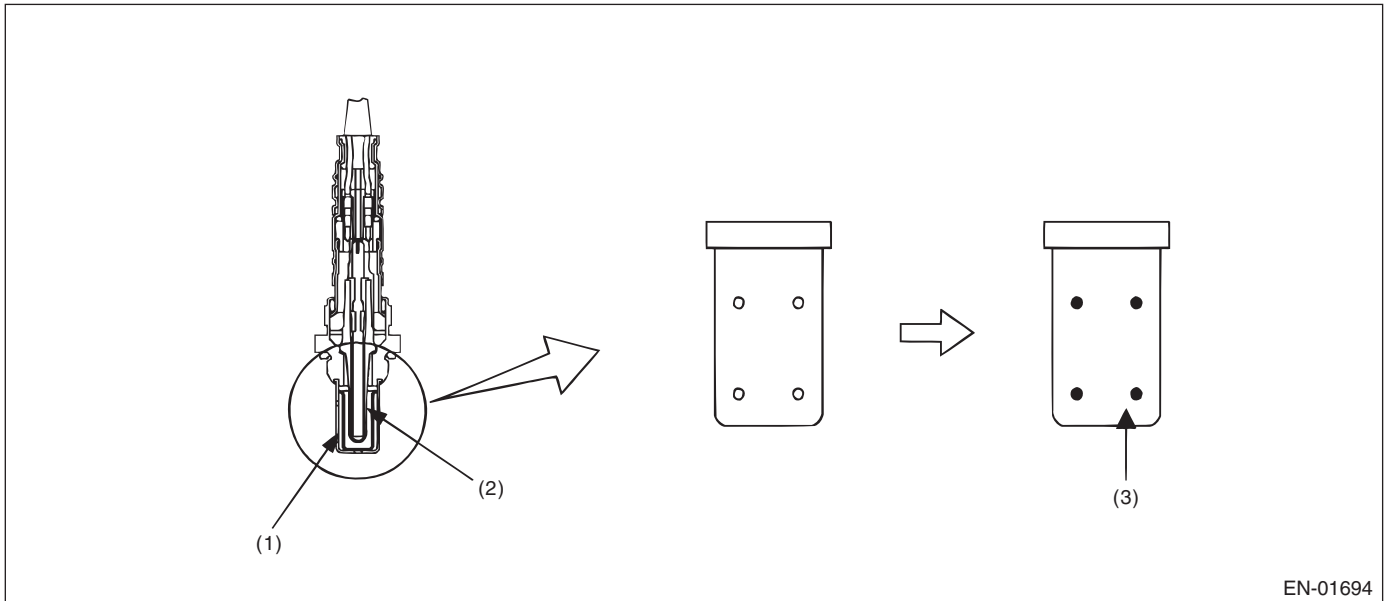
1. OUTLINE OF DIAGNOSIS

Detect the slow response of front oxygen (A/F) sensor.

Front oxygen (A/F) sensor cover has some ventilation holes for exhaust gas. Clogged ventilation holes are diagnosed.

When the holes are clogged, the A/F output variation becomes slow compared with the actual A/F variation because oxygen which reaches the zirconia layer is insufficient. Therefore, if the sensor cover holes are clogged, the rich to lean judgment in the ECM is delayed when the change from rich to lean occurs.

Judge as NG when the actual movement in comparison to the ECM control amount is slow.



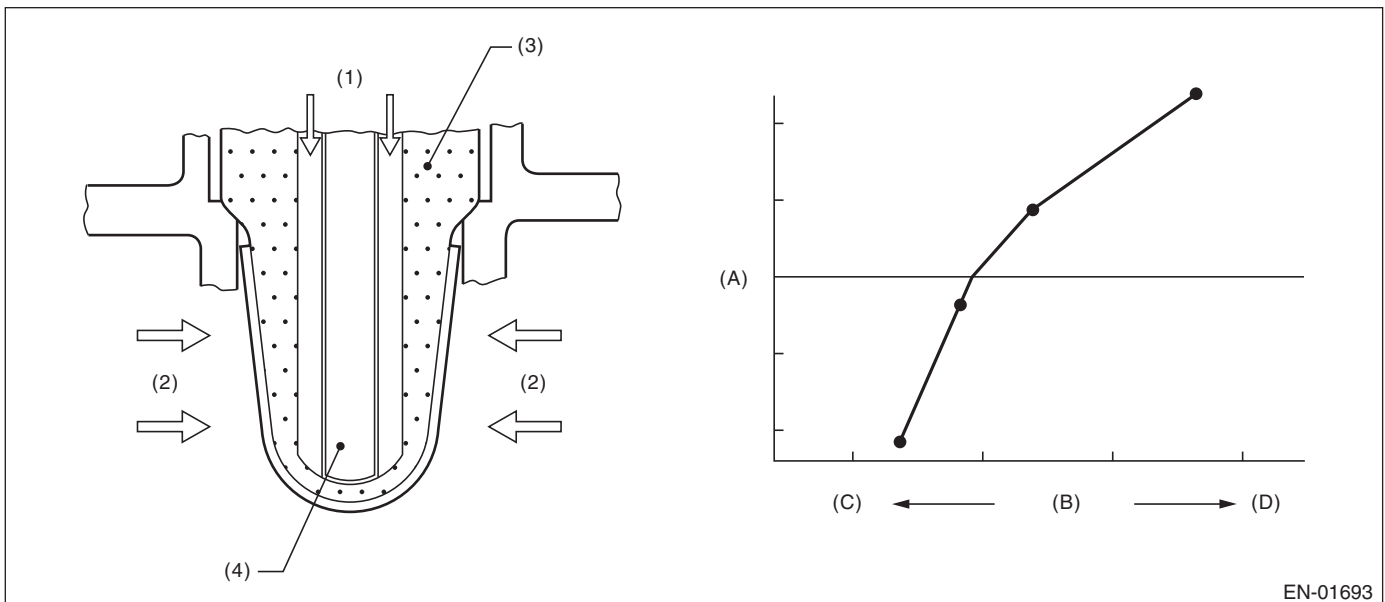
EN-01694

(1) Cover

(2) Zirconia

(3) Clogging

2. COMPONENT DESCRIPTION



EN-01693

(1) Atmosphere

(2) Exhaust gas

(3) ZrO_2

(4) Ceramic heater

(A) Electromotive force

(B) Air fuel ratio

(C) Lean

(D) Rich

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters enable conditions	1 second or more
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Closed loop control with main feedback	Operating
Front oxygen (A/F) sensor impedance	0 — 50 Ω
After engine starting	120 seconds or more
Engine coolant temperature	≥ 75°C (167°F)
Engine speed	1000 — 3200 rpm
Vehicle speed	10 — 120 km/h (6 — 75 MPH)
Amount of intake air	10 — 40 g (0.35 — 1.41 oz)/s
Engine load change during 0.5 engine revs.	≤ 0.02 g (0.001 oz)/rev
Learning value of EVAP conc. during purge	≤ 0.2
Total time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis only once at a constant speed of 10 to 120 km/h (6 to 75 MPH) after 120 seconds or more have passed after the engine starting.

5. DIAGNOSTIC METHOD

Calculate faf difference every 128 milliseconds, and the λ value difference. Calculate the diagnostic value after calculating for 210 seconds.

Judge as NG when the malfunction criteria below are met. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
$para_{fca} = td_{2faf}/td_{2lmd}$ where, $td_{2faf}(N) = td_{2faf}(n-1) + d_{2faf}(n) $ $td_{2lmd}(N) = td_{2lmd}(n-1) + d_{2lmd}(n) $ add up to a total of 210 seconds $d_{2faf}(n) = (faf(n) - faf(n-1)) - (faf(n-1) - faf(n-2))$ $d_{2lmd}(n) = (lmd(n) - lmd(n-1)) - (lmd(n-1) - lmd(n-2))$ faf = main feedback compensation coefficient every 128 milliseconds lmd = output lambda every 128 milliseconds	≥ 0.44

Time Needed for Diagnosis: 210 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate.
- A/F sensor sub learning compensation: Not allowed to calculate.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

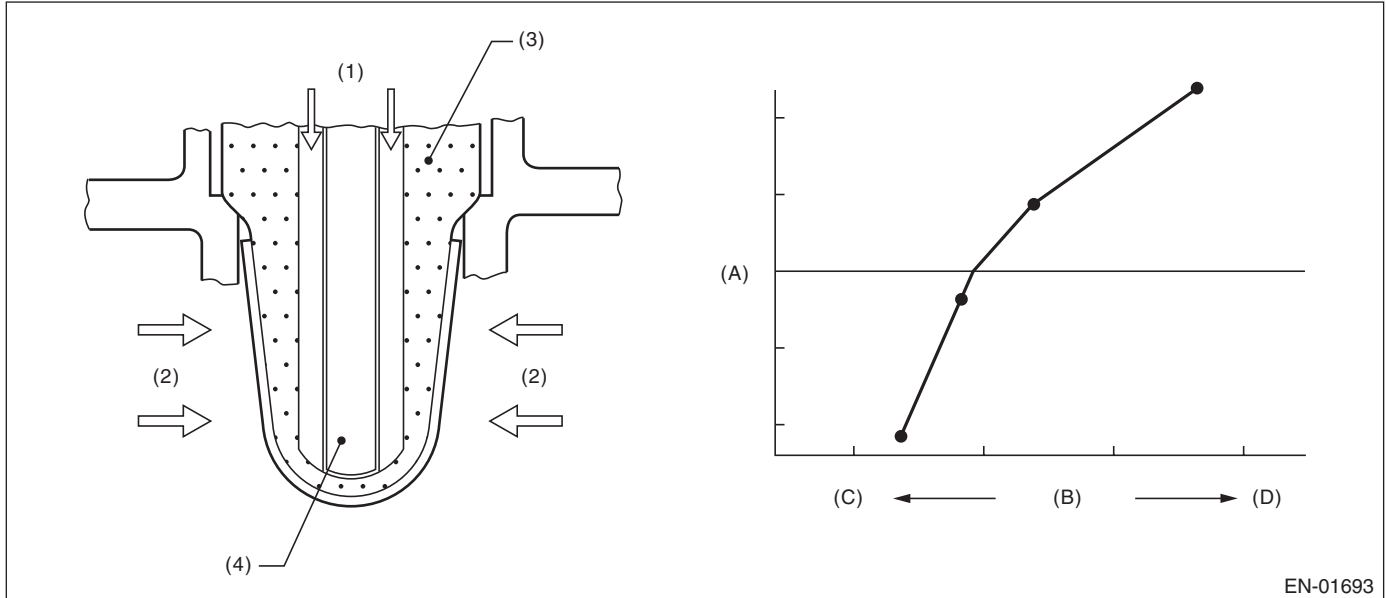
AE:DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect open circuits of the sensor.

Judge as NG when the impedance of the element is large.

2. COMPONENT DESCRIPTION



EN-01693

- | | |
|----------------------|-------------------------|
| (1) Atmosphere | (A) Electromotive force |
| (2) Exhaust gas | (B) Air fuel ratio |
| (3) ZrO ₂ | (C) Lean |
| (4) Ceramic heater | (D) Rich |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Time of heater duty ≥ 70%	≥ 30 sec.
Front oxygen (A/F) sensor impedance	≥ 500 Ω

Time Needed for Diagnosis: 5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor heater control: Not allowed to apply current to the heater.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- A/F sub learning: Not allowed to calculate the A/F sub learning compensation factor.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

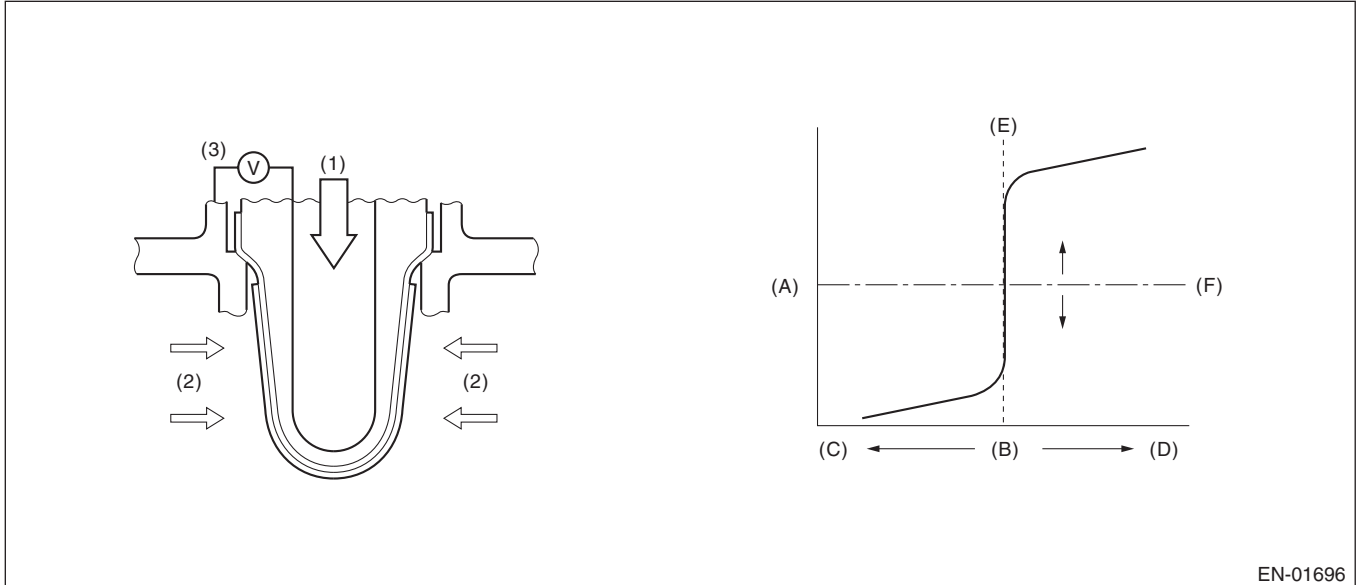
GENERAL DESCRIPTION

AF:DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect the continuity NG of oxygen sensor. If the oxygen sensor voltage reading is not within the probable range considering the operating conditions, judge as NG.

2. COMPONENT DESCRIPTION



EN-01696

(A) Electromotive force

(B) Air fuel ratio

(1) Atmosphere

(C) Rich

(D) Lean

(2) Exhaust gas

(E) Theoretical air fuel ratio

(F) Comparative voltage

(3) Electromotive force

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Used only for abnormality judgment

Secondary Parameters	Enable Conditions
High side	
Secondary air injection system	Not in operation
Closed loop control with the oxygen sensor	In operation
Misfire detection during 200 revs.	< 5 times
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	> 10.9 V
Low side 1	
Secondary air injection system	Not in operation
Closed loop control with the oxygen sensor	In operation
Misfire detection during 200 revs.	< 5 times
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	> 10.9 V
Amount of intake air	≥ 10 g/second
Low side 2	
Secondary air injection system	Not in operation
Closed loop control with the oxygen sensor	In operation
Misfire detection during 200 revs.	< 5 times
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	> 10.9 V
Amount of intake air	< 10 g/second
Current continuation time of the rear oxygen sensor heater	30 seconds or more
Low side 3	
Secondary air injection system	Not in operation
Closed loop control with the oxygen sensor	In operation
Misfire detection during 200 revs.	< 5 times
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	> 10.9 V
Amount of intake air	< 10 g/second
Current continuation time of the rear oxygen sensor heater	30 seconds or more
Fuel cut	Experienced

Used only for normality judgment

Secondary Parameters	Enable Condition
Secondary air injection system	Not in operation
Closed loop control with the oxygen sensor	In operation
Misfire detection during 200 revs.	< 5 times
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	> 10.9 V

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. GENERAL DRIVING CYCLE

After starting the engine, perform the diagnosis in series while the engine is in a constant operating condition.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the continuous time when the following conditions are established exceeds the predetermined time, and judge as OK if it doesn't.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
High side Maximum output voltage without continuity	≥ 1200 mV	P0138
Low side Minimum output voltage without continuity	< 30 mV	P0137

Time Needed for Diagnosis

High side: 2.5 seconds

Low side 1: 20 seconds

Low side 2: 40 seconds

Low side 3: Value from Map

Map

Fuel Cut Time (Seconds)	Time Needed for Diagnosis (Seconds)
0	40
2	40
10	60

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Sub feedback control: Not allowed.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AG:DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

NOTE:

For the detection conditions, refer to DTC P0137. <Ref. to GD(H4SO)-66, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AH:DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect the slow response of the oxygen sensor.

Judge as NG if either the rich to lean response diagnosis or lean to rich response diagnosis is NG, and judge as OK if both are OK.

[Rich → lean response diagnosis]

1. Measure the response time for oxygen sensor output changes when the A/F ratio changes to rich to lean. If the measured response time is larger than the threshold value, it is NG. If it is smaller, it is OK.

2. Judge as NG when the oxygen sensor voltage is large (rich) when recovering from a deceleration fuel cut.

[Lean → rich response diagnosis]

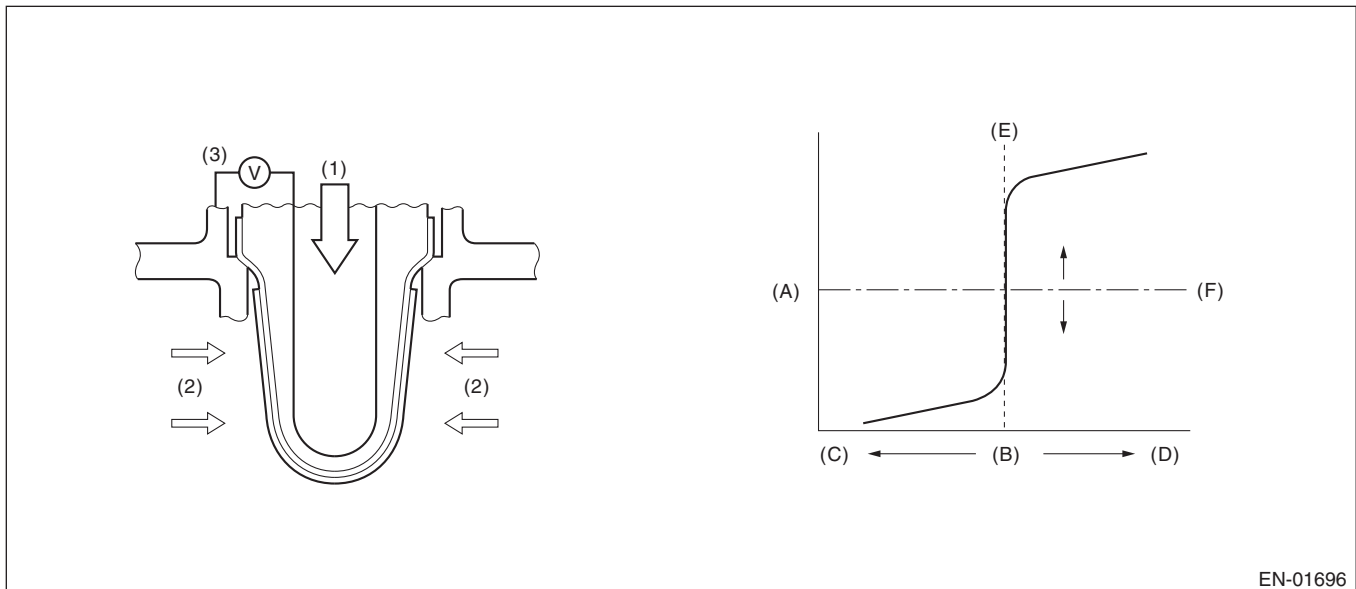
1. Measure the response time for oxygen sensor output changes when the A/F ratio changes to lean to rich. If the measured response time is larger than the threshold value, it is NG.

2. Judge as NG when the oxygen sensor voltage remains small when recovering from a deceleration fuel cut.

DIAGNOSTIC METHOD

Measure the response time of the output change of the oxygen sensor when the A/F ratio changes to rich to lean. And judge as NG when the measured response time is larger than the threshold value.

2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust gas
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich

- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

3. ENABLE CONDITION

- Rich → lean response diagnosis

Secondary Parameters	Enable Condition
Battery voltage	> 10.9 V
A/F sub feedback control condition	Completed
Deceleration fuel cut time is 6 seconds or more.	Experienced
After fuel cut	≥ 2 sec.
Rear oxygen heater current calculation time	≥ 60 sec.
Rear oxygen heater current continuous time	≥ 30 sec.
Catalyst warm-up counter (U5 model)	≥ 9000 times
Estimated temperature in catalyst layer (Except for U5 model)	≥ 400°C (752°F)

Diagnostic Trouble Code (DTC) Detecting Criteria

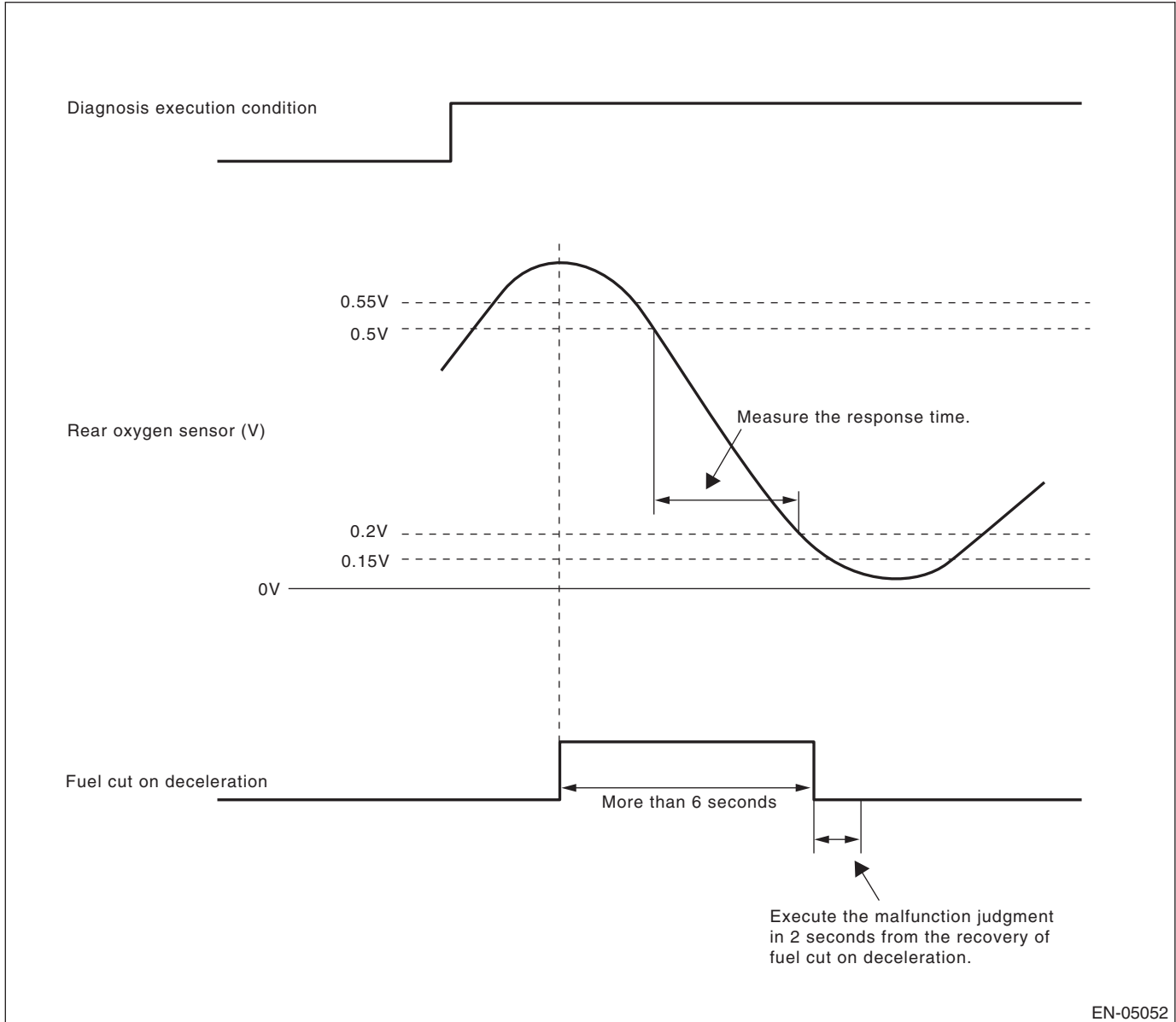
GENERAL DESCRIPTION

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once when deceleration fuel cut occurs after rapid acceleration. (Pay attention to the oxygen sensor voltage to decide on the timing of the deceleration.)

5. DIAGNOSTIC METHOD

When the oxygen sensor output voltage changes from 0.55 V (rich) to 0.15 V (lean), calculate the minimum response time for output change between 0.5 V and 0.2 V for the judgment criteria.



Abnormality Judgment

1. Judge as NG when the judgment value is larger than the threshold value after deceleration fuel cut. Response time (diagnosis value) > threshold value → abnormal

NOTE:

Variation time of rear oxygen sensor output voltage is short during fuel shut-off in deceleration. Carry out the NG judgment only after the fuel shut-off in deceleration. Even without deceleration fuel cut, judge as OK if the value is below the threshold.

When the deceleration fuel cut time is more than 6 seconds, judge as NG if the following criteria are met 2 seconds after recovering from the deceleration fuel cut.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

2. Judge as NG when the oxygen sensor voltage at recovery from a deceleration fuel cut is large. If the fuel cut time in a deceleration fuel cut is long (more than 6 s), and even after recovering from a deceleration fuel cut, the oxygen sensor voltage is high (0.55 V or more), judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from rich (0.5 V O ₂ output) to lean (0.2 V) if voltage reduces from 0.55 V to 0.15 V.	> 0.491 sec.
Time at over 0.55 V	> 2 sec.

Time Needed for Diagnosis: 1 time

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

1. Regardless of a deceleration fuel cut, if the response time (diagnosis value) when the oxygen sensor voltage has changed from rich to lean is shorter than the threshold value (judgment value), judge as a normal condition.

Response time (diagnosis value) ≤ threshold value → normal

2. Do not judge as a normal condition.

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from rich (0.5 V O ₂ output) to lean (0.2 V) if voltage reduces from 0.55 V to 0.15 V.	≤ 0.491 sec.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Sub feedback control: Not allowed.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

10. ENABLE CONDITION

- Lean → rich response diagnosis

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
A/F main feedback control condition	Completed
Deceleration fuel cut ≥ 6 seconds	Experienced
After fuel cut	≥ 2 sec.

11. GENERAL DRIVING CYCLE

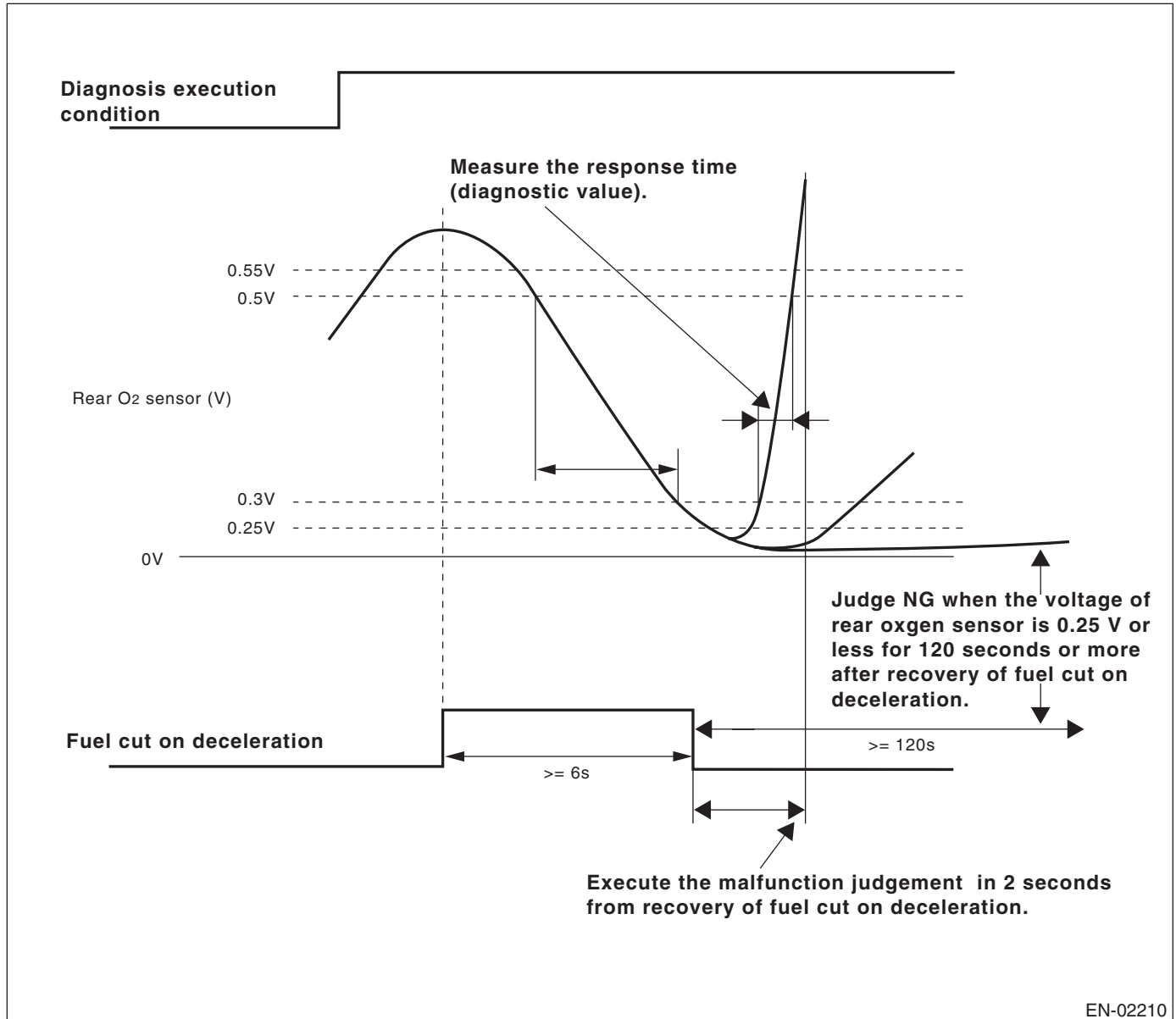
Perform the diagnosis only once when deceleration fuel cut occurs after rapid acceleration. (Pay attention to the oxygen sensor voltage to decide on the timing of the deceleration.)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

12. DIAGNOSTIC METHOD

Calculate the minimum value of 0.3 V to 0.5 V output change response time when the oxygen sensor output voltage changes from 0.25 V (lean) to 0.55 V (rich).



Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Abnormality Judgment

1. Judge as NG when the judgment value is larger than the threshold value after deceleration fuel cut.
Response time (diagnostic value) > threshold value → abnormal
2. If the oxygen sensor voltage is small after recovering from a deceleration fuel cut, and remains small, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from lean (0.3 V O ₂ output) to rich (0.5 V) when voltage drops from 0.5 V to 0.25 V.	> 2 sec.
Time at less than 0.25 V	> 120 sec.

Time Needed for Diagnosis: 1 time

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

1. Regardless of a deceleration fuel cut, if the response time (diagnostic value) when the oxygen sensor voltage has changed from rich to lean is shorter than the threshold value (judgment value), judge as normal.
Response time (diagnostic value) ≤ threshold value → normal
2. Normality judgement is not to be performed.
Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from lean (0.3 V O ₂ output) to rich (0.5 V) when voltage drops from 0.55 V to 0.25 V.	≤ 2 sec.

13.DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

14.MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

15.FAIL SAFE

Sub feedback control: Not allowed.

16.ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AI: DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect abnormalities in the rear oxygen sensor output property.

When looking at the intake air amount, coolant temperature, main feedback control, deceleration fuel cut and other operating conditions, even though the rear oxygen sensor voltage should be moving under those conditions, if the voltage is low, this is judged as a Low side NG. If the voltage is high, it is judged as a High side NG.

When either Low side or High side is NG, judged as rear oxygen sensor property NG.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 75^{\circ}\text{C}$ (167°F)
Target output voltage of the rear oxygen sensor	$\geq 0.6\text{ V}$
Air intake amount	10 g (0.35 oz)/seconds or more
Battery voltage	$> 10.9\text{ V}$
Closed loop with the oxygen sensor	In operation
Misfire detection during 200 revs.	5 times or less
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Deceleration fuel cut of 5 seconds or more.	Experienced

3. GENERAL DRIVING CYCLE

Perform the diagnosis only once after idling.

4. DIAGNOSTIC METHOD

Abnormality Judgment

When one of the following conditions is established, judged as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Maximum output voltage low side diagnosis	$< 0.55\text{ V}$
Minimum output voltage high side diagnosis	$> 0.25\text{ V}$

Time Needed for Diagnosis: 200 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

When the following conditions are established, judged as OK.

Judgment Value

Malfunction Criteria	Threshold Value
Maximum output voltage low side diagnosis	$\geq 0.55\text{ V}$
Minimum output voltage high side diagnosis	$\leq 0.25\text{ V}$

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

Sub feedback control: Not allowed.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AJ:DTC P0171 SYSTEM TOO LEAN (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect fuel system malfunction by the amount of main feedback control.

DIAGNOSTIC METHOD

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

2. ENABLE CONDITION

- Lean side

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	$\geq 75^{\circ}\text{C}$ (167°F)
Amount of intake air	\geq Value from Map 5
Intake air change during 0.5 engine revs.	≤ 0.02 g (0.001 oz)/rev

Map 5

Engine speed (rpm)	Idling	650	1000	1500	2000	2500	3000	3500	4000	4500
Measured value (g(oz)/rev)	NA	0.203 (0.0072)	0.183 (0.0065)	0.155 (0.0055)	0.149 (0.0053)	0.157 (0.0055)	0.162 (0.0057)	0.18 (0.0063)	0.193 (0.0068)	0.205 (0.0072)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling or at a constant speed after warming up the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. DIAGNOSTIC METHOD

Abnormality Judgment

Compare the diagnosed value (fsobd) with the threshold value, and if a condition where the malfunction criteria below are met continues for more than 50 seconds, judge that there is a fault in the fuel system.

Judgment Value

Malfunction Criteria	Threshold Value
$fsobd = (sglmd - tglmda) + faf + flaf$ where, sglmd = measured lambda tglmda = target lambda faf = main feedback compensation coefficient (every 64 milliseconds) flaf = main feedback learning compensation coefficient	$\geq fsobdL1$ See Map 4 fsobdL1 = lean side threshold value of fsobd

Map 4 Threshold value for fuel system malfunction criteria

Amount of air (g(oz)/s)	0 (0)	3.2 (0.113)	6.4 (0.226)	9.6 (0.339)	12.8 (0.451)	16 (0.564)	19.2 (0.677)
fsobdL1 (%)	40	40	33.2	26.5	26.5	26.5	26.5

Time Needed for Diagnosis: 10 seconds \times 5 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK when the malfunction criteria below continue for 10 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
$fsobd = (sglmd - tglmda) + faf + flaf$	$< 19\%$

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When similar driving conditions are repeated 3 times and the result is OK.
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AK:DTC P0172 SYSTEM TOO RICH (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect fuel system malfunction by the amount of main feedback control.

DIAGNOSTIC METHOD

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	$\geq 75^{\circ}\text{C}$ (168°F)
Amount of intake air	\geq Value from Map 5
Intake air change during 0.5 engine revs.	≤ 0.02 g (0.001 oz)/rev
Learning value of EVAP conc. during purge	< 0.1
Cumulative time of canister purge after engine start	20 seconds or more
Continuous period after canister purge starting	30 seconds or more

Map 5

Engine speed (rpm)	Idling	650	1000	1500	2000	2500	3000	3500	4000	4500
Measured value (g(oz)/rev)	NA	0.203 (0.0072)	0.183 (0.0065)	0.155 (0.0055)	0.149 (0.0053)	0.157 (0.0055)	0.162 (0.0057)	0.18 (0.0063)	0.193 (0.0068)	0.205 (0.0072)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling or at a constant speed after warming up the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. DIAGNOSTIC METHOD

Abnormality Judgment

Compare the diagnosed value (fsobd) with the threshold value, and if a condition where the malfunction criteria below are met continues for more than 50 seconds, judge that there is a fault in the fuel system.

Judgment Value

Malfunction Criteria	Threshold Value
$fsobd = (sglmd - tglmda) + faf + flaf$ where, sglmd = measured lambda tglmda = target lambda faf = main feedback compensation coefficient every 64 milliseconds flaf = main feedback learning compensation coefficient	$\leq fsobdR1$ See Map 4 fsobdR1 = rich side threshold value of fsobd

Map 4 Threshold value for fuel system malfunction criteria

Amount of air (g(oz)/s)	0 (0)	3.2 (0.113)	6.4 (0.226)	9.6 (0.339)	12.8 (0.451)	11.7 (0.413)	19.2 (0.677)
fsobdR1 (%)	-40	-40	-33.2	-26.5	-26.5	-26.5	-26.5

Time Needed for Diagnosis: 10 seconds × 5 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK when the malfunction criteria below continues for 10 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
$fsobd = (sglmd - tglmda) + faf + flaf$	$\geq -20\%$

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When similar driving conditions are repeated 3 times and the result is OK.
- When "Clear Memory" is performed

7. FAIL SAFE

Purge control solenoid valve control: Not allowed to purge.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AL:DTC P0181 FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/ PERFORMANCE

1. OUTLINE OF DIAGNOSIS

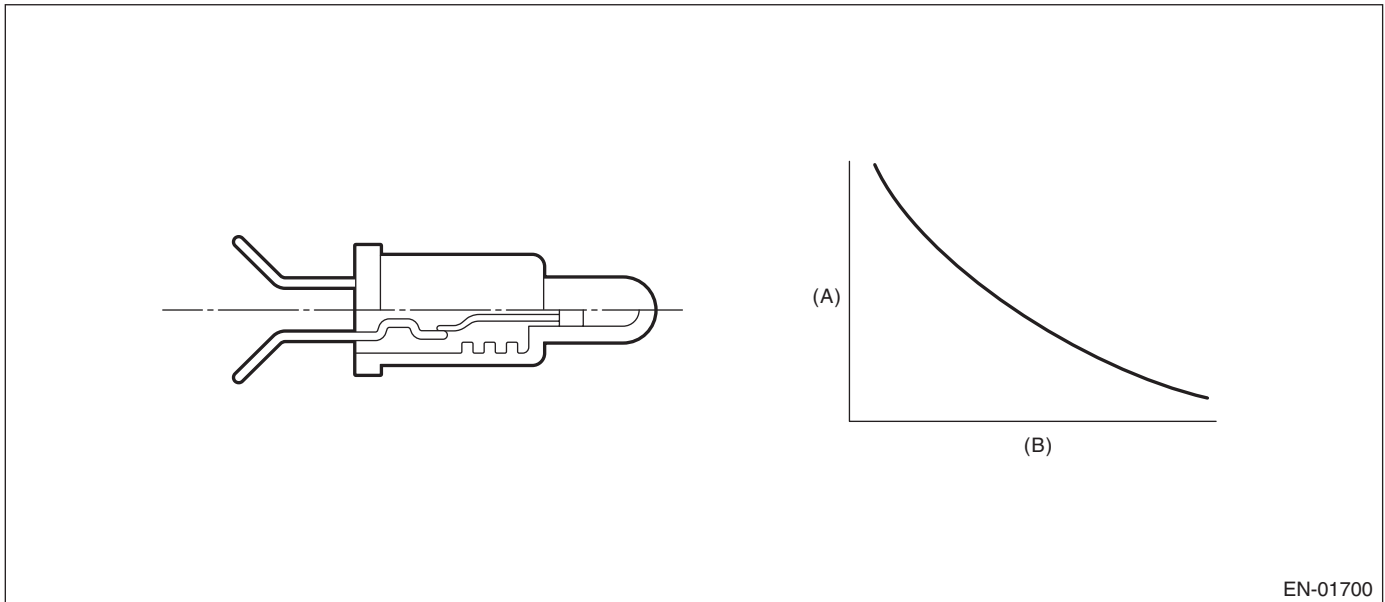
Detect faults in the fuel temperature sensor output properties.

Diagnosis is performed in two methods; drift diagnosis and stuck diagnosis. If either is NG, judge as NG. If both are OK, Judge as OK and clear the NG.

DRIFT DIAGNOSIS

Normally fuel temperature is lower than engine coolant temperature. When the fuel temperature becomes higher than the engine coolant temperature, the range is considered to be shifted, and judged as NG.

2. COMPONENT DESCRIPTION



(A) Resistance value (Ω)

(B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 120 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	$\geq 9.0 \ell$ (2.38 US gal, 1.98 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature – engine coolant temperature at engine start	$> 10^{\circ}\text{C}$ (18°F)
Fuel temperature – Engine coolant temperature	$\geq 10^{\circ}\text{C}$ (18°F)
Battery voltage	$> 10.9 \text{ V}$

Time Needed for Diagnosis: 120 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	$\geq 9.0 \ell$ (2.38 US gal, 1.98 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature – engine coolant temperature at engine start	$> 10^{\circ}\text{C}$ (18°F)
Fuel temperature – Engine coolant temperature	$< 10^{\circ}\text{C}$ (18°F)
Engine coolant temperature	$< 75^{\circ}\text{C}$ (167°F)
Battery voltage	$> 10.9 \text{ V}$

Stuck Diagnosis

As the engine warms up (cumulative amount of intake air after starting is large), if the fuel temperature which should rise does not, determine as being stuck and NG.

6. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	20 seconds or more
Battery voltage	$> 10.9 \text{ V}$

7. GENERAL DRIVING CYCLE

Always perform diagnosis after 20 seconds have passed since the engine started.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 551 kg (1215 lb)
Fuel temperature difference between Max. and Min.	< 2°C (3.6°F)

Time Needed for Diagnosis: Undetermined

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 551 kg (1215 lb)
Fuel temperature difference between Max. and Min.	≥ 2°C (3.6°F)

9. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

10.MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

11.FAIL SAFE

None

12.ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

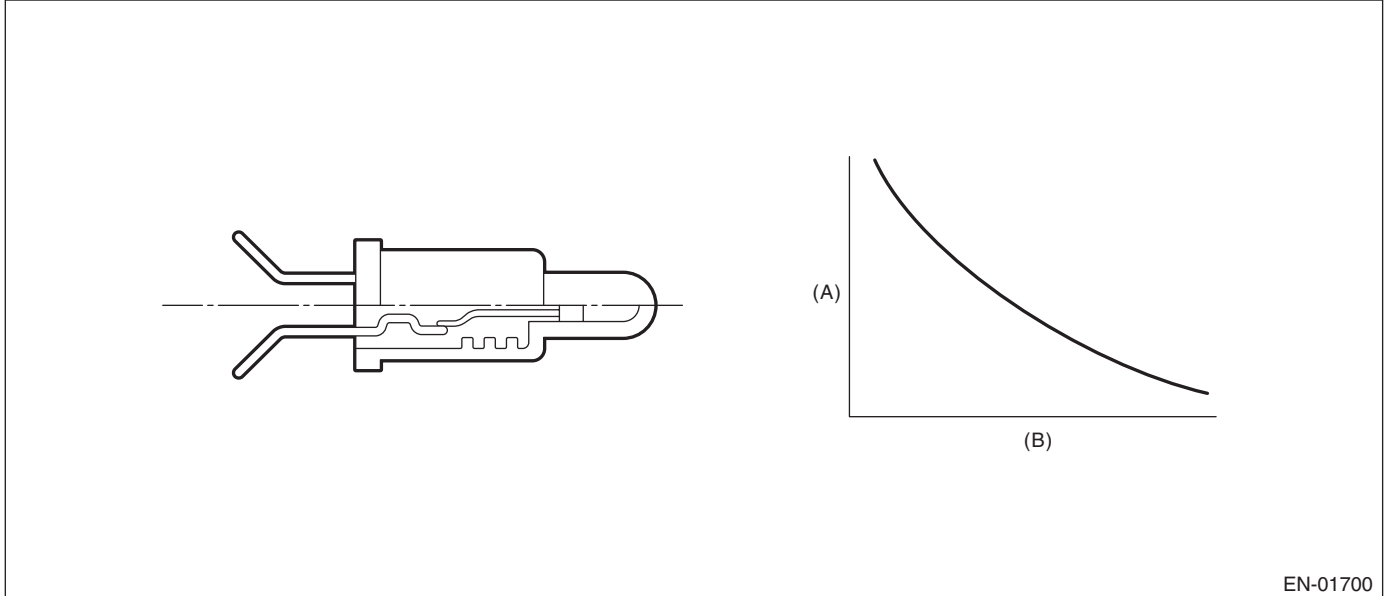
GENERAL DESCRIPTION

AM:DTC P0182 FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



EN-01700

(A) Resistance value (Ω)

(B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.166 V
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.166 V
Battery voltage	≥ 10.9 V

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

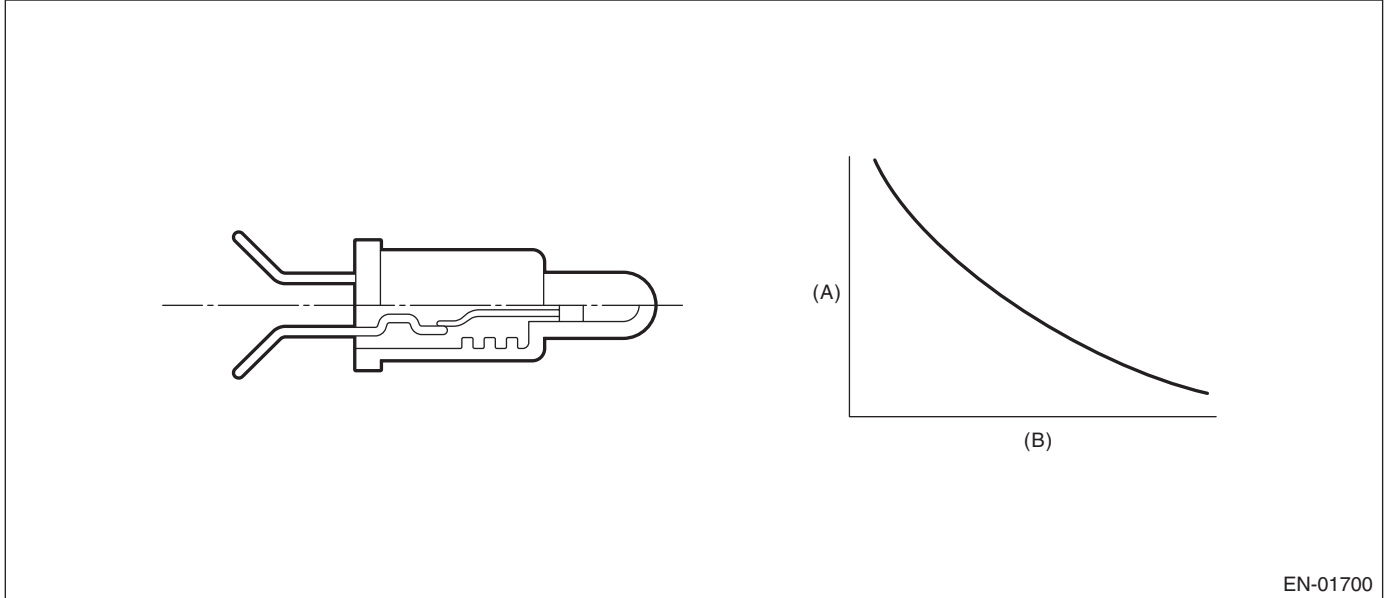
GENERAL DESCRIPTION

AN:DTC P0183 FUEL TEMPERATURE SENSOR “A” CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(A) Resistance value (Ω)

(B) Fuel temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\geq 4.716 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$< 4.716 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AO:DTC P0196 ENGINE OIL TEMPERATURE SENSOR CIRCUIT RANGE/ PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect for abnormal values in the oil temperature sensor output properties.

Judge as NG when the oil temperature does not rise even though the engine is running under a condition where it should rise.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine speed	500 rpm

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. DIAGNOSTIC METHOD

Abnormality Judgment

When the following conditions are established, judged as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Engine oil temperature	< 15°C (59°F)
After engine start oil temperature sensor characteristic diagnosis timer	≥ Judgment value for after engine start oil temperature sensor characteristic diagnosis timer

After engine start oil temperature sensor characteristic diagnosis timer (timer for diagnosis).

a. Timer stop at fuel cut mode

b. During the driving conditions except a) above, timer counts up.

64 milliseconds + TOILCNT milliseconds (at the time of 64 milliseconds)

Where, TOILCNT is determined as follows.

TOILCNT = 0 (at idle switch ON)

For TOILCNT at Idle switch off, refer to the following table.

		Vehicle speed km/h (MPH)							
		0 (0)	8 (5)	16 (10)	24 (15)	32 (20)	40 (25)	48 (30)	56 (35)
Temperature °C (°F)	-30 (-22)	64 ms	73.2 ms	83.9 ms	96.3 ms	113.2 ms	133.9 ms	160.2 ms	194.6 ms
	-20 (-4)	64 ms	73.3 ms	84 ms	96.6 ms	113.7 ms	135 ms	162 ms	197.4 ms
	-10 (14)	64 ms	73.4 ms	84.2 ms	96.9 ms	114.5 ms	136.4 ms	164.4 ms	201.5 ms
	0 (32)	64 ms	73.5 ms	84.5 ms	97.4 ms	115.6 ms	138.5 ms	168 ms	207.6 ms
	10(50)	102.2 ms	114.8 ms	129.4 ms	146.7 ms	171.7 ms	203.4 ms	245.1 ms	302.1 ms

After engine start oil temperature characteristic diagnosis timer judgment value (t).

$t = 1882940 - 43302 \times T_i$ ($t \geq 1882940$)

T_i = The lowest coolant temperature after starting the engine

Time Needed for Diagnosis: Undetermined

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

When the following conditions are established, judged as OK.

Judgment Value

Malfunction Criteria	Threshold Value
Engine oil temperature	≥ 15°C (59°F)

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

Oil temperature sensor process: Engine oil temperature is fixed at 70°C (158°F).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AP:DTC P0197 ENGINE OIL TEMPERATURE SENSOR LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the oil temperature sensor.
Judge as NG when outside of the possible range.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Judge as NG when the continuous time when the following conditions are established is more than 0.5 seconds. Judge as OK and clear the NG when the following conditions are not established.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.166 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

Oil temperature sensor process: Engine oil temperature is fixed at 70°C (158°F).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AQ:DTC P0198 ENGINE OIL TEMPERATURE SENSOR HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the oil temperature sensor.
Judge as NG when outside of the judgment value.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Judge as NG when the continuous time when the following conditions are established is more than 0.5 seconds. Judge as OK and clear the NG when the following conditions are not established.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.716 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

Oil temperature sensor process: Engine oil temperature is fixed at 70°C (158°F).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

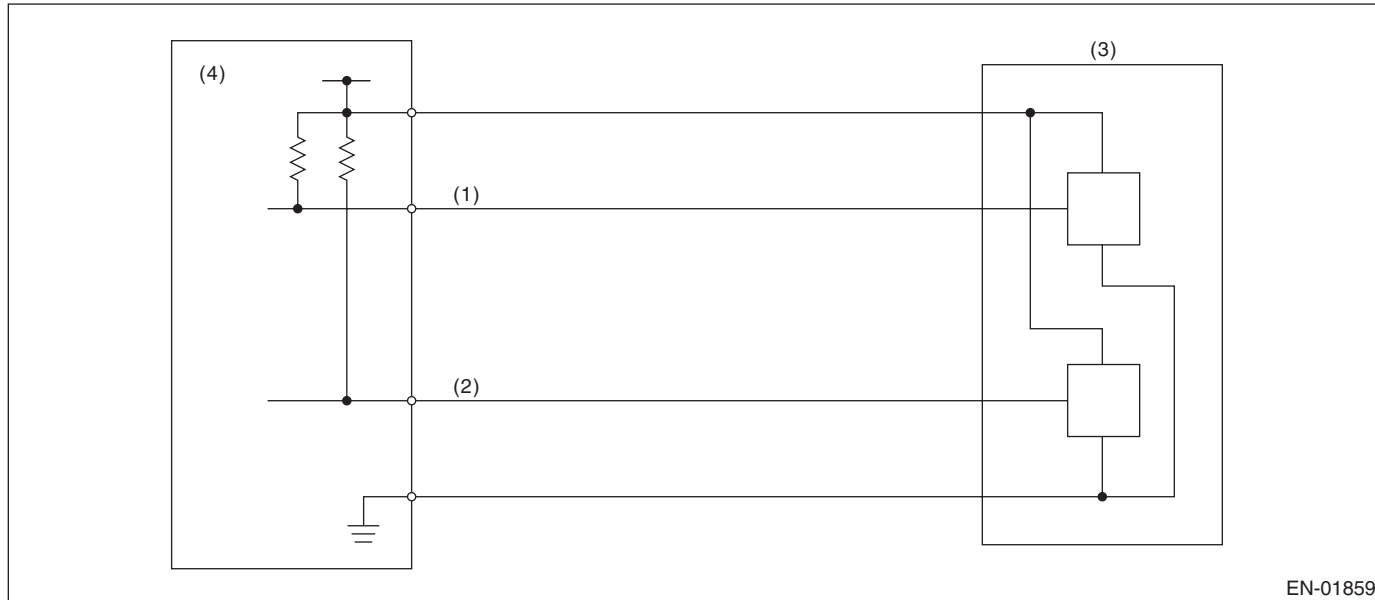
GENERAL DESCRIPTION

AR:DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



EN-01859

- (1) Throttle position sensor 1 signal (3) Throttle position sensor (4) Engine control module (ECM)
(2) Throttle position sensor 2 signal

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	≥ 0.749 V

Time Needed for Diagnosis: 24 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

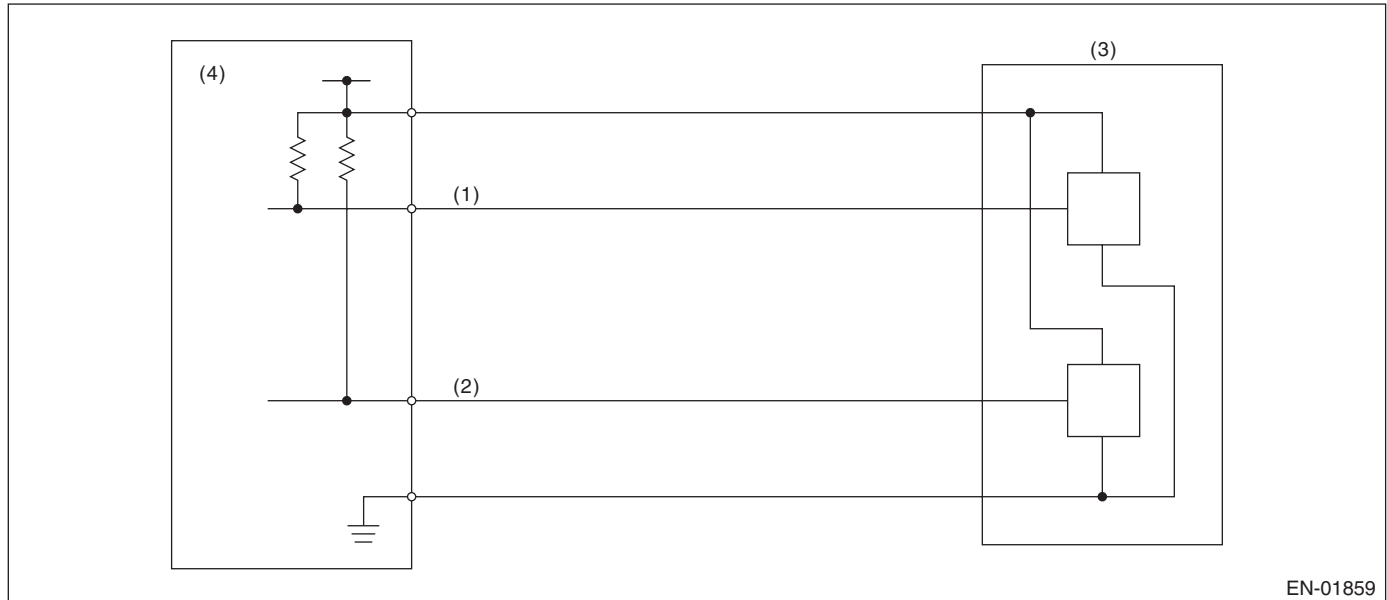
GENERAL DESCRIPTION

AS:DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



- (1) Throttle position sensor 1 signal (3) Throttle position sensor (4) Engine control module (ECM)
(2) Throttle position sensor 2 signal

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	≤ 4.747 V

Time Needed for Diagnosis: 24 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AT:DTC P0301 CYLINDER 1 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

Detect the presence of misfire occurrence. (Revolution fluctuation method)

Monitoring misfire which influences exhaust deterioration (1.5 times of FTP) and catalyst damage is made obligatory by the law. Misfire affecting these two has two patterns below.

- Intermittent misfire (The same cylinder misfires in random, or different cylinders misfire in random.): FTP 1.5 times misfire
- Every time misfire (The same cylinder misfires every time.): FTP 1.5 times misfire, Catalyst damage misfire

The following detecting methods are adopted for these detection.

1) Intermittent misfire: FTP 1.5 times misfire

- 180° Interval Difference Method (MT: 1,800 rpm or less; AT: None)
- 360° Interval Difference Method (whole range)
- 720° Interval Difference Method (3,000 rpm or more)

2) Every time misfire: FTP 1.5 times misfire, Catalyst damage misfire

- 360° Interval Difference Method

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters enable conditions	1 second or more
Intake manifold pressure change during 0.5 engine revs.	< 13.3 kPa (100 mmHg, 3.94 inHg)
Throttle position change during 16 milliseconds	< 21°
Fuel shut-off function	Not in operation
Atmospheric pressure	≥ 75.0 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9.0 ℓ (2.38 US gal, 1.98 Imp gal)
AT torque control	Not in operation
Evaporative system leak check	Not in operation
Engine speed	460 — 6,400 rpm
Intake manifold pressure	> Value from Map 3
Battery voltage	≥ 8 V
Fuel parameter determination	Not extremely low volatility

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Map 3

MT (Vehicle Speed < 64 km/h (40 MPH))

rpm	650	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6400
kPa (mmHg, inHg)	25.6 (192, 7.56)	23.1 (173, 6.82)	20.0 (150, 5.91)	20.0 (150, 5.91)	20.0 (150, 5.91)	21.6 (162, 6.38)	26.4 (198, 7.80)	28.0 (210, 8.27)	29.5 (221, 8.71)	32.4 (243, 9.57)	36.4 (273, 10.75)	39.9 (299, 11.78)	44.5 (324, 13.14)

MT (Vehicle Speed ≥ 64 km/h (40 MPH))

rpm	650	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6400
kPa (mmHg, inHg)	31.6 (237, 9.33)	31.6 (237, 9.33)	31.6 (237, 9.33)	31.1 (233, 9.19)	31.3 (235, 9.24)	33.1 (248, 9.78)	33.9 (254, 10.01)	28.8 (216, 8.51)	30.1 (226, 8.89)	33.3 (250, 9.84)	36.9 (277, 10.90)	40.1 (301, 11.84)	44.5 (324, 13.14)

AT

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6400
kPa (mmHg, inHg)	25.6 (192, 7.56)	24.4 (183, 7.21)	22.0 (165, 6.50)	22.4 (168, 6.62)	22.8 (171, 6.73)	23.9 (179, 7.06)	29.9 (224, 8.83)	31.3 (235, 9.24)	29.9 (244, 8.83)	35.6 (267, 10.51)	39.3 (295, 11.61)	43.3 (325, 12.79)	44.5 (334, 13.14)

3. GENERAL DRIVING CYCLE

- Detect misfires from idling to high rpm.
- Perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

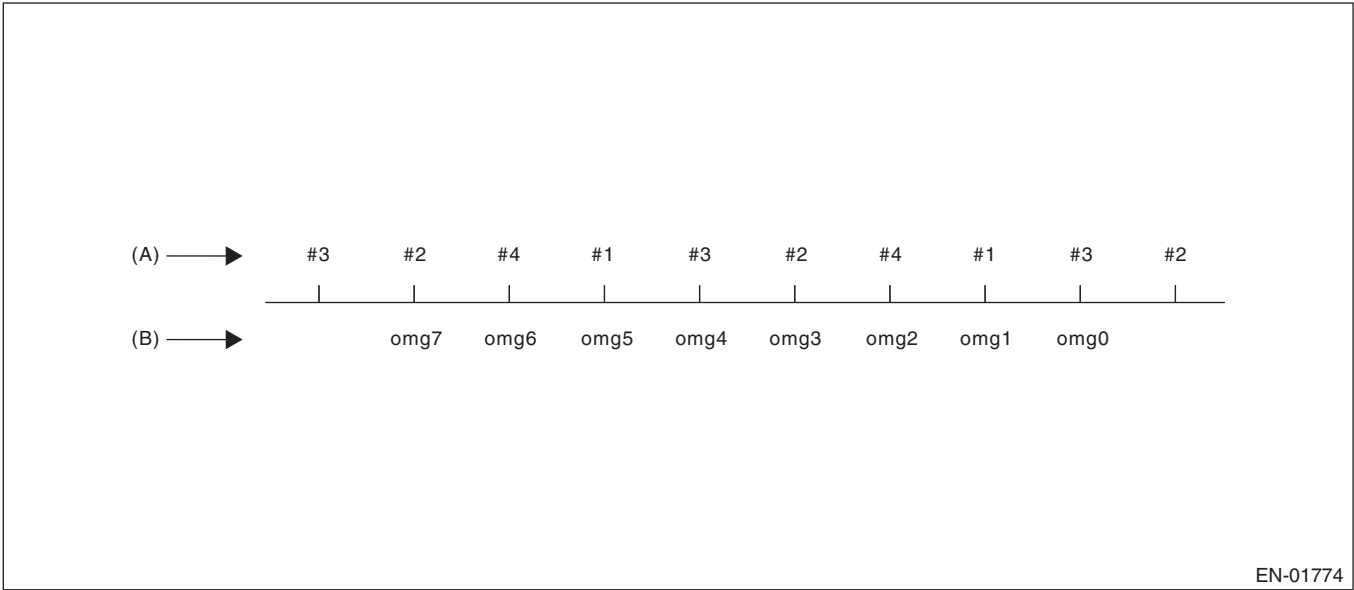
When a misfire occurs, the engine speed will decreased and the crankshaft position speed will change. Calculate the interval difference value (diagnostic value) from crankshaft position speed by the following formula, and judge whether a misfire is occurring or not comparing the calculated result with judgment value. Counting the number of misfires, if the misfire ratio is higher during 1000 rev. or 200 rev., Judge corresponding cylinders as NG.

Diagnostic value calculation (Calculate from angle speed)	→	Misfire detection every single ignition (Compare diagnostic value with judgment value)	→	NG judgment (Misfire occurrence judgment required by the law) (Compare number of misfire with judgment)
		<ul style="list-style-type: none"> • 180° Interval Difference Method • 360° Interval Difference Method • 720° Interval Difference Method 		<ul style="list-style-type: none"> • FTP 1.5 times misfire NG judgment • Catalyst damage misfire NG judgment

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

As shown in the following figure, pick a cylinder as the standard and name it omg 0. And the former crankshaft position speed is named omg 1, the second former crankshaft position speed is named omg 2, the third is named omg 3, etc.



EN-01774

(A) Ignition order

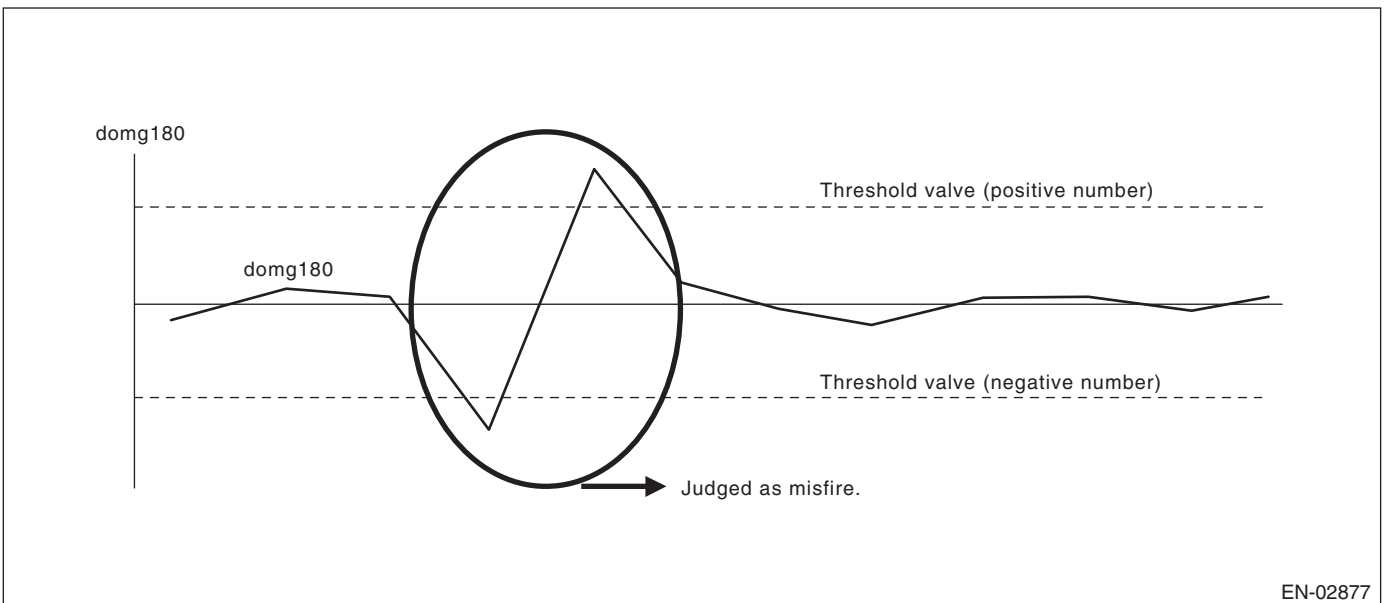
(B) Crankshaft position speed

180° Interval Difference Method

Diagnostic value $domg\ 180 = (omg\ 1 - omg\ 0) - (omg\ 5 - omg\ 1)/4$

Judge as a misfire in the following cases.

- $domg\ 180 >$ judgment value of positive side
 - $domg\ 180 \leq$ judgment value of negative side
- (Judgment value before 180°CA)



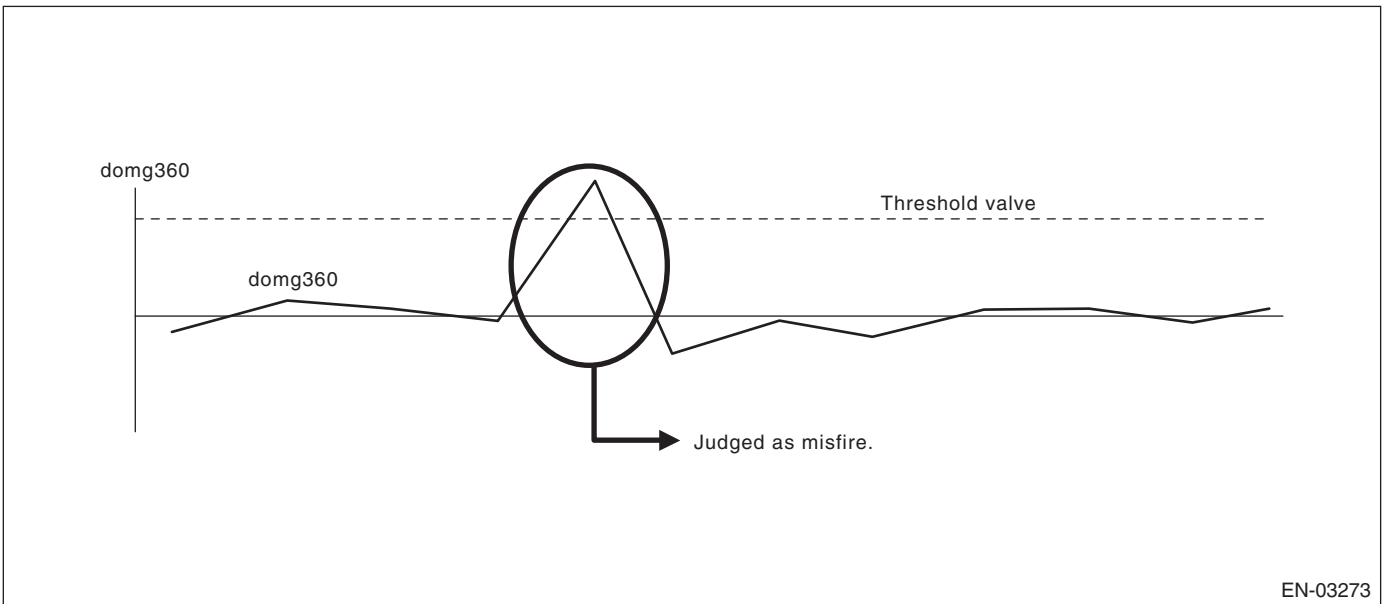
EN-02877

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

360° Interval Difference Method

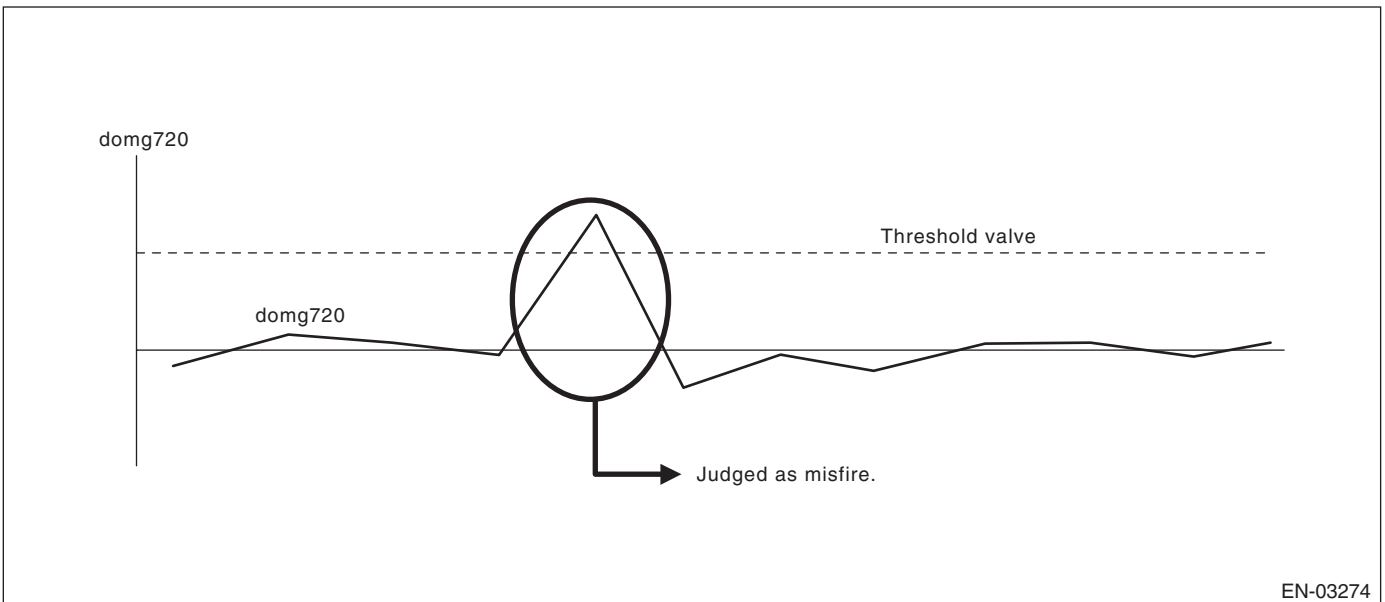
Diagnostic value	$\text{domg } 360 = (\text{omg } 1 - \text{omg } 0) - (\text{omg } 3 - \text{omg } 2)$
Misfire judgment	$\text{domg } 360 > \text{Judgment value} \rightarrow \text{Judge as misfire}$



EN-03273

720° Interval Difference Method

Diagnostic value	$\text{domg } 720 = (\text{omg } 1 - \text{omg } 0) - (\text{omg } 5 - \text{omg } 4)$
Misfire judgment	$\text{domg } 720 > \text{Judgment value} \rightarrow \text{Judge as misfire}$



EN-03274

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

FTP 1.5 times misfire (Misfire occurrence level which influences exhaust gas)

Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 1000 engine revs.)

Malfunction Criteria	Threshold Value
FTP emission diagnostic value	> 1.0 % in 1000 revs

Time Needed for Diagnosis: 1000 engine revs.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Catalyst damage misfire (Misfire occurrence level damaging catalyst)

Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 200 engine revs. (400 ignitions))

Malfunction Criteria	Threshold Value
Catalyst damage misfire diagnostic value	See Map 1

Map 1 Threshold value of malfunction criteria for misfire damaging catalyst

percentage		Intake air (g (oz)/rev)									
		0.16 (0.0006)	0.28 (0.010)	0.4 (0.014)	0.52 (0.018)	0.64 (0.023)	0.76 (0.027)	0.92 (0.032)	1.1 (0.039)	1.2 (0.042)	1.3 (0.046)
Engine speed (rpm)	700	25	25	25	25	22.5	20	16	12	12	12
	1000	25	25	25	25	22.5	20	15.75	11	11	11
	1500	25	25	22.5	20	18.25	16.75	13.5	10	10	10
	2000	20	20	20	20	17	14.25	12.75	11	11	11
	2500	20	20	18.25	16.75	15.5	14.25	12.75	11	11	11
	3000	16.75	16.75	15.5	14.25	12.75	11	11	11	11	11
	3500	16.75	16.75	14	11	10	9	8.5	7.75	7.75	7.75
	4000	14.25	14.25	11	7.75	6	5	5	5	5	5
	4500	11	11	8.25	7.75	5	5	5	5	5	5
	5000	11	11	9.5	7.75	5	5	5	5	5	5
	5500	9	9	7.75	6.75	5	5	5	5	5	5
	6000	9	5	5	5	5	5	5	5	5	5
6400	9	5	5	5	5	5	5	5	5	5	

These figures indicate the misfire rate (%) in 400 ignitions; for example, 22.5 (%) means 400 (ignition) × 22.5 (%) = 90 (ignition) misfires. This value or more is judged as a misfire.

Time Needed for Diagnosis: 200 engine revs.

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AU:DTC P0302 CYLINDER 2 MISFIRE DETECTED

NOTE:

For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4SO)-94, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AV:DTC P0303 CYLINDER 3 MISFIRE DETECTED

NOTE:

For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4SO)-94, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AW:DTC P0304 CYLINDER 4 MISFIRE DETECTED

NOTE:

For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4SO)-94, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

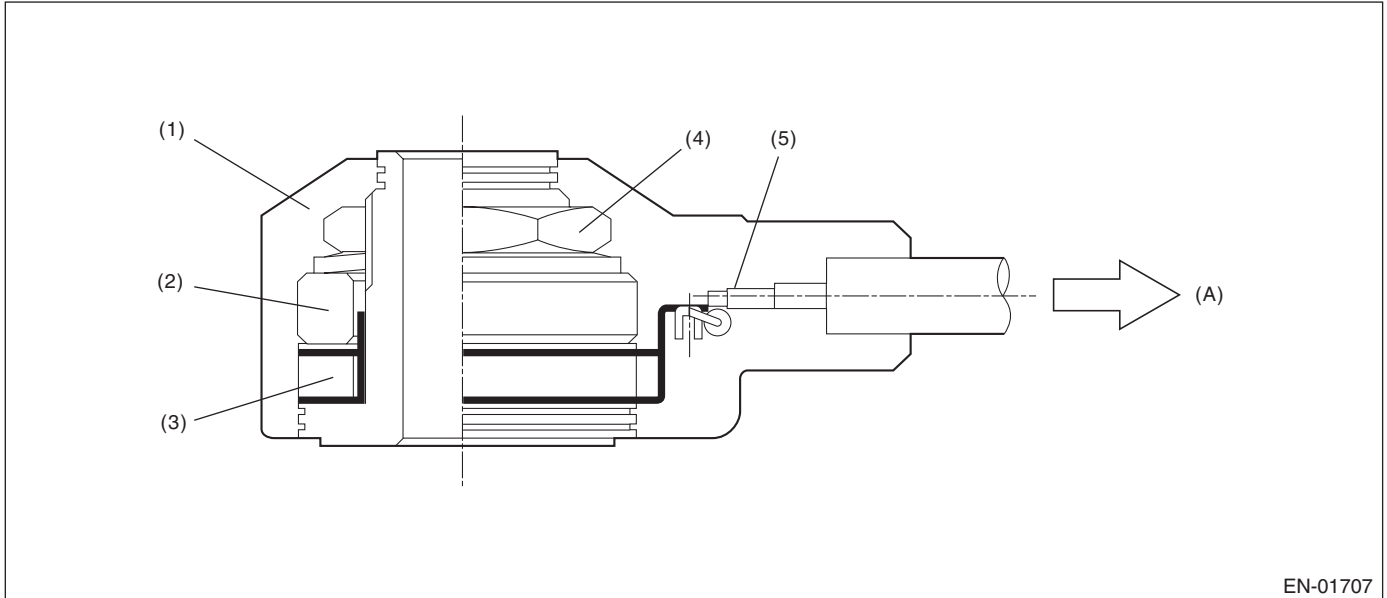
GENERAL DESCRIPTION

AX:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of knock sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



- (1) Case
- (2) Weight
- (3) Piezoelectric element

- (4) Nut
- (5) Resistance

- (A) To knock sensor harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 1 second or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.238 V
Ignition switch	ON

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.25 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

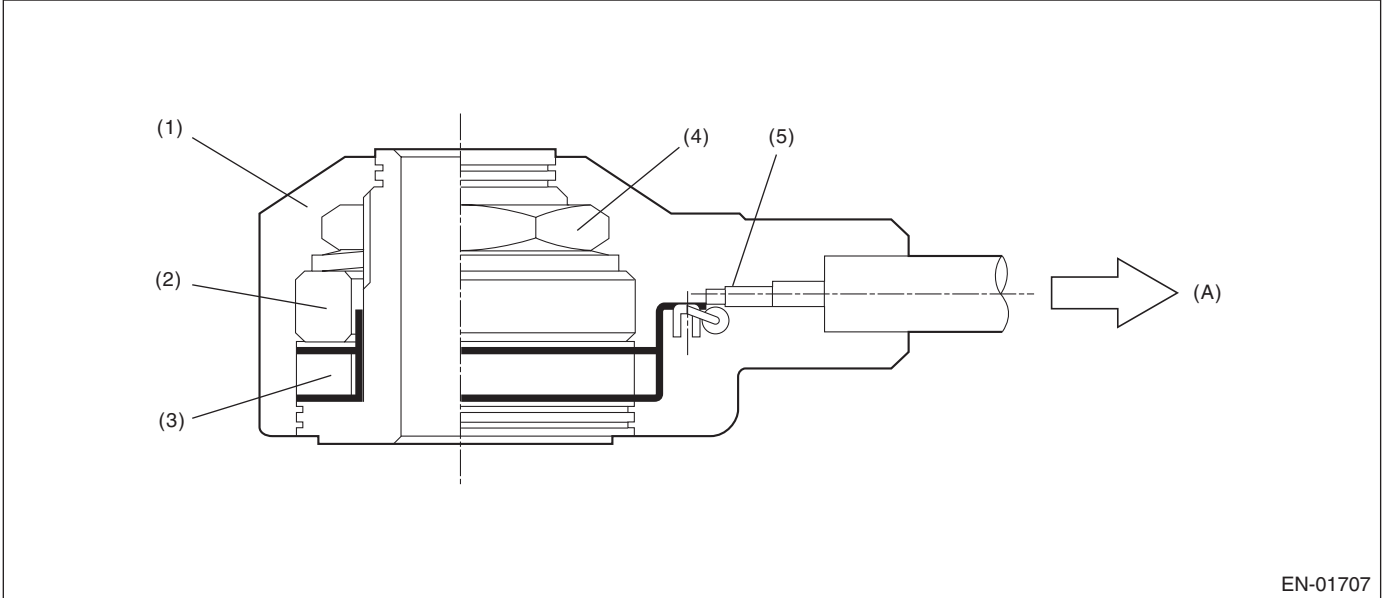
GENERAL DESCRIPTION

AY:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of knock sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



- (1) Case
- (2) Weight
- (3) Piezoelectric element

- (4) Nut
- (5) Resistance

- (A) To knock sensor harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 1 second or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.714 V
Ignition switch	ON

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.7 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

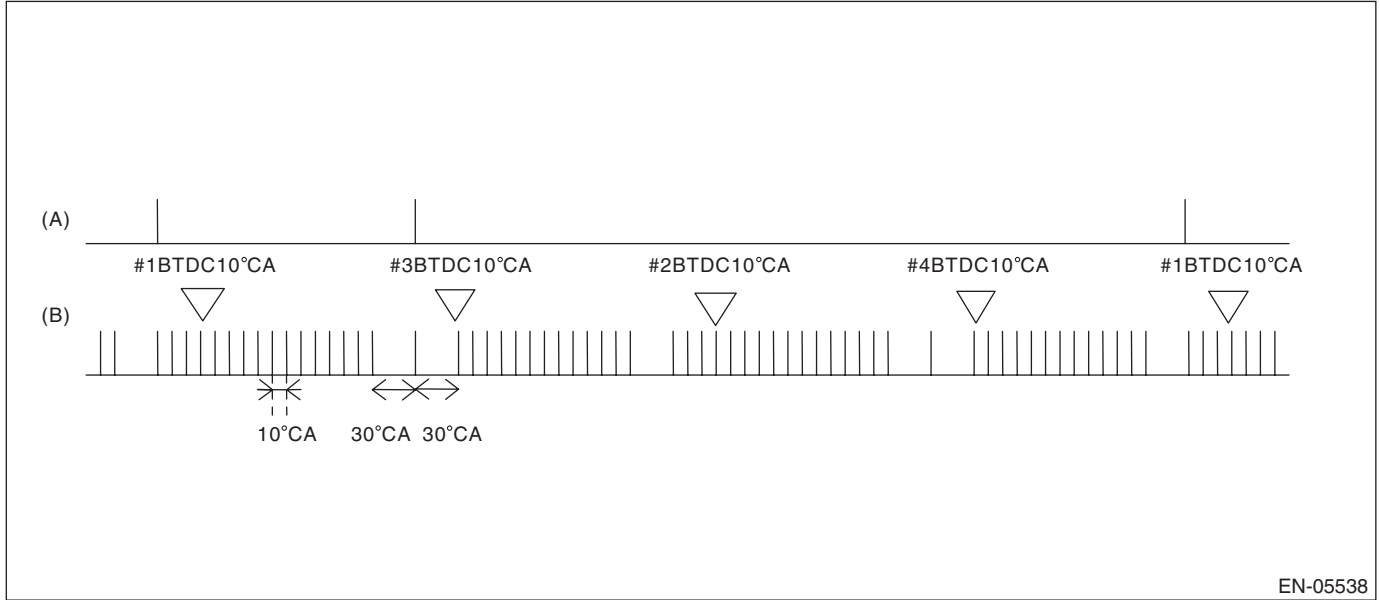
AZ:DTC P0335 CRANKSHAFT POSITION SENSOR “A” CIRCUIT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the crankshaft position sensor.

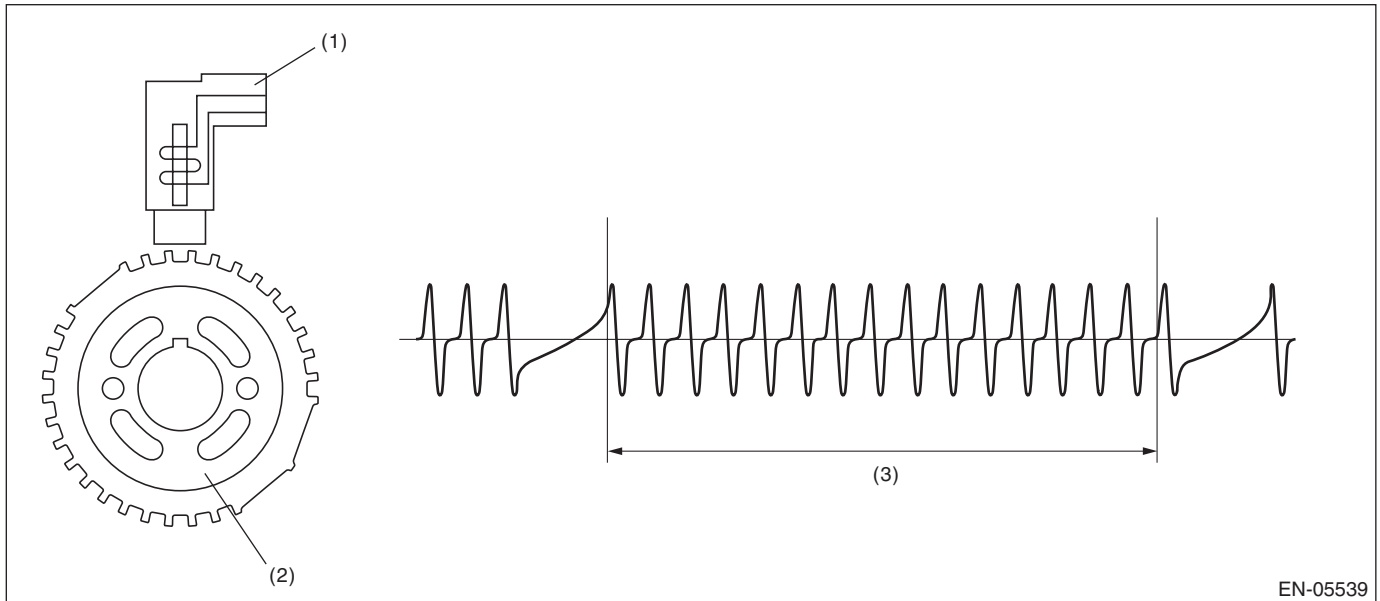
Judge as NG when the crank signal is not input even though the starter was turned on.

2. COMPONENT DESCRIPTION



(A) Camshaft signal

(B) Crankshaft signal



(1) Crankshaft position sensor

(2) Crank sprocket

(3) Crankshaft half-turn

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Starter switch	ON
Crankshaft position sensor signal	Not detected
Battery voltage	$\geq 8 \text{ V}$

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Crankshaft position sensor signal	Input exists
Battery voltage	$\geq 8 \text{ V}$

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

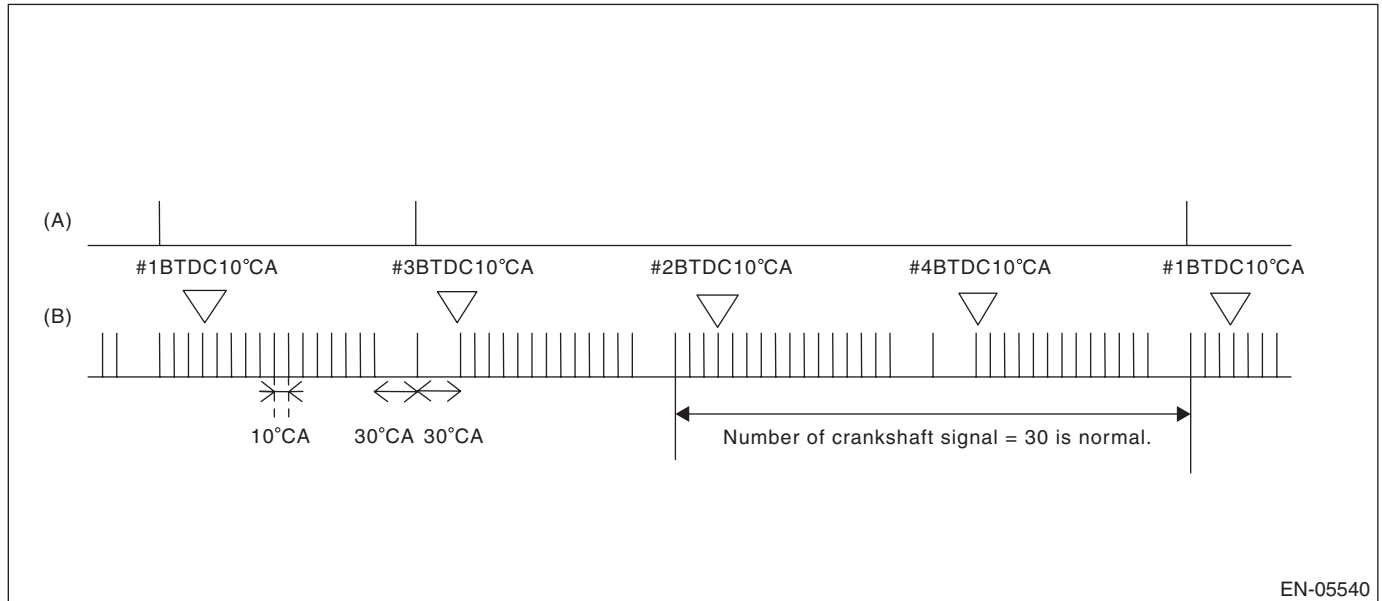
BA:DTC P0336 CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/ PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect for faults in crankshaft position sensor output properties.

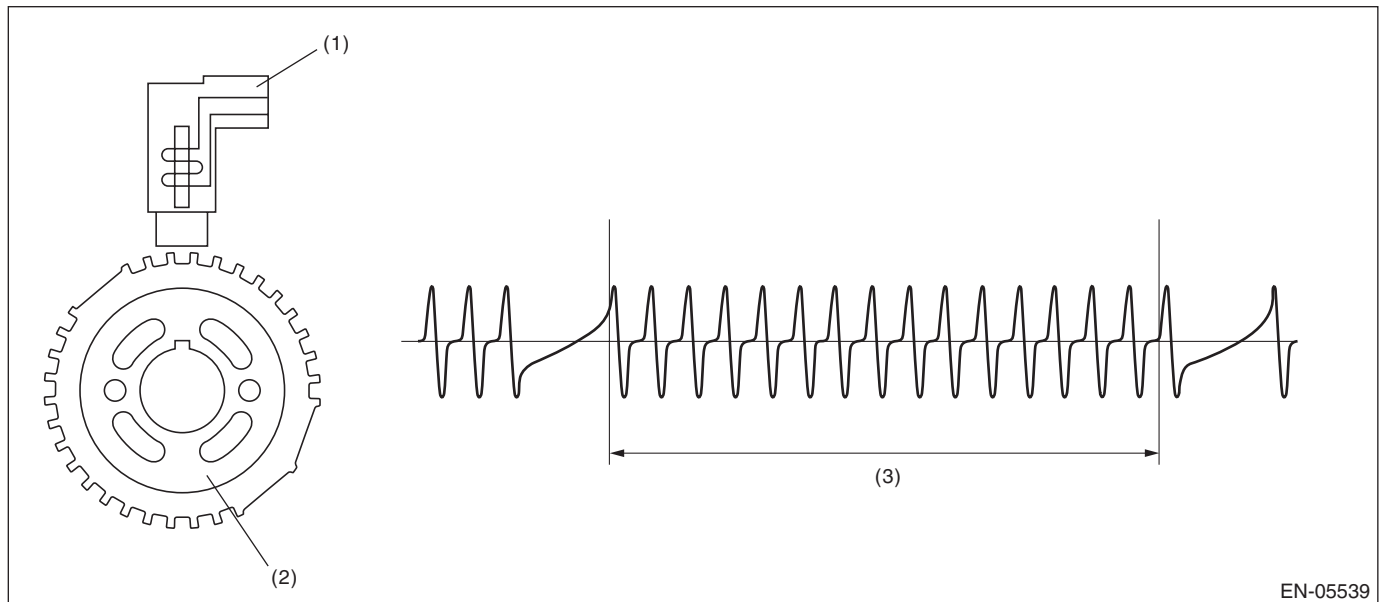
Judge as NG when there is a problem in the number of crankshaft signals for every revolution.

2. COMPONENT DESCRIPTION



(A) Camshaft signal

(B) Crankshaft signal



(1) Crankshaft position sensor

(2) Crank sprocket

(3) Crankshaft half-turn

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 8 \text{ V}$
Engine speed	$< 4000 \text{ rpm}$

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously under 4000 rpm engine speed.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when all the malfunction criteria below are completed more than 10 times in a row.

Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number identification	Completed
Number of crankshaft position sensor signal during 1 rev.	Not = 30

Time Needed for Diagnosis: 10 engine revs.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when all the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number distinction	Completed
Number of crankshaft position sensor signal during 1 rev.	= 30

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

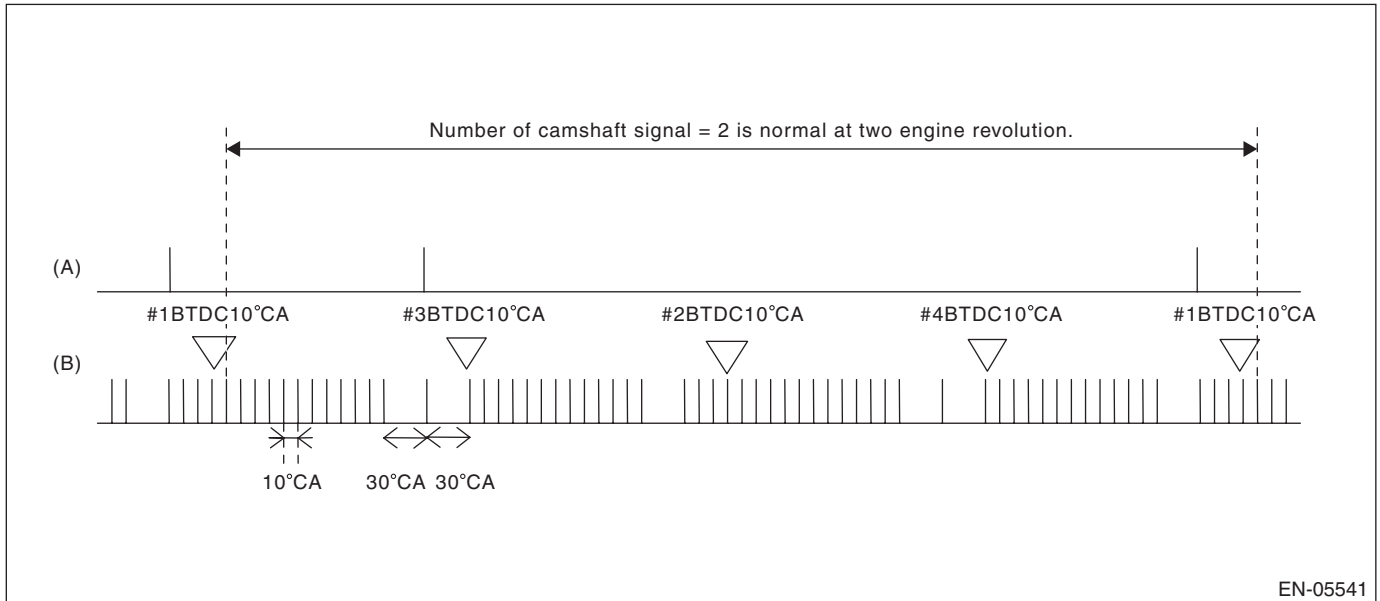
GENERAL DESCRIPTION

BB:DTC P0340 CAMSHAFT POSITION SENSOR “A” CIRCUIT (BANK 1 OR SINGLE SENSOR)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the camshaft position sensor.
Judge as NG when the number of camshaft signals remains abnormal.

2. COMPONENT DESCRIPTION



(A) Camshaft signal

(B) Crankshaft signal

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the following malfunction criteria continues for 8 engine revolutions or more.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage	$\geq 8 \text{ V}$
Number of camshaft sensor signals during 2 rev.	Not = 2

Time Needed for Diagnosis: 8 rev.

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the following criteria are established.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage	$\geq 8 \text{ V}$
Number of camshaft sensor signal during 2 rev.	2

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

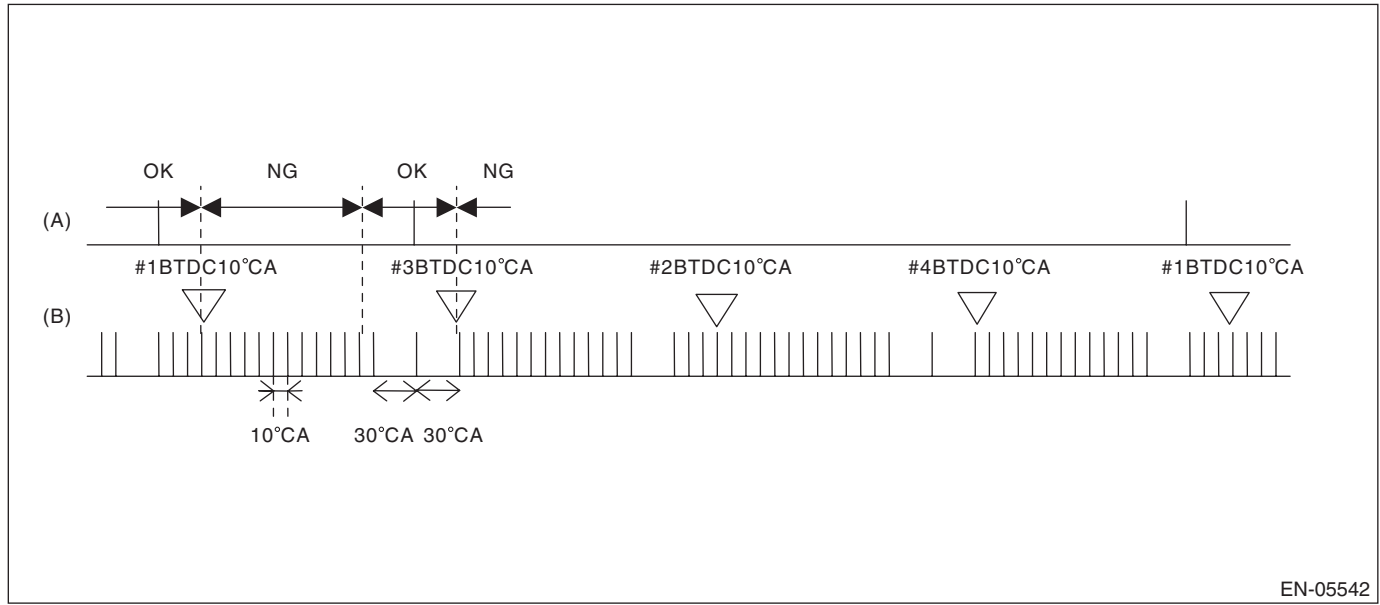
BC:DTC P0341 CAMSHAFT POSITION SENSOR "A" CIRCUIT RANGE/ PERFORMANCE (BANK 1 OR SINGLE SENSOR)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of camshaft position sensor output property.

Judge NG when the camshaft position signal input timing is shifted from the crankshaft position sensor signal because of timing belt tooth chip etc.

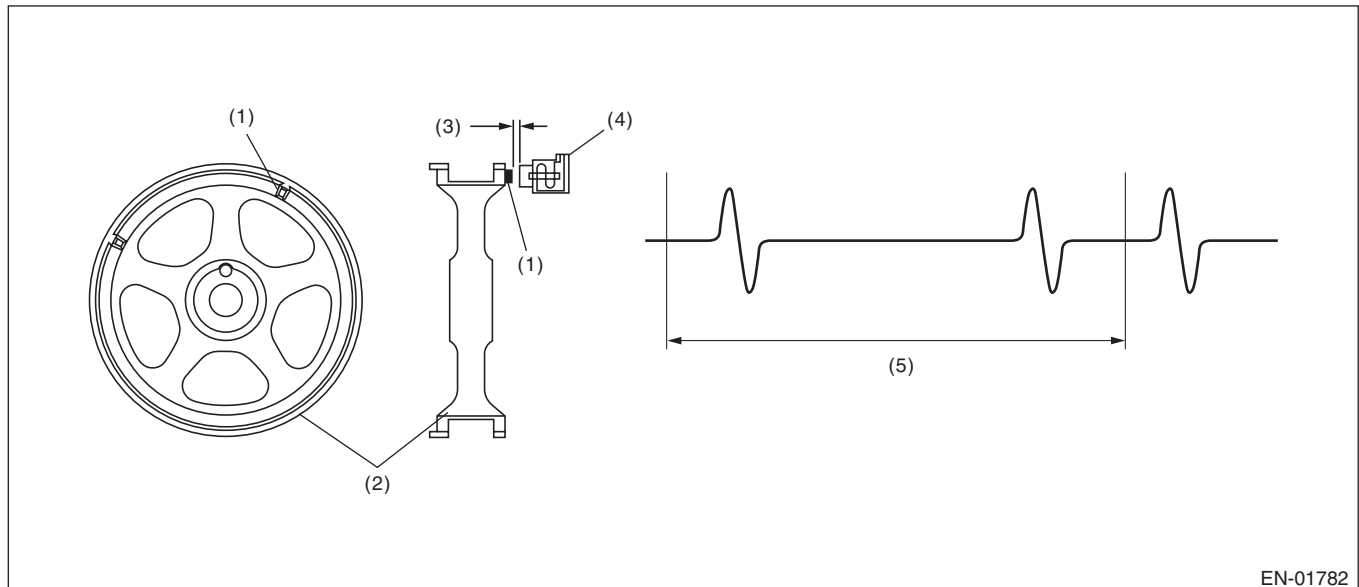
2. COMPONENT DESCRIPTION



EN-05542

(A) Camshaft signal

(B) Crankshaft signal



EN-01782

- (1) Boss
- (2) Cam sprocket

- (3) Air gap
- (4) Camshaft position sensor

- (5) Camshaft one revolution (Engine two revolutions)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Cylinder number identification	Completed
Battery voltage	≥ 8 V
Engine speed	550 — 1,000 rpm
Engine operation	Idling
Misfire	Not detected

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously at idle speed.

5. DIAGNOSTIC METHOD

Judge NG when the engine speed continues 4 revolutions for the malfunction criteria below. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Position of camshaft position sensor signal	Not between BTDC 10°CA and BTDC 80°CA

Time Needed for Diagnosis: 4 revs.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

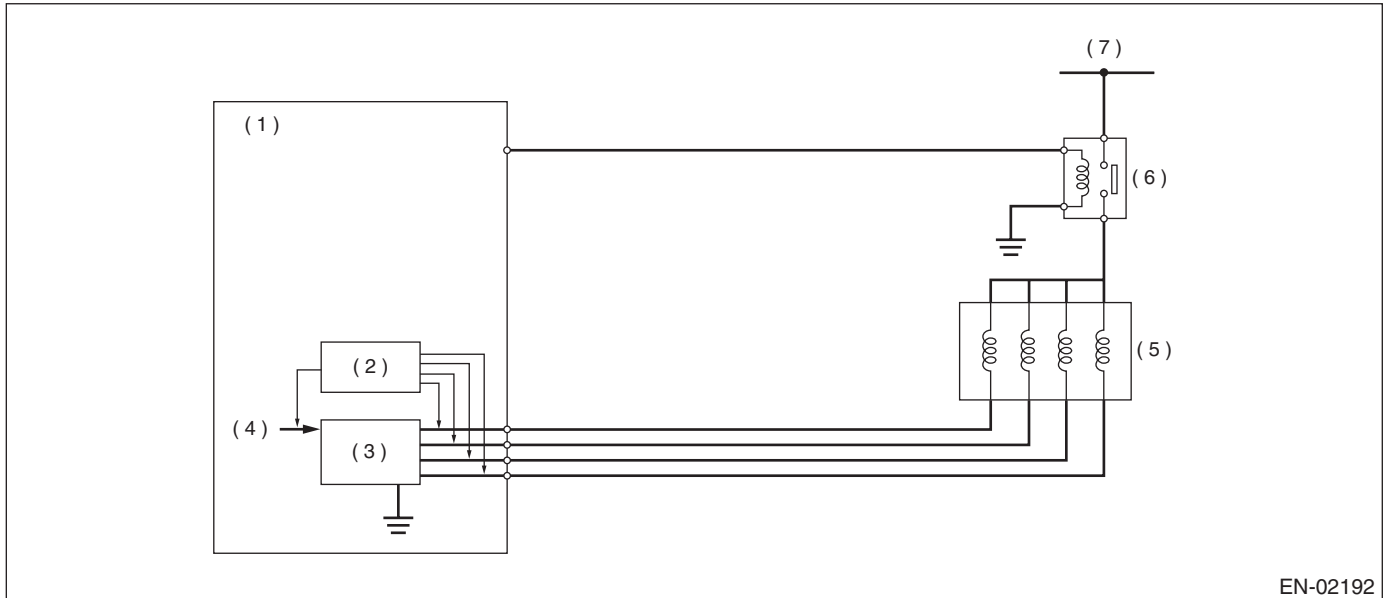
BD:DTC P0400 EXHAUST GAS RECIRCULATION FLOW

1. OUTLINE OF DIAGNOSIS

Detect EGR system malfunction.

Intake manifold pressure (negative pressure) is constant because the throttle valve is fully closed during deceleration fuel cut. At this time, when the EGR valve is opened/closed, the intake manifold pressure will change. EGR system OK/NG is judged by the range of this change.

2. COMPONENT DESCRIPTION



EN-02192

- | | | |
|-----------------------|---------------|--------------------------|
| (1) ECM | (4) CPU | (6) Main relay |
| (2) Detecting circuit | (5) EGR valve | (7) Battery power supply |
| (3) Switching circuit | | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	40 seconds or more
Engine coolant temperature	$\geq 75^{\circ}\text{C}$ (167°F)
Engine speed	1200 — 2,950 rpm
Intake manifold pressure (absolute pressure)	< 40.0 kPa (300 mmHg, 11.81 inHg)
Ambient air temperature	$\geq 5^{\circ}\text{C}$ (41°F)
Throttle position	$< 0.25^{\circ}$
Battery voltage	> 10.9 V
Atmospheric pressure	≥ 75.0 kPa (563 mmHg, 22.17 inHg)
Vehicle speed	≥ 53 km/h (33 MPH)
Fuel shut-off function	In operation
Neutral switch	Over 1 second after changing from OFF and ON to OFF.
Load (A/C, power steering, lighting, rear defogger, heater fan and radiator fan)	No change for over 5 seconds.

4. GENERAL DRIVING CYCLE

During deceleration fuel cut from more than 53 km/h (approx. 33 MPH), perform diagnosis once. Be careful of vehicle speed and engine speed. (Diagnosis will not be completed if the vehicle speed and engine speed conditions become out of specification due to deceleration.)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Measure the pressure values as follows when the enable conditions are established, and perform diagnosis by calculating those results.

1. Label the intake manifold pressure value as PMOF1, which is observed when enable conditions are established, and set the EGR target step to 50 steps (nearly full open).
2. Label the intake manifold pressure value as PMON, which is observed after one second has passed since EGR target step was set to 50 steps (when the enable conditions were established), and set the EGR target step to 0.
3. Label the intake manifold pressure value as PMOF2, which is observed after one second has passed since EGR target step was set to 0 (after two seconds have passed since the enable conditions were established).

Abnormality Judgment

Judge as NG when the following conditions are established, and judge as OK when not.

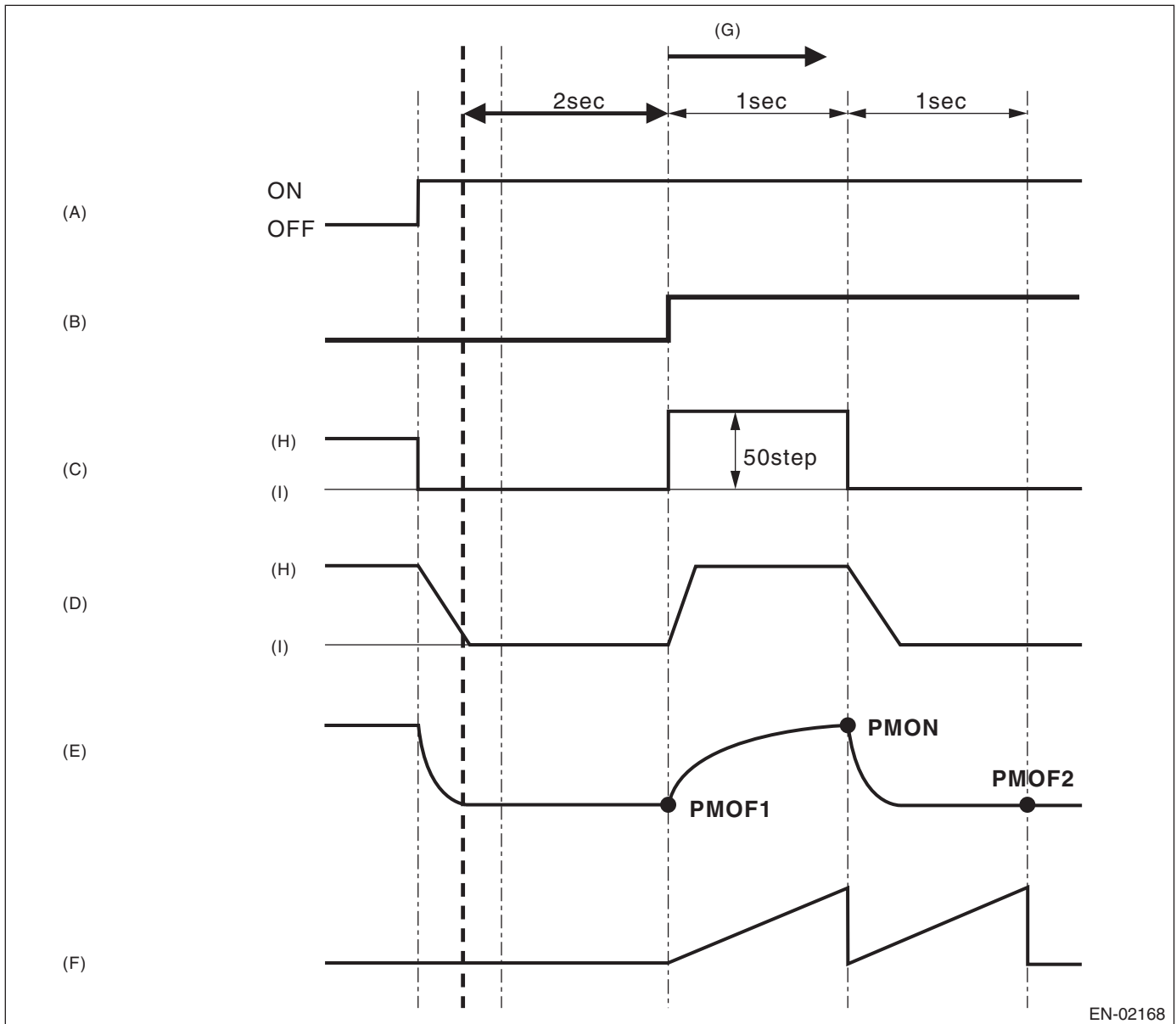
$PMON - (PMOF1 + PMOF2) / 2 < 2.48 \text{ kPa (18.63 mmHg, 0.733 inHg)}$

Time Needed for Diagnosis: 1 time

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.



EN-02168

- | | | |
|---------------------------------|--|---------------------|
| (A) Deceleration fuel cut | (E) Intake manifold pressure (During normal condition) | (G) Start diagnosis |
| (B) Diagnosis enable conditions | (F) Diagnostic mode timer | (H) Open |
| (C) EGR target step | | (I) Closed |
| (D) EGR actual step | | |

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

A/F main learning = Not allowed.

Knock learning = Not allowed.

EGR control: Not allowed to operate.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BE:DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

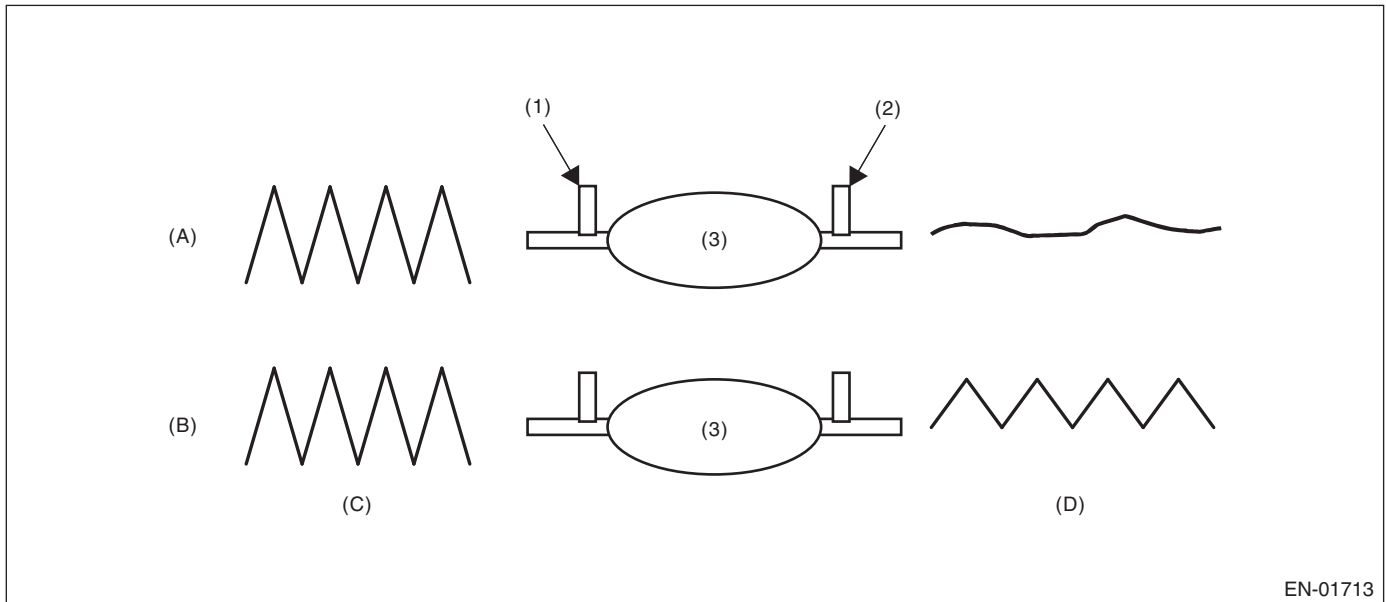
1. OUTLINE OF DIAGNOSIS

Detect the deterioration of the catalytic function.

Though the front oxygen sensor output would change slowly with a new catalyst, the sensor output with a deteriorated catalyst becomes high and the inversion time is shortened.

For this reason, the catalyst diagnosis is carried out by monitoring the front oxygen sensor output and comparing it with the front oxygen (A/F) sensor output.

2. COMPONENT DESCRIPTION



EN-01713

- (1) Front oxygen (A/F) sensor
- (2) Front oxygen sensor
- (3) Catalytic converter

- (A) Normal
- (B) Deterioration

- (C) Output waveform from the front oxygen (A/F) sensor
- (D) Output waveform from the front oxygen sensor

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Engine coolant temperature	≥ 70°C (158°F)
Catalyst warm-up counter (Map 2) (U5 model)	≥ 9000
Misfire detection during 200 revs.	< 5 times
Learning value of evaporation gas density	≤ 0.20
Sub feedback	In operation
Evaporative system diagnosis	Not in operation
Time of difference (< 0.10) between actual and target lambda	1000 milliseconds or more
Vehicle speed	> 70 km/h (43.5 MPH)
Amount of intake air	10 — 40 g (0.35 — 1.41 oz)/s
Engine load change every 0.5 engine revs.	< 0.02 g (0.001 oz)/rev
Rear oxygen output change from lower than 660 mV to higher than 660 mV	Experienced after fuel cut
After engine starting	≥ 205 sec.
Purge execution calculated time	5 seconds or more
Time from recovering from the fuel cut (U5 model)	≥ Value from Map 23
Estimated temperature inside catalyst layer (other than U5 model)	≥ 650°C (1202°F)

Map 2

Add the following value every 512 milliseconds.

Intake amount of air (g(oz)/s)	0 (0)	3.2 (0.113)	6.4 (0.226)	9.6 (0.339)	12.8 (0.451)	16 (0.564)	19.2 (0.677)	22.4 (0.790)	25.6 (0.903)	28.8 (1.016)	32 (1.129)	35.2 (1.242)
Total value for warm-up counter	-5	-5	15	31	46	62	77	92	108	123	127	127

Map 23

Time from recovering from the fuel cut (ms)	5000	30000	60000	180000
Value (ms)	0	60000	180000	300000

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once at a constant speed of 70 km/h (43 MPH).

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

After establishing the execution conditions, calculate the front oxygen (A/F) sensor lambda deviation cumulative value per 128 milliseconds ($\sum |(\text{sglmd}_n - \text{sglmd}_{n-1})|$) and rear oxygen sensor output voltage deviation cumulative value ($\sum |(\text{ro2sad}_n - \text{ro2sad}_{n-1})|$), and when the front oxygen (A/F) sensor lambda deviation cumulative value ($\sum |(\text{sglmd}_n - \text{sglmd}_{n-1})|$) becomes higher than the predetermined value, calculate the diagnostic value.

Judge as NG when the malfunction criteria below are met. Judge as OK if the criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
$\sum (\text{ro2sad}_n - \text{ro2sad}_{n-1}) / \sum (\text{sglmd}_n - \text{sglmd}_{n-1}) $	> 15.4 (U5 model), > 18.5 (other than U5 model)

Time Needed for Diagnosis: 30 to 55 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

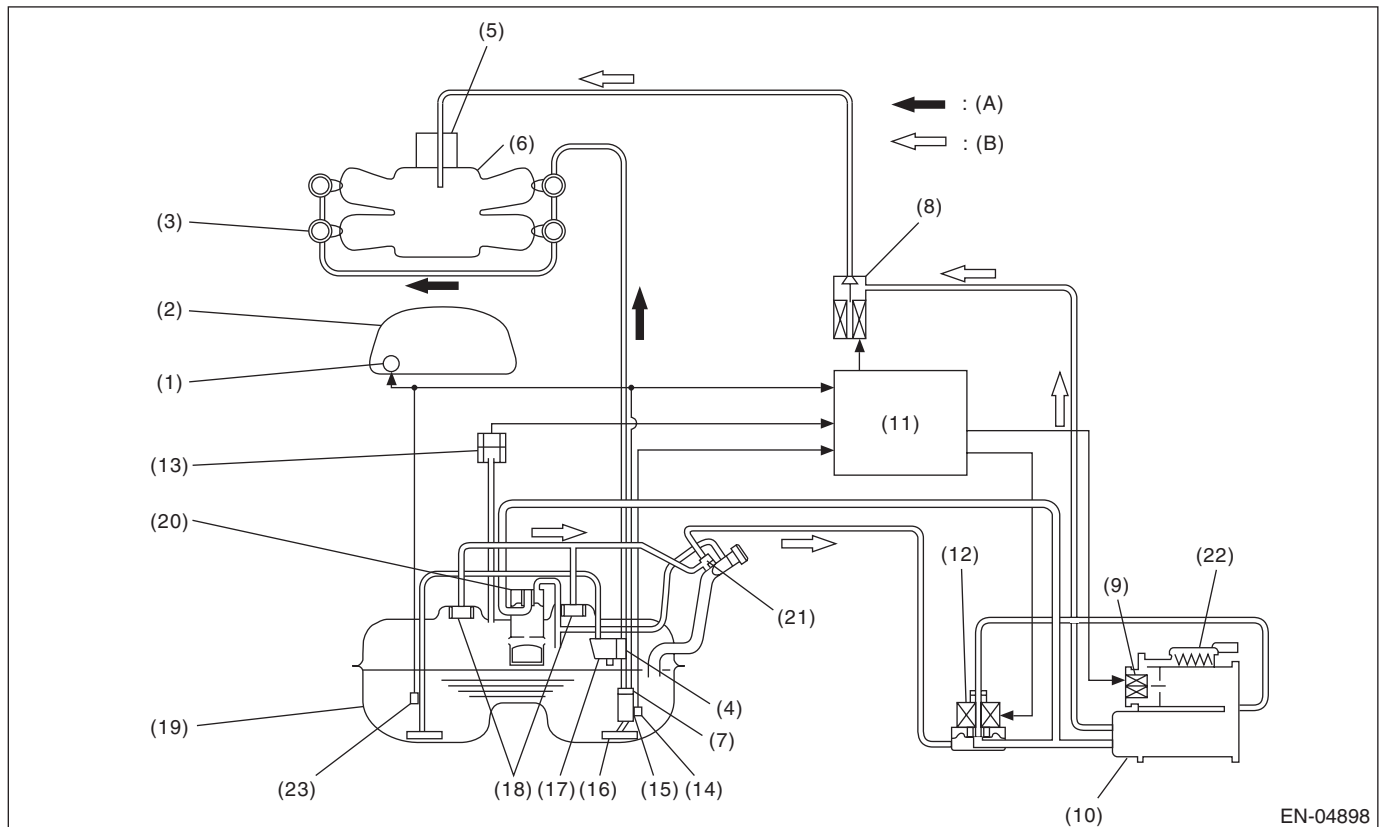
9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

BF:DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)

1. OUTLINE OF DIAGNOSIS

Check if there is a leakage in fuel system or not, and perform the function diagnosis of valve.



EN-04898

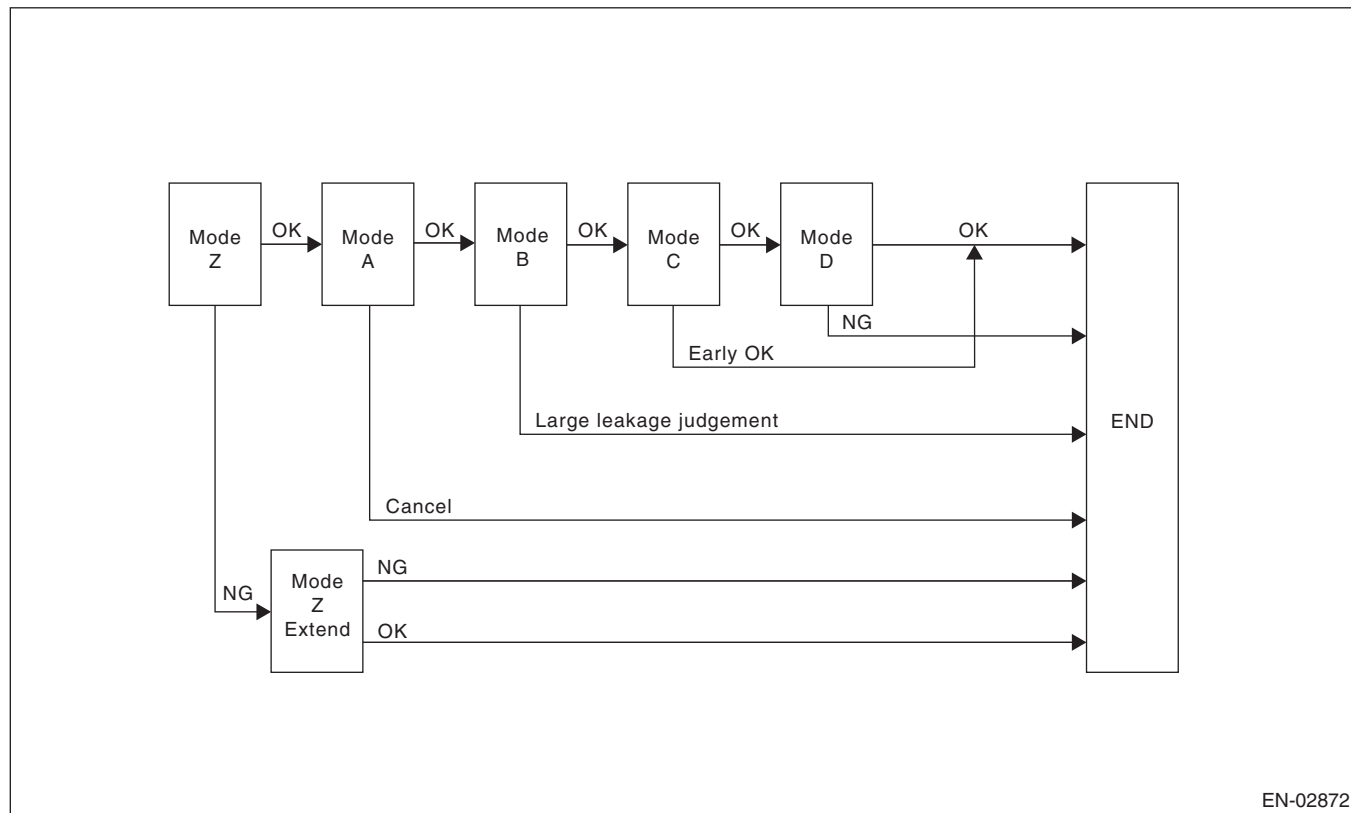
- | | | |
|----------------------------------|----------------------------------|----------------------------|
| (1) Fuel gauge | (10) Canister | (19) Fuel tank |
| (2) Combination meter | (11) Engine control module (ECM) | (20) Vent valve |
| (3) Fuel injector | (12) Pressure control valve | (21) Shut-off valve |
| (4) Pressure regulator | (13) Fuel tank pressure sensor | (22) Drain filter |
| (5) Throttle body | (14) Fuel temperature sensor | (23) Fuel sub level sensor |
| (6) Intake manifold | (15) Fuel level sensor | |
| (7) Fuel filter | (16) Fuel pump | (A) Fuel line |
| (8) Purge control solenoid valve | (17) Jet pump | (B) Vaporized fuel line |
| (9) Drain valve | (18) Fuel cut valve | |

In this system diagnosis, check for leakage and valve function is conducted by changing the fuel tank pressure and monitoring the pressure change using the fuel tank pressure sensor. During 0.04-inch diagnosis, perform in the order of mode Z → mode A → mode B → mode C and mode D; During 0.02-inch diagnosis, perform in the order of mode A → mode B → mode C → mode D and mode E.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

0.04-INCH DIAGNOSIS



EN-02872

Mode	Mode description	Diagnosis period
Mode Z (Purge control solenoid valve opening failure diagnosis)	Perform purge control solenoid valve opening failure diagnosis from the size of tank pressure variation from diagnosis start.	3 — 16 seconds
Mode A (Estimated evaporation amount)	Calculate the tank pressure change amount (P1).	10 seconds
Mode B (Sealed negative pressure, large leakage judgment)	Decrease the pressure in the tank to the target value by introducing the intake manifold pressure to the fuel tank. If the tank pressure cannot be reduced, it is diagnosed as large leak.	5 — 25 seconds
Mode C (Pressure increase check, advanced OK judgment)	Wait until the tank pressure returns to the target (start level of P2 calculation). If the tank pressure does not become the value, make advanced OK judgment.	1 — 15 seconds
Mode D (Negative pressure variation measurement, evaporation leakage diagnosis)	Calculate the tank pressure variation (P2), and obtain the diagnostic value using P1 found in Mode A. Perform the evaporation diagnosis using the diagnostic value.	10 seconds

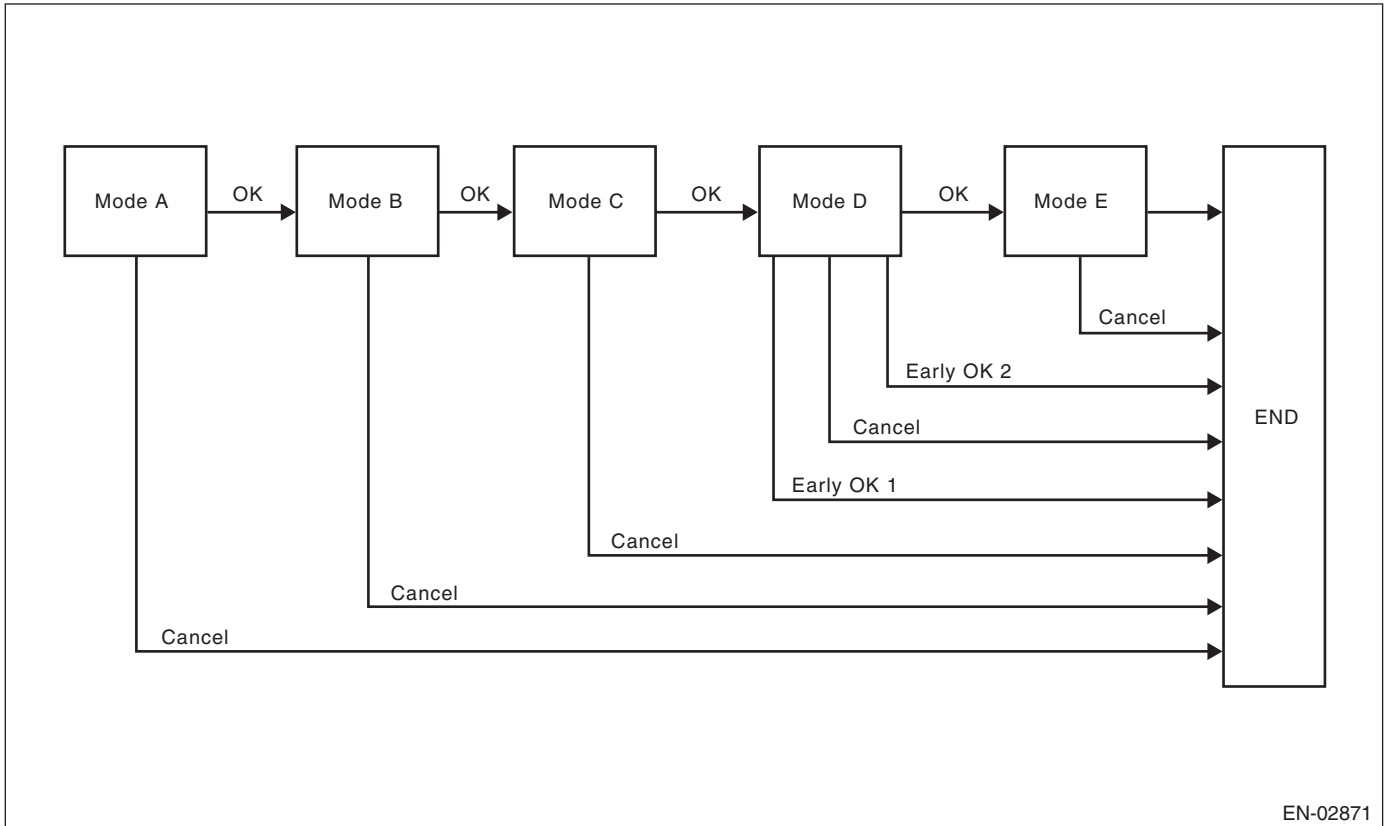
Mode Table for Evaporative Emission Control System Diagnosis

Mode	Tank internal pressure under normal conditions	Diagnostic item	DTC
Mode Z	Roughly the same as atmospheric pressure (Same as 0 kPa (0 mmHg, 0 inHg))	Purge control solenoid valve is judged to be open.	P0457
Mode A	Pressure is in proportion to amount of evaporative emission.		
Mode B	Negative pressure is formed due to intake manifold negative pressure.	Large leak	P0457
Mode C	Reaches target pressure		None
Mode D	Pressure change is small.	EVAP system large leak judgement [1.0 mm (0.04 in)]	P0442

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

0.02-inch Diagnosis



Mode	Mode Description	Diagnosis period
Mode A (0 point compensation)	When the pressure in the tank is high, wait until it returns to 0 point (Near 0 mmHg).	0 — 12 seconds
Mode B (Negative pressure introduced)	Decrease the pressure in the tank to the target value by introducing the intake manifold pressure to the fuel tank.	0 — 27 seconds
Mode C (Negative pressure maintained)	Wait until the tank pressure returns to the target (start level of P2 calculation).	0 — 20 seconds
Mode D (Negative pressure change calculated)	Calculate the time it takes for the tank pressure to return to the P2 calculation complete pressure. If the tank pressure does not return to the P2 calculation complete pressure, make advanced OK judgment.	0 — 200 seconds
Mode E (Evaporation generated amount calculated)	Calculate the amount of evaporation (P1).	0 — 280 seconds

2. COMPONENT DESCRIPTION

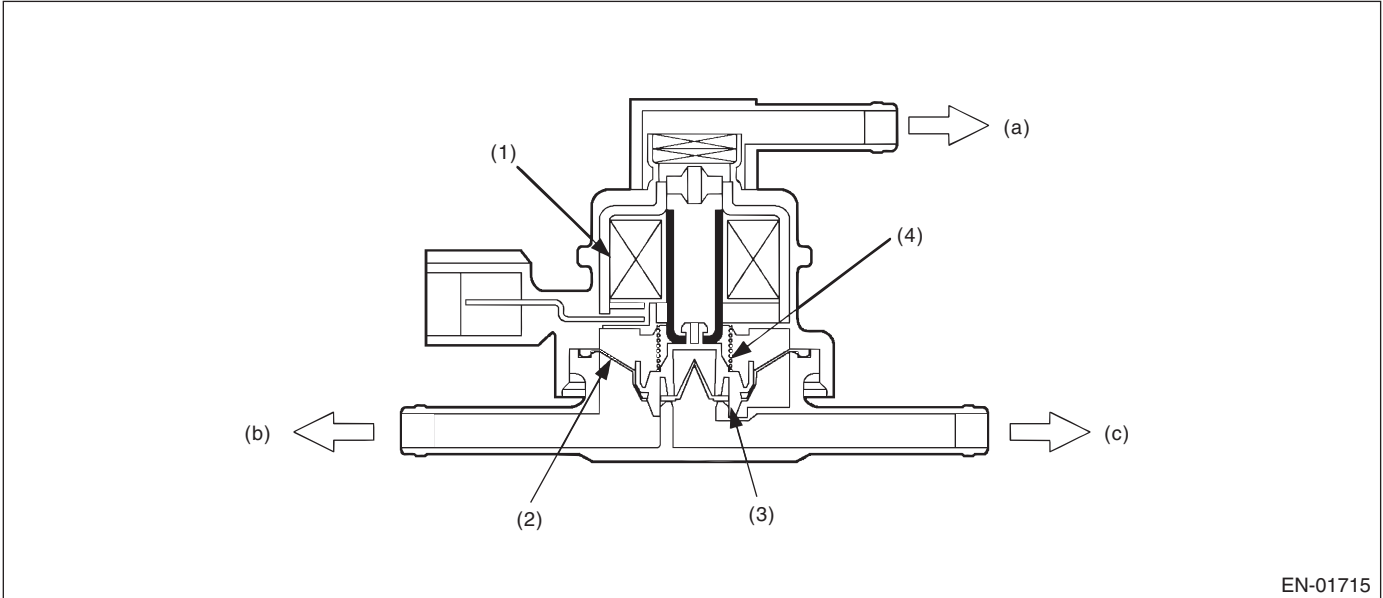
Pressure Control Solenoid Valve

PCV controls the fuel tank pressure to be equal to the atmospheric air pressure. Normally, the solenoid is set to OFF. The valve opens and closes mechanically in accordance with the pressure difference between tank and atmospheric air, or tank and canister.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

The valve is forcibly opened by setting the solenoid to ON at the time of diagnosis.



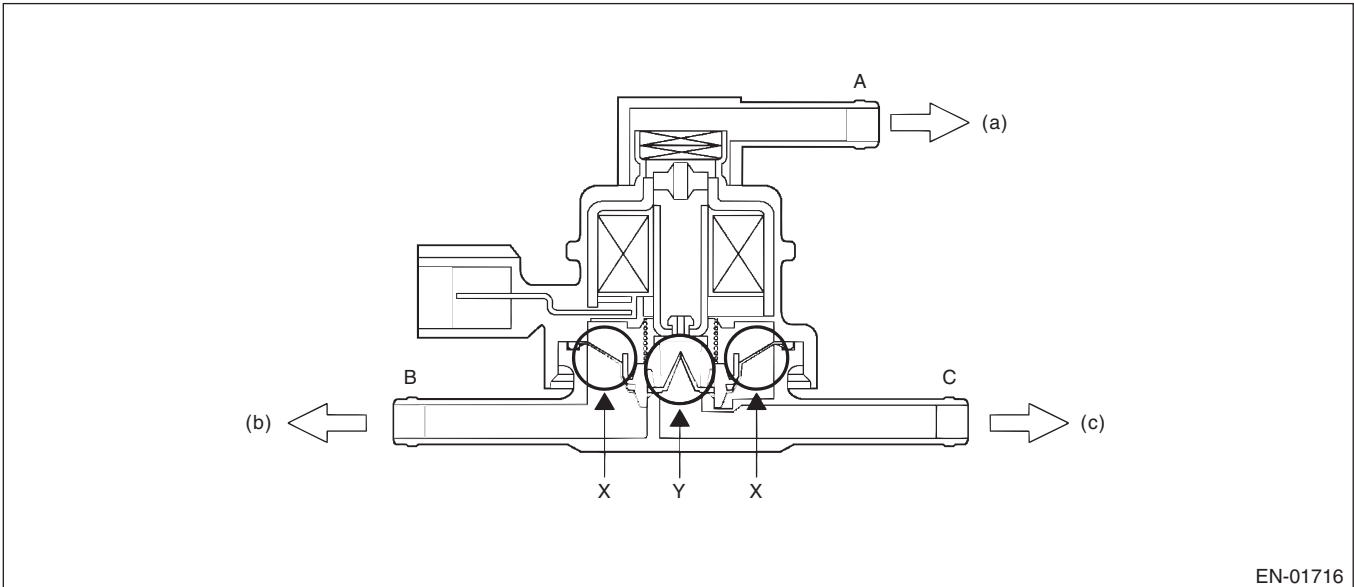
EN-01715

- | | | |
|---------------|------------|--------------------------|
| (1) Solenoid | (3) Valve | (a) Atmospheric pressure |
| (2) Diaphragm | (4) Spring | (b) Fuel tank |
| | | (c) Canister |

Valve Operation and Air Flow

In the figure below, divided by the diaphragm, the part above X is charged with atmospheric air pressure, and the part below X is charged with tank pressure. Also, the part above Y is charged with tank pressure, and the part below Y is charged with canister pressure.

If the atmospheric air pressure port is A, tank pressure port is B, and canister pressure port is C, the air flows according to pressure difference from each port as shown in the table below.



EN-01716

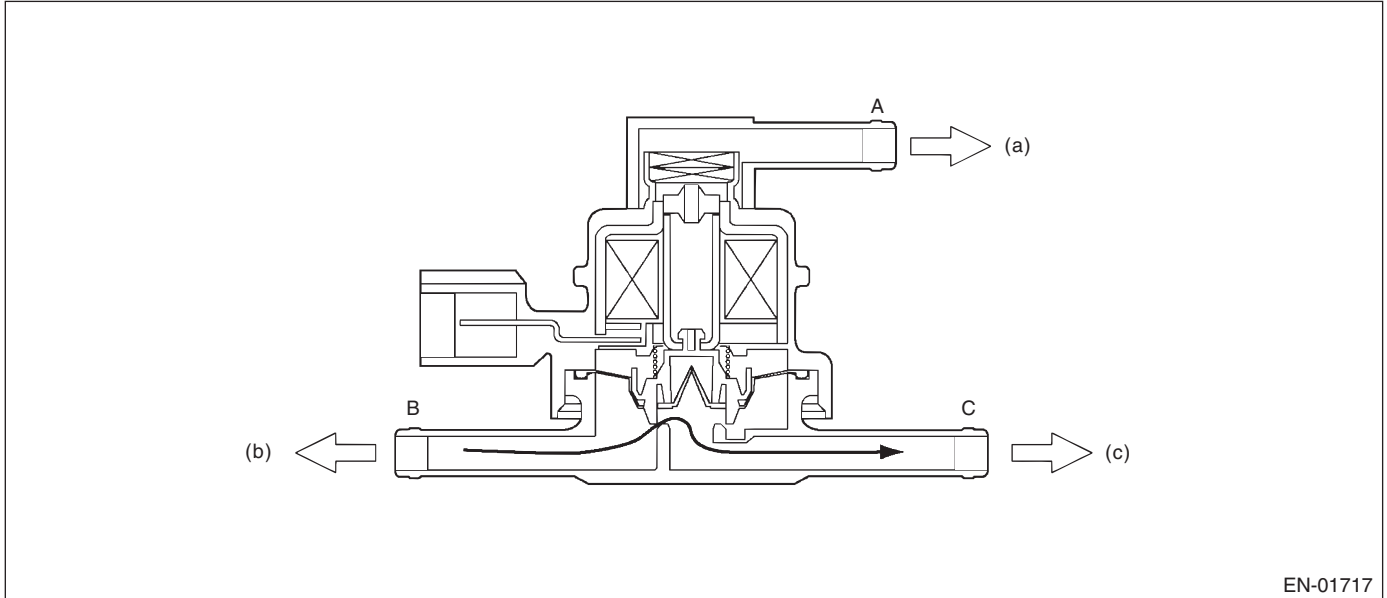
- | | | |
|--------------------------|---------------|--------------|
| (a) Atmospheric pressure | (b) Fuel tank | (c) Canister |
|--------------------------|---------------|--------------|

Condition of pressure	Flow
A < B (solenoid OFF)	B → C
B < C (solenoid OFF)	C → B
Solenoid ON	B ↔ C

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

When $A < B$ (Solenoid OFF)



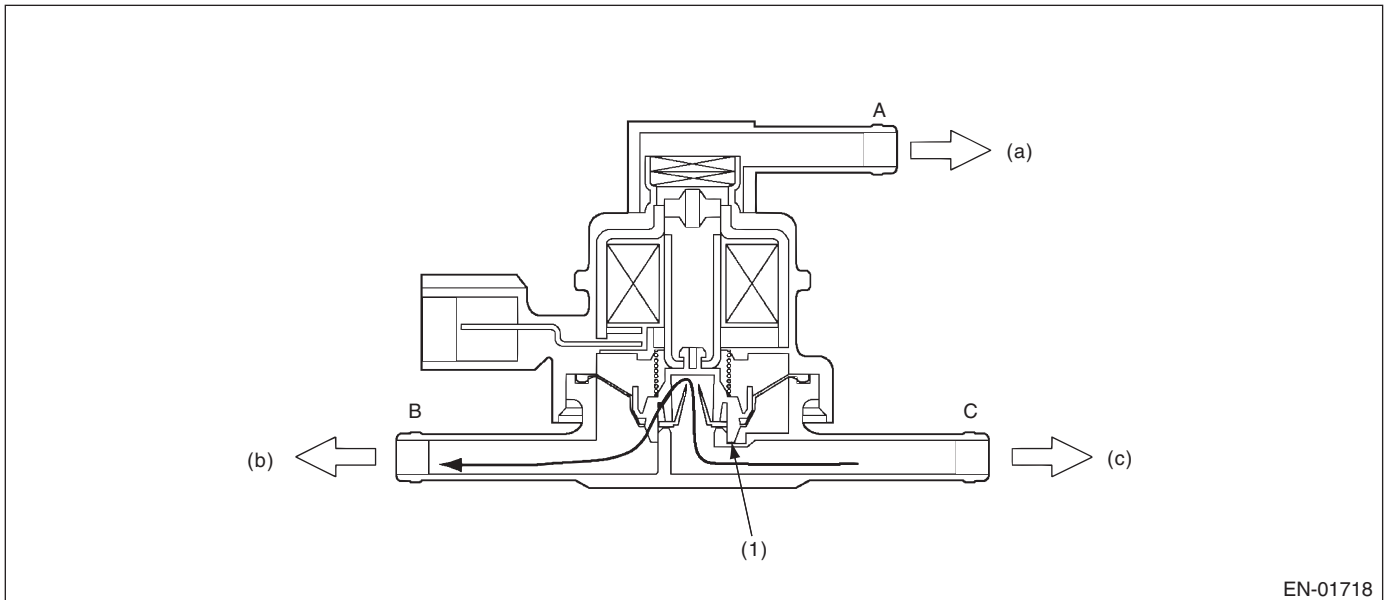
EN-01717

(a) Atmospheric pressure

(b) Fuel tank

(c) Canister

When $B < C$ (Solenoid OFF)



EN-01718

(1) Valve

(a) Atmospheric pressure

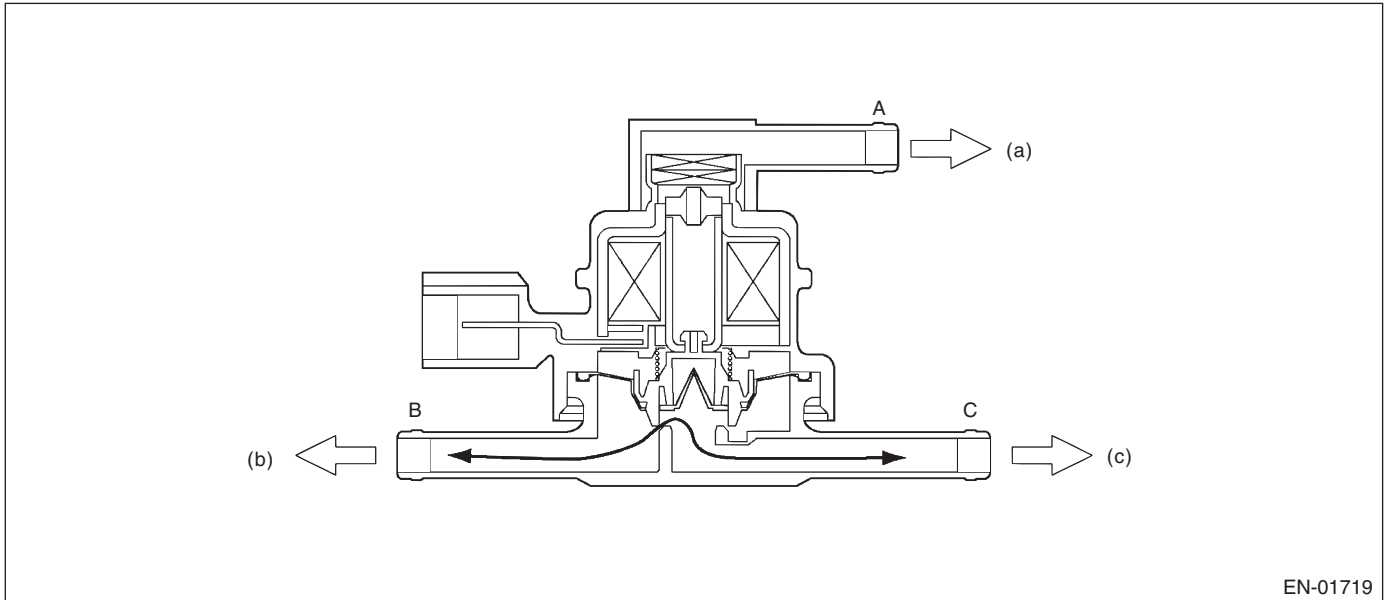
(b) Fuel tank

(c) Canister

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

When Solenoid is ON



EN-01719

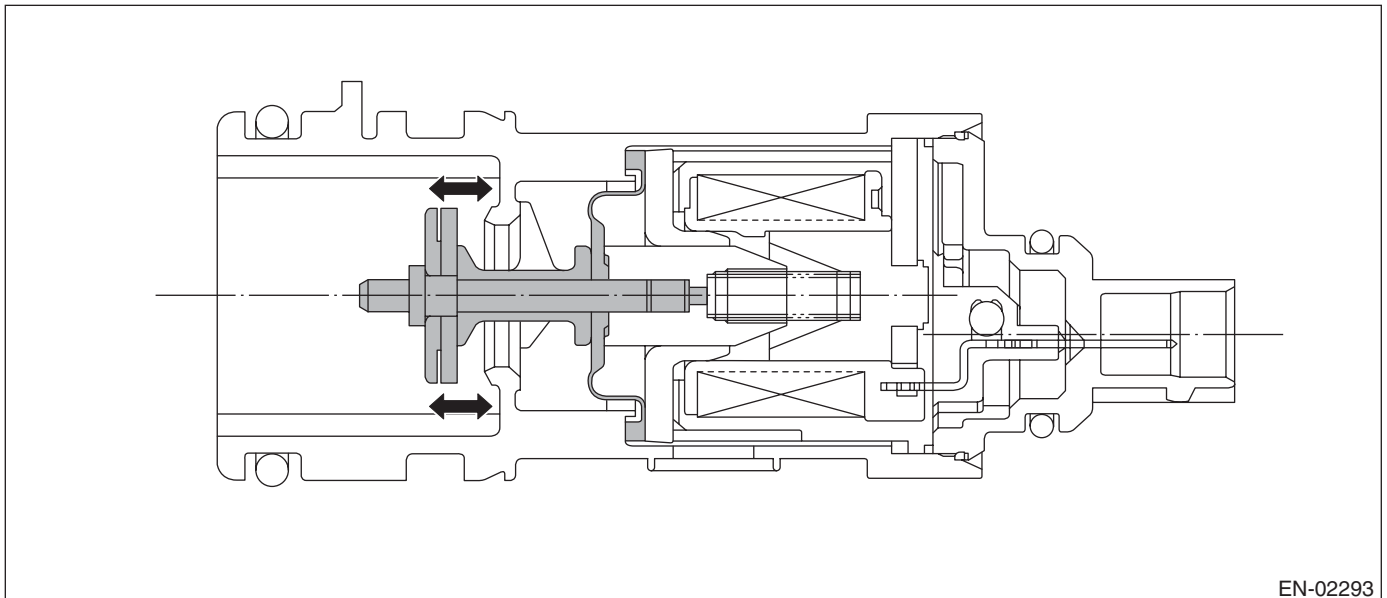
(a) Atmospheric pressure

(b) Fuel tank

(c) Canister

Drain Valve

Drain valve controls the ambient air to be introduced to the canister.



EN-02293

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

0.04-inch Diagnosis

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75.1 kPa (563 mmHg, 22.17 inHg)
Total time of canister purge operation	120 seconds or more
After engine starting	856 seconds or more
Learning value of evaporation gas density	≤ 0.08
Engine speed	1,050 — 6,000 rpm
Fuel tank pressure	≥ -4.00 kPa (-30 mmHg, -1.18 inHg)
Intake manifold vacuum (relative pressure)	< -26.7 kPa (-200 mmHg, -7.87 inHg)
Vehicle speed	≥ 32 km/h (20 MPH)
Fuel level	9.0 — 51.0 (2.38 — 13.47 US gal, 1.98 — 11.22 Imp gal)
Closed air/fuel ratio control	In operation
Fuel temperature	-10 — 45°C (14 — 113°F)
Intake air temperature	≥ -10 °C (14°F)
Pressure change per second	< 0.23 kPa (1.7 mmHg, 0.07 inHg)
Minimum pressure change value every one second – Maximum pressure change value every one second	< 0.23 kPa (1.7 mmHg, 0.07 inHg)
Change of fuel level	< 2.5 \varnothing /128 milliseconds (0.66 US gal/128 milliseconds, 0.55 Imp gal/128 milliseconds)
Air fuel ratio	0.76 — 1.25

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

0.02-inch Diagnosis

Secondary Parameters	Enable Condition
(At starting a diagnosis)	
Evap. diagnosis	Incomplete
Battery voltage	≥ 10.9 V
Atmospheric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)
Time from 0.02 inch leak, previous incomplete diagnosis	
When cancelling in mode A	> 120 sec.
When cancelling in other than mode A	> 600 sec.
Total time of canister purge operation	120 seconds or more
After engine starting	120 seconds or more
Fuel Temp.	-10 — 70°C (14 — 158°F)
Fuel level	9.0 — 51.0 ℓ (2.38 — 13.47 US gal, 1.98 — 11.22 Imp gal)
Intake manifold vacuum (relative pressure)	< -8.0 kPa (-60 mmHg, -2.36 inHg)
Fuel tank pressure	-0.67 — 1.43 kPa (-5 — 10.7 mmHg, -0.20 — 0.42 inHg)
Vehicle speed	≥ 30 km/h (19 MPH)
Closed air/fuel ratio control	In operation
Engine speed	550 — 6000 rpm
(During diagnosis)	
Change of fuel level	≤ Value from Map
Pressure change every one second	< 0.06 kPa (0.44 mmHg, 0.02 inHg)
Minimum pressure change value every one second —	< 0.07 kPa (0.51 mmHg, 0.02 inHg)
Maximum pressure change value every one second	
Pressure change in tank every second	≤ 0.1 kPa (0.75 mmHg, 0.03 inHg)
Atmospheric pressure change (Mode D)	-0.48 — 0.32 kPa (-3.6 — 2.4 mmHg, -0.14 — 0.09 inHg)
Atmospheric pressure change (Mode E)	-0.32 — 0.32 kPa (-2.4 — 2.4 mmHg, -0.09 — 0.09 inHg)

Map

Fuel level (ℓ, US gal, Imp gal)	0	10, 2.64, 2.2	20, 5.28, 4.4	30, 7.93, 6.6	40, 10.57, 8.8	50, 13.21, 11	60, 15.85, 13.2
Change (ℓ, US gal, Imp gal)	4.2, 1.11, 0.92	4.2, 1.11, 0.92	4.1, 1.08, 0.9	4.0, 1.06, 0.88	3.9, 1.03, 0.86	3.8, 1.0, 0.84	3.8, 1.0, 0.84

4. GENERAL DRIVING CYCLE

0.04-inch Diagnosis

- After 856 seconds or more have passed since the engine started, perform the diagnosis only once at a constant speed of 32 km/h (20 MPH) or more.
- Pay attention to the fuel temperature and fuel level.

0.02-inch Diagnosis

- After 770 seconds or more have passed since the engine started, perform the diagnosis at a constant speed of 68 km/h (42 MPH) or more, to judge as NG or OK.
- If judgment cannot be made, repeat the diagnosis.
- Be careful of the remaining fuel level.

5. DIAGNOSTIC METHOD

Purge control solenoid valve stuck open fault diagnosis

DTC

P0457 Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)

Purpose of Mode Z

When performing the leakage diagnosis of EVAP system, the purge control solenoid valve must operate normally. Therefore, mode Z is used to diagnose the purge control solenoid valve stuck open condition. Note that if a purge control solenoid valve stuck open fault is detected, the EVAP system leakage diagnosis is cancelled.

Diagnostic method

Purge control solenoid valve functional diagnosis is performed by monitoring the tank pressure in mode Z.

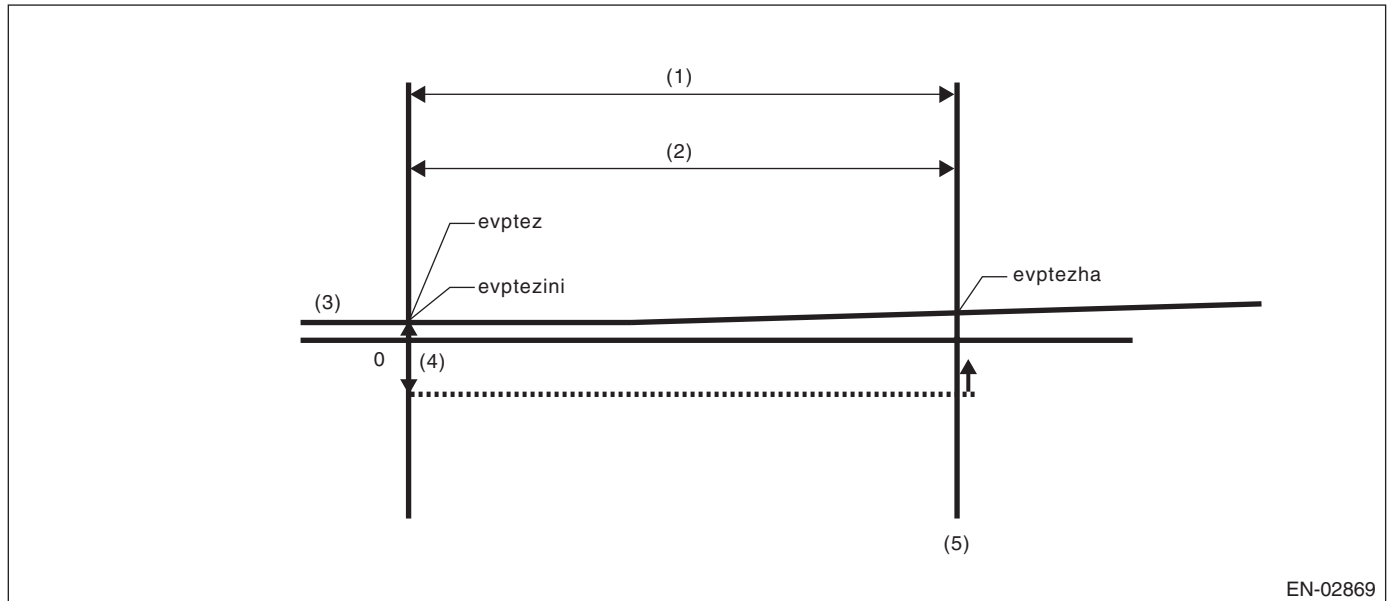
Normality Judgment

Judge OK and change to Mode A when the criteria below are completed in 3 seconds after Mode Z started.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
(Tank pressure when Mode Z started) – (Tank pressure when Mode Z finished)	≤ 0.4 kPa (3 mmHg, 0.12 inHg)	P0457

Normal



EN-02869

- | | | |
|---------------|-----------------------------------|-----------------|
| (1) Mode Z | (3) Fuel tank pressure | (5) OK judgment |
| (2) 3 seconds | (4) 0.4 kpa (3.0 mmHg, 0.12 inHg) | |

- $evptez - evptezha \leq 0.4 \text{ kPa (3.0 mmHg, 0.12 inHg)}$
- $evptezini - evptezha \leq 0.4 \text{ kPa (3.0 mmHg, 0.12 inHg)}$

Judge as normal when both are established.

Abnormality Judgment

If OK judgment cannot be made, extend Mode Z 16 seconds more, and judge as NG when all the criteria below are completed after 16 seconds.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
(Tank pressure when Mode Z started) – (Tank pressure when Mode Z finished)	> 0.6 kPa (4.5 mmHg, 0.18 inHg)	P0457
Tank pressure when Mode Z started	≤ 1.43 kPa (10.7 mmHg, 0.42 inHg)	
Time of 2 0 or more fuel no sloshing	≥ 40 sec.	

Diagnostic Trouble Code (DTC) Detecting Criteria

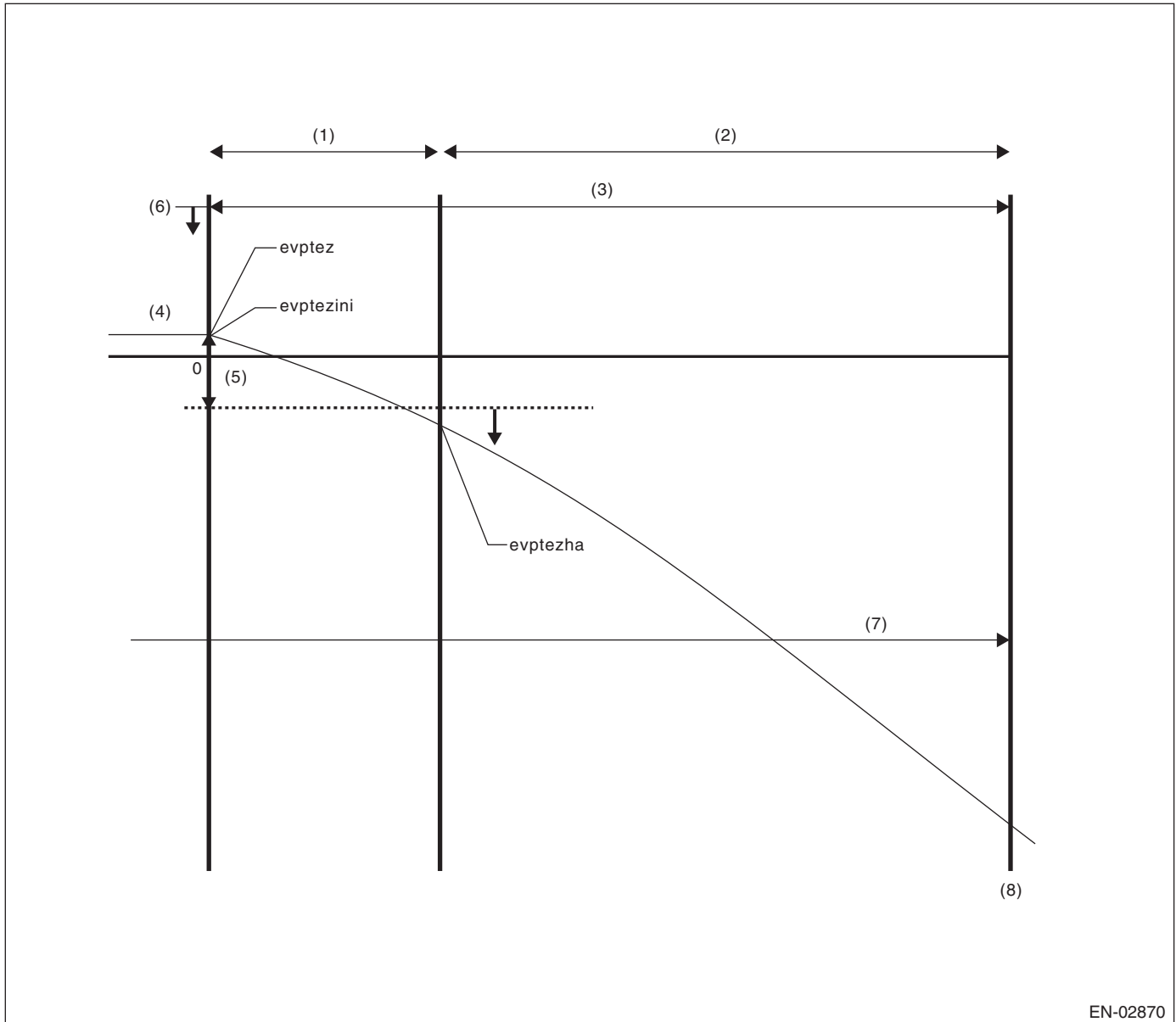
GENERAL DESCRIPTION

Time Needed for Diagnosis: 16 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

When judgment for purge control solenoid valve stuck open NG is made, end the evaporative diagnosis. Cancel the evaporative diagnosis when the OK/NG judgment for purge control solenoid valve stuck open cannot be made in Mode Z.

Purge Control Solenoid Valve Open Fixation



EN-02870

- | | | |
|---------------------|-------------------------------------|-------------------------------------|
| (1) Mode Z | (4) Fuel tank pressure | (7) No fuel sloshing for 40 seconds |
| (2) Extended mode Z | (5) 0.87 kpa (6.5 mmHg, 0.26 inHg) | (8) NG judgment |
| (3) 16 seconds | (6) 1.43 kpa (10.7 mmHg, 0.42 inHg) | |

- $evptezini, evptez \leq 1.43 \text{ kPa (10.7 mmHg, 0.42 inHg)}$
 - $evptez - evptezha \leq 0.87 \text{ kPa (6.5 mmHg, 0.26 inHg)}$
 - $evptezini - evptezha \leq 0.87 \text{ kPa (6.5 mmHg, 0.26 inHg)}$
 - No fuel sloshing of over 2 \varnothing (0.53 US gal, 0.44 Imp gal) for 40 seconds or more.
- Judge as normal when all are established.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Leak Diagnosis

DTC

P0442 Evaporative Emission Control System Leak Detected (Small Leak)

P0457 Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)

Diagnostic method

- The diagnostic method consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to atmospheric pressure.
- The diagnosis is divided into the following five phases.

Mode A: (Estimated evaporation gas amount)

Calculate the tank pressure change amount (P1) when using mode A. After calculating P1, switch to mode B.

Mode B: (Negative pressure sealed)

Introduce negative pressure in the intake manifold to the tank.

Approximately 0 → -1.4 kPa (0 → -10.5 mmHg, 0 → -0.41 inHg)

When the pressure above (desired negative pressure) is reached, enters Mode C.

In this case, if the tank pressure does not reach the target negative pressure, judge that there is a large leakage (10 seconds or 25 seconds) in the system and terminate the evaporative emission control system diagnosis.

Abnormality Judgment

Judge as NG (large leak) when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Time to reach target negative pressure Or mode B time (Min. pressure value in tank when in mode B) – (Tank pressure when mode B started)	≥ 25 sec. ≥ 10 sec. < -0.53 kPa (-4 mmHg, -0.16 inHg)	P0457

Mode C: (Check pressure rise)

Stop the introduction of negative pressure. (Wait until the tank pressure returns to the start level of P2 calculation.)

Change to Mode D when the tank pressure returns to the start level of P2 calculation.

Judge immediate OK and change to Mode E when it does not return in spite of spending the specified time.

Tank pressure when starting calculation of P2	Make advanced OK judgment
-1.3 kPa (-9.75 mmHg, -0.38 inHg)	15 seconds

Mode D: (Measure amount of negative pressure change)

Monitor the tank pressure change amount in mode D. In this case, the tank pressure increases (nears atmospheric pressure), because evaporation occurs. However, if any leakage exists, the pressure increases additionally in proportion to this leakage. The pressure variation of this tank is P2.

After calculating P2, perform a small leak diagnosis according to the items below.

When Mode D is ended

Assign tank variations measured in Mode A and Mode D; P1 and P2, to the formula below, judge small leaks in the system. If the measured judgment value exceeds the threshold value, it is judged to be a malfunction.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Abnormality Judgment

Judge as NG when the criteria below are met and judge as OK and clear NG when not met.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 – 1.5 × P1 P2: Tank pressure that changes every 10 seconds in mode D P1: Tank pressure that changes every 10 seconds in mode A	> Value from Map 7 * Threshold value: Map (Remaining Fuel vs Tank temperature)	P0442

* 1.5: Evaporation amount compensation value when below negative pressure (Amount of evaporation occurrence increases as a vacuum condition increases.)

Map 7 Malfunction criteria limit for evaporation diagnosis

Fuel temperature vs Fuel level	5°C (41°F)	15°C (59°F)	25°C (77°F)	35°C (95°F)	45°C (113°F)
10 ℓ (2.6 US gal, 2.2 Imp gal)	0.49 kPa (3.68 mmHg, 0.145 inHg)	0.49 kPa (3.68 mmHg, 0.145 inHg)	0.53 kPa (3.95 mmHg, 0.156 inHg)	0.54 kPa (4.07 mmHg, 0.160 inHg)	0.56 kPa (4.17 mmHg, 0.164 inHg)
20 ℓ (5.3 US gal, 4.4 Imp gal)	0.50 kPa (3.77 mmHg, 0.148 inHg)	0.51 kPa (3.79 mmHg, 0.149 inHg)	0.53 kPa (4.01 mmHg, 0.158 inHg)	0.56 kPa (4.17 mmHg, 0.164 inHg)	0.57 kPa (4.27 mmHg, 0.168 inHg)
30 ℓ (7.9 US gal, 6.6 Imp gal)	0.51 kPa (3.85 mmHg, 0.152 inHg)	0.52 kPa (3.9 mmHg, 0.154 inHg)	0.54 kPa (4.06 mmHg, 0.160 inHg)	0.57 kPa (4.27 mmHg, 0.168 inHg)	0.60 kPa (4.48 mmHg, 0.176 inHg)
40 ℓ (10.6 US gal, 8.8 Imp gal)	0.65 kPa (4.88 mmHg, 0.192 inHg)	0.65 kPa (4.90 mmHg, 0.193 inHg)	0.66 kPa (4.98 mmHg, 0.196 inHg)	0.71 kPa (5.32 mmHg, 0.209 inHg)	0.76 kPa (5.73 mmHg, 0.226 inHg)
50 ℓ (13.2 US gal, 11.0 Imp gal)	0.79 kPa (5.90 mmHg, 0.232 inHg)	0.79 kPa (5.90 mmHg, 0.232 inHg)	0.79 kPa (5.90 mmHg, 0.232 inHg)	0.85 kPa (6.38 mmHg, 0.251 inHg)	0.88 kPa (6.60 mmHg, 0.260 inHg)

Time Needed for Diagnosis: 30 to 100 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Leak Diagnosis

DTC

P0456 Evaporative Emission Control System Leak Detected (very small leak)

Diagnostic method

- The diagnostic method consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to atmospheric pressure.
- The diagnosis is divided into the following five phases.

Mode A: (0 point compensation)

When the pressure in the tank is high, wait until it returns to 0 point (Near 0 mmHg.). Shift to mode B when returned to the 0 point. Cancel the diagnosis when 0 point does not return in the specified time.

Mode B: (Vacuum pressure introduction)

Introduce negative pressure in the intake manifold to the tank.
Approximately 0 → -2.0 kPa (0 → -15 mmHg, 0 → -0.59 inHg)

When the pressure above (desired negative pressure) is reached, enters Mode C.

At this time, if the tank internal pressure does not reach the target vacuum pressure, cancel the diagnosis.

Mode C: (Vacuum pressure maintained)

Stop the introduction of negative pressure. (Wait until the tank pressure returns to the start level of P2 calculation.)

Change to Mode D either when the tank pressure returns to the start level of P2 calculation, or when the pre-determined amount of time has passed.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Mode D: (Vacuum pressure change amount calculation)

Monitor the tank pressure in mode D, calculate (P2) the pressure change in the tank, and measure the time (evpdset) for the tank pressure to return when calculation of P2 is completed. Shift to Mode E when the tank pressure returns to the end level of P2 calculation. If it does not return to the P2 calculation end tank internal pressure after the predetermined amount of time has passed, make advanced OK judgment or cancel the diagnosis.

Normality Judgment

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Advanced OK judgment 1	
Mode D time	≥ 30 sec.
Tank internal pressure	≤ -1.8 kPa (-13.4 mmHg, -0.53 inHg)
Advanced OK judgment 2	
Mode D time	≥ 200 sec.
P2	≤ 0.9 — 1.3 kPa (7 — 9.6 mmHg, 0.28 — 0.38 inHg)

Mode E: (Evaporation occurrence amount calculation)

Calculate the change of tank pressure with the time evpdset to judge as NG/OK according to the value of P1. (There are gray judgments.)

Abnormality Judgment

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
P1	< Value from Map 7 * Threshold value: Map (Remaining fuel vs evpdset)

Map 7 Malfunction criteria limit for evaporation diagnosis

Time (evpdset) vs fuel level	0 seconds	30 seconds	80 seconds	100 seconds	150 seconds	200 seconds
10 ℓ (2.6 US gal, 2.2 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.21 kPa (1.6 mmHg, 0.063 inHg)	0.29 kPa (2.2 mmHg, 0.087 inHg)	0.29 kPa (2.2 mmHg, 0.087 inHg)	0.29 kPa (2.2 mmHg, 0.087 inHg)	0.29 kPa (2.2 mmHg, 0.087 inHg)
30 ℓ (7.9 US gal, 6.6 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.21 kPa (1.6 mmHg, 0.063 inHg)	0.29 kPa (2.2 mmHg, 0.087 inHg)	0.29 kPa (2.2 mmHg, 0.087 inHg)	0.29 kPa (2.2 mmHg, 0.087 inHg)	0 kPa (0 mmHg, 0 inHg)
50 ℓ (13.2 US gal, 11.0 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.24 kPa (1.8 mmHg, 0.071 inHg)	0.29 kPa (2.2 mmHg, 0.087 inHg)	0.29 kPa (2.2 mmHg, 0.087 inHg)	0 kPa (0 mmHg, 0 inHg)	0 kPa (0 mmHg, 0 inHg)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Normality Judgment

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
P1	> Value from Map 8 * Threshold value: Map (Remaining fuel vs evpdset)

Map 8 Malfunction criteria limit for evaporation diagnosis

Time (evpdset) vs fuel level	0 seconds	30 seconds	80 seconds	100 seconds	150 seconds	200 seconds
10 ℓ (2.6 US gal, 2.2 Imp gal)	0.16 kPa (1.2 mmHg, 0.047 inHg)	0.37 kPa (2.8 mmHg, 0.110 inHg)	0.45 kPa (3.4 mmHg, 0.134 inHg)	0.45 kPa (3.4 mmHg, 0.134 inHg)	0.45 kPa (3.4 mmHg, 0.134 inHg)	0.45 kPa (3.4 mmHg, 0.134 inHg)
30 ℓ (7.9 US gal, 6.6 Imp gal)	0.16 kPa (1.2 mmHg, 0.047 inHg)	0.37 kPa (2.8 mmHg, 0.110 inHg)	0.45 kPa (3.4 mmHg, 0.134 inHg)	0.45 kPa (3.4 mmHg, 0.134 inHg)	0.45 kPa (3.4 mmHg, 0.134 inHg)	0.45 kPa (3.4 mmHg, 0.134 inHg)
50 ℓ (13.2 US gal, 11.0 Imp gal)	0.16 kPa (1.2 mmHg, 0.047 inHg)	0.40 kPa (3 mmHg, 0.118 inHg)	0.45 kPa (3.4 mmHg, 0.134 inHg)	0.45 kPa (3.4 mmHg, 0.134 inHg)	0.45 kPa (3.4 mmHg, 0.134 inHg)	0.45 kPa (3.4 mmHg, 0.134 inHg)

Time Needed for Diagnosis: 65 to 514 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

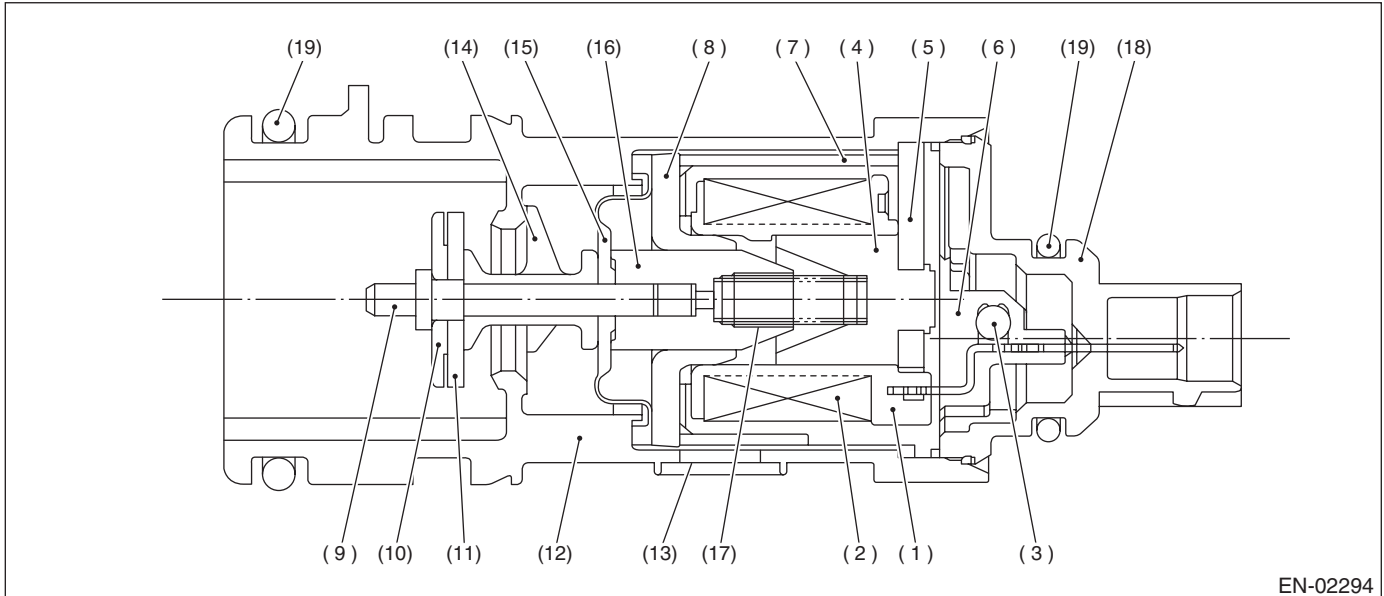
BG:DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the drain valve.

Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



- | | | |
|-----------------|--------------------|-------------------|
| (1) Bobbin | (8) Magnetic plate | (14) Retainer |
| (2) Coil | (9) Shaft | (15) Diaphragm |
| (3) Diode | (10) Plate | (16) Movable core |
| (4) Stator core | (11) Valve | (17) Spring |
| (5) End plate | (12) Housing | (18) Cover |
| (6) Body | (13) Filter | (19) O-ring |
| (7) Yoke | | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting all the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when all the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs OFF signal	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Pressure control solenoid valve control: Open the pressure control solenoid valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

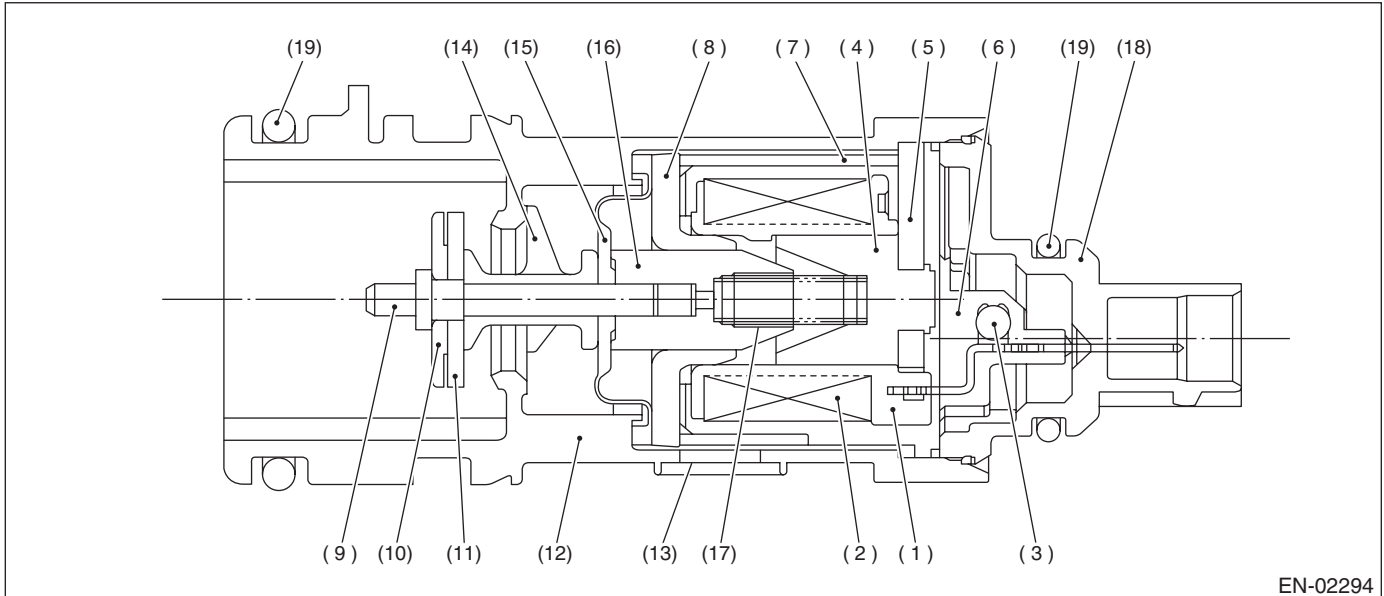
BH:DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the drain valve.

Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



- | | | |
|-----------------|--------------------|-------------------|
| (1) Bobbin | (8) Magnetic plate | (14) Retainer |
| (2) Coil | (9) Shaft | (15) Diaphragm |
| (3) Diode | (10) Plate | (16) Movable core |
| (4) Stator core | (11) Valve | (17) Spring |
| (5) End plate | (12) Housing | (18) Cover |
| (6) Body | (13) Filter | (19) O-ring |
| (7) Yoke | | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when all the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs ON signal	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Pressure control solenoid valve control: Open the pressure control solenoid valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

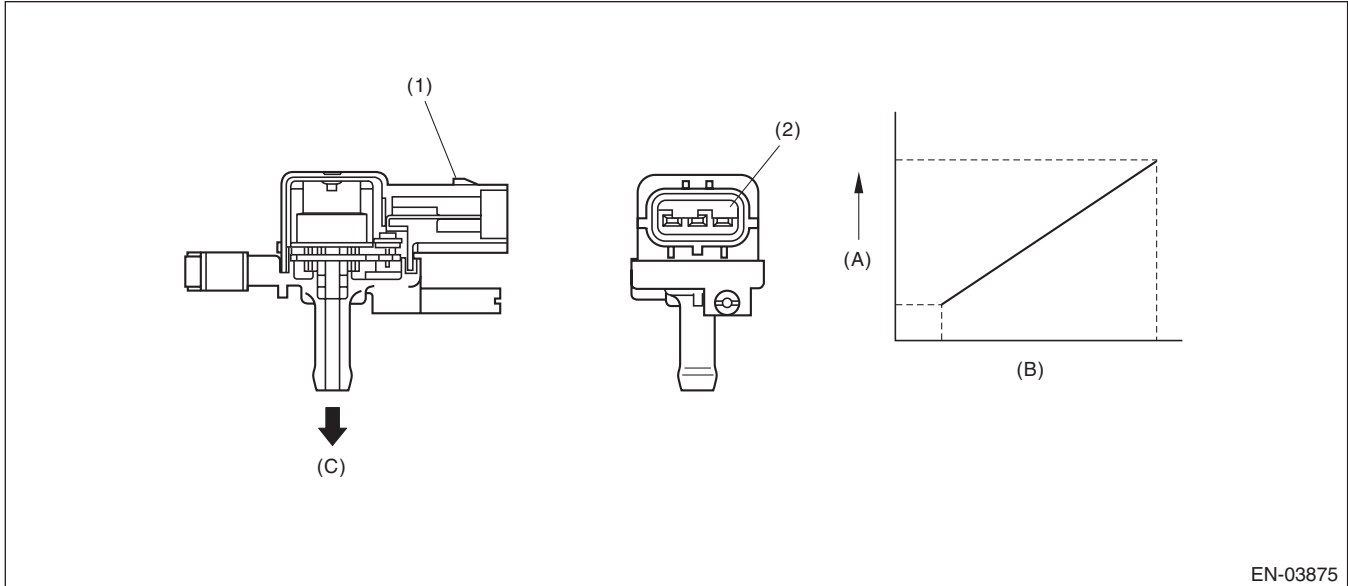
BI: DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR

1. OUTLINE OF DIAGNOSIS

Detect the tank pressure sensor output property abnormality.

If there is no variation of tank internal pressure when there should be under the operating condition, judge as NG.

2. COMPONENT DESCRIPTION



- (1) Connector
(2) Terminals

- (A) Output voltage
(B) Input voltage

- (C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	60 seconds or more
Fuel level	$\geq 9.0 \text{ l}$ (2.4 US gal, 2.0 Imp gal)
Fuel temperature	$< 35^{\circ}\text{C}$ (95°F)
Battery voltage	$\geq 10.9 \text{ V}$
Atmospheric pressure	$> 75.1 \text{ kPa}$ (563 mmHg, 22.2 inHg)

4. GENERAL DRIVING CYCLE

- Perform the diagnosis continuously after 60 seconds or more have passed since the engine started.
- Be sure to check the fuel level and fuel temperature.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Number of times when the difference between the maximum value and minimum value for the fuel level every 60 seconds is 2 ℓ (0.53 US gal, 0.44 Imp gal) or more (with enable conditions established)	≥ 16 times
Maximum – Minimum tank pressure (with enable conditions established)	< 0.05 kPa (0.375 mmHg, 0.01 inHg)
Maximum – Minimum fuel temperature (with enable condition completed)	≥ 7°C (12.6°F)

If the maximum value – minimum value for the fuel level every 60 seconds is less than 2 liters, extend 60 seconds and make judgment with the maximum and minimum values for the fuel level in 120 seconds. If a difference does not appear though the time was extended 60 seconds, extend the time (180, 240, 300 seconds) and continue the judgment. If the maximum value – minimum value for the fuel level is 2 liters or more, the diagnosis counter counts up.

Time Needed for Diagnosis: 1 minute × 16 times or more

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Maximum – Minimum tank pressure	≥ 0.05 kPa (0.375 mmHg, 0.01 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Purge control solenoid valve control: Not allowed to purge fixed mode.

9. ECM OPERATION AT DTC SETTING

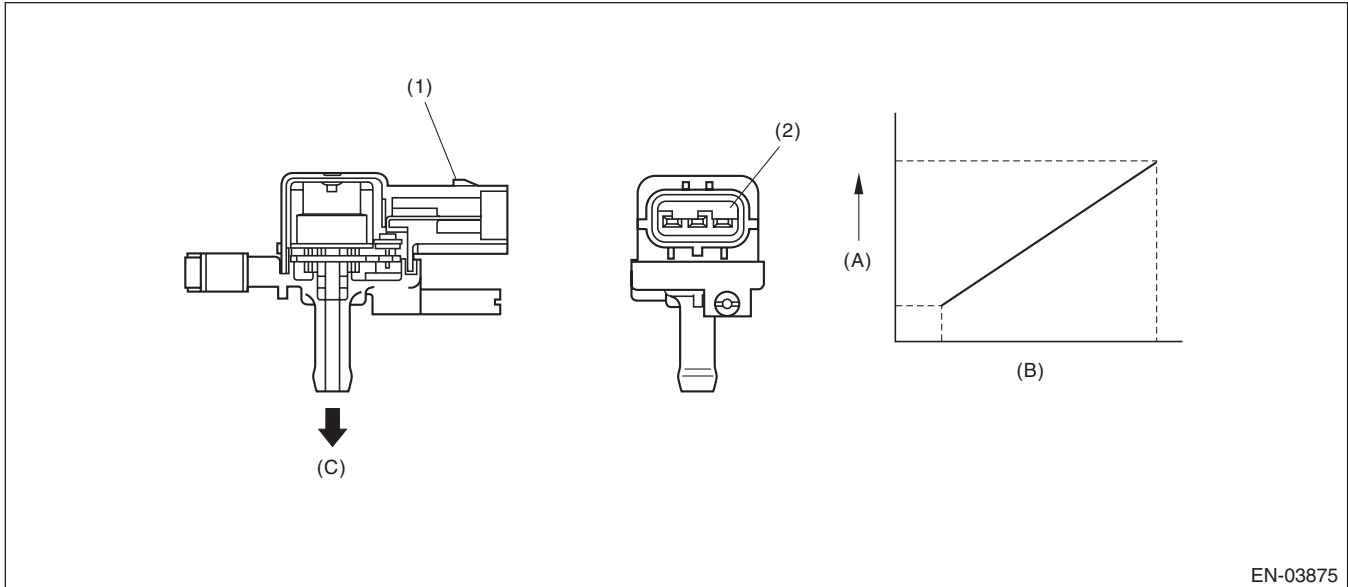
Memorize the freeze frame data. (For test mode \$02)

BJ:DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the fuel tank pressure sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



EN-03875

- (1) Connector
- (2) Terminals

- (A) Output voltage
- (B) Input voltage

- (C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 15 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≤ -7.48 kPa (-56.15 mmHg, -2.21 inHg)

Time Needed for Diagnosis: 15 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	> -7.48 kPa (-56.15 mmHg, -2.21 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Purge control solenoid valve control: Not allowed to purge fixed mode.

9. ECM OPERATION AT DTC SETTING

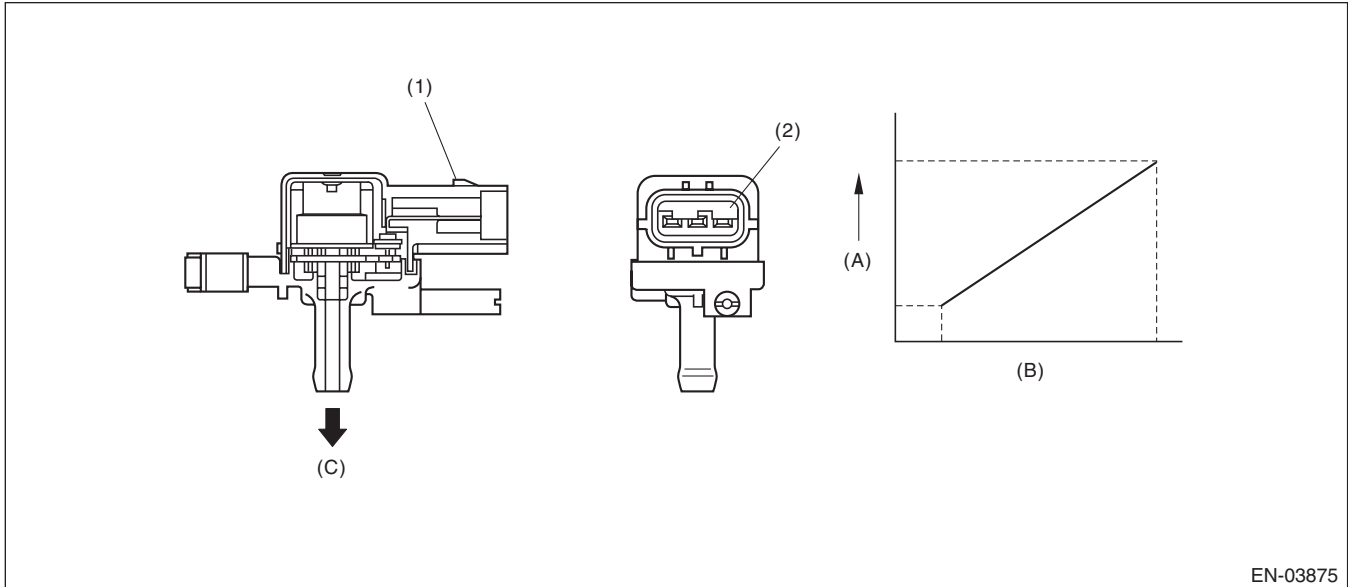
Memorize the freeze frame data. (For test mode \$02)

BK:DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the fuel tank pressure sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



EN-03875

- | | | |
|---------------|--------------------|------------------|
| (1) Connector | (A) Output voltage | (C) To fuel tank |
| (2) Terminals | (B) Input voltage | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Vehicle speed	$\geq 2 \text{ km/h (1 MPH)}$
All conditions of EVAP canister purge	Completed
Learning value of evaporation gas density	≤ 0.08
Main feedback compensation coefficient	≥ 0.9
Battery voltage	$\geq 10.9 \text{ V}$

4. GENERAL DRIVING CYCLE

Perform the diagnosis continually when purging.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 15 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	> 7.98 kPa (59.85 mmHg, 2.36 inHg)
Fuel temperature	< 35°C (95°F)
Atmospheric pressure	≥ 75.1 kPa (563 mmHg, 22.2 inHg)

Time Needed for Diagnosis: 15 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≤ 7.98 kPa (59.85 mmHg, 2.36 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Purge control solenoid valve control: Not allowed to purge fixed mode.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BL:DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)

NOTE:

For the detection standard, refer to DTC P0442 “EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)”. <Ref. to GD(H4SO)-119, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BM:DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF)

NOTE:

For the detection standard, refer to DTC P0442 “EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)”. <Ref. to GD(H4SO)-119, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

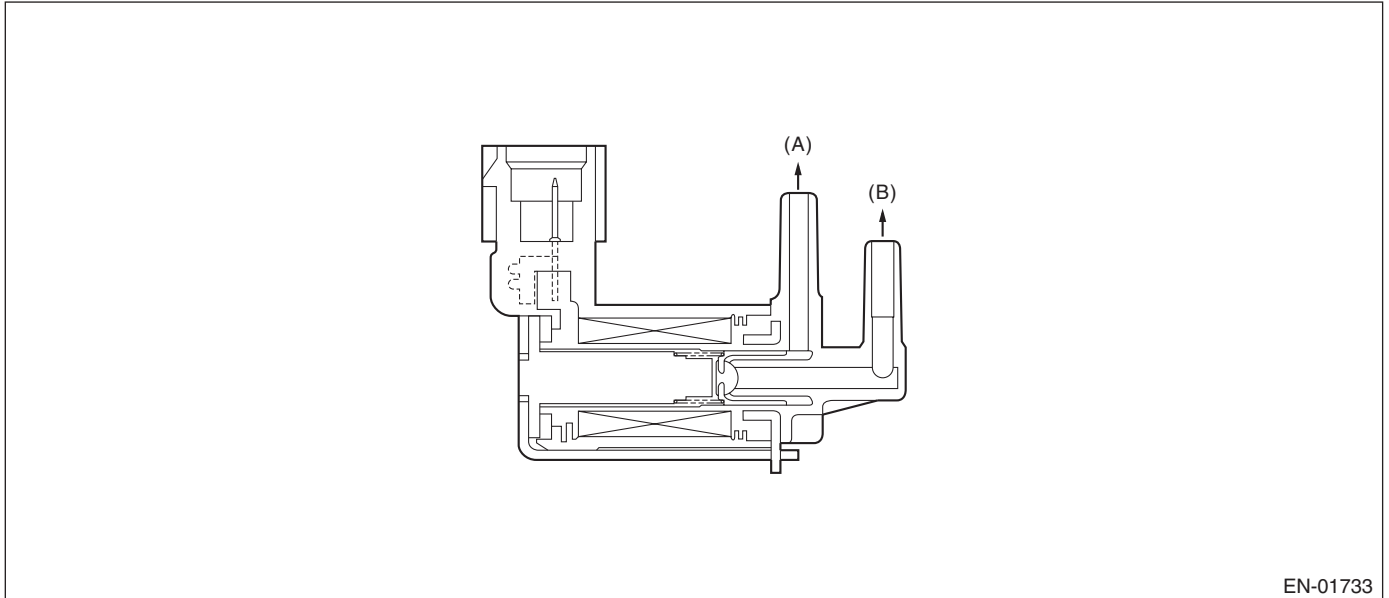
BN:DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the purge control solenoid valve.

Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



EN-01733

(A) To canister

(B) To intake manifold

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Continuous time with the following conditions established:	≥ 2.5 sec.
Duty ratio of "ON"	$< 75\%$
Terminal output voltage	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

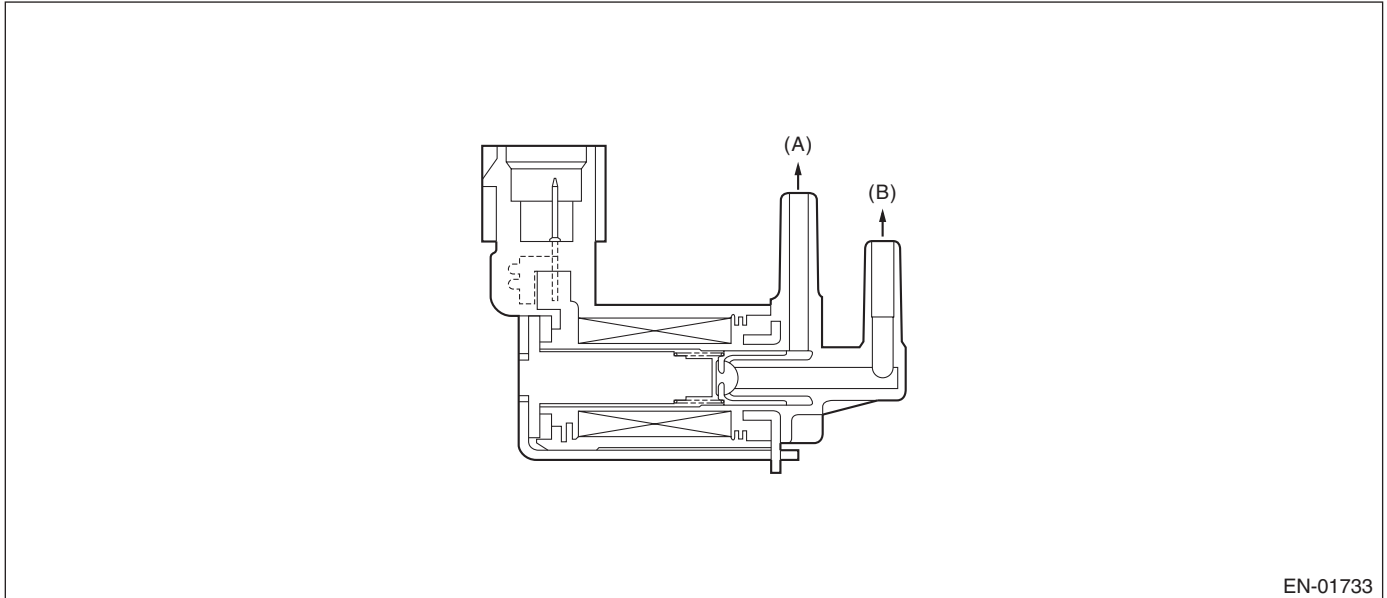
BO:DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the purge control solenoid valve.

Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



EN-01733

(A) To canister

(B) To intake manifold

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Continuous time with the following conditions established:	≥ 2.5 sec.
Duty ratio of "ON"	≥ 25%
Terminal output voltage	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

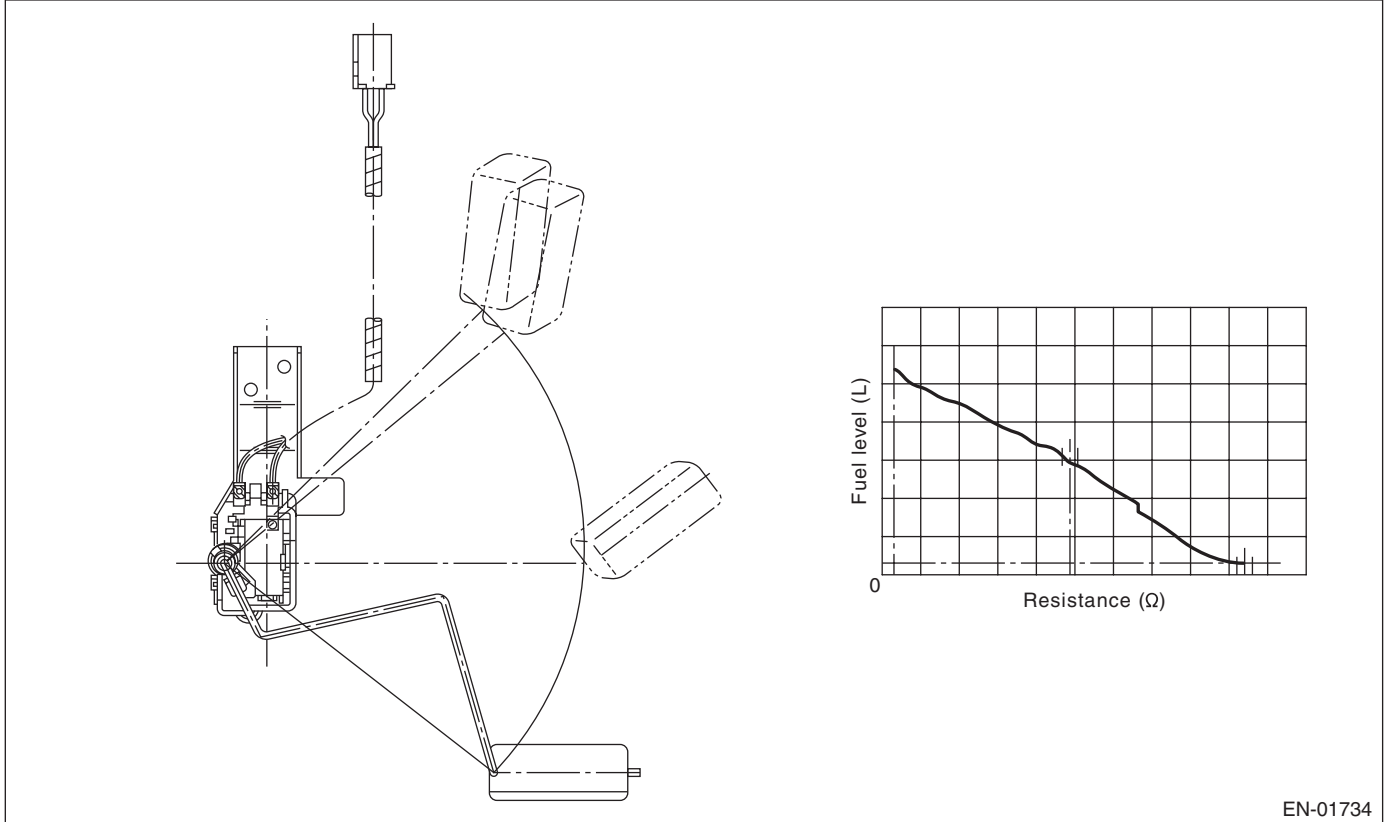
BP:DTC P0461 FUEL LEVEL SENSOR "A" CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect malfunctions of the fuel level sensor output property.

If the fuel level does not vary in a particular driving condition / engine condition where it should, judge as NG.

2. COMPONENT DESCRIPTION



EN-01734

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	> 331 kg (729.9 lb)
Max. – Min. values of fuel level output	< 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
After engine starting	5 seconds or more

Time Needed for Diagnosis: Undetermined

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	> 331 kg (729.9 lb)
Max. – Min. values of fuel level output	≥ 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
After engine starting	5 seconds or more

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

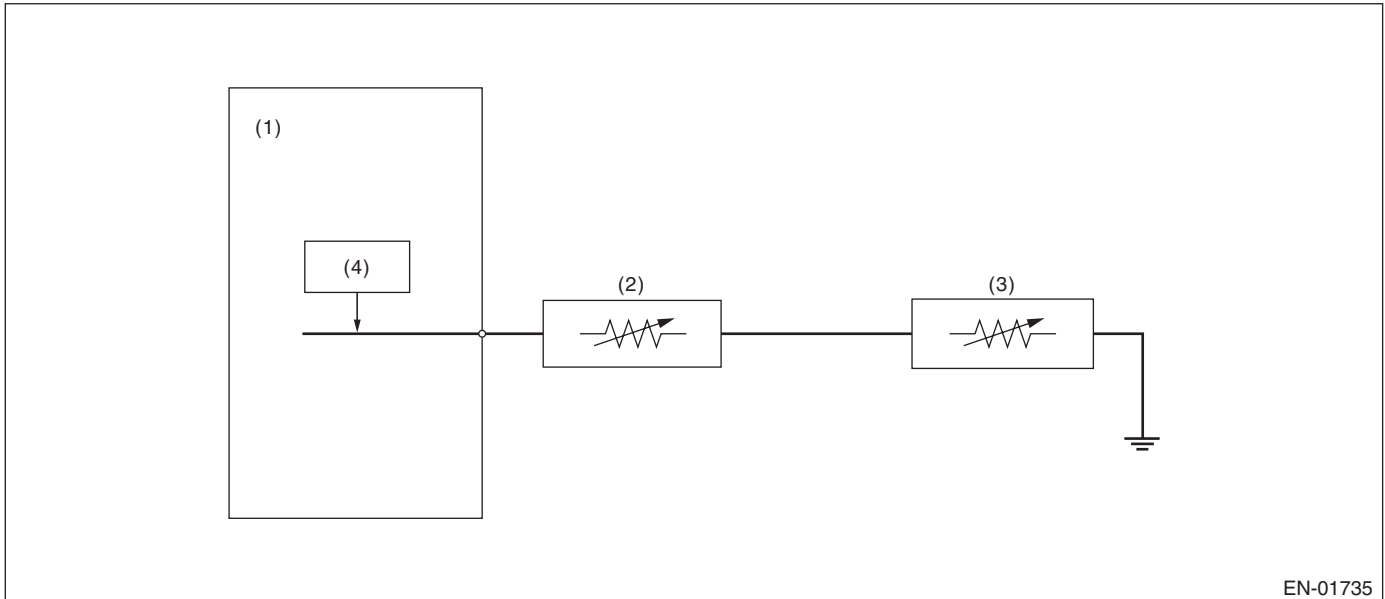
GENERAL DESCRIPTION

BQ:DTC P0462 FUEL LEVEL SENSOR “A” CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)

(3) Fuel sub level sensor

(4) Detecting circuit

(2) Fuel level sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	≤ 0.035 V

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	> 0.035 V

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

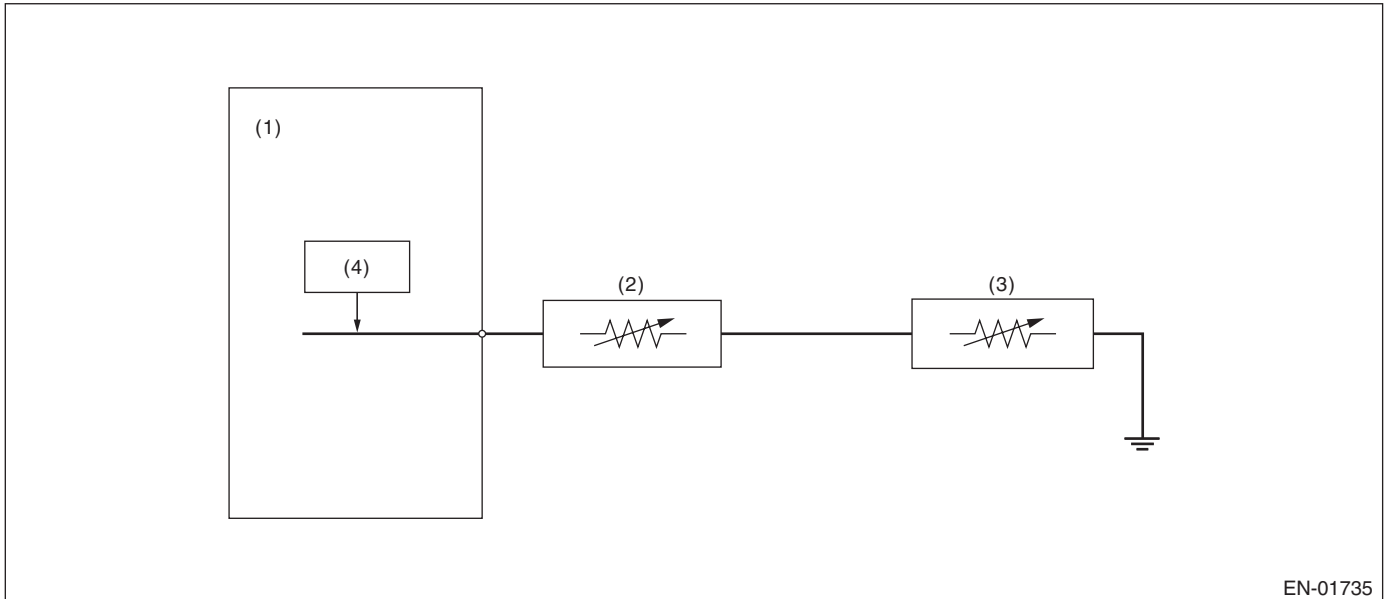
GENERAL DESCRIPTION

BR:DTC P0463 FUEL LEVEL SENSOR "A" CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)

(3) Fuel sub level sensor

(4) Detecting circuit

(2) Fuel level sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Condition
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below exceeds the time required for diagnosis (2.5 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	≥ 4.911 V

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	< 4.911 V

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BS:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT

1. OUTLINE OF DIAGNOSIS

Detect the unstable output faults from the fuel level sensor caused by noise. Judge as NG when the max. value and cumulative value of output voltage variation of the fuel level sensor is larger than the threshold value.

2. ENABLE CONDITION

Malfunction Criteria	Threshold Value
Engine speed	≥ 500 rpm
After engine starting	1 second or more
Ignition switch	ON
Battery voltage	> 10.9 V
Idle switch	ON
Fuel level	9.0 — 51 ℓ (2.38 — 13.47 US gal, 1.98 — 11.22 Imp gal)
Vehicle speed = 0 km/h (0 MPH)	10 seconds or more

3. GENERAL DRIVING CYCLE

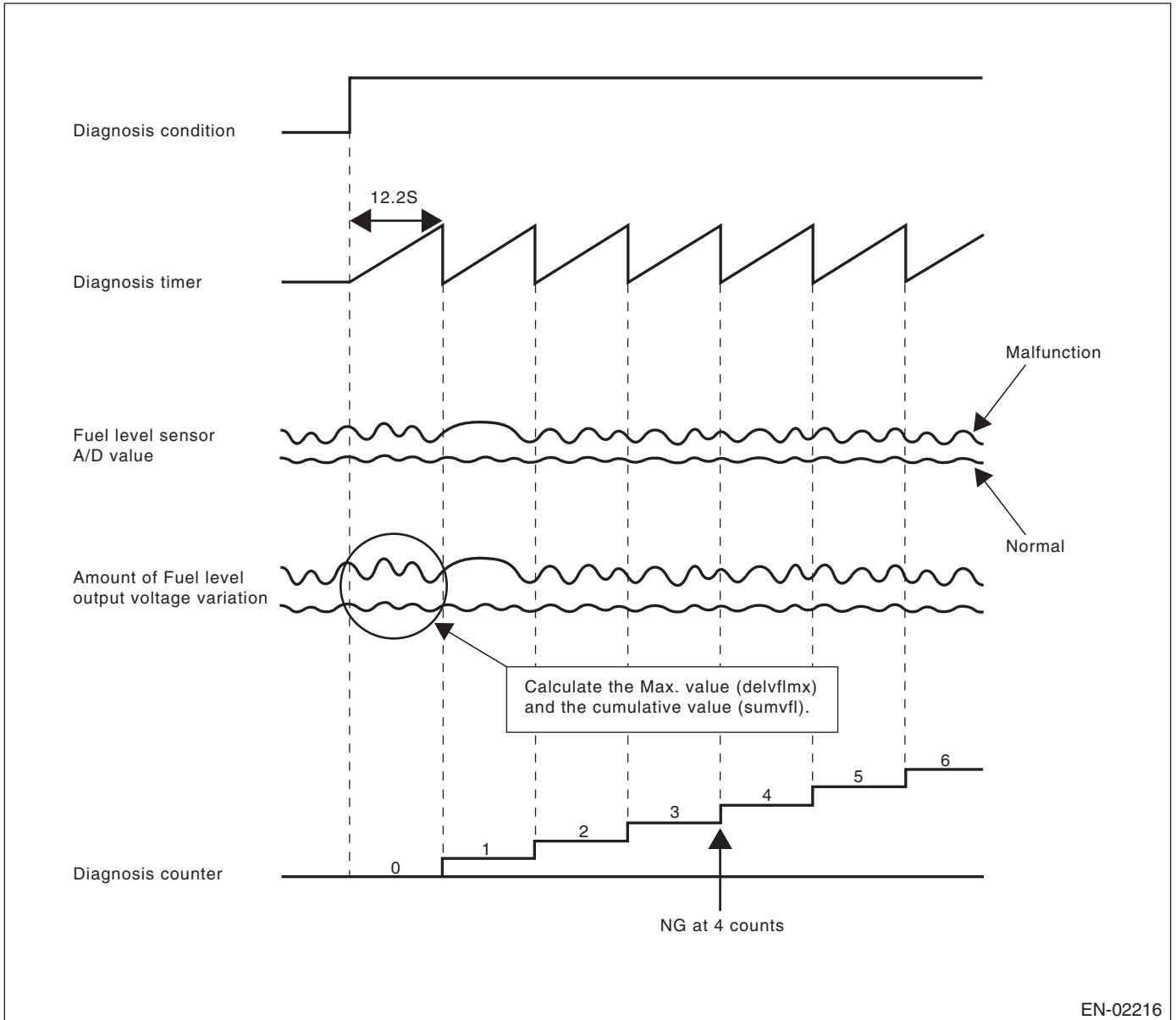
- Always perform the diagnosis continuously at idle speed.
- Pay attention to the fuel level.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. DIAGNOSTIC METHOD

Calculate the Max. value (delflmax) and cumulative value (sumfl) of output voltage variation of fuel level sensor during 12.2 seconds. Judge as normal when both max. and cumulative values are not over the threshold value. Otherwise, when either of them is over the threshold value, the diagnosis counter counts up. Judge as NG if the counter indicated 4 counts.



Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Abnormality Judgment

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Total times of the condition reaching follows, DELFLMAX $\geq 0.2 - 0.26$ V or SUMFL ≥ 16 V At that time, DELFLMAX: Maximum difference of sensor output for 12.2 seconds; SUMFL: Integrated value of the sensor output deviation for 12.2 seconds	≥ 4 times

The diagnosis counter does not count up when the following conditions are completed within 12.2 seconds.

Maximum value – minimum value of change of tank pressure for 12.2 seconds	≥ 0.05 kPa (0.375 mmHg, 0.02 inHg)
Maximum value – minimum value of battery voltage for 12.2 seconds	≥ 1.65 V

Time Needed for Diagnosis: 12.2 seconds \times 4 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
DELFLMAX SUMFL At that time, DELFLMAX: Maximum difference of sensor output for 12.2 seconds; SUMFL: Integrated value of the sensor output deviation for 12.2 seconds	$< 0.2 - 0.26$ V < 16 V

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BT:DTC P0483 FAN RATIONALITY CHECK

1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the radiator fan.

Judge as NG when the engine coolant temperature slowly decreases even when the radiator fan is rotating.

2. ENABLE CONDITION

Diagnostic enable condition is established if the radiator fan changes from OFF → ON when all of the conditions below are met.

When one of the conditions below is not met, the diagnostic enable condition is not established.

Secondary Parameters	Enable Conditions
Engine speed	560 — 900 rpm
Idle switch	ON
Vehicle speed	< 2 km/h (1 MPH)
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously when the radiator fan changes from OFF → ON when idling.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 5 minutes.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	≥ 100°C (212°F)
Radiator fan signal change	OFF to ON
Engine coolant temperature	Does not decrease

Time Needed for Diagnosis: 5 minutes

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Radiator fan signal change	OFF to ON
Engine coolant temperature	Decrease

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BU:DTC P0502 VEHICLE SPEED SENSOR "A" CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed. Judge NG when low vehicle speed (0 km/h (0 MPH)) remains whereas it seemed to be in a usual driving speed.

2. ENABLE CONDITION (FOR ABNORMALITY JUDGMENT ONLY)

Secondary Parameters	Enable Condition
Engine speed	< 4000 rpm
Fuel cut in decel.	In operation
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during deceleration fuel cut.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 4 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 1

Time Needed for Diagnosis: 4 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when all of the following criteria are established.

Malfunction Criteria	Threshold Value
Vehicle speed	≥ 1
Starter switch	OFF
Starter switch ON → OFF time	≥ 3 sec.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6 MPH)
- ISC control: Open loop compensation is set to specified value (1 g (0.04 oz)/s). Not allowed to calculate ISC feed back amount.
- Radiator fan control: Both main and sub fan ON
- Tumble generator valve control: Open the tumble generator valve.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BV:DTC P0503 VEHICLE SPEED SENSOR “A” INTERMITTENT/ERRATIC/HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed. Judge NG when high vehicle speed (240 km/h (149 MPH) or more) remains whereas it seemed to be in a usual driving speed.

2. ENABLE CONDITION (FOR ABNORMALITY JUDGMENT ONLY)

Secondary Parameters	Enable Condition
Engine speed	< 4000 rpm
Fuel cut in decel.	In operation
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously during deceleration fuel cut.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 4 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	≥ 240

Time Needed for Diagnosis: 4 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when all of the following criteria are established.

Malfunction Criteria	Threshold Value
Vehicle speed	< 240
Starter switch	OFF
Starter switch ON → OFF time	≥ 3 sec.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6 MPH)
- ISC control: Open loop compensation is set to specified value (1 g (0.04 oz)/s). Not allowed to calculate ISC feed back amount.
- Radiator fan control: Both main and sub fan ON
- Tumble generator valve control: Open the tumble generator valve.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BW:DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling. Judge as NG when actual engine speed is not close to target engine speed during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 75°C (167°F)
Battery voltage	≥ 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9.0 ℓ (2.38 US gal, 1.98 Imp gal)
After engine starting	≥ 10.5 sec.
Feedback in ISC	In operation
Lambda value	0.81 — 1.1
After air condition switching ON/OFF	> 5.1 sec.
After intake manifold pressure changes more than 4 kPa (30 mmHg, 1.2 inHg)	> 5.1 sec.
After neutral switch ON/OFF change	> 5.1 sec.
Vehicle speed	0 km/h (0 MPH)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling after warming up engine.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below is 10 seconds × 3 times.

Judgment Value

Malfunction Criteria	Threshold Value
Actual – target engine speed	< –100 rpm
Feedback value for ISC	Max.

Time Needed for Diagnosis: 10 seconds × 3 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear NG when the continuous time of meeting the malfunction criteria below becomes more than 10 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Actual – target engine speed	≥ –100 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BX:DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling. Judge as NG when actual engine speed is not close to target engine speed during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 75°C (167°F)
Battery voltage	≥ 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9.0 ℓ (2.38 US gal, 1.98 Imp gal)
After engine starting	≥ 10.5 sec.
Feedback in ISC	In operation
Lambda value	0.81 — 1.1
After air condition switching ON/OFF	> 5.1 sec.
After intake manifold pressure changes more than 4 kPa (30 mmHg, 1.2 inHg)	> 5.1 sec.
After neutral switch ON/OFF change	> 5.1 sec.
Vehicle speed	0 km/h (0 MPH)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling after warming up engine.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below is 10 seconds × 3 times.

Judgment Value

Malfunction Criteria	Threshold Value
Actual – target engine speed	≥ 200 rpm
Feedback value for ISC	Min.

Time Needed for Diagnosis: 10 seconds × 3 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear NG when the continuous time of meeting the malfunction criteria below becomes more than 10 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Actual – target engine speed	< 200 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BY:DTC P0512 STARTER REQUEST CIRCUIT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.
Judge ON NG when the starter SW signal remains ON.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as ON NG when the continuous time of meeting the malfunction criteria below becomes more than 3 minutes.

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed	> 500 rpm
Starter OFF signal	Not detected
Battery voltage	> 8 V

Time Needed for Diagnosis: 180 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge ON OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Starter OFF signal	Detected
Battery voltage	> 8 V

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

BZ:DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect malfunctions in which the engine speed continues to rise during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Feedback in ISC	In operation
Vehicle speed	< 4 km/h (2 MPH)
After engine starting	1 second or more

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously if the vehicle speed at less than 4 km/h (2 MPH).

4. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the all malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed – targeted engine speed	> 2000 rpm
Feedback compensation for ISC	≤ 0
Engine speed change every 180 degree engine revs.	≥ -5 rpm

Time Needed for Diagnosis: 2 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear NG when the continuous time of meeting the malfunction criteria below becomes more than 5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed – targeted engine speed	< 200 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

Fuel cut: Cuts off fuel for only #1 and #2 cylinders, or for all cylinders according to vehicle speed, engine speed, and throttle position.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CA:DTC P0600 SERIAL COMMUNICATION LINK

1. OUTLINE OF DIAGNOSIS

Detect malfunction of CAN communication.

Judge as NG when CAN communication is not established, CAN communication with AT is not established, and the data from the AT is not normal.

2. COMPONENT DESCRIPTION

ECM and TCM are connected by high speed CAN.

(Common Specifications)

CAN Protocol 2.0 B (Active)

Frame Format: 11 Bit ID Frame (Standard Frame)

(High speed CAN)

Conforms to ISO11898

Communication Speed: 500 kbps

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Starter switch	OFF
Engine	run

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when either of the following conditions is established.

Judge as OK and clear the NG when the continuous time when all of the following criteria are established is more than the predetermined time (1 second).

Judgment Value

Malfunction Criteria	Threshold Value
bus off flag or warning flag	set
ID is not received from the TCM	= 500 milliseconds

Time Needed for Diagnosis: 1 time

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR CLEAR PARAMETERS

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CB:DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of microcomputer (RAM).

When there is a problem in the main CPU normal RAM, or the sub CPU normal RAM, judge as NG. Judge as OK when both are operating properly.

If it is possible to write data to the whole area of RAM in the initial routine, and is possible to read the same data, it is judged as OK, and if not, NG.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

Diagnosis with the initial routine.

3. GENERAL DRIVING CYCLE

Perform the diagnosis as soon as the ignition switch is turned to ON.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Main CPU normal RAM abnormal Write 5AA5A55A and then read. (Whole area of RAM) Or write A55A5AA5 and then read. (Whole area of RAM)	5AA5A55A cannot be read. A55A5AA5 cannot be read.
Sub CPU normal RAM abnormal Write 5AA5 and then read. (Whole area of RAM) Or write A55A and then read. (Whole area of RAM)	5AA5 cannot be read. A55A cannot be read.

Time Needed for Diagnosis: Undetermined

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Main CPU normal RAM abnormal Write 5AA5A55A and then read. (Whole area of RAM) And write A55A5AA5 and then read. (Whole area of RAM)	5AA5A55A can be read. A55A5AA5 can be read.
Sub CPU normal RAM abnormal Write 5AA5 and then read. (Whole area of RAM) And write A55A and then read. (Whole area of RAM)	5AA5 can be read. A55A can be read.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CC:DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR

1. OUTLINE OF DIAGNOSIS

Judge as NG when SUM value of ROM is outside the standard value.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
SUM value of ROM	Specification

Time Needed for Diagnosis: Undetermined

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

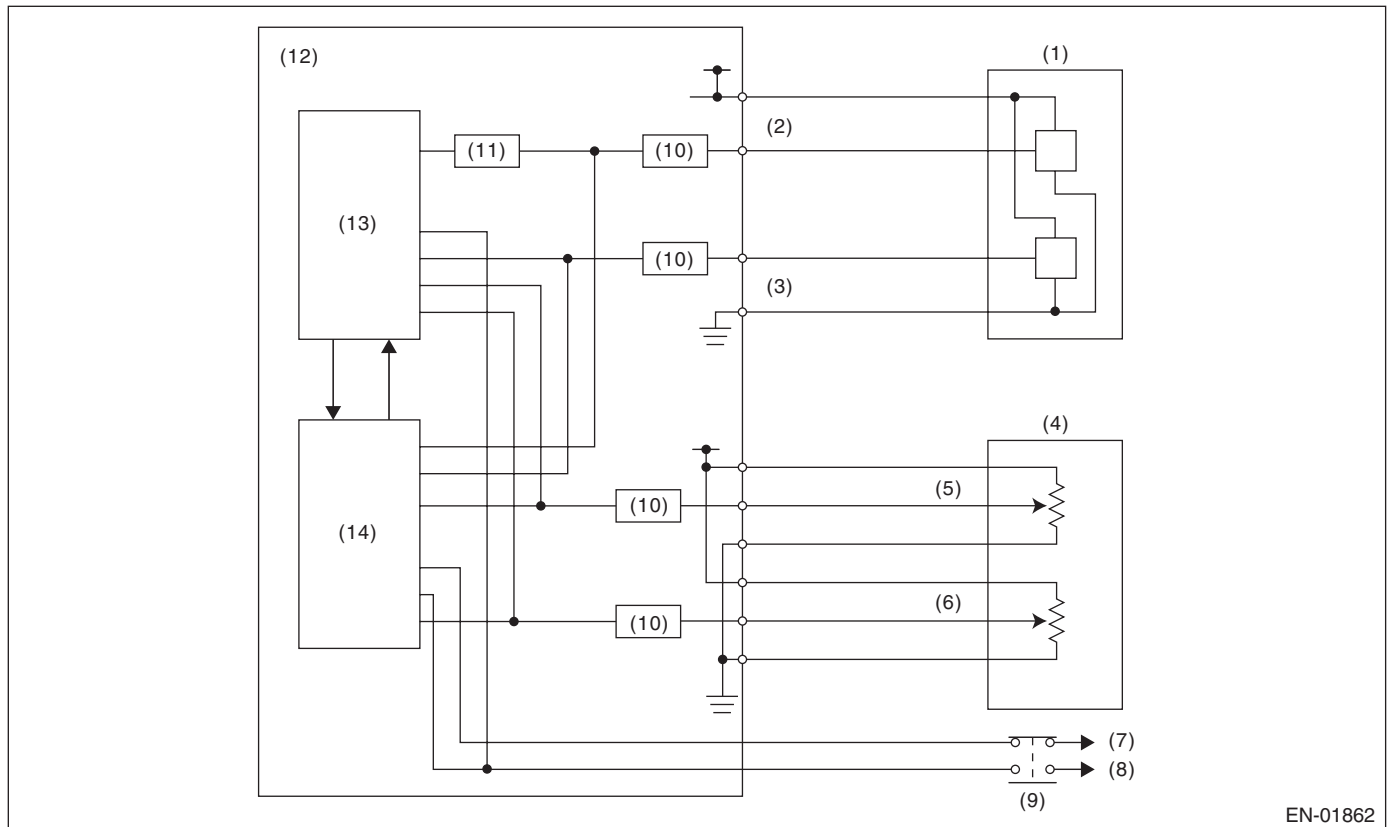
CD:DTC P0607 CONTROL MODULE PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge as NG when either the following is completed.

- When the read value of throttle position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the read value of accelerator pedal position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the sub CPU operates abnormally.
- When the communication between main CPU \leftrightarrow sub CPU is abnormal.
- When the input amplifier circuit of throttle position sensor 1 is abnormal.
- When the cruise control cannot be canceled correctly.
- When the signal of brake SW1 and 2 is mismatched.
- When the directed angle from the main CPU is abnormal.

2. COMPONENT DESCRIPTION



EN-01862

- | | | |
|---|---|----------------------------------|
| (1) Throttle position sensor | (6) Accelerator pedal position sensor 2 | (10) I/F circuit |
| (2) Throttle position sensor 1 | (7) Battery | (11) Amplifier circuit |
| (3) Throttle position sensor 2 | (8) Stop light | (12) Engine control module (ECM) |
| (4) Accelerator pedal position sensor | (9) Brake switch | (13) Sub CPU |
| (5) Accelerator pedal position sensor 1 | | (14) Main CPU |

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
(1) Ignition switch	ON
(2) Ignition switch	ON
(3) None	—
(4) None	—
(5) Throttle opening angle	
(6) Brake switch (only with cruise control)	ON
(7) None	—
(8) Cruise control	OFF

4. GENERAL DRIVING CYCLE

- (1) — (4): Always perform the diagnosis continuously.
- (5): Always perform the diagnosis continuously when idling.
- (6): Perform the diagnosis when the brake pedal is depressed.
- (7): Always perform the diagnosis continuously.
- (8): Always perform the diagnosis continuously when the cruise control pedal is not operating.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
(1) Difference of CPU reading value of the throttle position sensor signal	0.0858 V
(2) Difference of CPU on read value of the accelerator pedal position sensor signal	0.038 V
(3) WD pulse from sub CPU	WD pulse occur
(4) Communication between CPU	Possible to communicate
(5) Throttle position sensor 1 opening angle — (Throttle position sensor 1 opening angle after the amplifier) 1/4	< 3°
(6) Cruise control cancel signal at brake ON	Cruise control cancel signal ON
(7) Brake switch 1, 2 signal	SW 1 and 2 are matched

Time Needed for Diagnosis:

- 1. 250 milliseconds
- 2. 250 milliseconds
- 3. 200 milliseconds
- 4. 200 milliseconds
- 5. 24 milliseconds
- 6. 250 milliseconds
- 7. 200 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

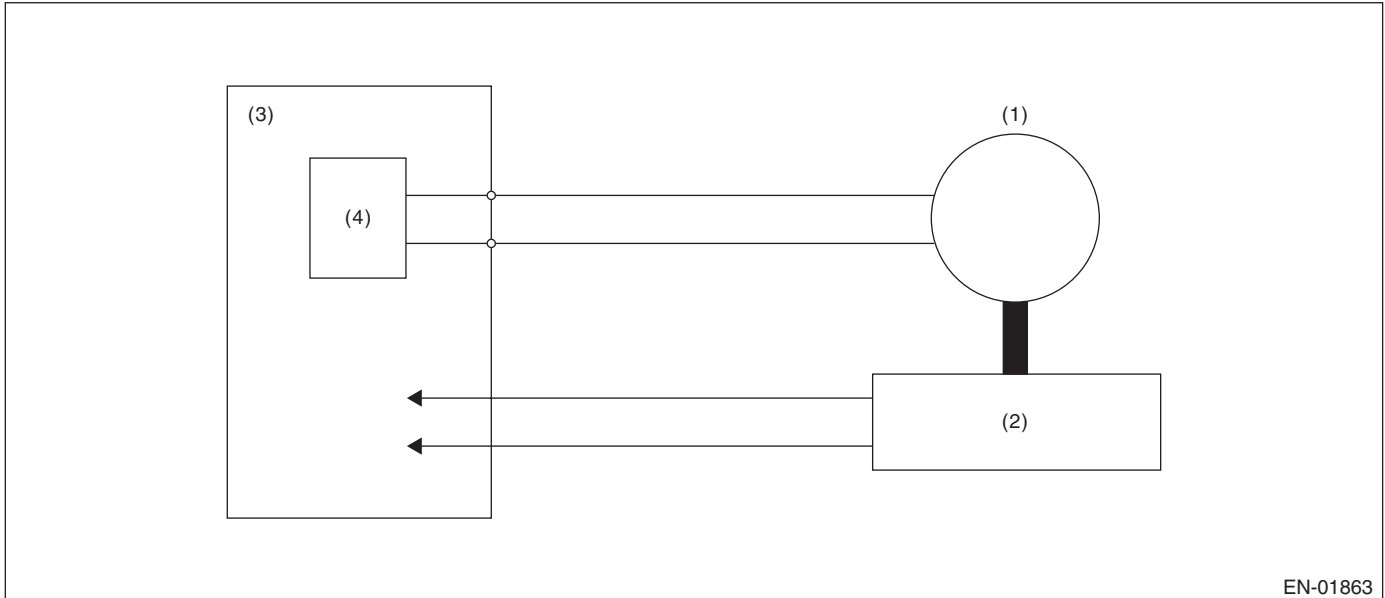
GENERAL DESCRIPTION

CE:DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1)

1. OUTLINE OF DIAGNOSIS

Judge as NG when the target opening angle and actual opening angle is mismatched or the current to motor is more than specified duty for specified time continuously.

2. COMPONENT DESCRIPTION



- (1) Motor
(2) Throttle position sensor
(3) Engine control module (ECM)
(4) Drive circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Normal operation of electric throttle control	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously when the electric throttle control is operating.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

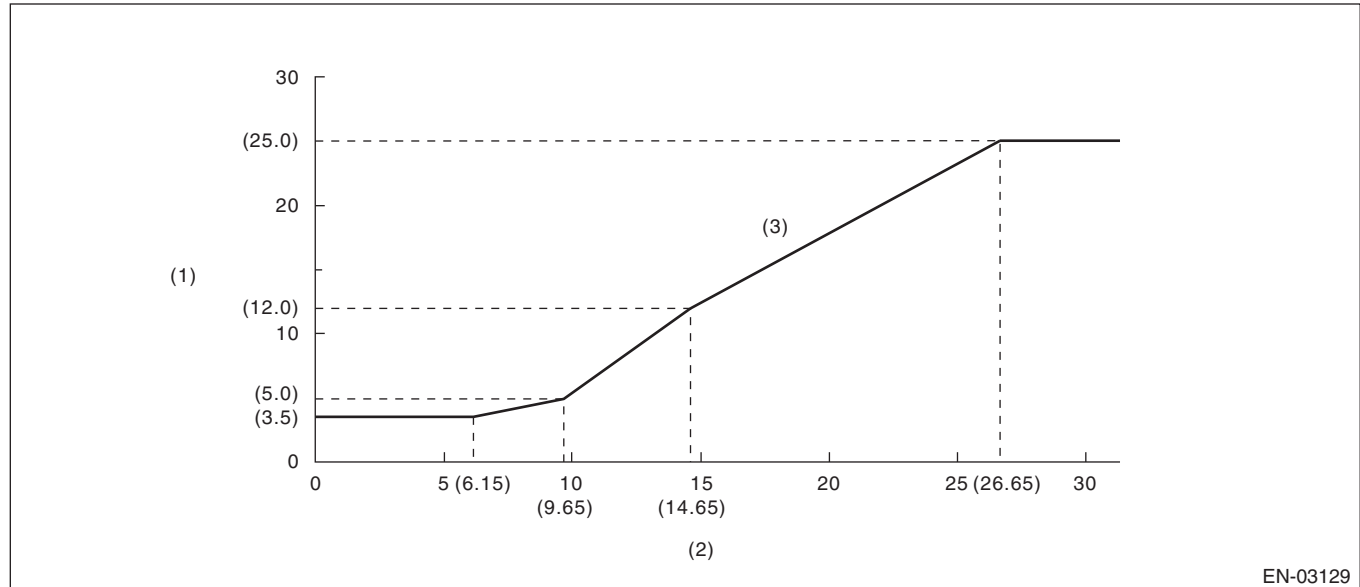
Judgment Value

Malfunction Criteria	Threshold Value
Difference between target opening angle and actual opening angle	3.5° or less
Output duty to drive circuit	95% or less

Time Needed for Diagnosis:

- Target opening angle and actual opening angle: 250 milliseconds (For NG) 2000 milliseconds (For OK)
- Output duty to drive circuit: 2000 milliseconds

Details of Judgment Value

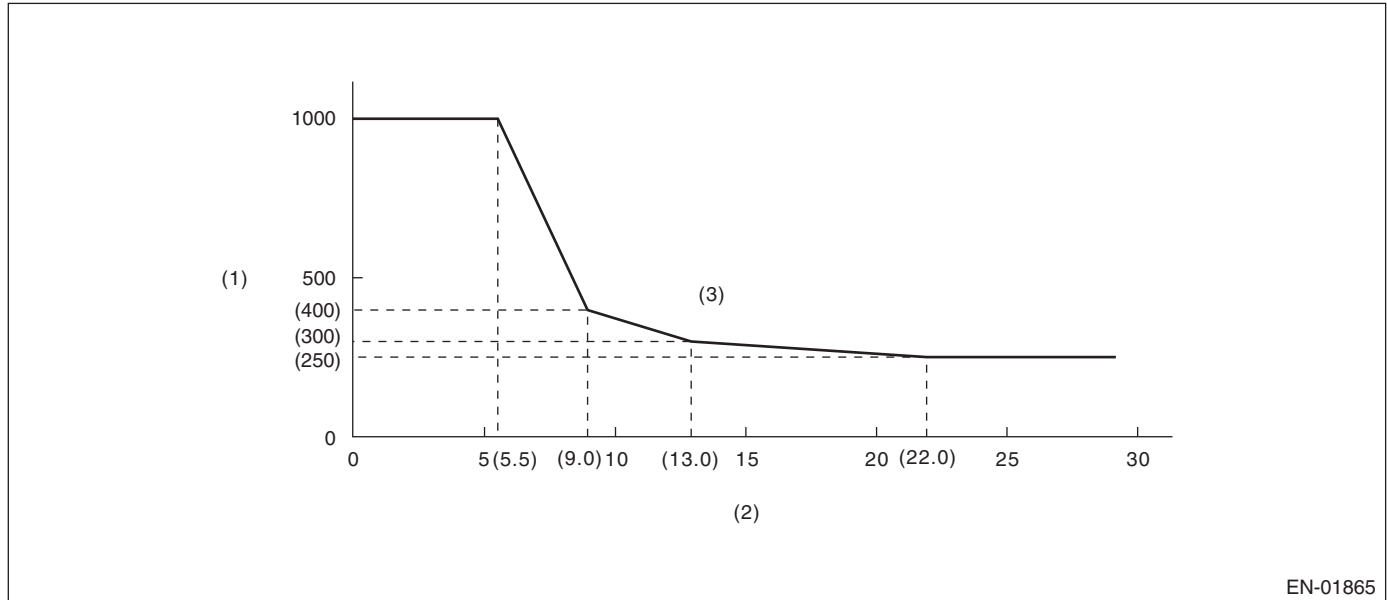


- (1) Difference between target opening angle and actual opening angle (°) (2) Target throttle opening angle (°) (3) NG area

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Details of Judgment (The actual opening angle \leq target opening angle is always 1000 milliseconds)



EN-01865

(1) Judgment time (milliseconds)

(2) Throttle position sensor 1 opening angle

(3) NG area

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

CF:DTC P0691 FAN 1 CONTROL CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of radiator fan circuit.

Judge as NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
After engine starting	1 second or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM outputs OFF signal	Low level

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
After engine starting	1 second or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM outputs OFF signal	High level

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CG:DTC P0692 FAN 1 CONTROL CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of radiator fan circuit.

Judge as NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
After engine starting	1 second or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM outputs ON signal	High level

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
After engine starting	1 second or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM outputs ON signal	Low level

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CH:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

1. OUTLINE OF DIAGNOSIS

CAN communication is established with AT and, judge as NG when there is a MIL lighting request.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than pre-determined amount of time (2.5 seconds).

Judge as OK and clear the NG when the following conditions are not met.

Judgment Value

Malfunction Criteria	Threshold Value
MIL lighting request from TCM	set

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CI: DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the neutral SW.

Judge NG when the ECM neutral terminal input differs from the reception data from TCM.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

4. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 2.56 seconds. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal when park/neutral = "OFF" and any other switches = "ON" on AT	LOW (ON)

Time Needed for Diagnosis: 2.56 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

Control of cruise control: Not allowed to control.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CJ:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the neutral SW.

Judge NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change. Judge as OK and clear the NG if there is change in the neutral SW.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below)	LOW (ON)
Driving condition change	a) to b)
a) Vehicle speed = 0 km/h (0 MPH) and engine speed 600 — 900 rpm	
b) Vehicle speed ≥ 64 km/h (40 MPH) and engine speed 1600 — 2550 rpm	

Time Needed for Diagnosis: Monitoring 3 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

Control of cruise control: Not allowed to control.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CK:DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL)

1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.

Judge NG when the ECM neutral terminal input differs from the reception data from TCM.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

4. DIAGNOSTIC METHOD

Judge as NG when the continuous time until meeting the malfunction criteria below becomes 2.56 seconds.

Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal when park/neutral = "ON" and any other switches = "OFF" on AT	HIGH (OFF)

Time Needed for Diagnosis: 2.56 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

Control of cruise control: Not allowed to control.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CL:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL)

1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.

Judge NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change. Judge as OK and clear the NG if there is change in the neutral SW.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below)	HIGH (OFF)
Driving condition change	a) to b)
a) Vehicle speed = 0 km/h (0 MPH) and engine speed 600 — 900 rpm	
b) Vehicle speed ≥ 64 km/h (40 MPH) and engine speed 1600 — 2550 rpm	

Time Needed for Diagnosis: Monitoring 3 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

Control of cruise control: Not allowed to control.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CM:DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect that λ value remains Low.

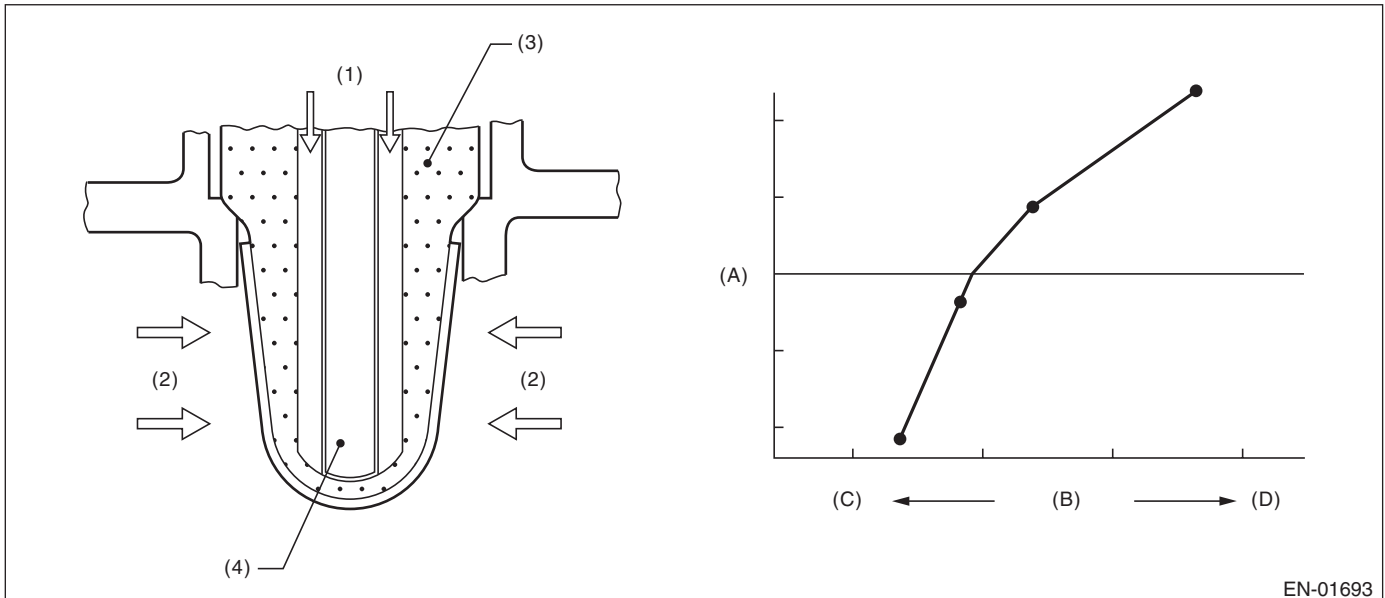
Judge as NG when lambda value is abnormal in accordance with λ value of front oxygen (A/F) sensor and running conditions such as vehicle speed, amount of intake air, engine coolant temperature, sub feedback control, etc.

λ value = Actual air fuel ratio/Theoretical air fuel ratio

$\lambda > 1$: Lean

$\lambda < 1$: Rich

2. COMPONENT DESCRIPTION



EN-01693

- (1) Atmosphere
- (2) Exhaust gas
- (3) ZrO₂
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters enable conditions	4 seconds or more
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Rear oxygen sensor sub feedback	Execution
Rear oxygen sensor output voltage – Feedback target voltage	–0.2 V — 0.1 V
Or rear oxygen sensor sub feedback compensation coefficient	On Min.
Or rear oxygen sensor sub feedback compensation coefficient	On Max.
After engine starting	60 seconds or more
Engine coolant temperature	≥ 75°C (167°F)
Vehicle speed	≥ 20 km/h (12 MPH)
Amount of intake air	≥ 6 g (0.21 oz)/s
Load change during 0.5 engine revs.	≤ 0.02 g (0.001 oz)/rev
Front oxygen (A/F) sensor impedance	0 — 50 Ω
Learning value of evaporation gas density	≤ 0.2
Total time of operating canister purge	20 seconds or more
Target lambda load compensation coefficient	–0.03 — 0

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12 MPH) or more after 60 seconds have passed since the engine started.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 10 seconds. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
λ value when rear oxygen sensor sub feedback compensation coefficient is not at maximum limit	≤ 0.85

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate.
- Front oxygen (A/F) sensor sub learning compensation: Not allowed to calculate.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CN:DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect that λ value remains High.

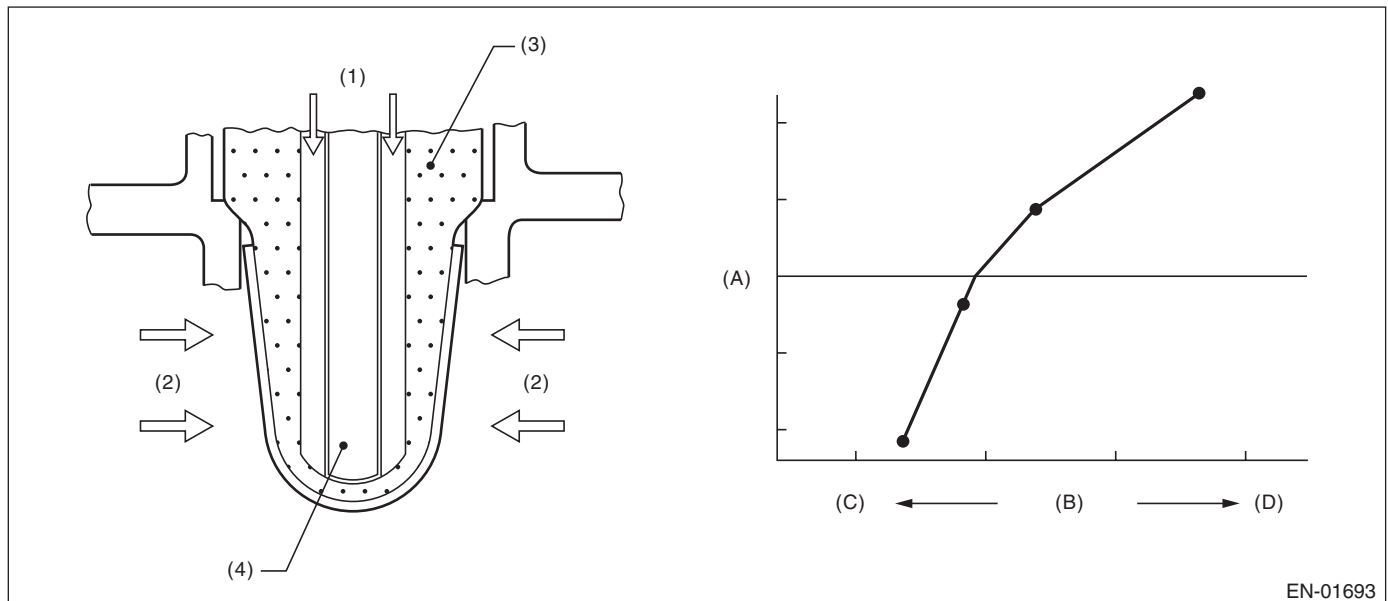
Judge as NG when lambda value is abnormal in accordance with λ value of front oxygen (A/F) sensor and running conditions such as vehicle speed, amount of intake air, engine coolant temperature, sub feedback control, etc.

λ value = Actual air fuel ratio/Theoretical air fuel ratio

$\lambda > 1$: Lean

$\lambda < 1$: Rich

2. COMPONENT DESCRIPTION



EN-01693

- (1) Atmosphere
- (2) Exhaust gas
- (3) ZrO₂
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters enable conditions	4 seconds or more
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Rear oxygen sensor sub feedback	Execution
Rear oxygen sensor output voltage – Feedback target voltage	–0.2 V — 0.1 V
Or rear oxygen sensor sub feedback compensation coefficient	On Min.
Or rear oxygen sensor sub feedback compensation coefficient	On Max.
After engine starting	60 seconds or more
Engine coolant temperature	≥ 75°C (167°F)
Vehicle speed	≥ 20 km/h (12 MPH)
Amount of intake air	≥ 6 g (0.21 oz)/s
Load change during 0.5 engine revs.	≤ 0.02 g (0.001 oz)/rev
Front oxygen (A/F) sensor impedance	0 — 50 Ω
Learning value of evaporation gas density	≤ 0.2
Total time of operating canister purge	20 seconds or more
Target lambda load compensation coefficient	–0.03 — 0

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant vehicle speed of 20 km/h (12 MPH) or more after 60 seconds have passed since the engine started.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 10 seconds. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
λ value when rear oxygen sensor sub feedback compensation coefficient cannot be at minimum limit	≥ 1.15

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate.
- Front oxygen (A/F) sensor sub learning compensation: Not allowed to calculate.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

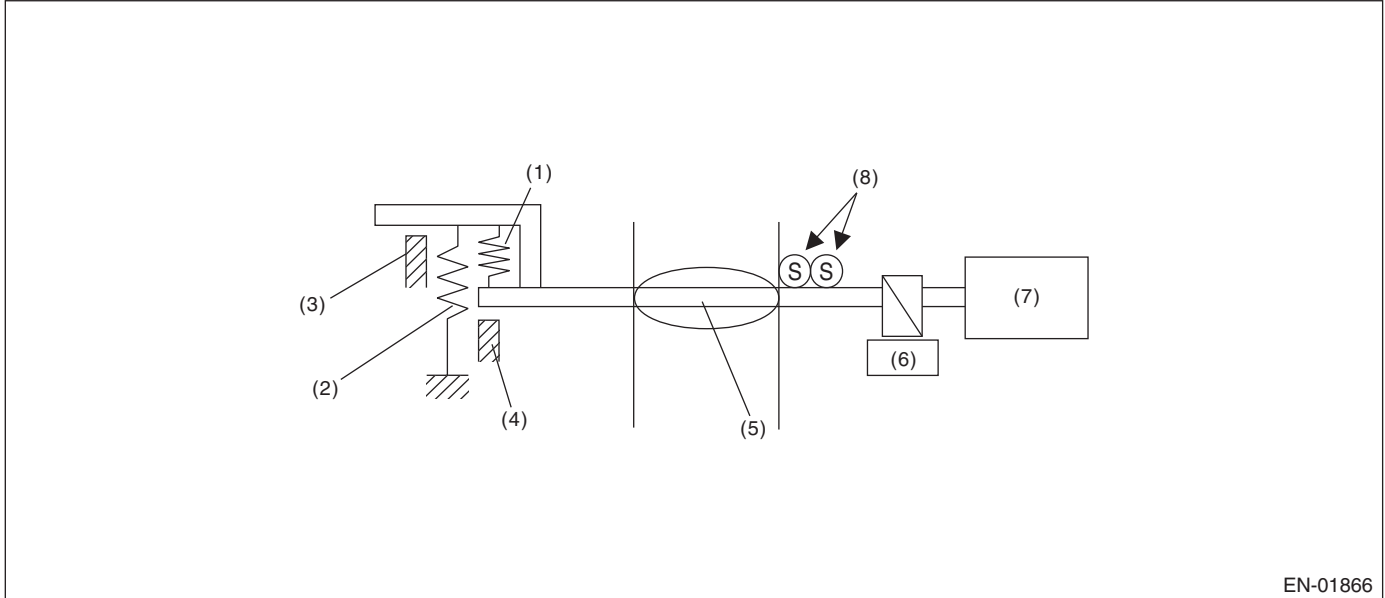
GENERAL DESCRIPTION

CO:DTC P1160 RETURN SPRING FAILURE

1. OUTLINE OF DIAGNOSIS

Judge as NG when the valve does not move to the close direction with the motor power stopped and the valve open more than the default opening.

2. COMPONENT DESCRIPTION



- | | | |
|--------------------------|-------------------------|----------------------------------|
| (1) Opener spring | (4) Full closed stopper | (7) DC motor |
| (2) Return spring | (5) Throttle valve | (8) Main and sub throttle sensor |
| (3) Intermediate stopper | (6) Gear | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle opening angle	OFF
Motor continuity	OFF

4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (Only after clearing memory)

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Opening variation after continuity is set to OFF	$\geq 2^\circ$

Time Needed for Diagnosis: 1880 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

8. FAIL SAFE

Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

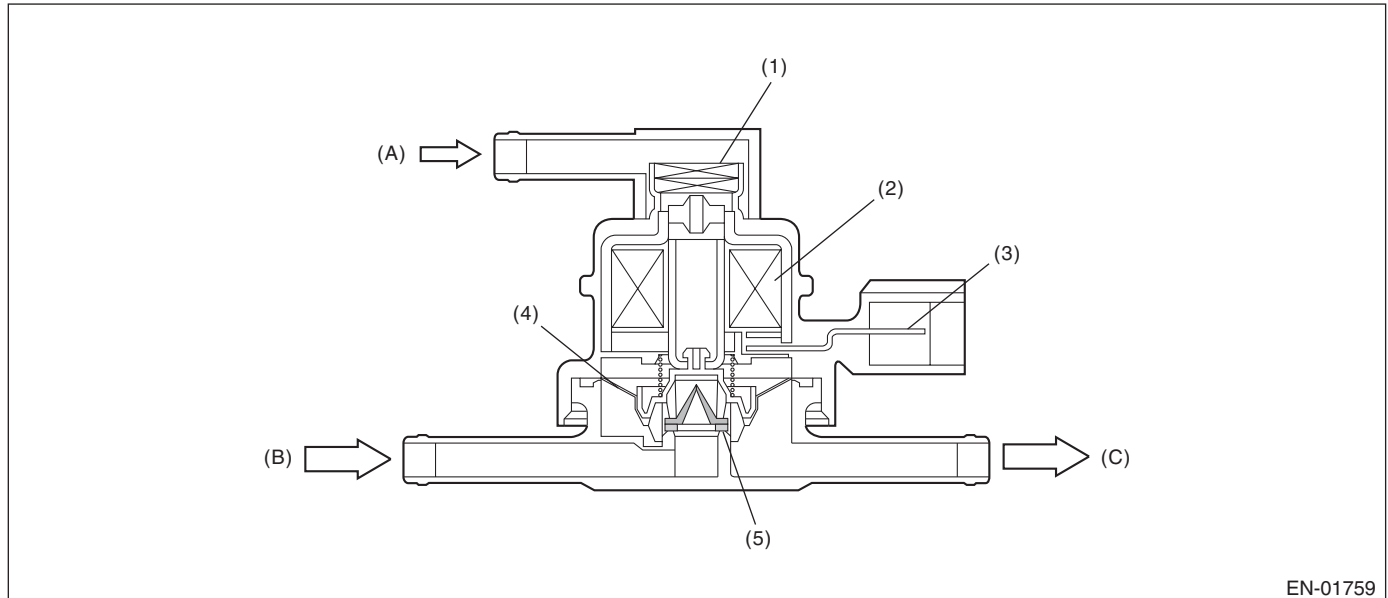
CP:DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of pressure control solenoid valve.

Judge as NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



EN-01759

- | | | |
|------------------------|---------------|--------------------------|
| (1) Filter | (4) Diaphragm | (A) Atmospheric pressure |
| (2) Coil | (5) Valve | (B) Shut-off valve |
| (3) Connector terminal | | (C) To fuel tank |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

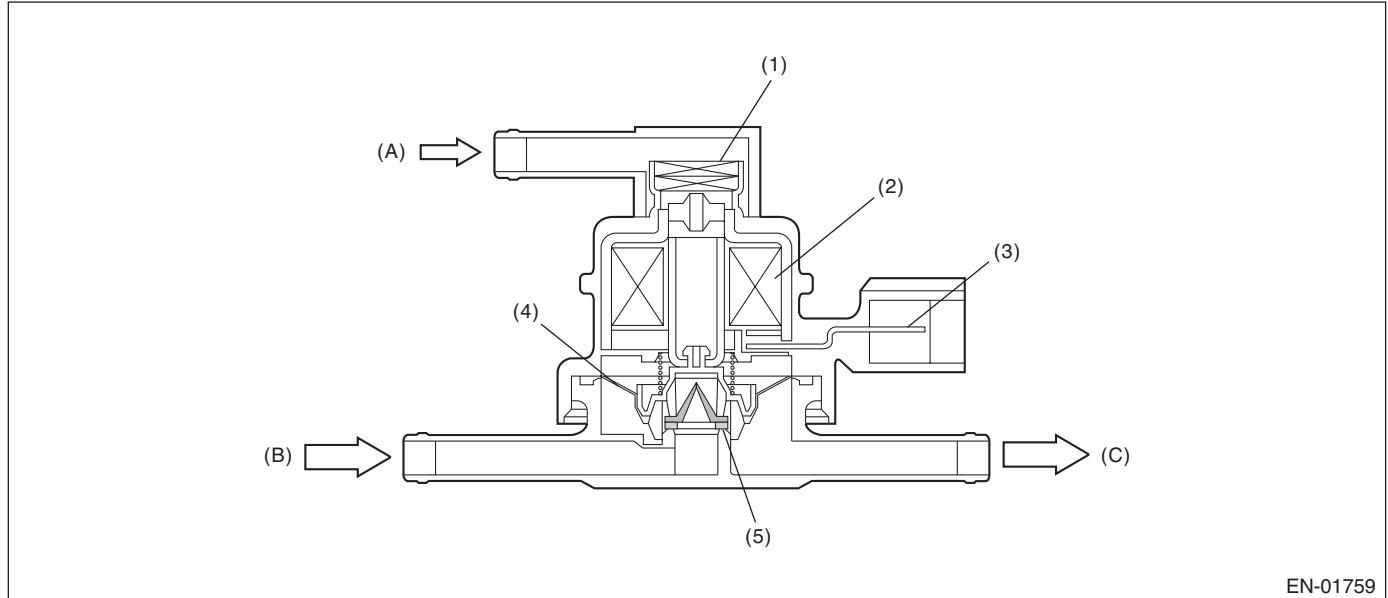
CQ:DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of pressure control solenoid valve.

Judge as NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



- | | | |
|------------------------|---------------|--------------------------|
| (1) Filter | (4) Diaphragm | (A) Atmospheric pressure |
| (2) Coil | (5) Valve | (B) Shut-off valve |
| (3) Connector terminal | | (C) To fuel tank |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

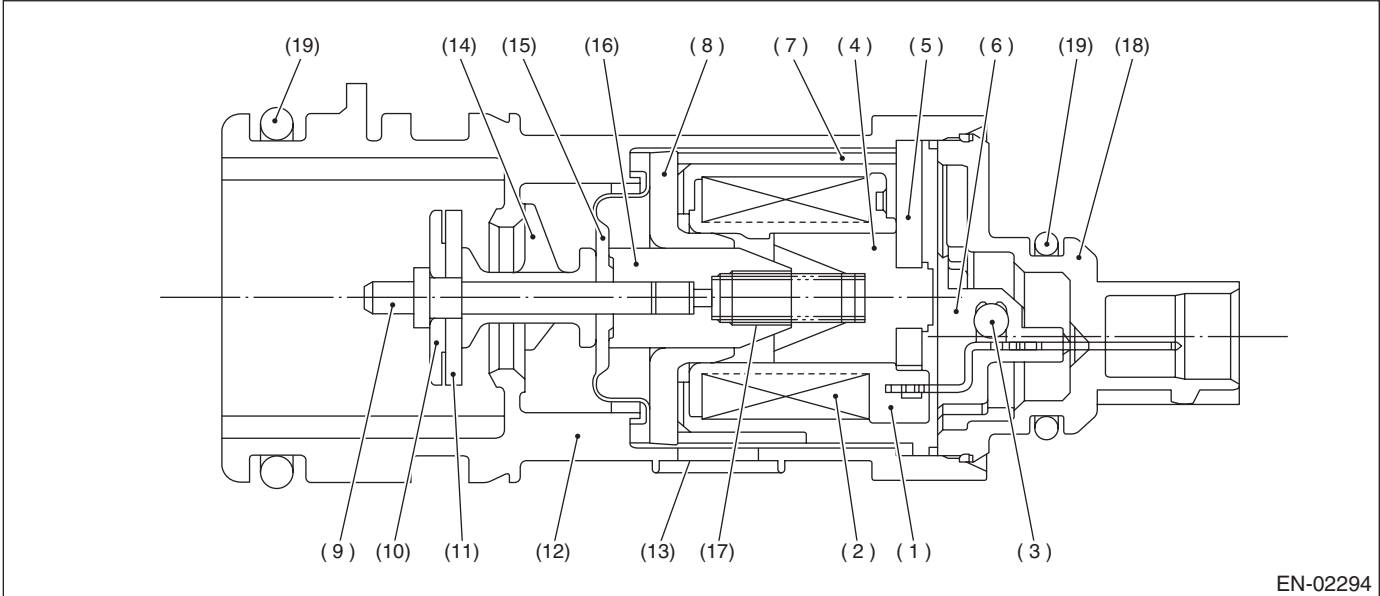
GENERAL DESCRIPTION

CR:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

1. OUTLINE OF DIAGNOSIS

Detect the abnormal function (stuck closed) of the drain valve.
Judge as NG when fuel tank pressure is low.

2. COMPONENT DESCRIPTION



- | | | |
|-----------------|--------------------|-------------------|
| (1) Bobbin | (8) Magnetic plate | (15) Diaphragm |
| (2) Coil | (9) Shaft | (16) Movable core |
| (3) Diode | (10) Plate | (17) Spring |
| (4) Stator core | (11) Valve | (18) Cover |
| (5) End plate | (12) Housing | (19) O-ring |
| (6) Body | (13) Filter | |
| (7) Yoke | (14) Retainer | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Drain valve	Open
Battery voltage	≥ 10.9 V
Atmospheric pressure	≥ 75.0 kPa (563 mmHg, 22.17 inHg)
Tank pressure when starter is OFF → ON	$-0.7 \sim 1.4$ kPa ($-5 \sim 10.7$ mmHg, $-0.20 \sim 0.42$ inHg)

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time while meeting all of the malfunction criteria below is more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tank pressure	≤ -4.0 kPa (-30 mmHg, -1.18 inHg)

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when all the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Tank pressure	> -4.0 kPa (-30 mmHg, -1.18 inHg)
Cumulative time when all of the malfunction criteria below is completed.	≥ 30 sec.
Purge control solenoid valve duty ratio	Not = 0
Fuel temp.	-10 — 45°C (14 — 113°F)
Intake manifold relative pressure	≤ -26.7 kPa (-200 mmHg, -7.87 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Pressure control solenoid valve control: Open the pressure control solenoid valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

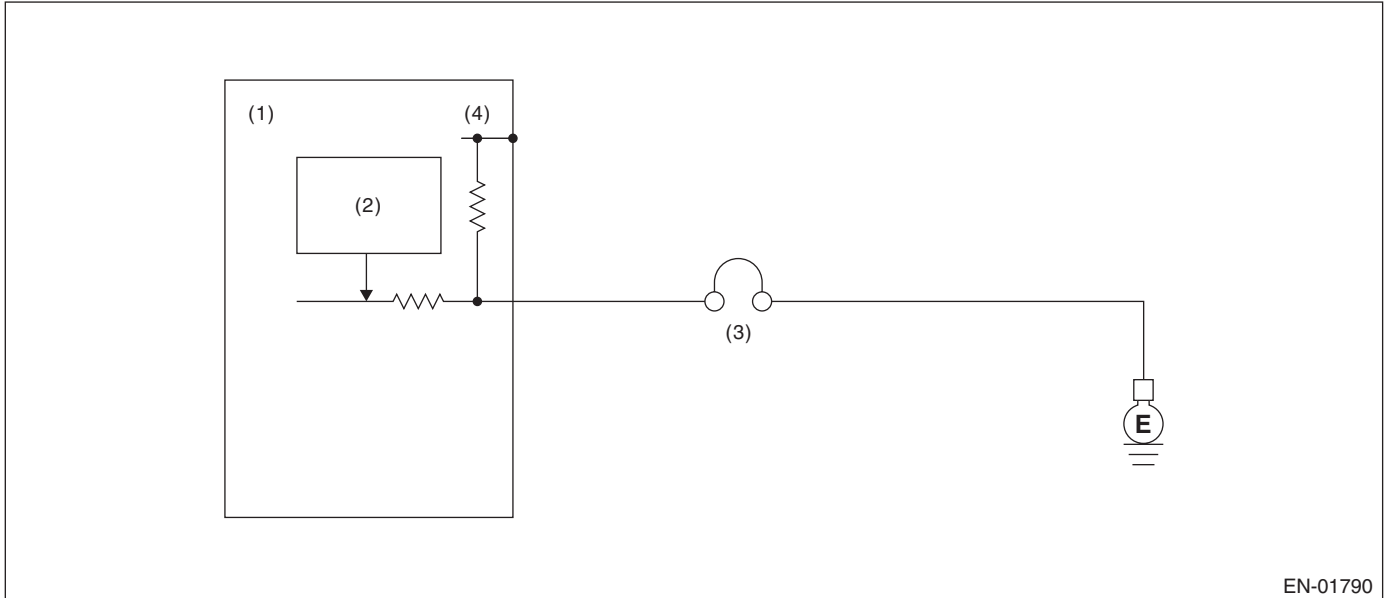
CS:DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM

1. OUTLINE OF DIAGNOSIS

Detect the blow-by hose release abnormality.

Judge as NG when the diagnosis terminal voltage is high.

2. COMPONENT DESCRIPTION



EN-01790

- (1) Engine control module (ECM) (3) PCV diagnosis connector
(2) Detecting circuit (4) 5 V

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time with the following criteria established exceeds 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Engine speed	≥ 500 rpm
Positive crankcase ventilation diagnosis voltage	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK when the following conditions are established after predetermined amount of time has passed.
Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Engine speed	≥ 500 rpm
Positive crankcase ventilation diagnosis voltage	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

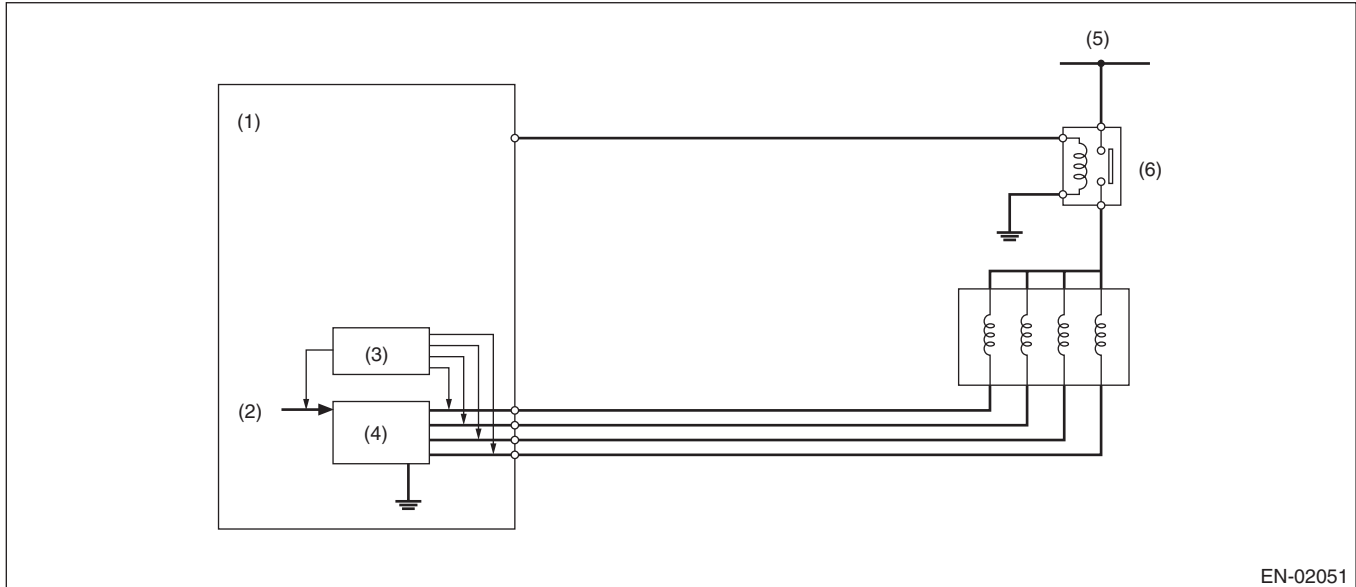
GENERAL DESCRIPTION

CT:DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT)

1. OUTLINE OF DIAGNOSIS

- Detects open or short circuit of EGR.
- Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



EN-02051

- (1) Engine control module (ECM) (3) Detecting circuit (5) Battery voltage
(2) Computer unit (CPU) (4) Switch circuit (6) Main relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
EGR valve target position	> 0 step
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously during EGR operation.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time with the following criteria established exceeds the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	Low level

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs OFF signal	High level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate.
- Knock sensor learning compensation: Not allowed to calculate.
- EGR control: Not allowed to operate.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

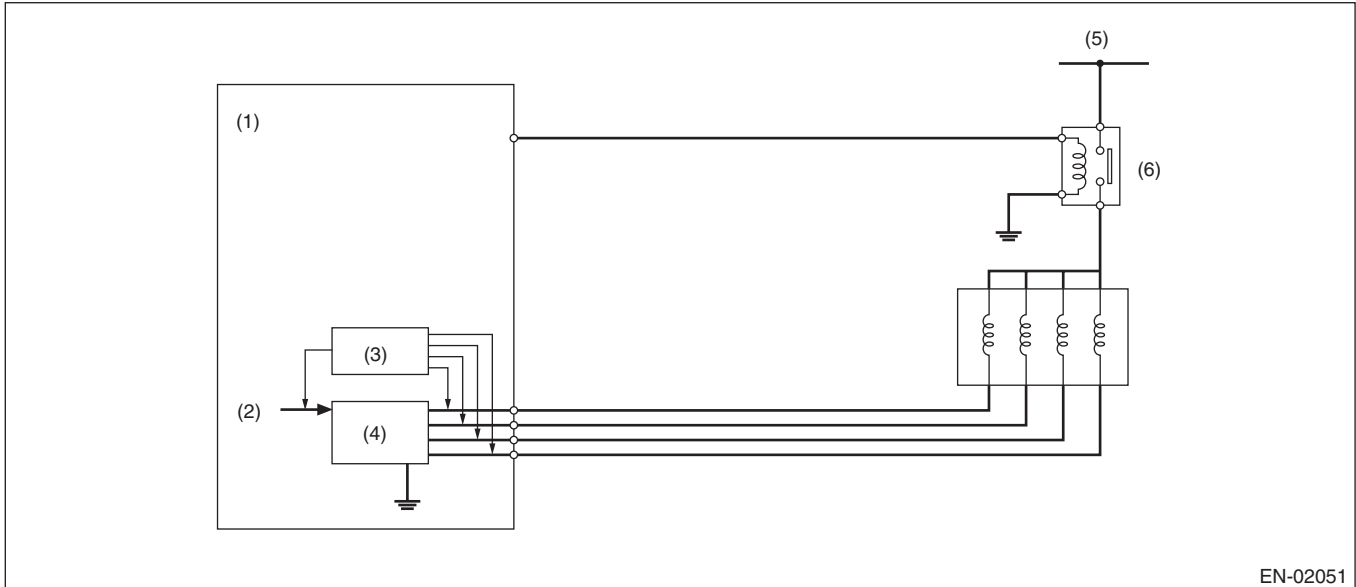
GENERAL DESCRIPTION

CU:DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT)

1. OUTLINE OF DIAGNOSIS

- Detects open or short circuit of EGR.
- Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



(1) Engine control module (ECM)

(3) Detecting circuit

(5) Battery voltage

(2) Computer unit (CPU)

(4) Switch circuit

(6) Main relay

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
EGR valve target position	> 0 step

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time with the following criteria established exceeds the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	High level

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal voltage level when ECM outputs ON signal	Low level

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate.
- Knock sensor learning compensation: Not allowed to calculate.
- EGR control: Not allowed to operate.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CV:DTC P1494 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (LOW INPUT)

NOTE:

For the detection conditions, refer to DTC P1492. <Ref. to GD(H4SO)-196, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CW:DTC P1495 EGR SOLENOID VALVE SIGNAL #2 CIRCUIT MALFUNCTION (HIGH INPUT)

NOTE:

For the detection conditions, refer to DTC P1493. <Ref. to GD(H4SO)-198, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CX:DTC P1496 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (LOW INPUT)

NOTE:

For the detection conditions, refer to DTC P1492. <Ref. to GD(H4SO)-196, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CY:DTC P1497 EGR SOLENOID VALVE SIGNAL #3 CIRCUIT MALFUNCTION (HIGH INPUT)

NOTE:

For the detection conditions, refer to DTC P1493. <Ref. to GD(H4SO)-198, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CZ:DTC P1498 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (LOW INPUT)

NOTE:

For the detection conditions, refer to DTC P1492. <Ref. to GD(H4SO)-196, DTC P1492 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (LOW INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

DA:DTC P1499 EGR SOLENOID VALVE SIGNAL #4 CIRCUIT MALFUNCTION (HIGH INPUT)

NOTE:

For the detection conditions, refer to DTC P1493. <Ref. to GD(H4SO)-198, DTC P1493 EGR SOLENOID VALVE SIGNAL #1 CIRCUIT MALFUNCTION (HIGH INPUT), Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DB:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.

Judge as OFF NG when the engine starts without starter ON experience.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as OFF NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 1 km/h (1 MPH)
Starter ON signal	Not detected
engine speed, after engine speed of less than 500 rpm continues for more than 0.8 seconds.	≥ 500 rpm

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OFF OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Starter ON	Experienced
Battery voltage	> 8 V

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DC:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of back-up power supply circuit.

Judge as NG when the backup voltage becomes smaller than the battery voltage.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time with the following criteria established exceeds 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	Low
Battery voltage	≥ 10.9 V
Engine speed	≥ 500 rpm

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	High
Battery voltage	≥ 10.9 V
Engine speed	≥ 500 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DD:DTC P1602 CONTROL MODULE PROGRAMMING ERROR

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of catalytic converter initial warm-up retard angle control.

Judge as NG if the ECM is not operating properly when performing catalytic converter initial warm-up retard angle control.

Judge as NG when judged NG in either or both diagnosis of exhaust temperature and diagnosis of idle speed.

- Diagnosis of exhaust temperature

Judge as NG if the exhaust temperature is below the specified value at 14 seconds after a cold start.

- Diagnosis of idle speed

Judge as NG when actual engine speed is not close to target engine speed after stopping retard angle control.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Battery voltage	> 10.9 V
Diagnosis of cold start	Incomplete
Engine	Start
Vehicle speed	≤ 2 km/h (1 MPH)
Misfire during 200 engine revs.	< 5
Time elapsed after engine start	= 14 seconds

3. GENERAL DRIVING CYCLE

Diagnose at cold start.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. DIAGNOSTIC METHOD

- Diagnosis of exhaust temperature

Abnormality Judgment

Calculate the estimated exhaust temperature when the enable conditions for judgment were established. Judge as NG if the following conditions are established within 14 seconds after starting the engine.

Judgment Value

Malfunction Criteria	Threshold Value
Estimated exhaust temperature	< Value from Map 1

Map 1

Engine coolant temperature at start °C (°F)	-40 (-40)	-30 (-22)	-20 (-4)	-10 (-14)	0 (32)	10 (50)	20 (68)	30 (86)	40 (104)	50 (122)
Threshold value AT model °C (°F)	152 (306)	152 (306)	152 (306)	152 (306)	152 (306)	143 (289)	135 (275)	127 (261)	121 (250)	118 (244)
Threshold value MT model °C (°F)	135 (275)	135 (275)	135 (275)	135 (275)	135 (275)	135 (275)	134 (273)	129 (264)	126 (259)	119 (246)

Time Needed for Diagnosis: 14 seconds

Malfunction indicator light: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgement

Judge as OK when the following conditions are established after predetermined amount of time has passed.

Judgment Value

Malfunction Criteria	Threshold Value
Estimated exhaust temperature	≥ Value from Map 1

- Diagnosis of idle speed

Judges NG when all of the following conditions are established, and judge as OK if they are not established.

Malfunction Criteria	Threshold Value
Continuous time of (target engine RPM – engine RPM > 300)	≥ 10000 ms
(actual retard amount > AT model:18°C A, MT model:13°C A)	≥ 3000 ms

Time Needed for Diagnosis: 6 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

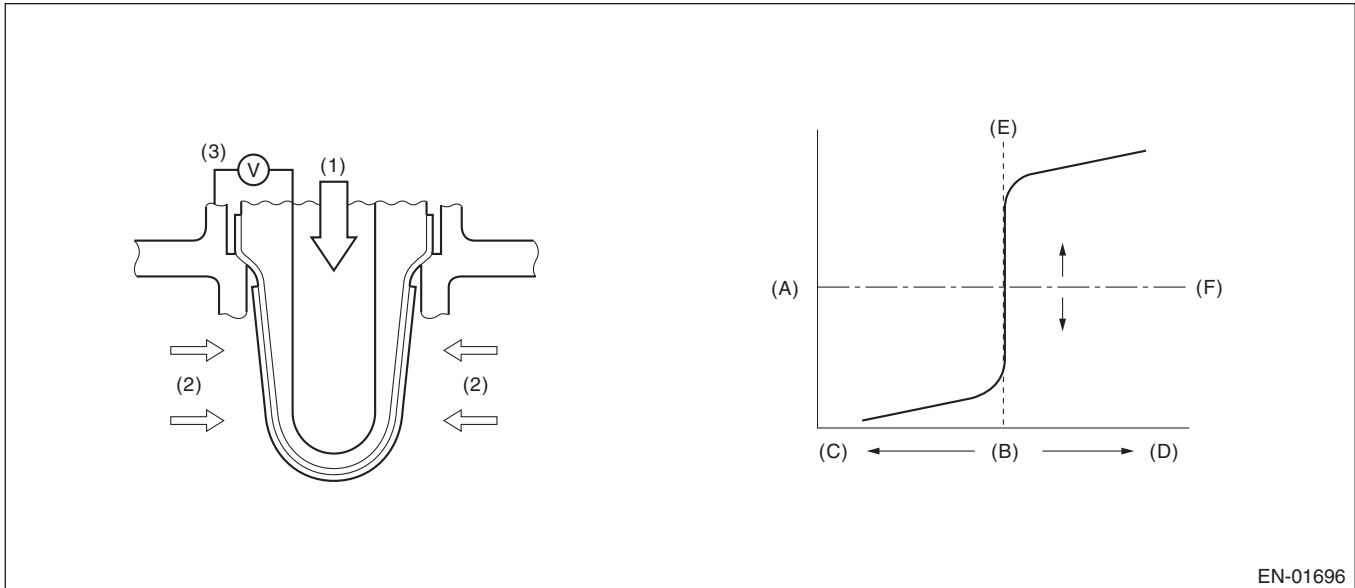
DE:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the amount of sub feedback control.

Judge as NG when the sub feedback learning control is being performed and when the learning value goes to the lean side.

2. COMPONENT DESCRIPTION



EN-01696

- | | | |
|-------------------------|-------------------------|--------------------------------|
| (1) Atmosphere | (A) Electromotive force | (D) Lean |
| (2) Exhaust gas | (B) Air fuel ratio | (E) Theoretical air fuel ratio |
| (3) Electromotive force | (C) Rich | (F) Comparative voltage |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Continuous time when the following conditions are established	1 second or more
Sub feedback learning execution conditions	Completed

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant speed of 50 — 100 km/h (31 — 62 MPH).

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 5 seconds or more. Judge as OK when the continuous time of not meeting the malfunction criteria below becomes 5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	≤ -0.02

Time Needed for Diagnosis: 5 seconds × 1 time

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When similar driving conditions are repeated 3 times and the result is OK.
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

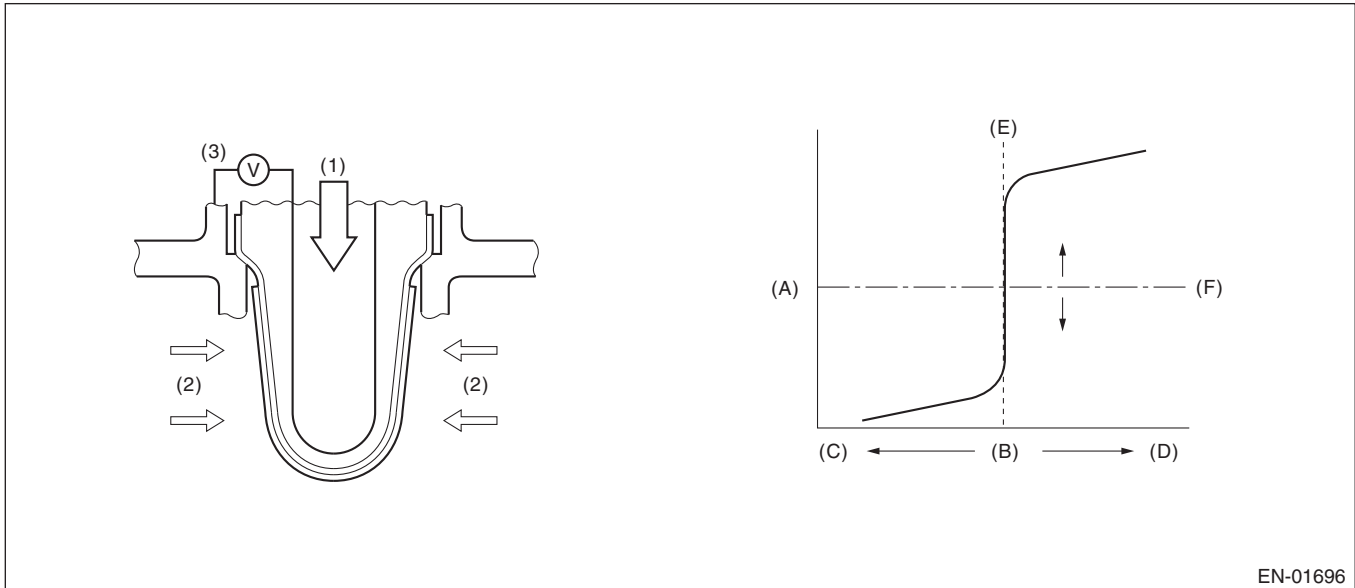
DF:DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel system from the amount of sub feedback control.

Judge as NG when the sub feedback learning control is being performed and when the learning value goes to the rich side.

2. COMPONENT DESCRIPTION



EN-01696

- | | | |
|-------------------------|-------------------------|--------------------------------|
| (1) Atmosphere | (A) Electromotive force | (D) Lean |
| (2) Exhaust gas | (B) Air fuel ratio | (E) Theoretical air fuel ratio |
| (3) Electromotive force | (C) Rich | (F) Comparative voltage |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Continuous time when the following conditions are established	1 second or more
Sub feedback learning execution conditions	Completed

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant speed of 50 — 100 km/h (31 — 62 MPH).

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 5 seconds or more. Judge as OK when the continuous time of not meeting the malfunction criteria below becomes 5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	≥ 0.038

Time Needed for Diagnosis: 5 seconds × 1 time

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When similar driving conditions are repeated 3 times and the result is OK.
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

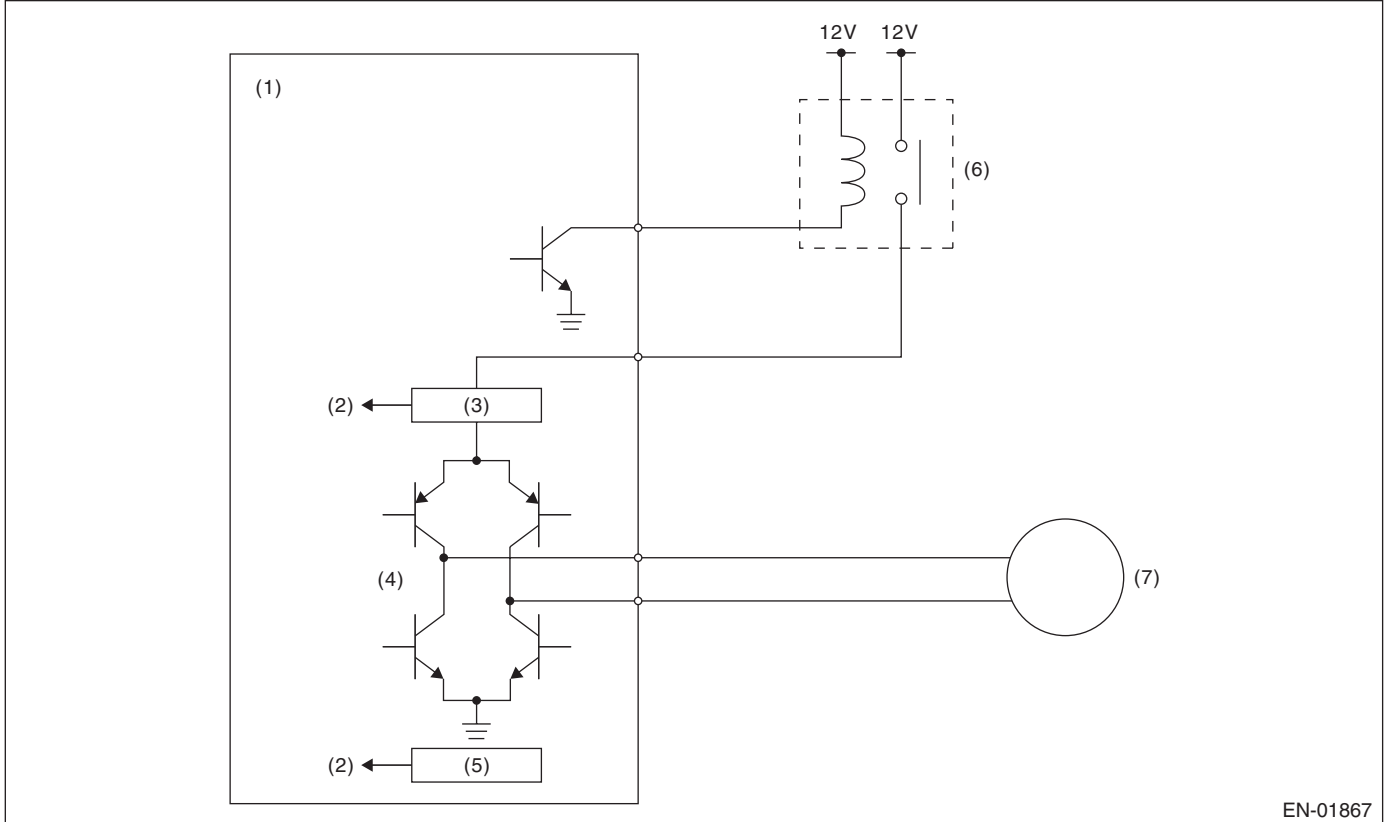
Memorize the freeze frame data. (For test mode \$02)

DG:DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/ PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge as NG when the motor current becomes too large or drive circuit is heated.

2. COMPONENT DESCRIPTION



EN-01867

- | | | |
|-----------------------------------|-----------------------------------|---------------------------------------|
| (1) Engine control module (ECM) | (4) Drive circuit | (6) Electronic throttle control relay |
| (2) Detecting circuit | (5) Temperature detection circuit | (7) Motor |
| (3) Overcurrent detection circuit | | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Under control of electronic throttle control	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Motor current	$\leq 8 \text{ A}$
Drive circuit inner temperature	$\leq 175^{\circ}\text{C}$ (347°F)

Time Needed for Diagnosis:

- 500 milliseconds (For NG)
- 2000 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

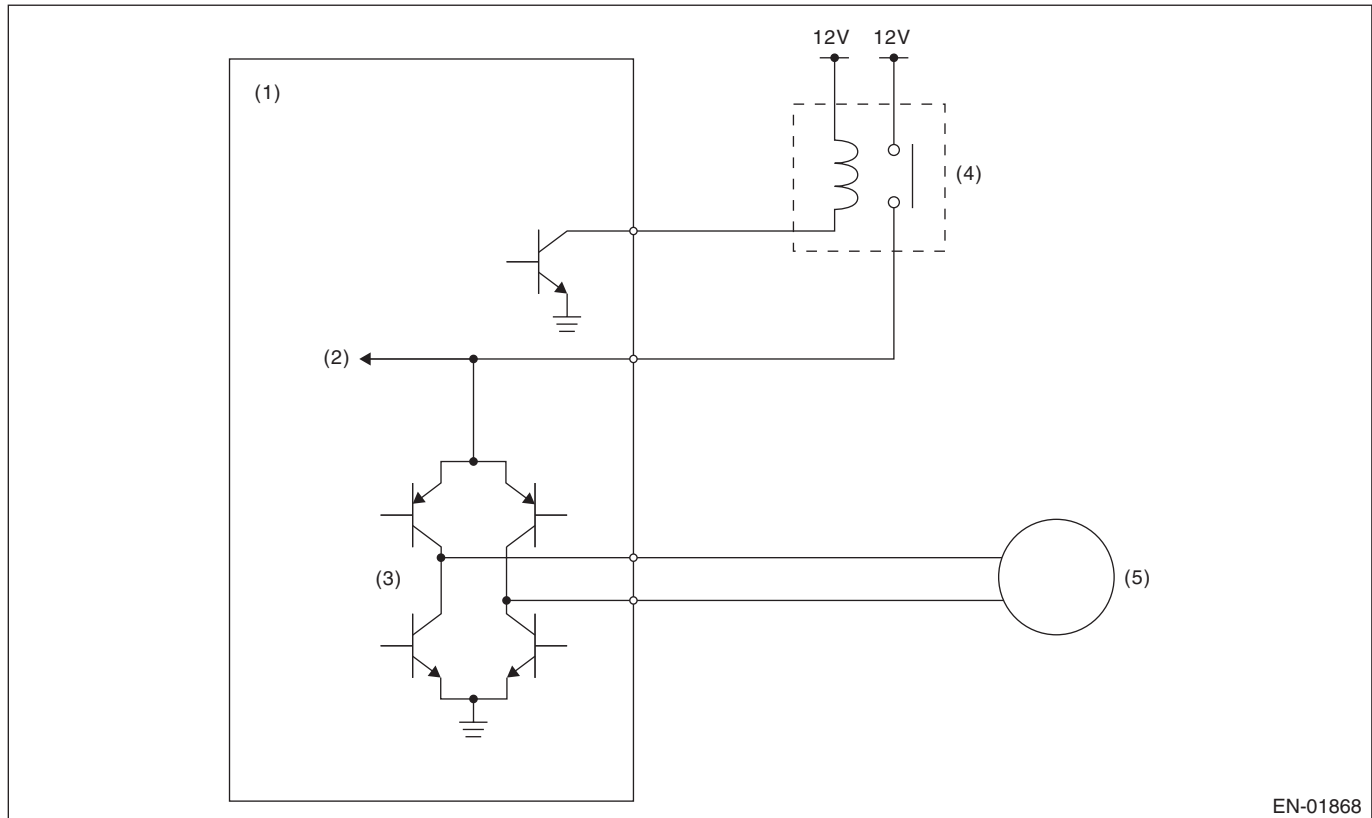
Memorize the freeze frame data. (For test mode \$02)

DH:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Judge as NG when the electronic throttle control power is not supplied even when ECM sets the electronic throttle control relay to ON.

2. COMPONENT DESCRIPTION



EN-01868

- | | | |
|---------------------------------|---------------------------------------|-----------|
| (1) Engine control module (ECM) | (3) Drive circuit | (5) Motor |
| (2) Voltage detection circuit | (4) Electronic throttle control relay | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Electronic throttle control relay output	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	≥ 5 V

Time Needed for Diagnosis:

- 400 milliseconds (For NG)
- 2000 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

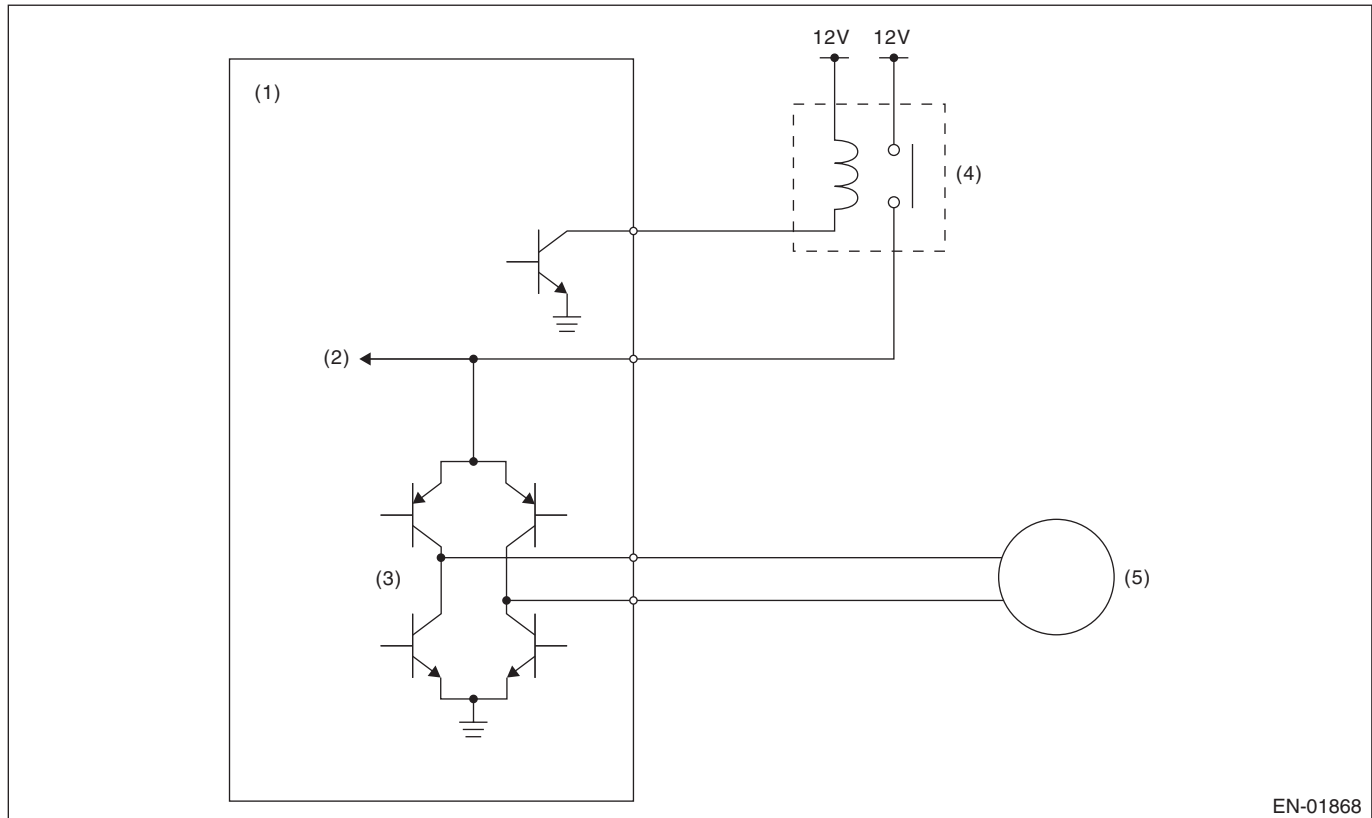
Memorize the freeze frame data. (For test mode \$02)

DI: DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Judge as NG when the electronic throttle control power is supplied even when ECM sets the electronic throttle relay to OFF.

2. COMPONENT DESCRIPTION



EN-01868

- | | | |
|---------------------------------|---------------------------------------|-----------|
| (1) Engine control module (ECM) | (3) Drive circuit | (5) Motor |
| (2) Voltage detection circuit | (4) Electronic throttle control relay | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Electronic throttle control relay output	OFF

4. GENERAL DRIVING CYCLE

- When ignition switch ON → OFF
- Ignition switch OFF → ON (Only after clearing memory)

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	≤ 5 V

Time Needed for Diagnosis:

- 600 milliseconds (For NG)
- 400 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

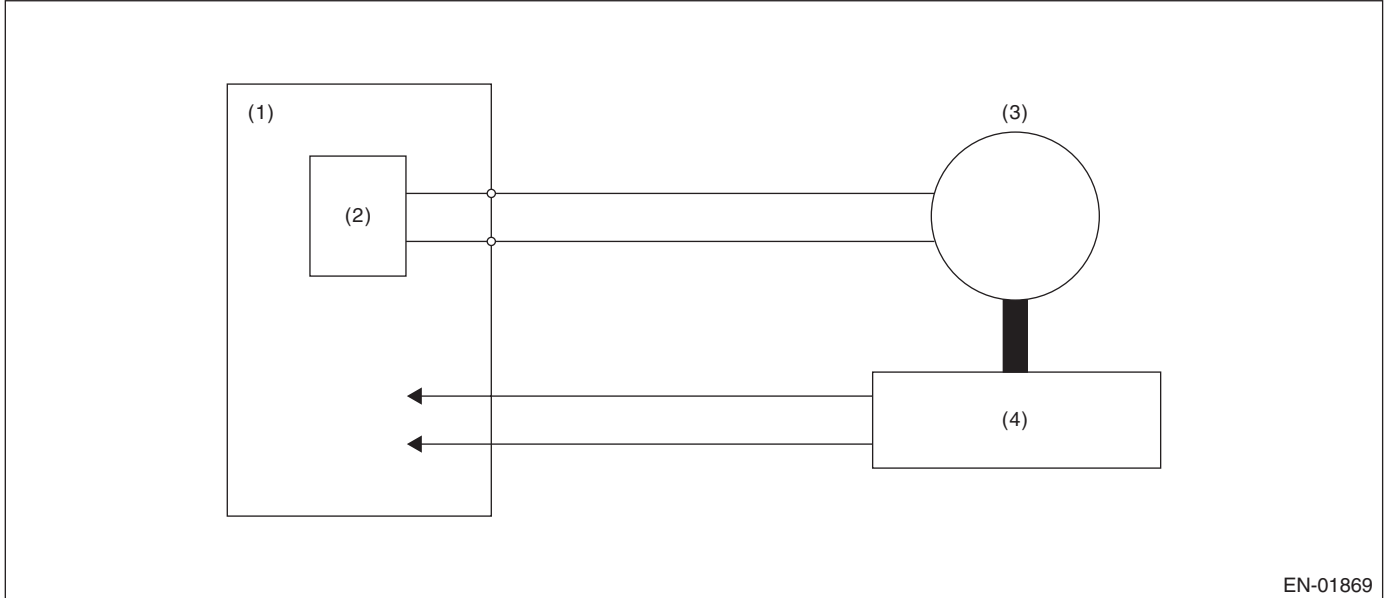
Memorize the freeze frame data. (For test mode \$02)

DJ:DTC P2109 THROTTLE/PEDAL POSITION SENSOR “A” MINIMUM STOP PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge as NG when all close point learning cannot conducted or abnormal value is detected.

2. COMPONENT DESCRIPTION



- | | |
|---------------------------------|------------------------------|
| (1) Engine control module (ECM) | (3) Motor |
| (2) Drive circuit | (4) Throttle position sensor |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON → OFF
Ignition switch (only after cleaning the memory)	OFF → ON

4. GENERAL DRIVING CYCLE

Perform the diagnosis at all close point learning.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Throttle opening angle at all close point learning	10.127° or more, 19.872° or less
Throttle sensor opening angle when the ignition switch is ON – Throttle minimum stop position	≥ 1.683°

Time Needed for Diagnosis: 8 — 80 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

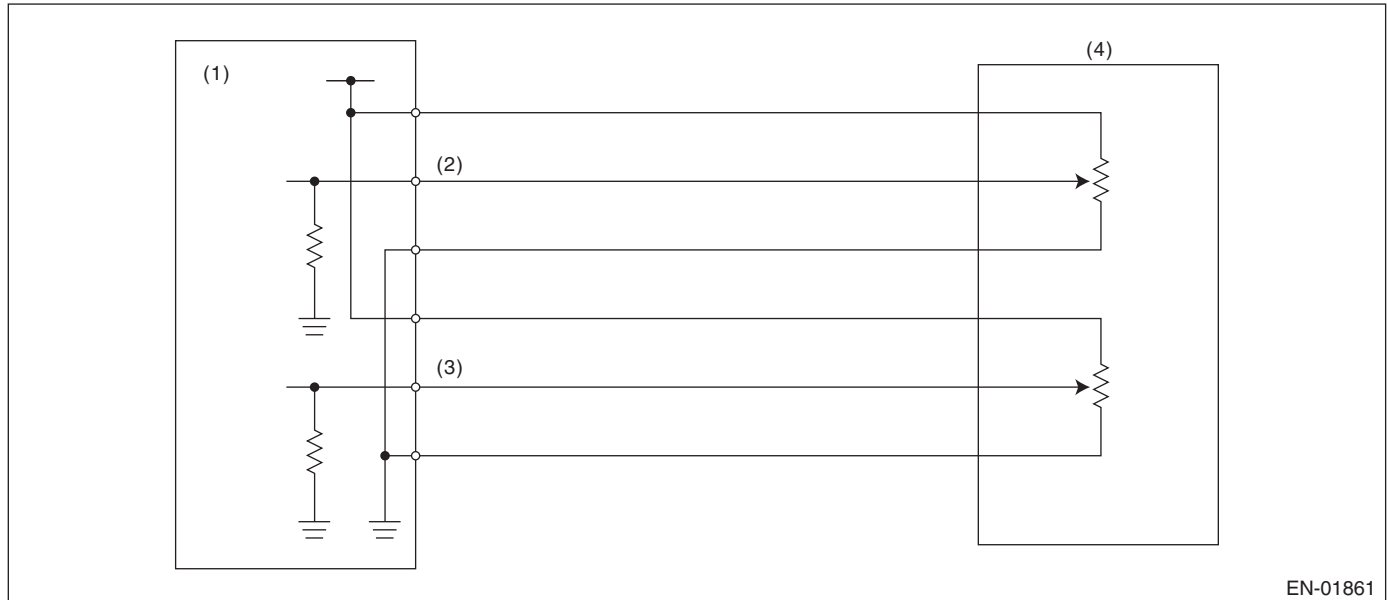
DK:DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 1.

Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



- | | | |
|--|--|---------------------------------------|
| (1) Engine control module (ECM) | (3) Accelerator pedal position sensor 2 signal | (4) Accelerator pedal position sensor |
| (2) Accelerator pedal position sensor 1 signal | | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 0.308 V

Time Needed for Diagnosis: 100 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

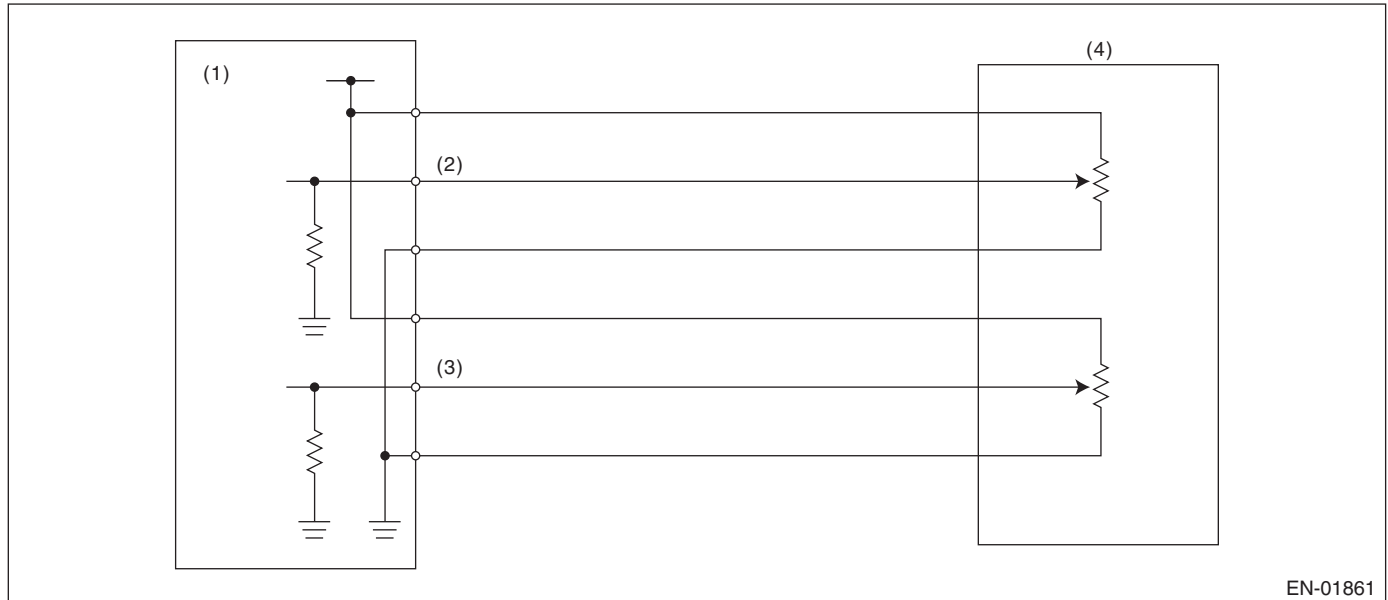
Memorize the freeze frame data. (For test mode \$02)

DL:DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 1.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



- | | | |
|--|--|---------------------------------------|
| (1) Engine control module (ECM) | (3) Accelerator pedal position sensor 2 signal | (4) Accelerator pedal position sensor |
| (2) Accelerator pedal position sensor 1 signal | | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	$\leq 4.856 \text{ V}$

Time Needed for Diagnosis: 100 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

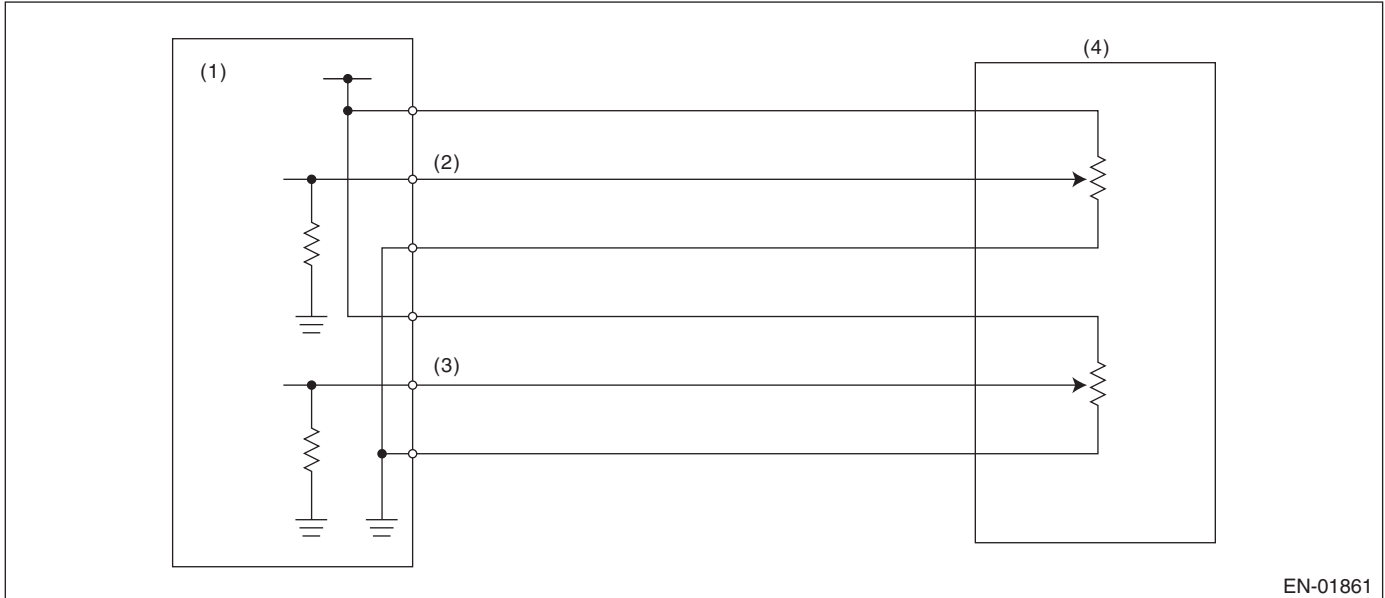
DM:DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2.

Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



- | | | |
|--|--|---------------------------------------|
| (1) Engine control module (ECM) | (3) Accelerator pedal position sensor 2 signal | (4) Accelerator pedal position sensor |
| (2) Accelerator pedal position sensor 1 signal | | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	$\geq 0.308 \text{ V}$

Time Needed for Diagnosis: 100 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

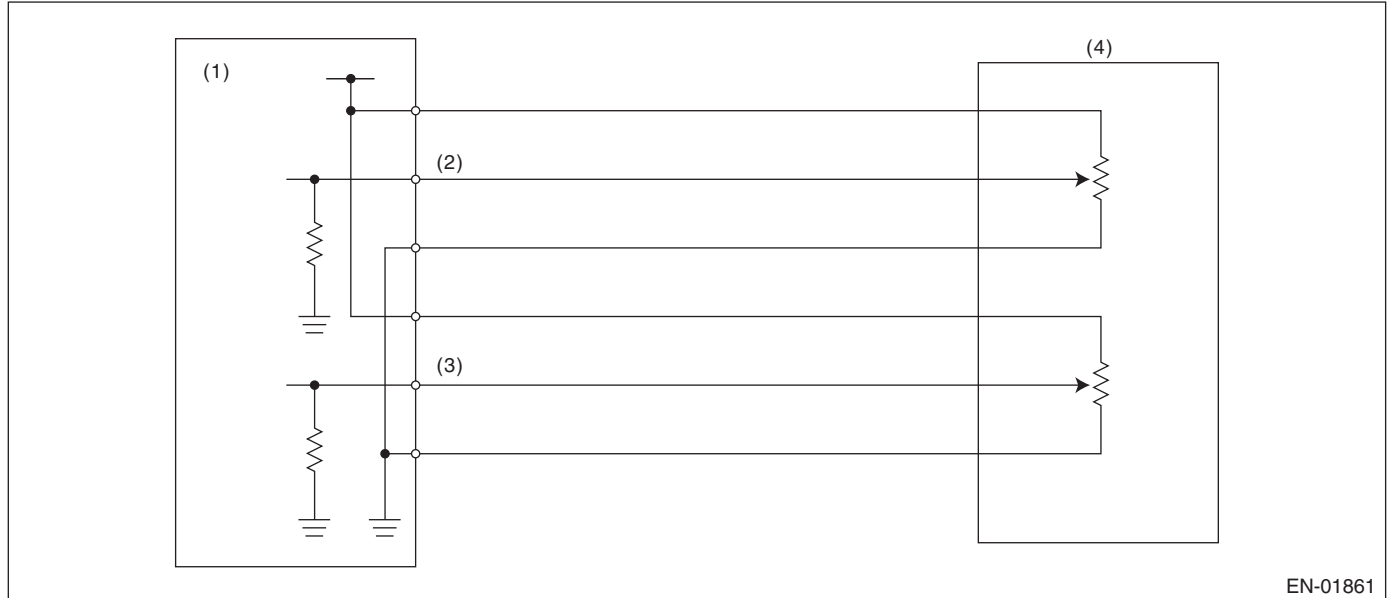
DN:DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2.

Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



- | | | |
|--|--|---------------------------------------|
| (1) Engine control module (ECM) | (3) Accelerator pedal position sensor 2 signal | (4) Accelerator pedal position sensor |
| (2) Accelerator pedal position sensor 1 signal | | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 2 input voltage	$\leq 4.865 \text{ V}$

Time Needed for Diagnosis: 100 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

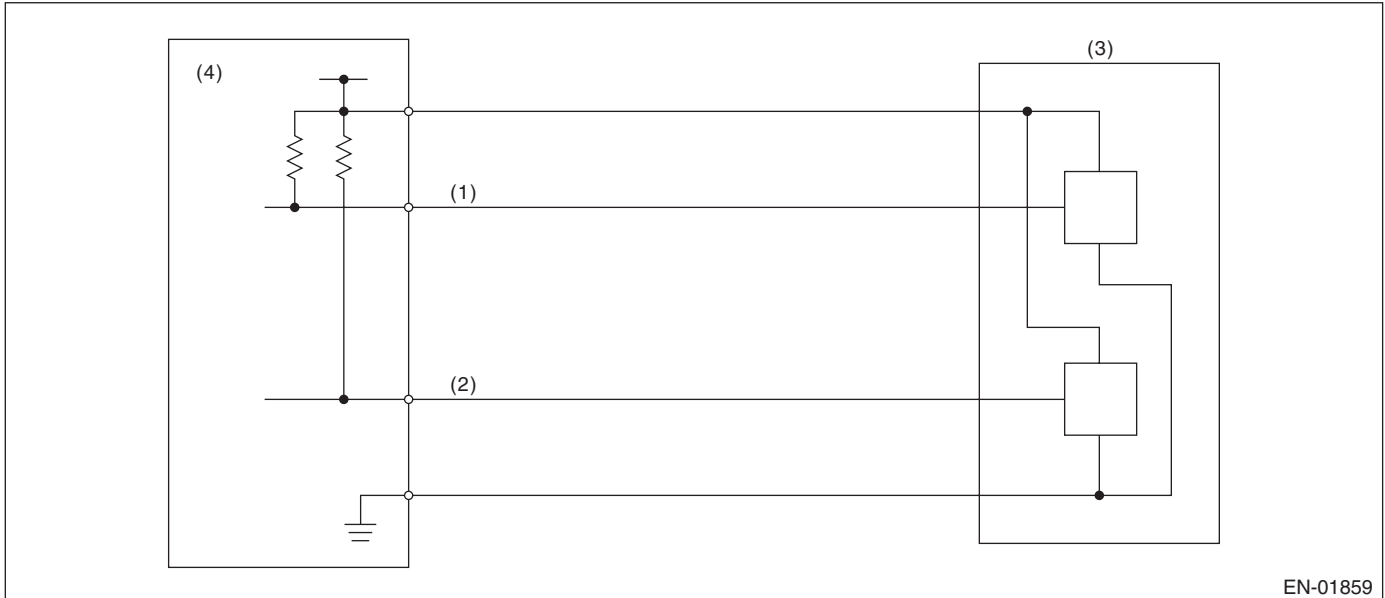
GENERAL DESCRIPTION

DO:DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A"/"B" VOLTAGE CORRELATION

1. OUTLINE OF DIAGNOSIS

Judge as NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

2. COMPONENT DESCRIPTION



- (1) Throttle position sensor 1 signal (3) Throttle position sensor
(2) Throttle position sensor 2 signal (4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

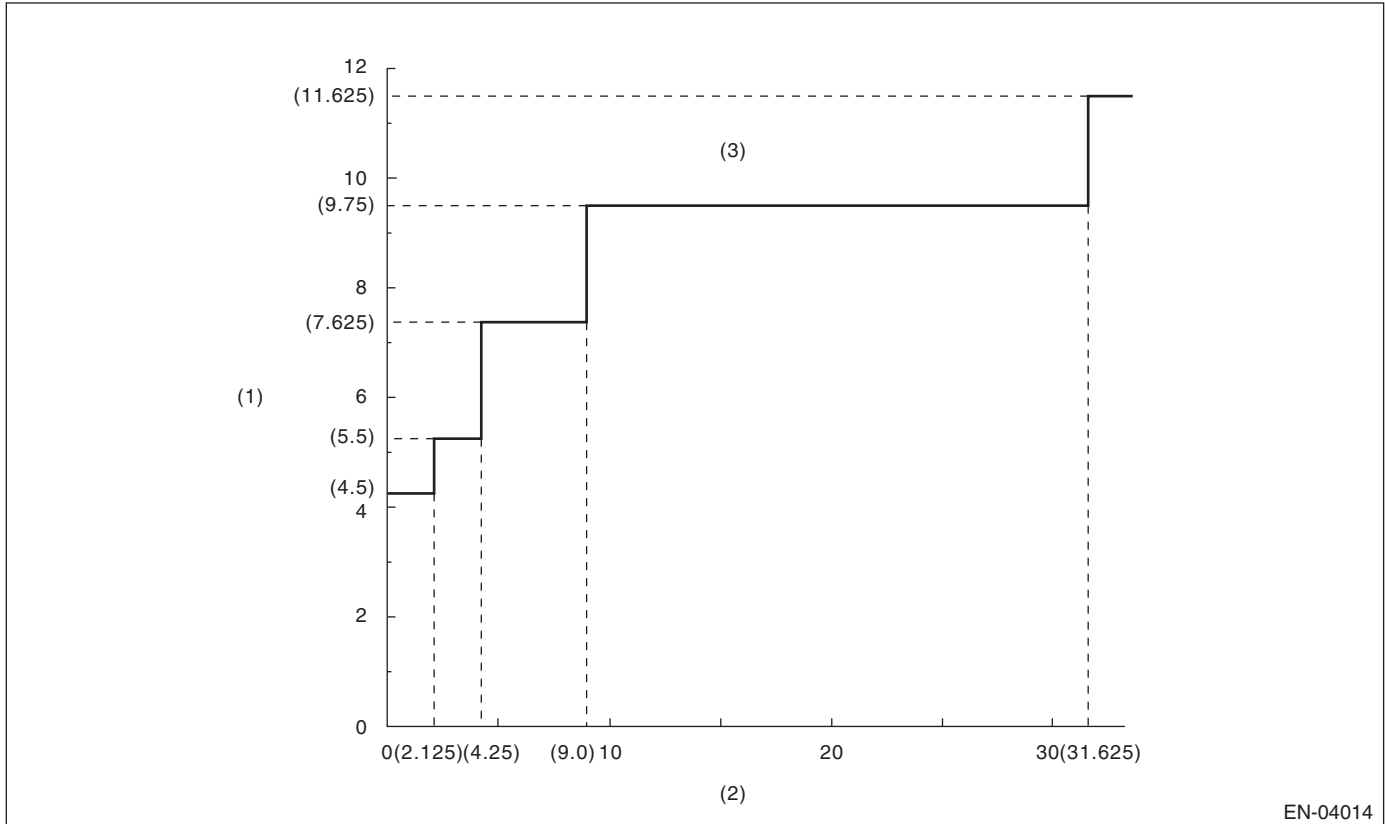
5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	$\leq 4.5^\circ$

Details of Judgment Value



EN-04014

(1) Sensor output difference (°)

(2) Throttle position sensor 1 opening angle (°)

(3) NG area

Time Needed for Diagnosis: 24 milliseconds (For NG), 24 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

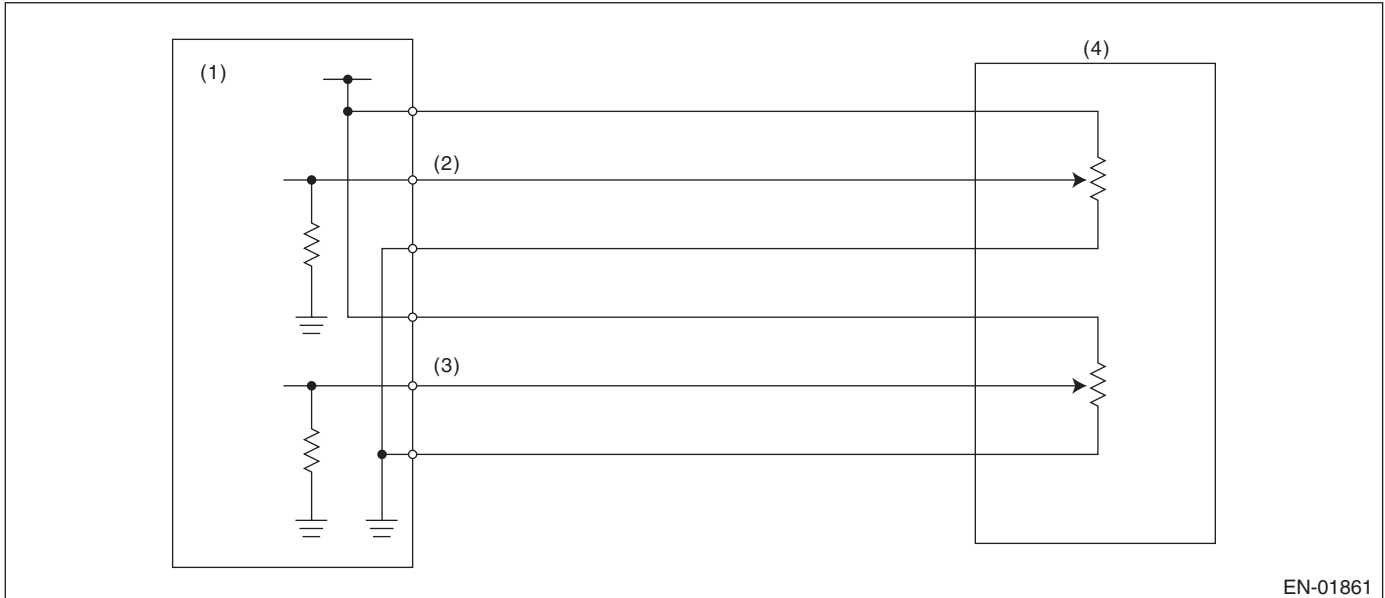
GENERAL DESCRIPTION

DP:DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION

1. OUTLINE OF DIAGNOSIS

Judge as NG when the signal level of accelerator pedal position sensor 1 is different from the accelerator pedal position sensor 2.

2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM) (3) Accelerator pedal position sensor 2 signal (4) Accelerator pedal position sensor 2 signal
(2) Accelerator pedal position sensor 1 signal

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 6 (V)

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

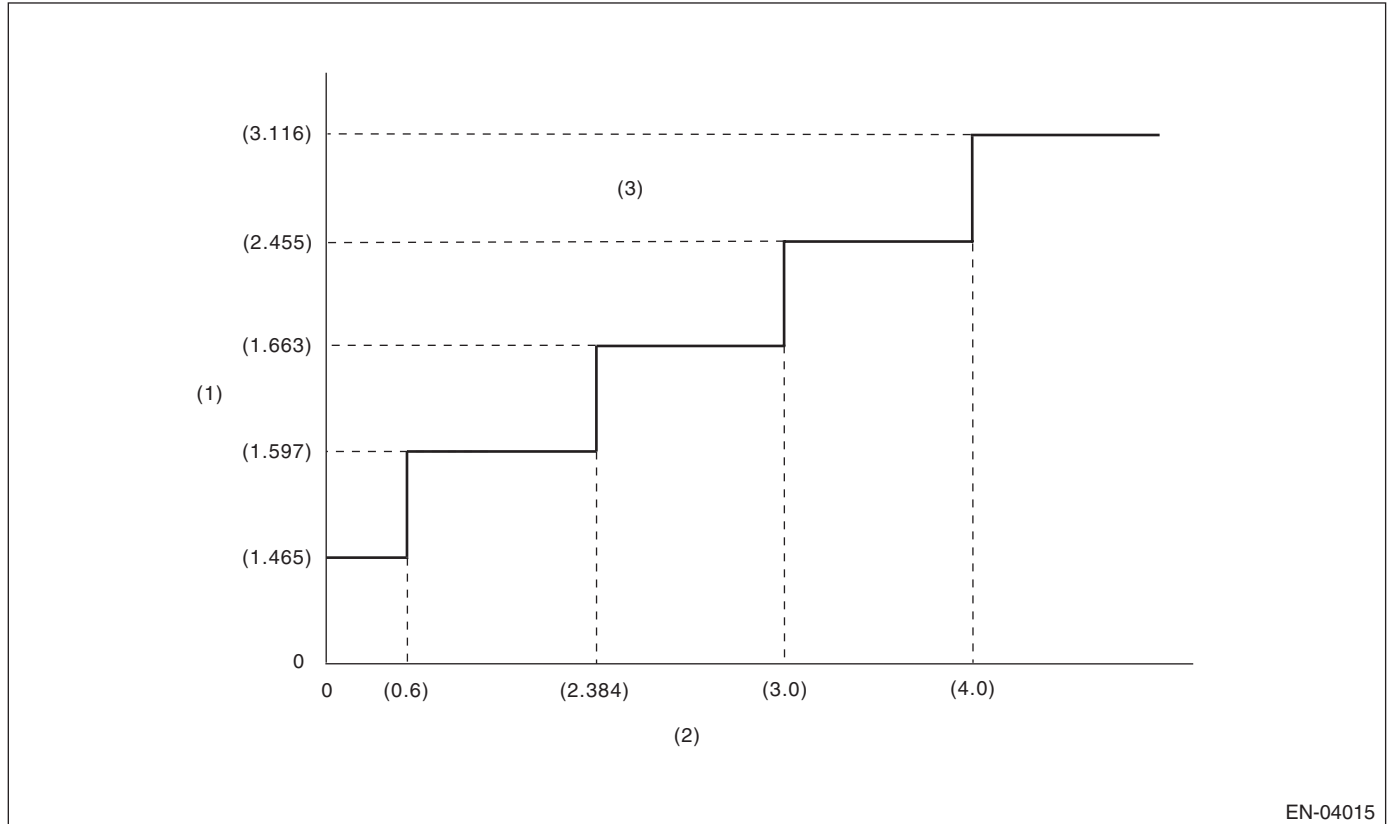
5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	$\leq 1.465^\circ$

Details of Judgment Value



(1) Sensor output difference ($^\circ$)

(2) Throttle position sensor 2 opening angle ($^\circ$)

(3) NG area

Time Needed for Diagnosis:

- 116 milliseconds (For NG)
- 1000 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Throttle opening is fixed to 6° .

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DQ:DTC P2227 BAROMETRIC PRESSURE CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of atmospheric pressure sensor output property.

Judge as NG when the atmospheric pressure sensor output is largely different from the intake manifold pressure at engine starting.

2. COMPONENT DESCRIPTION

The atmospheric pressure sensor is built into the ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 300 rpm
Vehicle speed	< 1 km/h (1 MPH)

4. GENERAL DRIVING CYCLE

Perform the diagnosis before engine starts with the ignition switch ON.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.3 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric pressure – Manifold pressure	≥ 26.7 kPa (200 mmHg, 7.88 inHg)
Intake manifold pressure at engine startup – Manifold pressure	< 1.33 kPa (10 mmHg, 2.95 inHg)

Time Needed for Diagnosis: 0.3 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the continuous time with the following criteria established is more than 0.3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Atmospheric pressure – Manifold pressure	< 26.7 kPa (200 mmHg, 7.88 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101 kPa (760 mmHg, 29.8 inHg).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DR:DTC P2228 BAROMETRIC PRESSURE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of the atmospheric pressure sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION

The atmospheric pressure sensor is built into the ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 0.118 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 0.118 V

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101 kPa (760 mmHg, 29.8 inHg).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DS:DTC P2229 BAROMETRIC PRESSURE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of the atmospheric pressure sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION

The atmospheric pressure sensor is built into the ECM.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 4.936 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 4.936 V

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Atmospheric pressure sensor process: Fix the atmospheric pressure to 101 kPa (760 mmHg, 29.8 inHg).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

General Description

FUEL INJECTION (FUEL SYSTEMS)

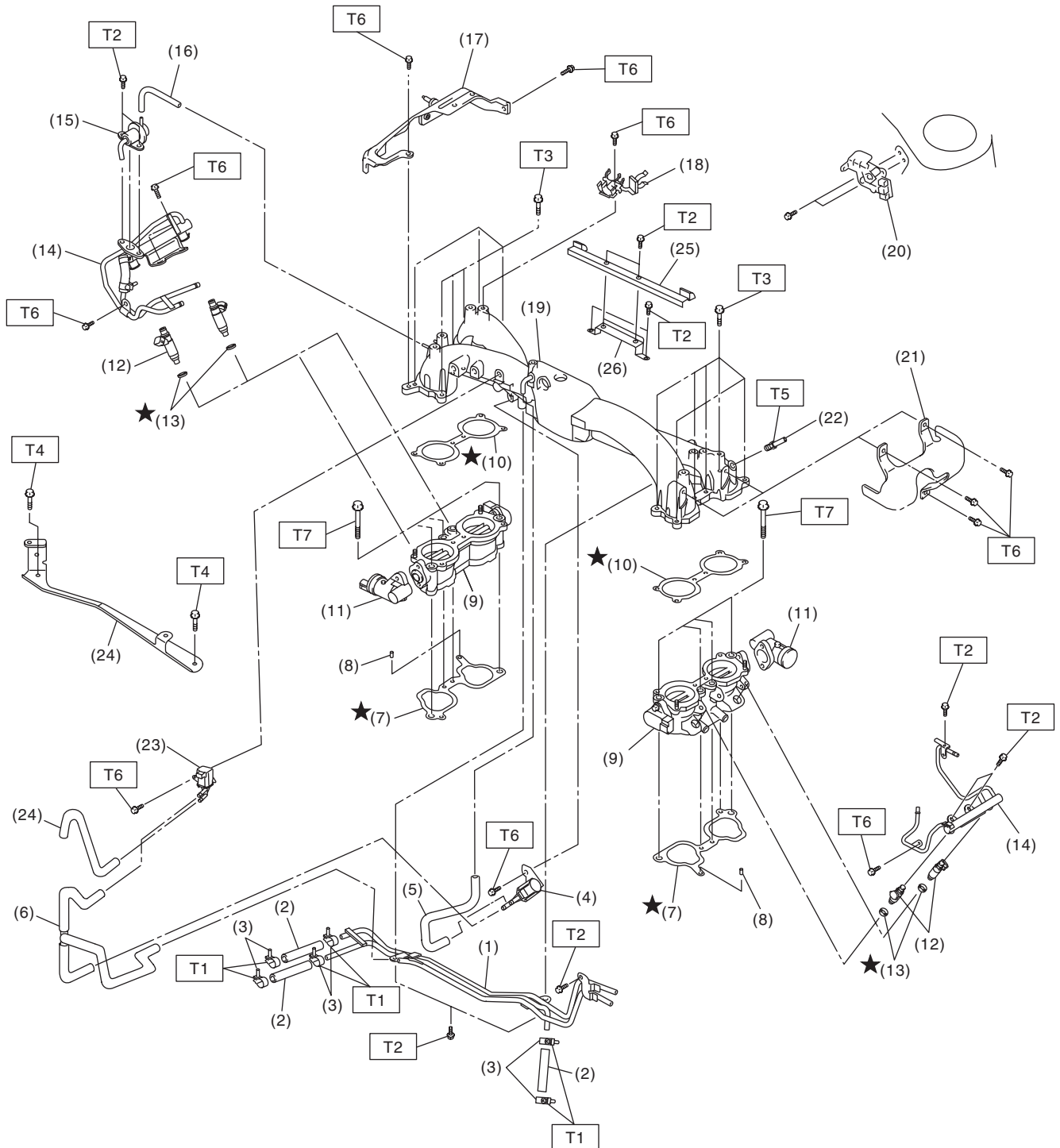
1. General Description

A: SPECIFICATION

Fuel tank	Capacity	60 ℓ (15.9 US gal, 13.2 Imp gal)
	Locations	Under rear seat
Fuel pump	Type	Impeller
	Shutoff discharge pressure	450 — 677 kPa (4.59 — 6.9 kg/cm ² , 65.27 — 98.2 psi)
	Discharge rate	145 ℓ (38.3 US gal, 31.9 Imp gal)/h or more [300 kPa, 12 V (3.06 kg/cm ² , 43.5 psi)]
Fuel filter		Intank type

B: COMPONENT

1. INTAKE MANIFOLD



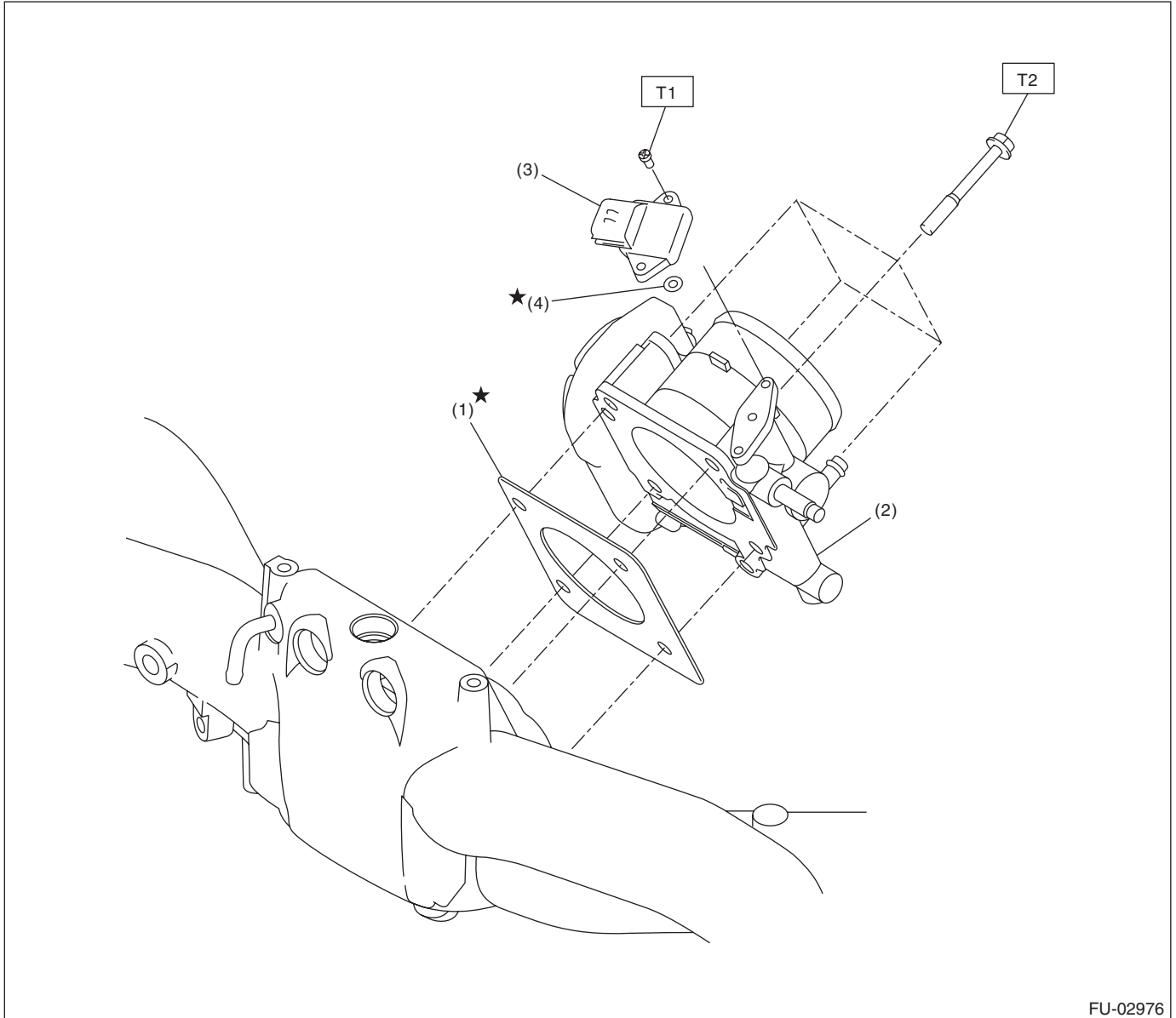
FU-02991

General Description

FUEL INJECTION (FUEL SYSTEMS)

(1) Fuel pipe ASSY	(14) Fuel injector pipe	(25) Collector cover bracket (Front)
(2) Fuel hose	(15) Pressure regulator	(26) Collector cover bracket (Rear)
(3) Clamp	(16) Pressure regulator hose	(27) Collector cover bracket (Rear)
(4) Purge control solenoid valve 1	(17) Fuel pipe protector RH	
(5) Vacuum hose A	(18) Blow-by hose stay	<hr/>
(6) Vacuum control hose	(19) Intake manifold	Tightening torque:N·m (kgf-m, ft-lb)
(7) Intake manifold gasket	(20) Wastegate control solenoid valve ASSY	T1: 1.25 (0.13, 0.94)
(8) Guide pin	(21) Fuel pipe protector LH	T2: 6.4 (0.65, 4.7)
(9) Tumble generator valve ASSY	(22) Nipple	T3: 8.25 (0.84, 6.1)
(10) Tumble generator valve gasket	(23) Purge control solenoid valve 2	T4: 8.5 (0.87, 6.3)
(11) Tumble generator valve actuator	(24) Vacuum hose B	T5: 17 (1.73, 12.5)
(12) Fuel injector		T6: 19 (1.9, 14.0)
(13) O-ring		T7: 25 (2.5, 18.1)

2. AIR INTAKE SYSTEM



FU-02976

- (1) Gasket
- (2) Throttle body

- (3) Manifold absolute pressure sensor
- (4) O-ring

Tightening torque: N·m (kgf·m, ft·lb)

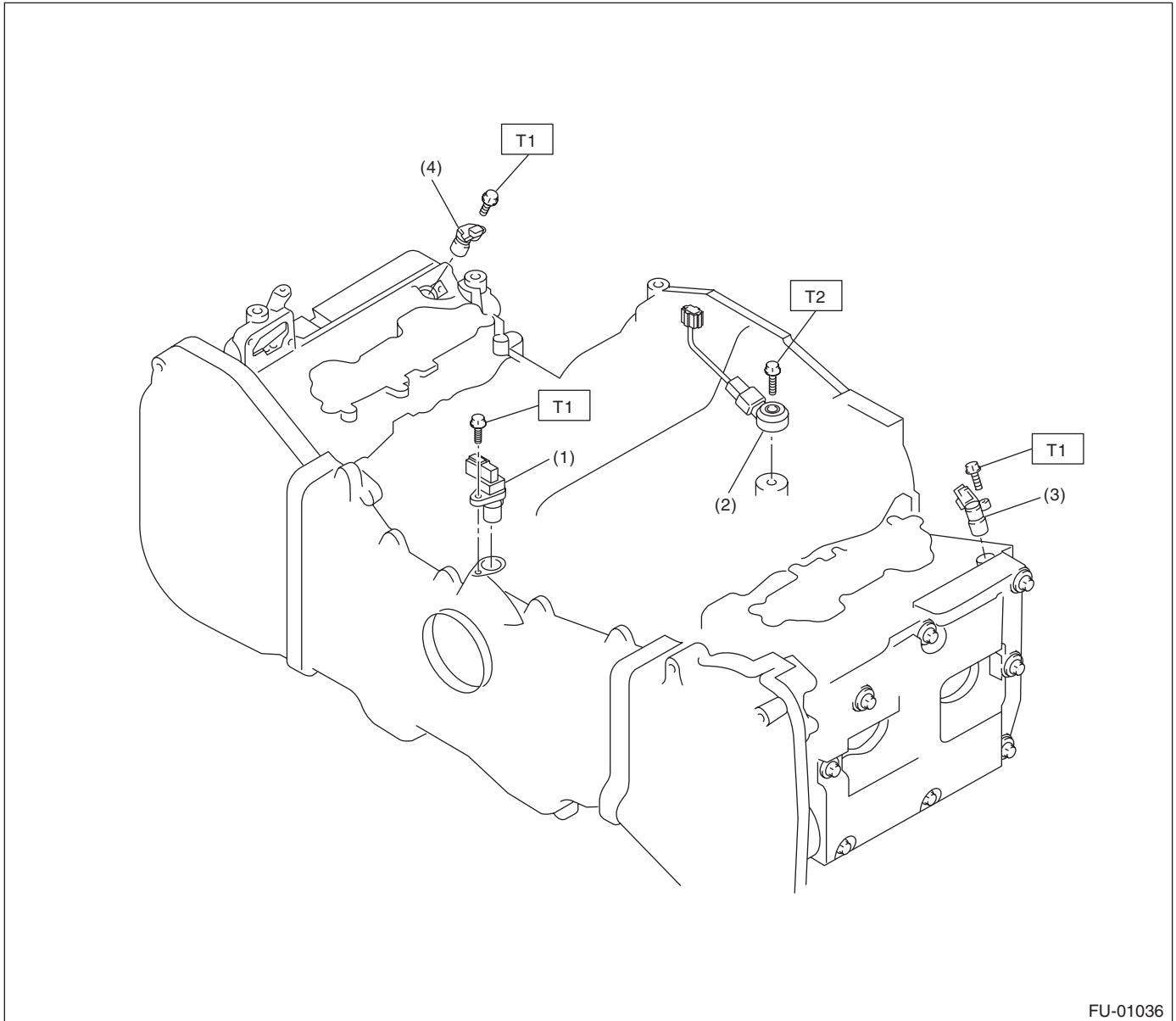
T1: 1.6 (0.16, 1.2)

T2: 8 (0.8, 5.8)

General Description

FUEL INJECTION (FUEL SYSTEMS)

3. CRANKSHAFT POSITION, CAMSHAFT POSITION AND KNOCK SENSORS



FU-01036

- (1) Crankshaft position sensor
- (2) Knock sensor

- (3) Camshaft position sensor LH
- (4) Camshaft position sensor RH

Tightening torque: N·m (kgf·m, ft·lb)

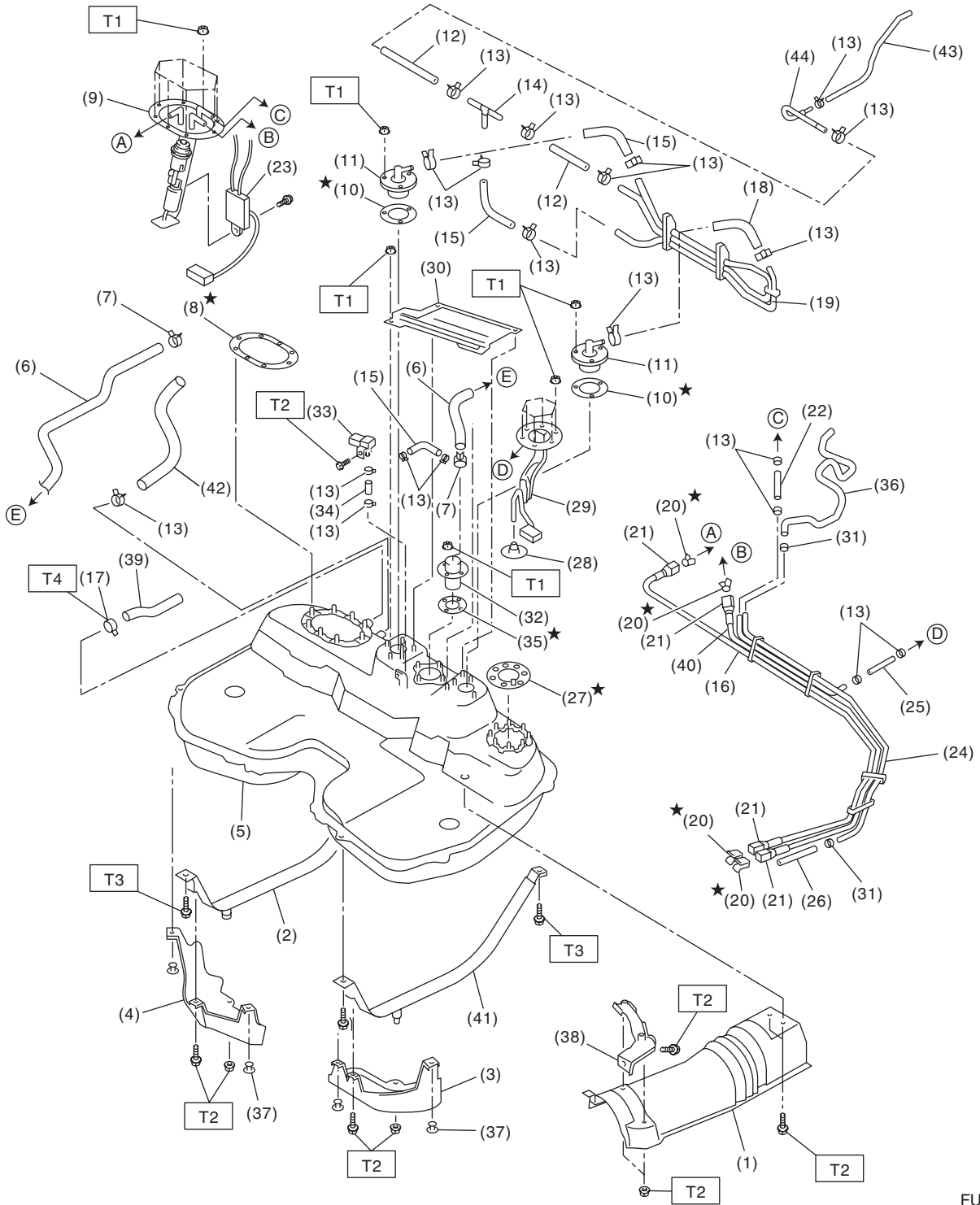
T1: 6.4 (0.65, 4.7)

T2: 24 (2.4, 17.4)

General Description

FUEL INJECTION (FUEL SYSTEMS)

4. FUEL TANK



FU-02992

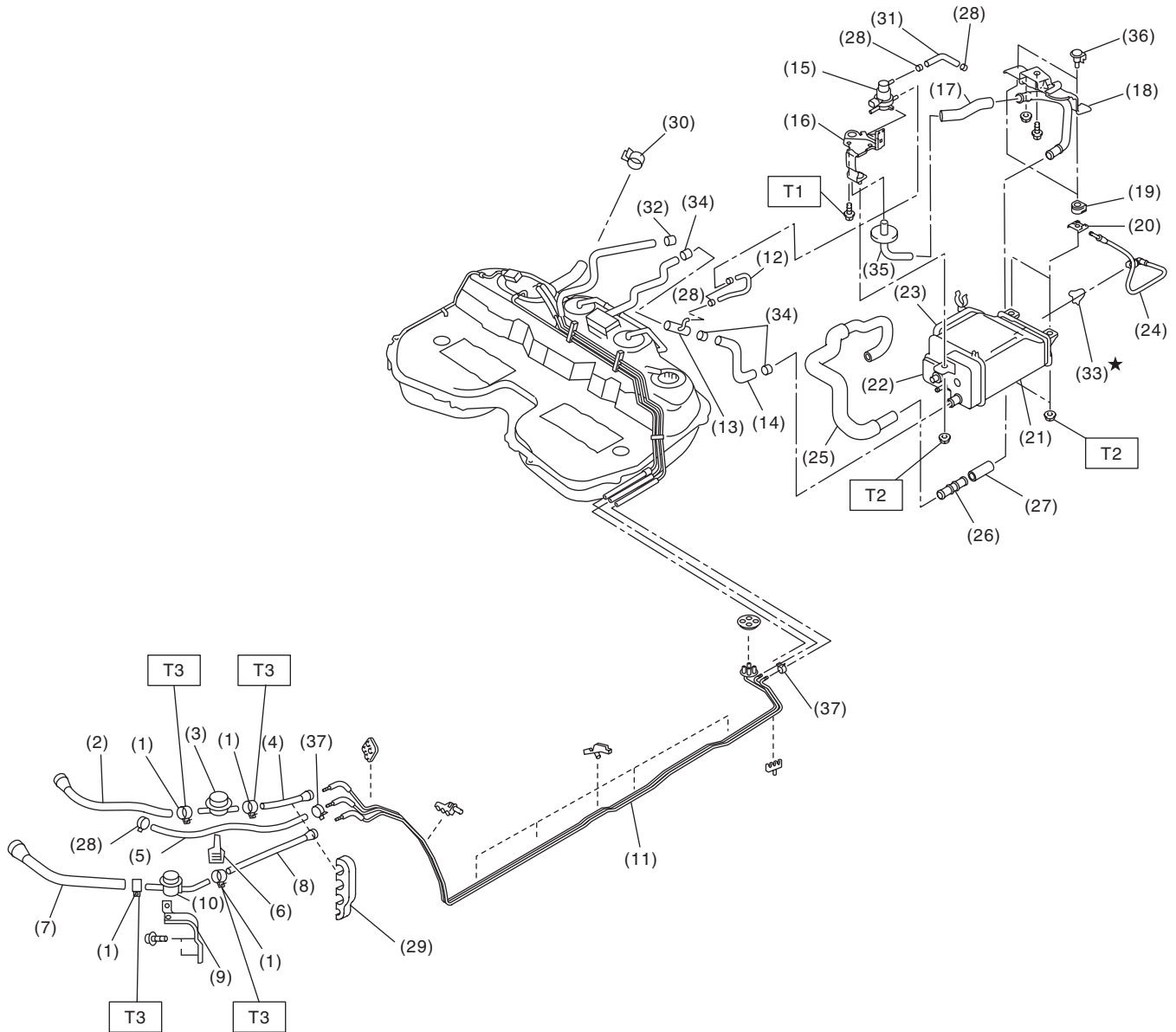
General Description

FUEL INJECTION (FUEL SYSTEMS)

(1) Heat shield cover	(18) Evaporation hose C	(35) Vent valve gasket
(2) Fuel tank band	(19) Evaporation pipe ASSY	(36) Purge hose
(3) Protector LH	(20) Retainer	(37) Clip
(4) Protector RH	(21) Quick connector	(38) Cover bracket
(5) Fuel tank	(22) Jet pump hose A	(39) Filler hose
(6) Canister hose A	(23) Fuel level sensor	(40) Fuel return tube
(7) Clamp	(24) Fuel pipe ASSY	(41) Fuel tank band LH
(8) Fuel pump gasket	(25) Jet pump hose B	(42) Evaporation hose E
(9) Fuel pump ASSY	(26) Evaporation hose D	(43) Evaporation hose F
(10) Fuel cut valve gasket	(27) Fuel sub level sensor gasket	(44) Evaporation pipe
(11) Fuel cut valve	(28) Jet pump filter	
(12) Evaporation hose A	(29) Fuel sub level sensor	
(13) Clip	(30) Protect cover	
(14) Joint pipe	(31) Clip	
(15) Evaporation hose B	(32) Vent valve	
(16) Fuel delivery tube	(33) Fuel tank pressure sensor	
(17) Clamp	(34) Fuel tank pressure sensor hose	

Tightening torque:N·m (kgf-m, ft-lb)**T1: 4.4 (0.45, 3.3)****T2: 7.4 (0.75, 5.4)****T3: 33 (3.4, 25)****T4: 1.96 (0.20, 1.45)**

5. FUEL LINE



FU-02993

General Description

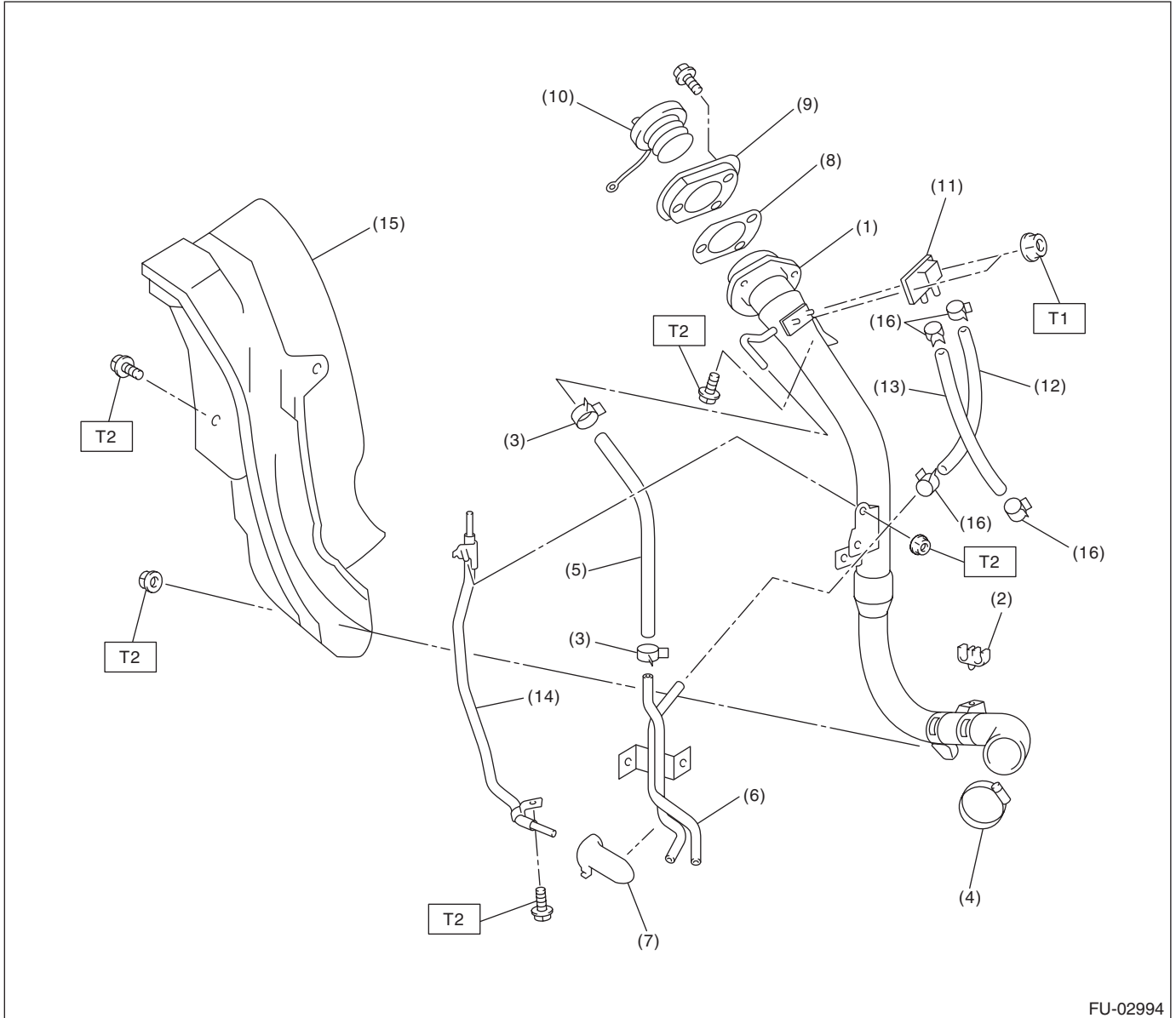
FUEL INJECTION (FUEL SYSTEMS)

(1) Clamp	(16) Pressure control solenoid valve bracket	(29) Clip
(2) Fuel return hose A	(17) Drain hose C	(30) Clamp
(3) Fuel damper valve (Return)	(18) Canister upper bracket	(31) Pressure control solenoid valve hose
(4) Fuel return hose B	(19) Cushion rubber	(32) Clamp
(5) Evaporation hose A	(20) Canister lower bracket	(33) Retainer
(6) Clip	(21) Canister	(34) Clamp
(7) Fuel delivery hose A	(22) Drain valve	(35) Drain pipe
(8) Fuel delivery hose B	(23) Drain filter	(36) Canister bracket spacer
(9) Fuel damper valve bracket	(24) Pressure control solenoid valve tube	(37) Clamp
(10) Fuel damper valve (Delivery)		
(11) Fuel pipe ASSY		
(12) Evaporation hose B	(25) Drain hose A	<hr/> Tightening torque:N·m (kgf-m, ft-lb)
(13) Joint pipe	(26) Connector drain	T1: 25 (2.5, 18.1)
(14) Canister hose A	(27) Drain hose B	T2: 23 (2.3, 16.6)
(15) Pressure control solenoid valve	(28) Clip	T3: 1.25 (0.13, 0.9) <hr/>

General Description

FUEL INJECTION (FUEL SYSTEMS)

6. FUEL FILLER PIPE



FU-02994

- | | | |
|-----------------------------|-------------------------|---------------------------------|
| (1) Fuel filler pipe ASSY | (8) Filler pipe packing | (15) Fuel filler pipe protector |
| (2) Evaporation hose holder | (9) Filler ring | (16) Clamp |
| (3) Clip | (10) Filler cap | |
| (4) Clamp | (11) Shut valve | |
| (5) Evaporation hose A | (12) Evaporation hose B | |
| (6) Evaporation pipe | (13) Evaporation hose C | |
| (7) Evaporation pipe holder | (14) Joint pipe | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 4.4 (0.45, 3.3)

T2: 7.5 (0.76, 5.5)

General Description

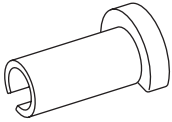
FUEL INJECTION (FUEL SYSTEMS)

C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.

- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from the battery.
- Place "NO FIRE" signs near the working area.
- Prepare a container and cloth to prevent scattering of fuels when performing work where fuels can be spilled. If the fuel spills, wipe it off immediately to prevent from penetrating into floor or flowing out for environmental protection.
- Follow all government and local regulations concerning disposal of refuse when disposing fuel.

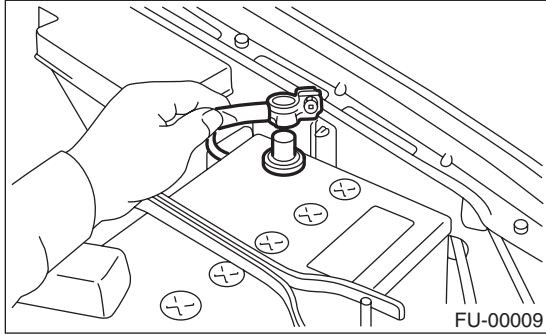
D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST42099AE000	42099AE000	CONNECTOR REMOVER	Removal of quick connector

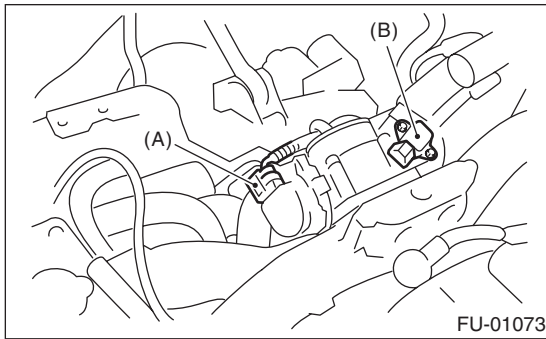
2. Throttle Body

A: REMOVAL

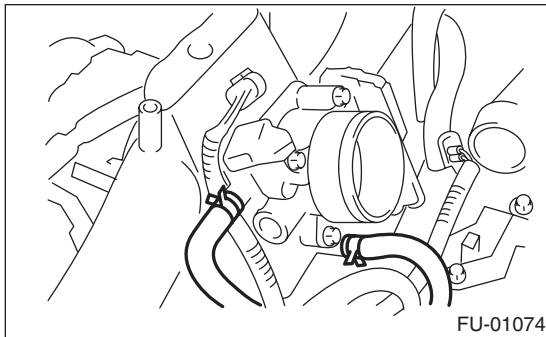
- 1) Disconnect the ground cable from the battery.



- 2) Remove the collector cover.
- 3) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 4) Disconnect the connector from the throttle position sensor (A), and the manifold pressure sensor (B).



- 5) Disconnect the engine coolant hoses from throttle body.



- 6) Remove the bolts which install throttle body to the intake manifold.

B: INSTALLATION

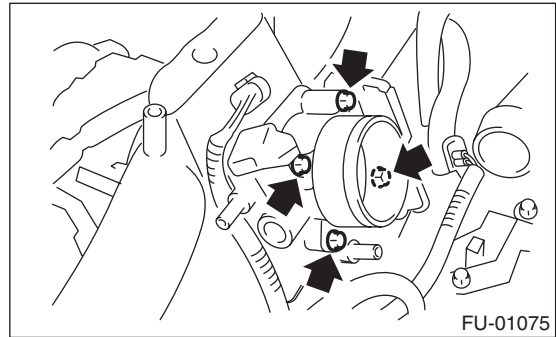
Install in the reverse order of removal.

NOTE:

Use a new gasket.

Tightening torque:

8 N·m (0.8 kgf-m, 5.8 ft-lb)



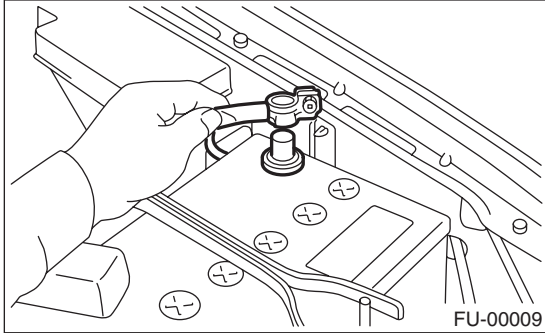
Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

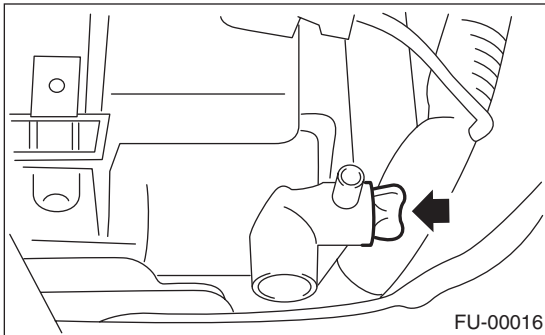
3. Intake Manifold

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Release the fuel pressure. <Ref. to FU(H4DOTC)-49, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 3) Disconnect the ground cable from the battery.

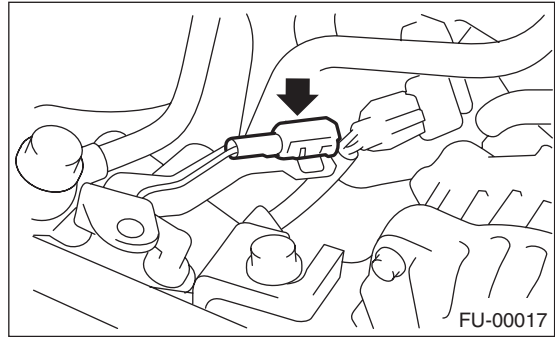


- 4) Open the fuel filler flap lid, and remove the fuel filler cap.
- 5) Remove the collector cover.
- 6) Lift-up the vehicle.
- 7) Remove the under cover.
- 8) Drain the coolant about 3.0 ℓ (3.2 US qt, 2.6 Imp qt).



- 9) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
- 10) Remove the air cleaner element.
- 11) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 12) Remove the coolant filler tank. <Ref. to CO(H4SO)-43, REMOVAL, Coolant Filler Tank.>
- 13) Remove the power steering pump.
 - (1) Remove the front side of the V-belts. <Ref. to ME(H4DOTC)-40, REMOVAL, V-belt.>

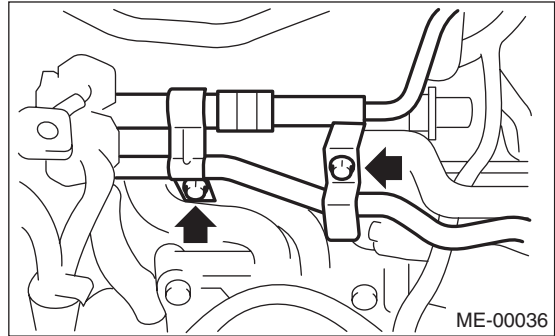
- (2) Disconnect the power steering switch connector.



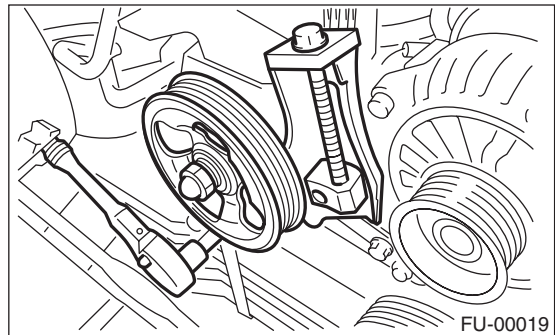
- (3) Remove the bolts which install the power steering pipe bracket to the intake manifold.

NOTE:

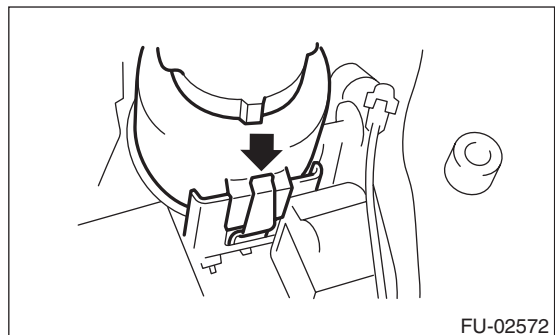
Do not disconnect the power steering hose.



- (4) Remove the bolts which install power steering pump bracket.



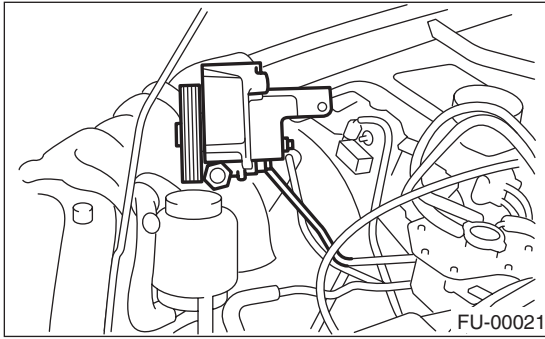
- (5) Remove the reservoir tank from the bracket by pulling it upward.



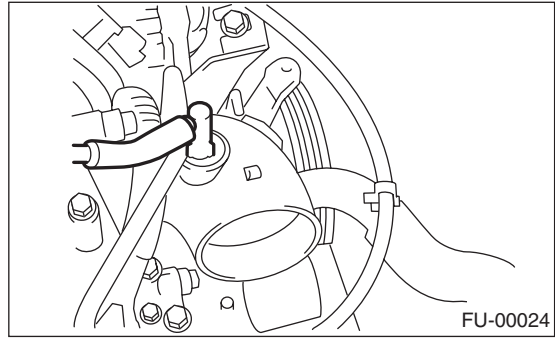
Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

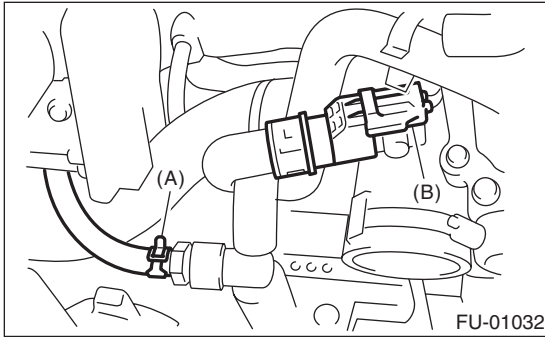
13) Place the power steering pump on the right side wheel apron.



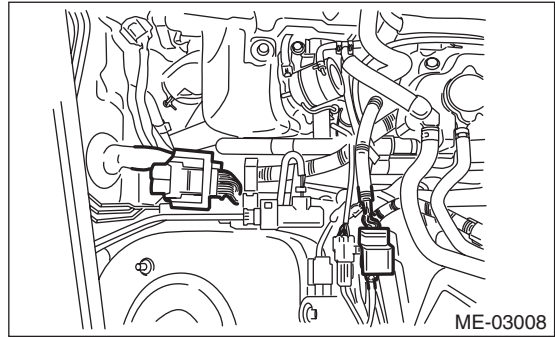
17) Disconnect the pressure hose from the intake duct.



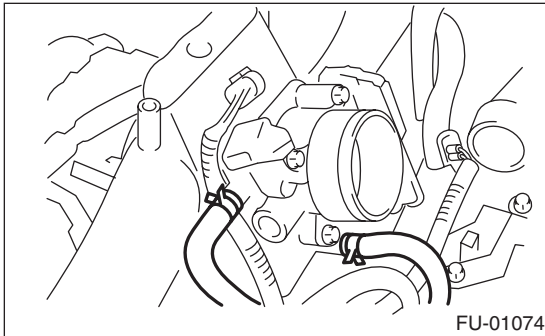
14) Disconnect the emission hose (A) and the connector (B) from the PCV hose assembly.



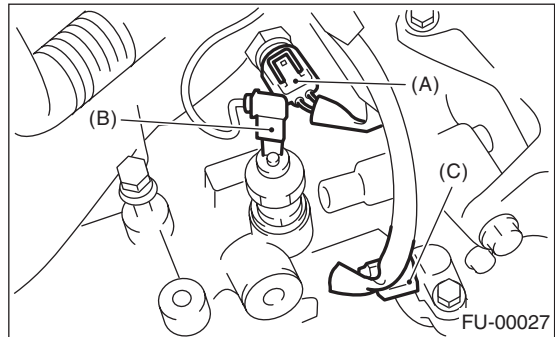
18) Disconnect the engine harness connectors from the bulk head harness connector.



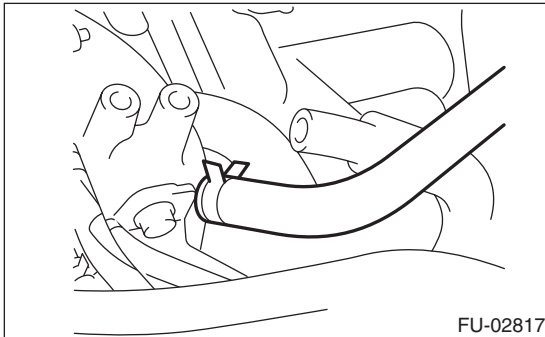
15) Disconnect the engine coolant hose from throttle body.



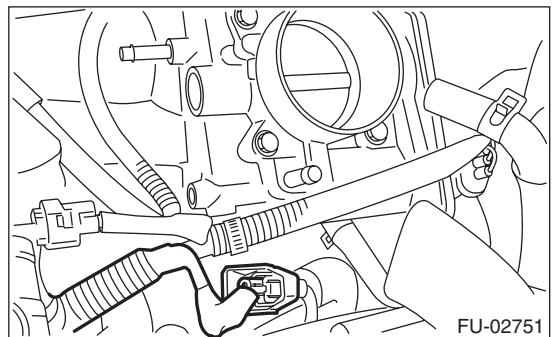
19) Disconnect the connectors from the engine coolant temperature sensor (A), oil pressure switch (B) and crankshaft position sensor (C).



16) Disconnect the brake booster hose.



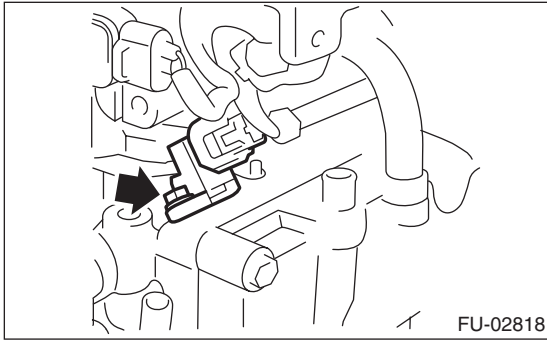
20) Disconnect the knock sensor connector.



Intake Manifold

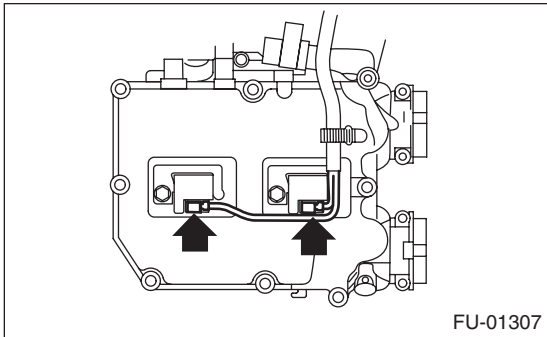
FUEL INJECTION (FUEL SYSTEMS)

21) Disconnect the connector from camshaft position sensor.

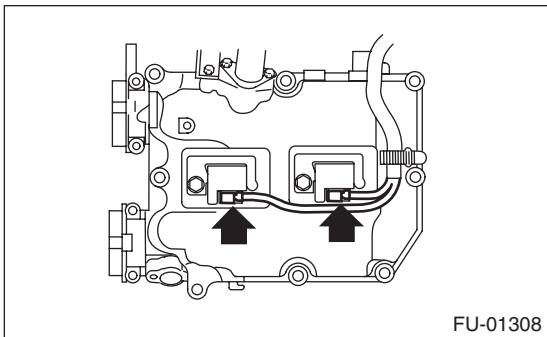


22) Disconnect the connector from ignition coil.

- RH side

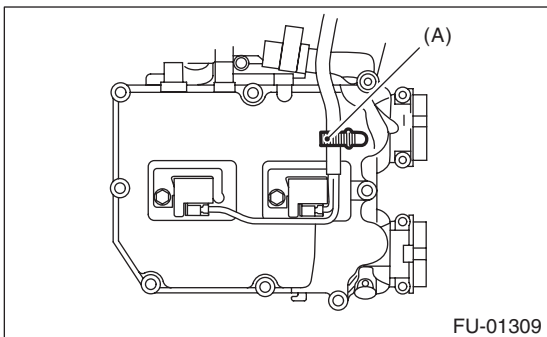


- LH side

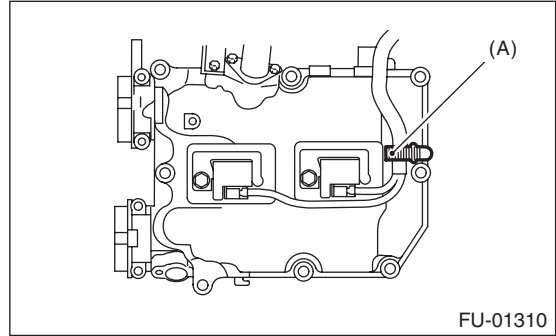


23) Disconnect the engine harness fixed by clip (A) from the bracket.

- RH side



- LH side

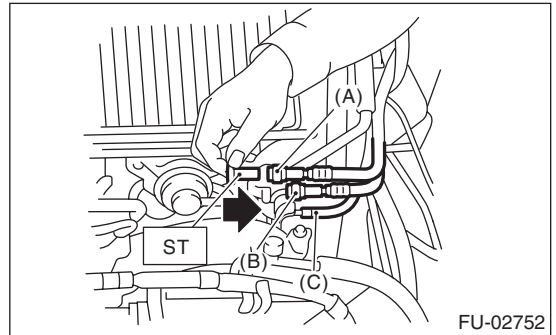


24) Using the ST, disconnect the fuel hose from each fuel pipe. <Ref. to FU(H4DOTC)-64, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>

CAUTION:

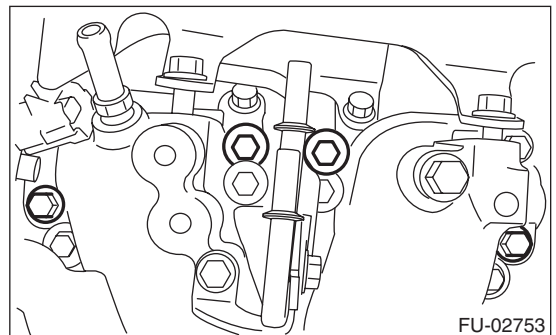
- Be careful not to spill fuel.
- Catch the fuel from hoses using a container or cloth.

ST 42099AE000 CONNECTOR REMOVER



- (A) Fuel delivery hose
- (B) Return hose
- (C) Evaporation hose

25) Remove the bolts which hold intake manifold onto the cylinder heads.



26) Remove the intake manifold.

B: INSTALLATION

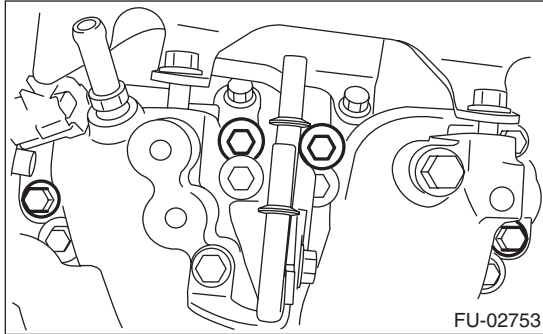
1) Install the intake manifold onto cylinder heads.

NOTE:

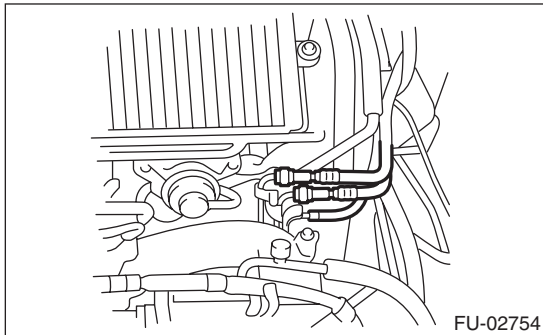
Use a new gasket.

Tightening torque:

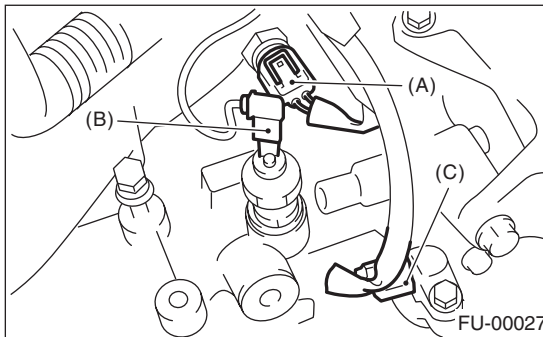
25 N·m (2.5 kgf·m, 18.1 ft·lb)



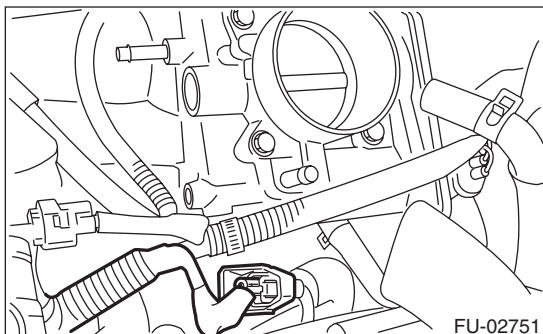
2) Connect the fuel delivery hose, return hose, and evaporation hose.



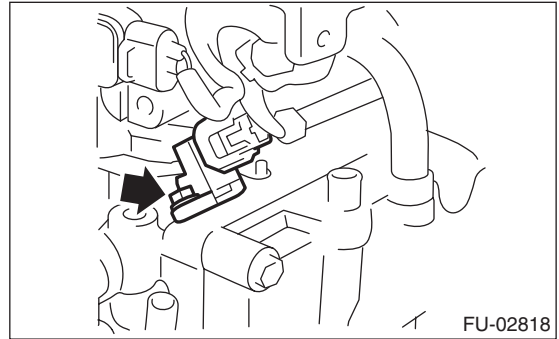
3) Connect the connector to the engine coolant temperature sensor (A), oil pressure switch (B) and crankshaft position sensor (C).



4) Connect the connector to the knock sensor.

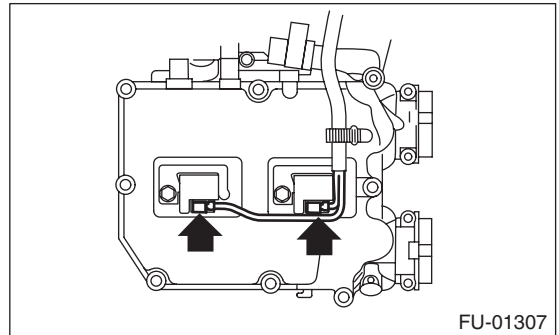


5) Connect the connectors to camshaft position sensor.

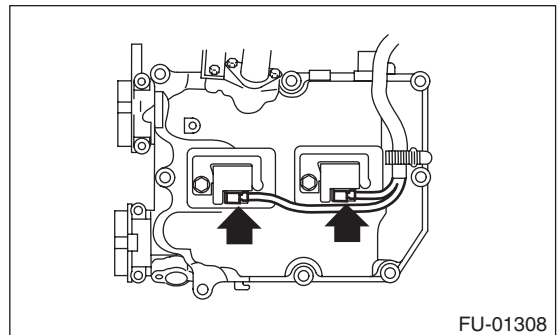


6) Connect the connector to the ignition coil.

• RH side



• LH side

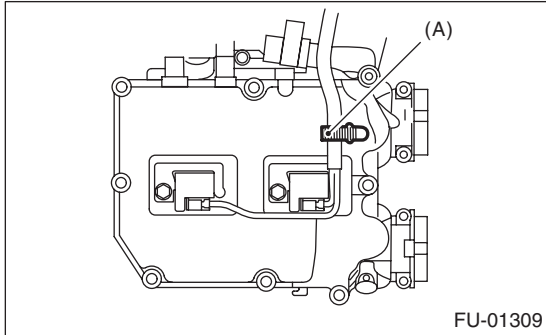


Intake Manifold

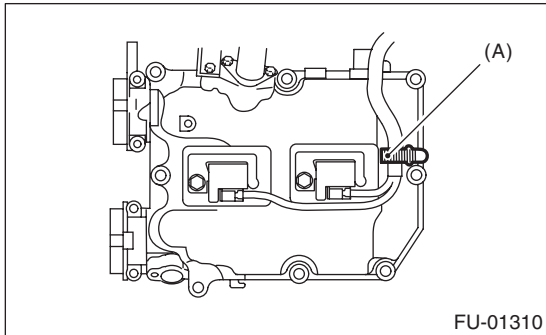
FUEL INJECTION (FUEL SYSTEMS)

7) Connect the engine harness with clip (A) to the bracket.

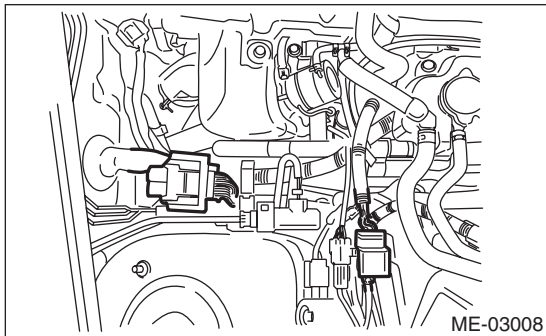
- RH side



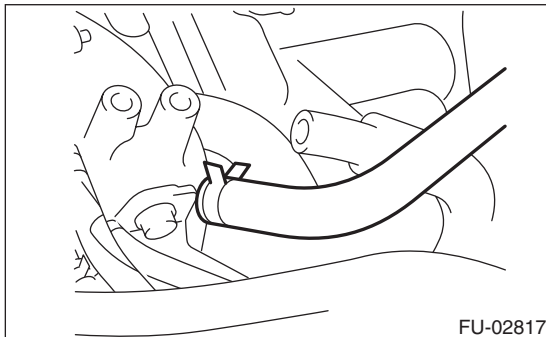
- LH side



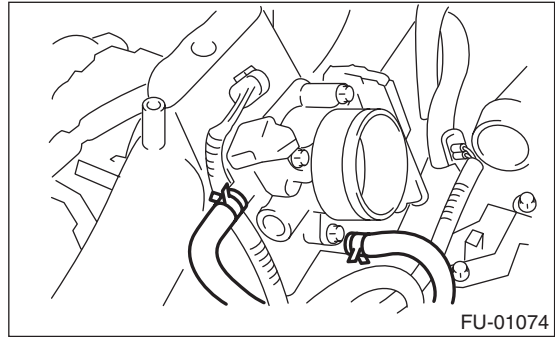
8) Connect the engine harness connectors to bulk-head harness connectors.



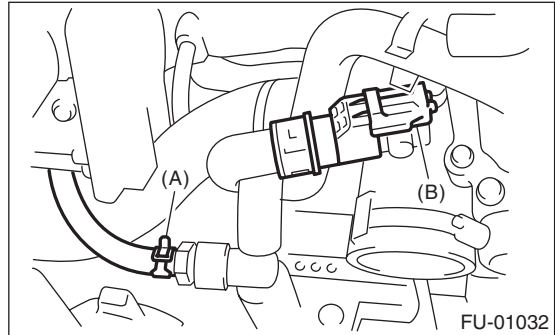
9) Connect the brake booster vacuum hose.



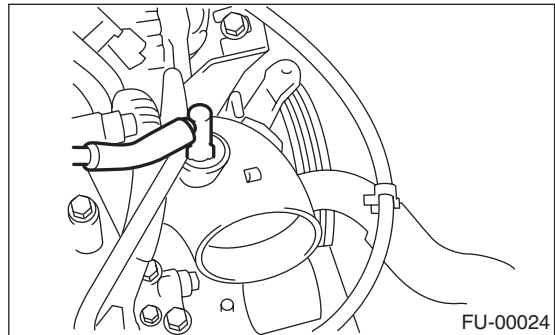
10) Connect the engine coolant hoses to throttle body.



11) Connect the emission hose (A) and the connector (B) to the PCV hose assembly.

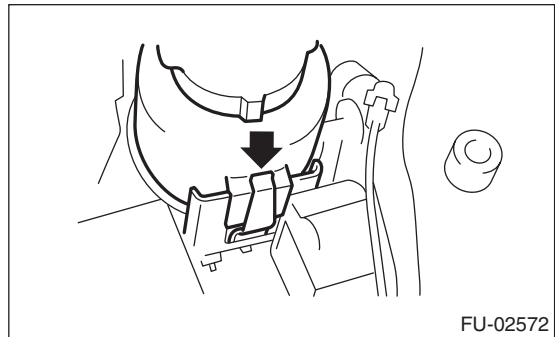


12) Connect the pressure hose to the intake duct.

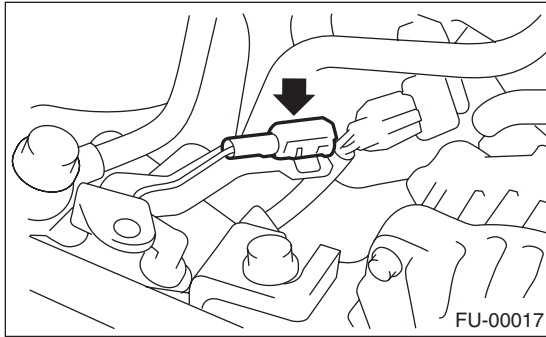


13) Install the power steering pump.

(1) Install the reservoir tank to the bracket.



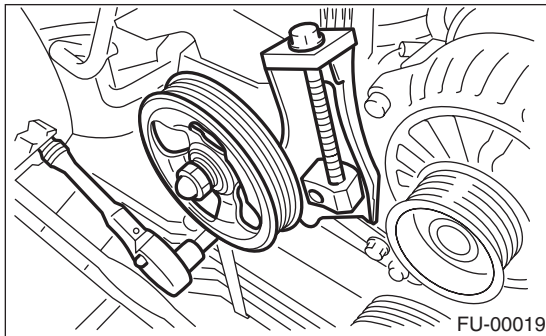
- (2) Connect the connector to the power steering pump switch.



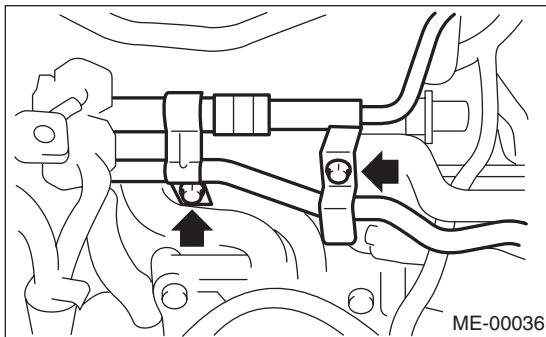
- (3) Install the power steering pump, and tighten the bolts.

Tightening torque:

22 N·m (2.2 kgf-m, 15.9 ft-lb)



- (4) Install the power steering pipe bracket onto the right side intake manifold.



- (5) Install the front side V-belts. <Ref. to ME(H4DOTC)-40, INSTALLATION, V-belt.>

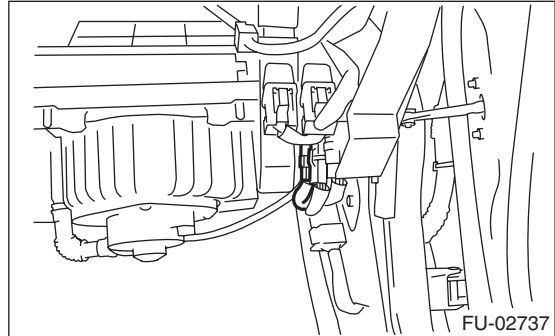
- 14) Install the coolant filler tank. <Ref. to CO(H4SO)-43, INSTALLATION, Coolant Filler Tank.>

- 15) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

- 16) Install the air cleaner element.

- 17) Install the air cleaner upper cover and air intake duct as a unit. <Ref. to IN(H4DOTC)-8, INSTALLATION, Air Cleaner Case.>

- 18) Connect the connector to fuel pump relay.



- 19) Install the passenger's side front side sill cover.

- 20) Install the glove box. <Ref. to EI-36, INSTALLATION, Glove Box.>

- 21) Install the collector cover.

- 22) Connect the ground cable to the battery.

- 23) Lift-up the vehicle.

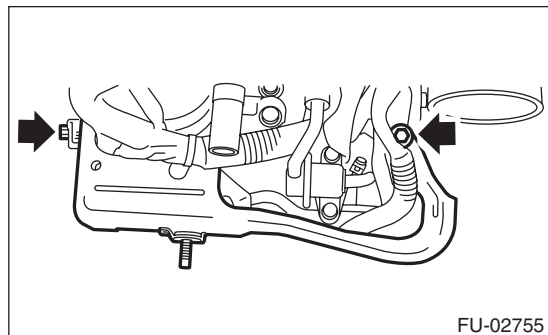
- 24) Install the under cover.

- 25) Fill engine coolant.

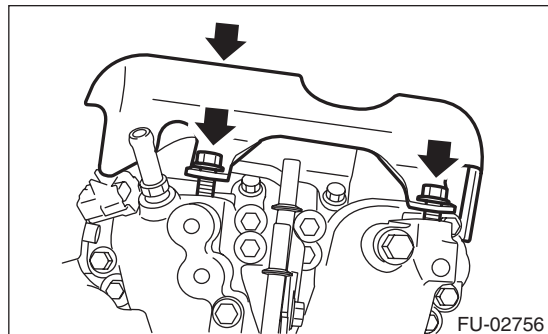
- <Ref. to CO(H4SO)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

C: DISASSEMBLY

- 1) Remove the fuel pipe protector RH.



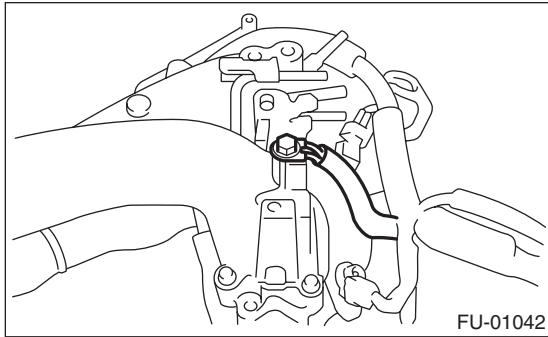
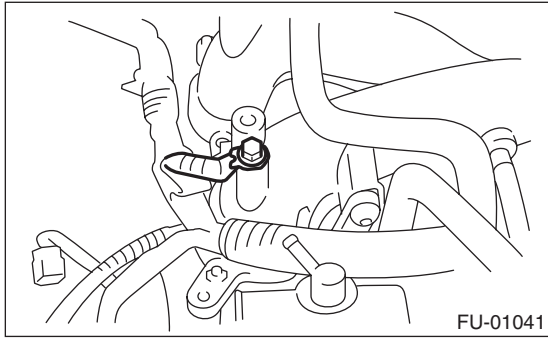
- 2) Remove the fuel pipe protector LH.



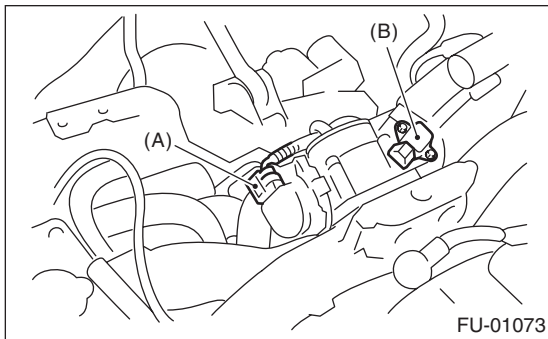
Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

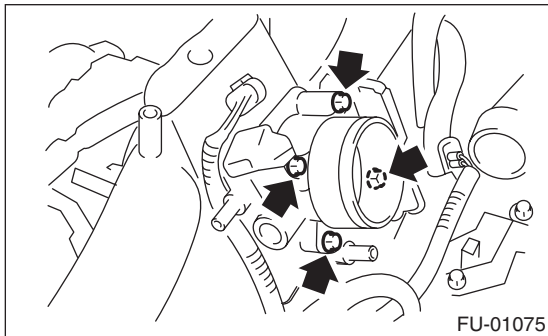
3) Remove the engine ground terminal from the intake manifold.



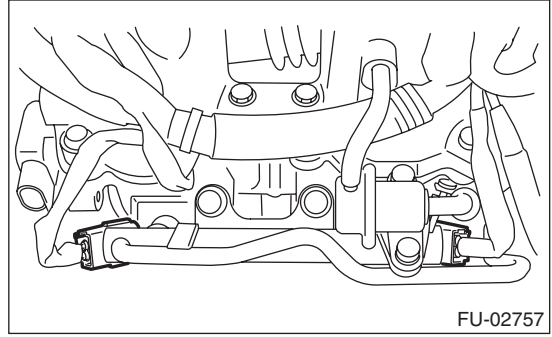
4) Disconnect the connector from the throttle position sensor (A), and the manifold pressure sensor (B).



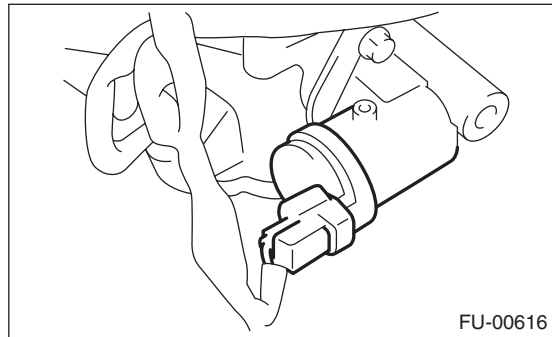
5) Remove the throttle body from intake manifold.



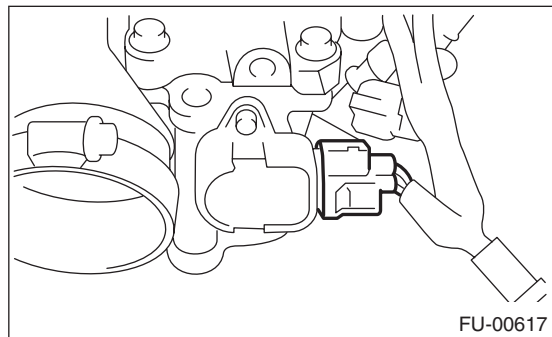
6) Disconnect the connector from fuel injector.



7) Disconnect the connector from tumble generator valve actuator.

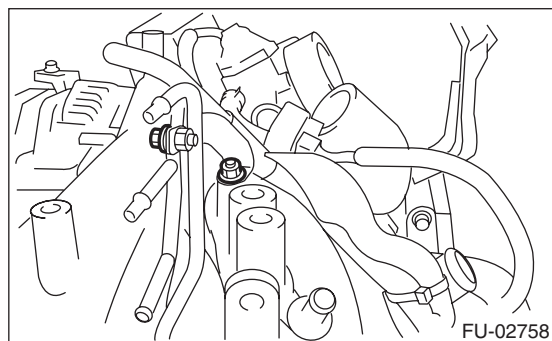


8) Disconnect the connector from tumble generator valve sensor.



9) Remove the purge control solenoid valve. <Ref. to EC (H4DOTC)-8, REMOVAL, Purge Control Solenoid Valve.>

10) Remove the two bolts which hold fuel pipes on the left side of intake manifold.

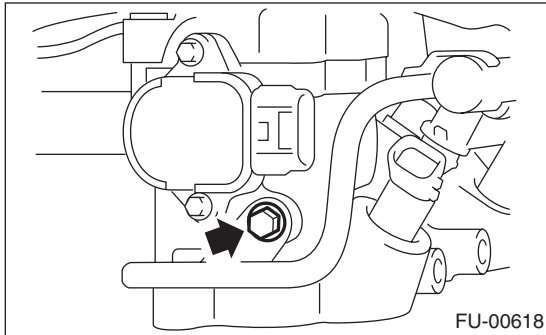
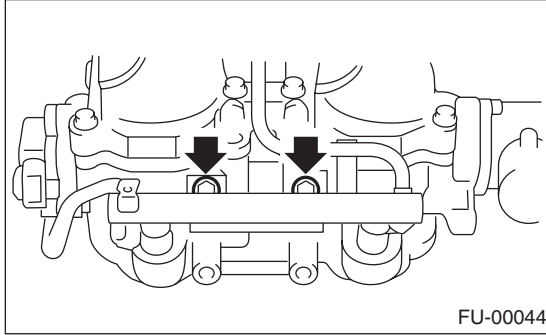


Intake Manifold

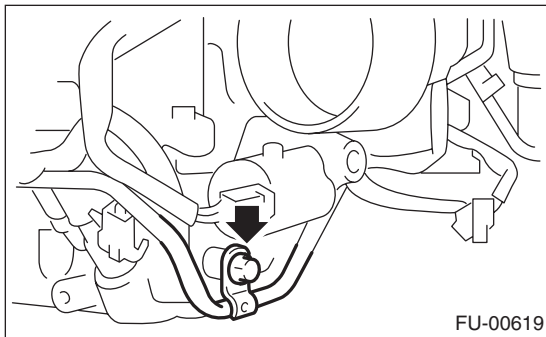
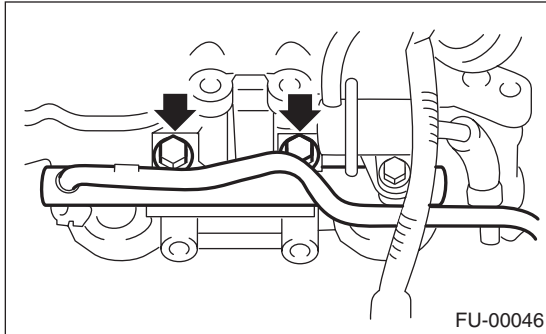
FUEL INJECTION (FUEL SYSTEMS)

11) Remove the bolt which holds fuel injector pipe onto intake manifold.

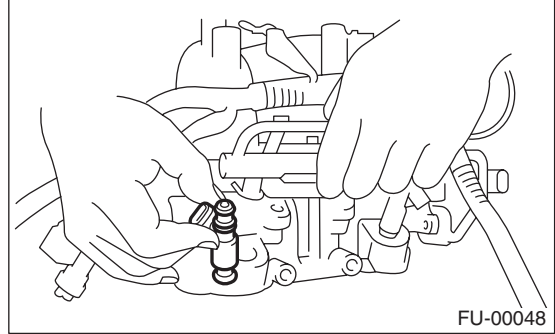
- LH side



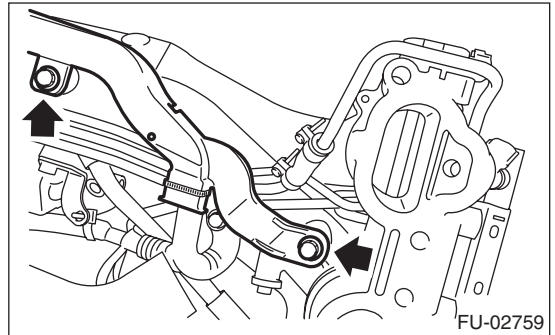
- RH side



12) Remove the fuel injector.

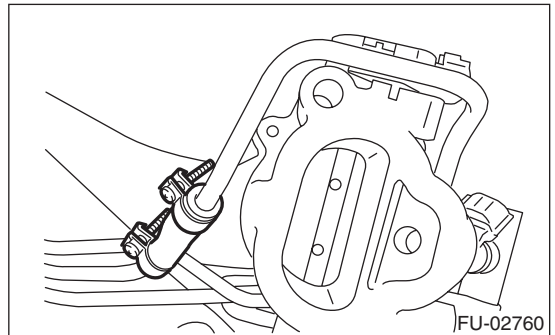


13) Remove the harness bracket which holds the engine harness onto intake manifold.

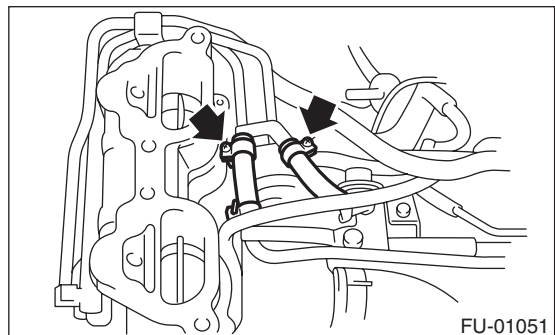


14) Remove the engine harness from intake manifold.

15) Loosen the clamp which holds the front LH side fuel hose to injector pipe to remove the pipe from clamp.



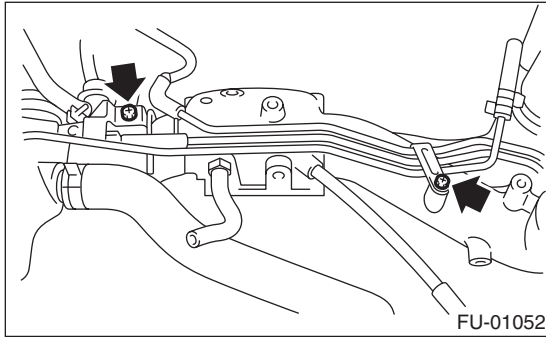
16) Loosen the clamp which holds the RH side fuel hose to injector pipe to remove the pipe from clamp.



Intake Manifold

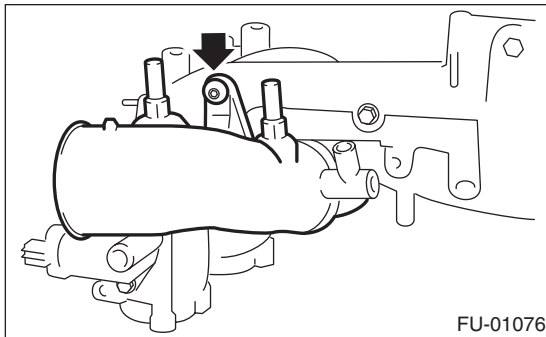
FUEL INJECTION (FUEL SYSTEMS)

17) Remove the bolts which install fuel pipes on intake manifold.

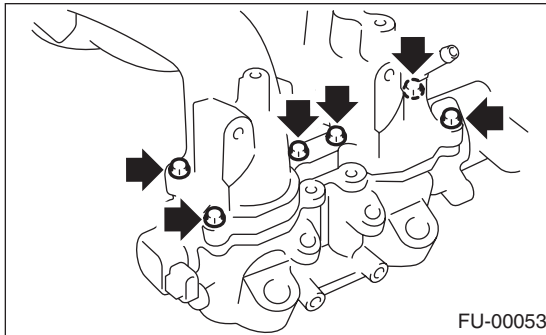


18) Remove the fuel pipe assembly and pressure regulator from intake manifold.

19) Remove the intake duct from intake manifold.



20) Remove the tumble generator assembly from intake manifold.



D: ASSEMBLY

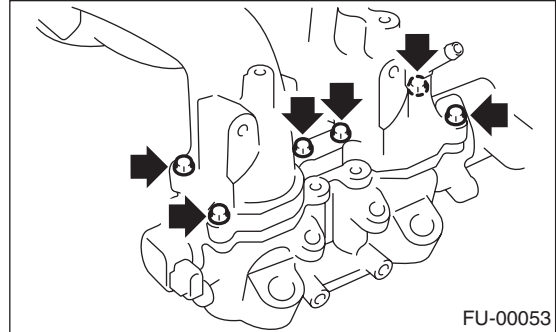
NOTE:

Use a new gasket.

1) Install the tumble generator valve assembly onto intake manifold.

Tightening torque:

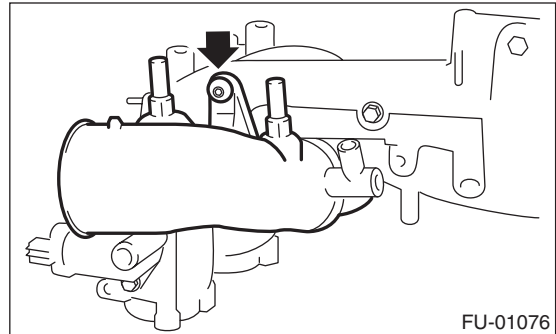
8.25 N·m (0.84 kgf-m, 6.1 ft-lb)



2) Install the air intake duct to the intake manifold.

Tightening torque:

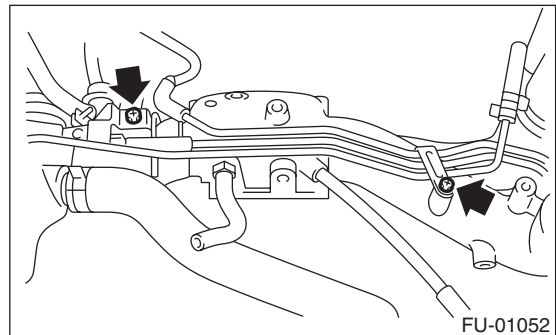
19 N·m (1.9 kgf-m, 14.0 ft-lb)



3) Install the fuel pipe assembly and pressure regulator to intake manifold.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



4) Install the fuel injector pipe LH.

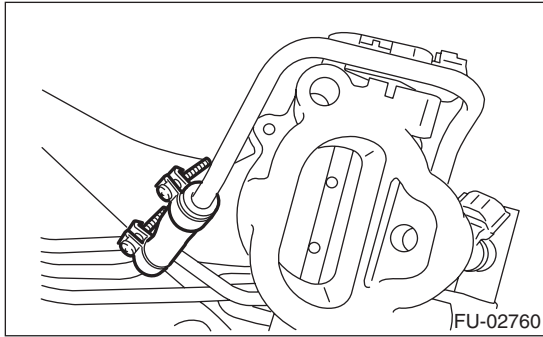
Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

5) Connect the fuel hose LH to the injector pipe, and tighten the clamp screw.

Tightening torque:

1.25 N·m (0.13 kgf·m, 0.94 ft·lb)

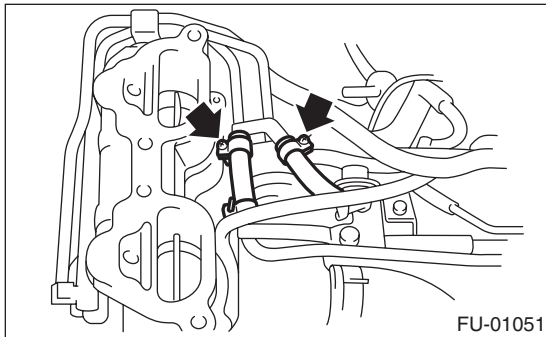


6) Install the fuel injector pipe RH.

7) Connect the fuel hose RH to the injector pipe, and tighten the clamp screw.

Tightening torque:

1.25 N·m (0.13 kgf·m, 0.94 ft·lb)

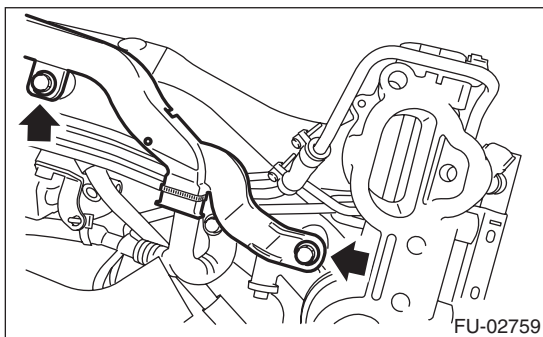


8) Install the engine harness onto intake manifold.

9) Install the harness bracket which holds the engine harness onto intake manifold.

Tightening torque:

19 N·m (1.9 kgf·m, 14.0 ft·lb)

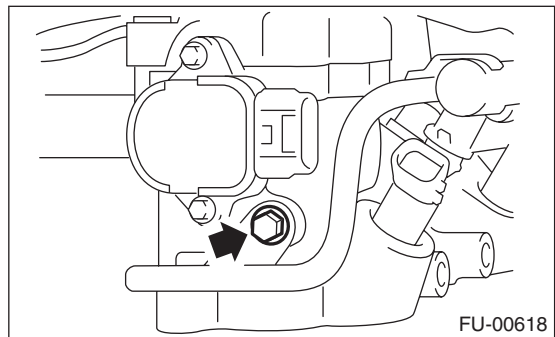
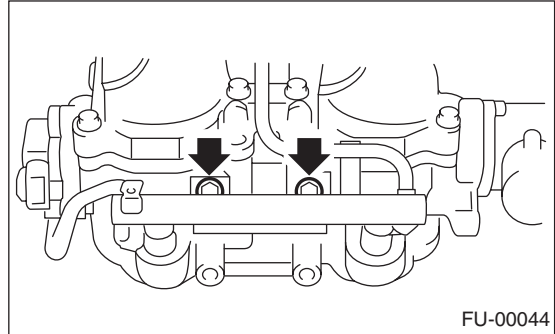


10) Tighten the bolts which secure fuel injector pipe onto intake manifold.

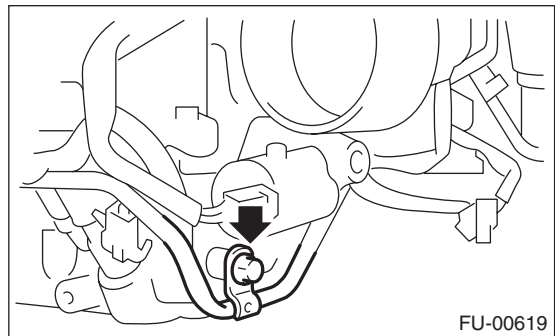
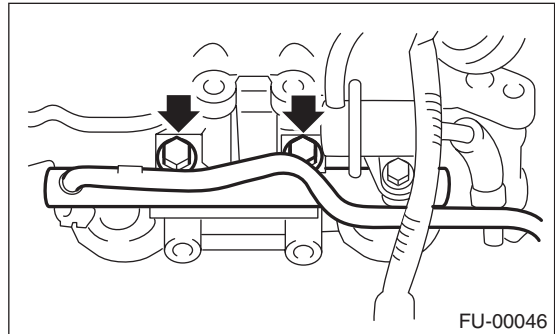
Tightening torque:

19 N·m (1.9 kgf·m, 14.0 ft·lb)

- LH side



- RH side



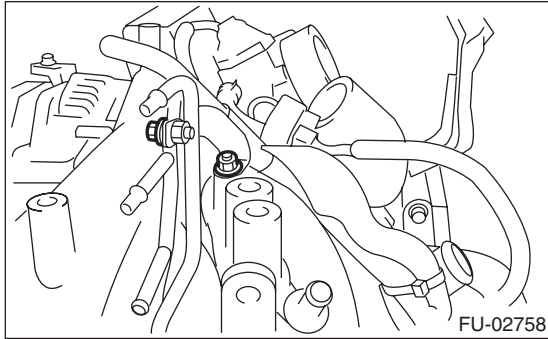
Intake Manifold

FUEL INJECTION (FUEL SYSTEMS)

11) Tighten the two bolts which install the fuel pipe on the left side of intake manifold.

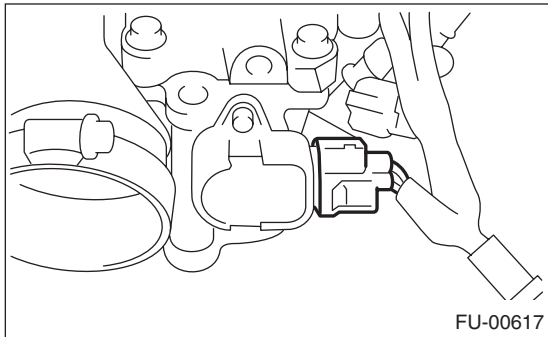
Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

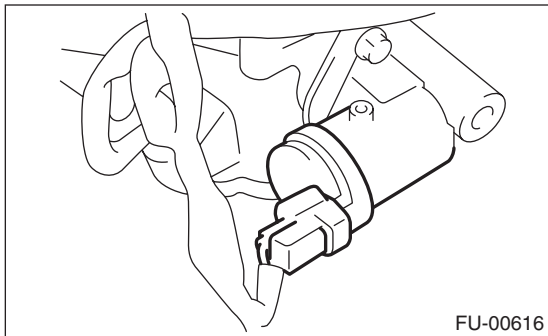


12) Install the purge control solenoid valve. <Ref. to EC (H4DOTC)-8, INSTALLATION, Purge Control Solenoid Valve.>

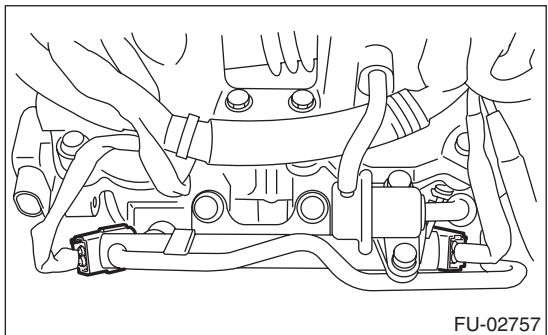
13) Connect the connector to the tumble generator valve sensor.



14) Connect the connector to the tumble generator valve actuator.



15) Connect the connector to the fuel injector.



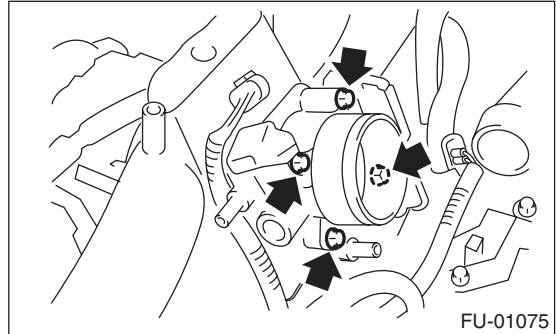
16) Install the throttle body to intake manifold.

NOTE:

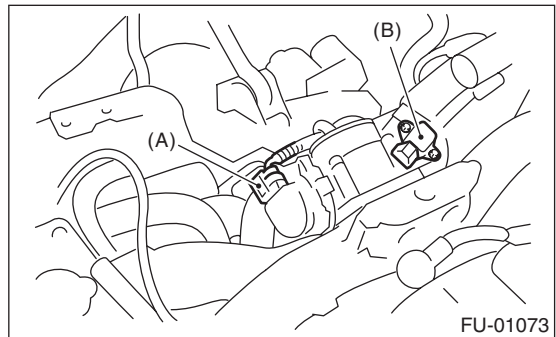
Use a new gasket.

Tightening torque:

8 N·m (0.8 kgf-m, 5.8 ft-lb)



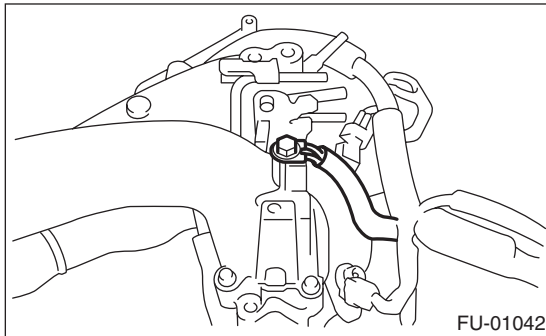
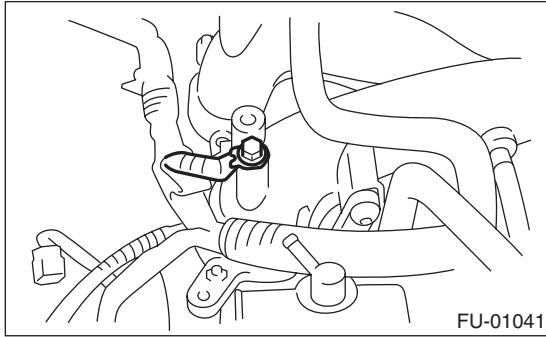
17) Connect the connector to the throttle position sensor (A), and the manifold pressure sensor (B).



18) Install the engine ground terminal to the intake manifold.

Tightening torque:

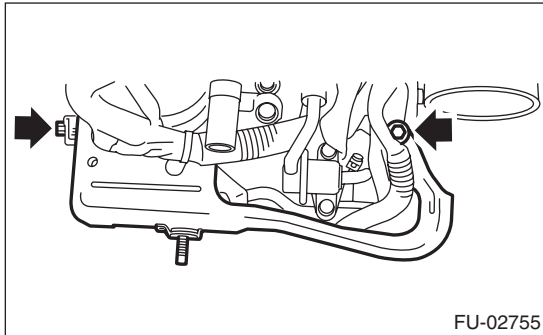
19 N·m (1.9 kgf-m, 14.0 ft-lb)



19) Install the fuel pipe protector RH.

Tightening torque:

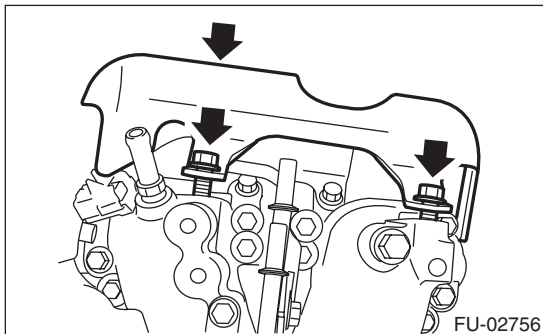
19 N·m (1.9 kgf-m, 14.0 ft-lb)



20) Install the fuel pipe protector LH.

Tightening torque:

19 N·m (1.9 kgf-m, 14.0 ft-lb)



E: INSPECTION

Make sure that the fuel pipe and fuel hose are not cracked and those connections are tight.

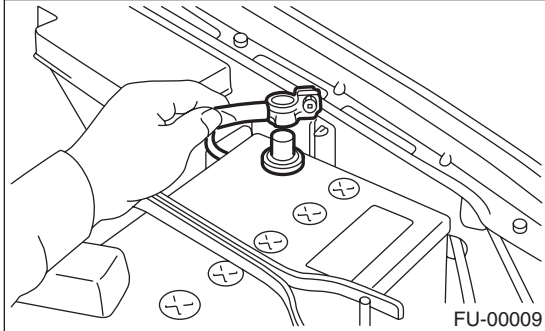
Engine Coolant Temperature Sensor

FUEL INJECTION (FUEL SYSTEMS)

4. Engine Coolant Temperature Sensor

A: REMOVAL

1) Disconnect the ground cable from the battery.

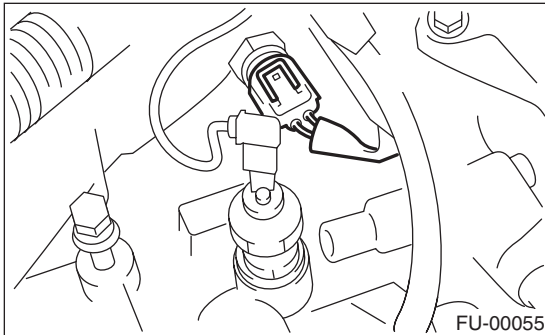


2) Remove the collector cover.

3) Remove the generator. <Ref. to SC (H4SO)-14, REMOVAL, Generator.>

4) Drain the engine coolant. <Ref. to CO(H4SO)-18, DRAINING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

5) Disconnect the connectors from the engine coolant temperature sensor.



6) Remove the engine coolant temperature sensor.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Use a new gasket.

Tightening torque:

18 N·m (1.8 kgf·m, 13.3 ft·lb)

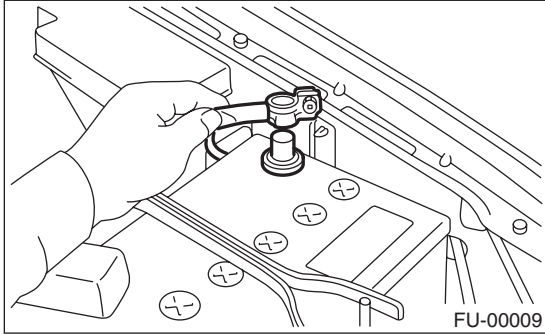
Crankshaft Position Sensor

FUEL INJECTION (FUEL SYSTEMS)

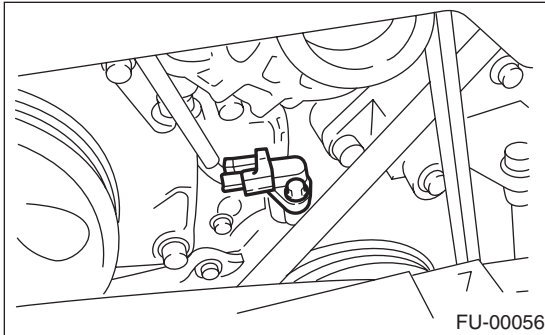
5. Crankshaft Position Sensor

A: REMOVAL

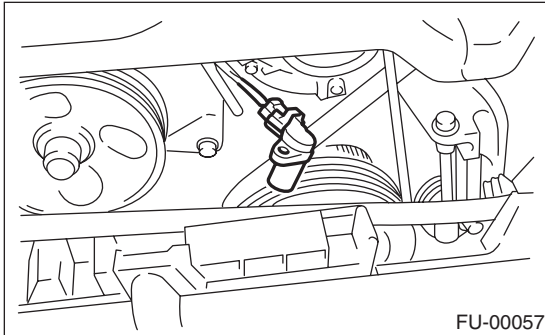
- 1) Disconnect the ground cable from the battery.



- 2) Remove the collector cover.
- 3) Remove the bolt which installs crankshaft position sensor to cylinder block.



- 4) Remove the crankshaft position sensor, and then disconnect the connector from it.

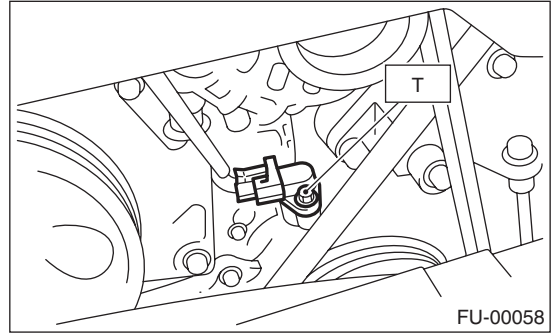


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

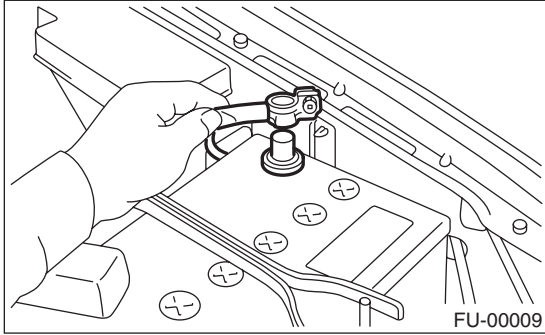
T: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



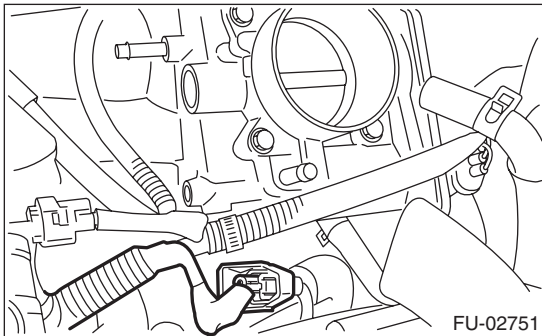
7. Knock Sensor

A: REMOVAL

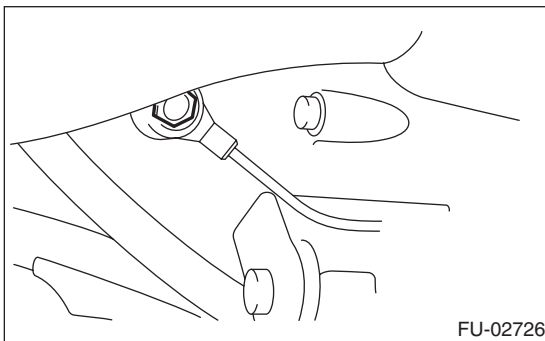
- 1) Disconnect the ground cable from the battery.



- 2) Remove the collector cover.
- 3) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 4) Disconnect the knock sensor connector.



- 5) Remove the knock sensor from the cylinder block.



B: INSTALLATION

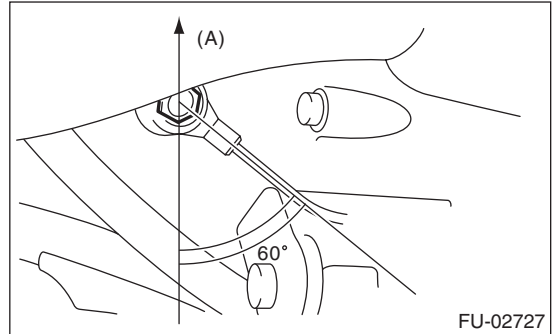
- 1) Install the knock sensor to the cylinder block.

Tightening torque:

24 N·m (2.4 kgf-m, 17.4 ft-lb)

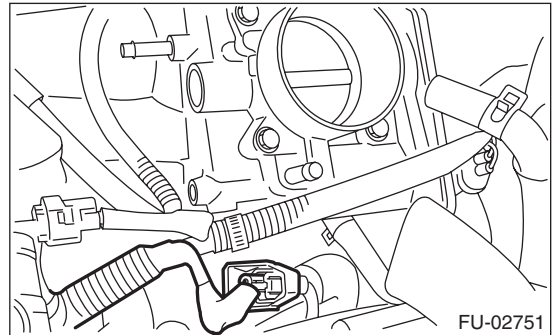
NOTE:

The portion of the knock sensor cord that is pulled out must be positioned at a 60° angle relative to the engine rear.

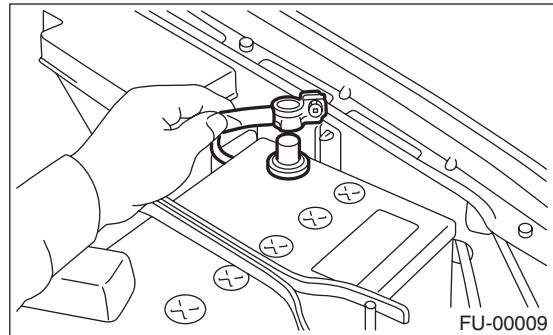


(A) Front side

- 2) Connect the knock sensor connector.



- 3) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>
- 4) Install the collector cover.
- 5) Connect the ground cable to the battery.



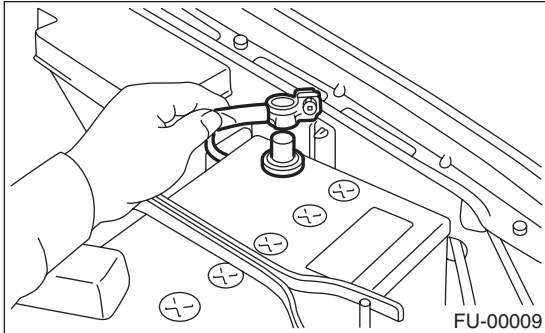
Mass Air Flow and Intake Air Temperature Sensor

FUEL INJECTION (FUEL SYSTEMS)

8. Mass Air Flow and Intake Air Temperature Sensor

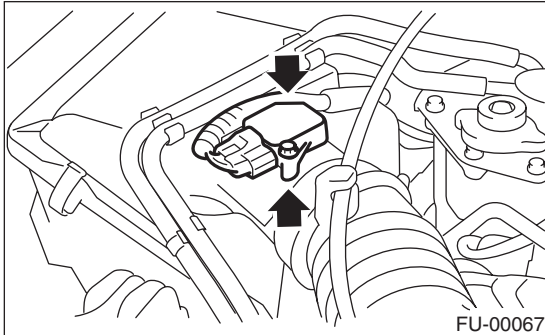
A: REMOVAL

1) Disconnect the ground cable from the battery.



2) Disconnect the connector from the mass air flow and intake air temperature sensor.

3) Remove the mass air flow and intake air temperature sensor.



B: INSTALLATION

Install in the reverse order of removal.

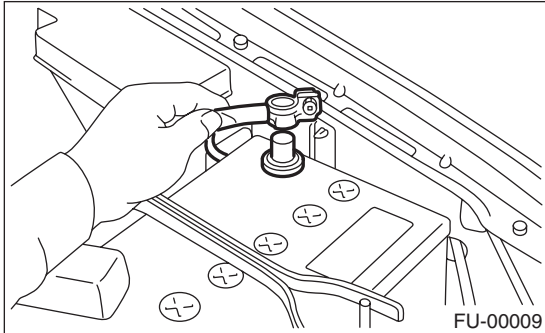
Tightening torque:

1.0 N·m (0.1 kgf-m, 0.7 ft-lb)

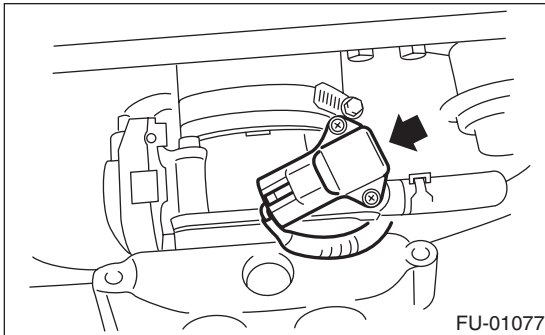
9. Manifold Absolute Pressure Sensor

A: REMOVAL

- 1) Disconnect the ground cable from the battery.



- 2) Remove the collector cover.
- 3) Disconnect the connector from manifold absolute pressure sensor.



- 4) Remove the manifold absolute pressure sensor from throttle body.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Use new O-rings.

Tightening torque:

1.6 N·m (0.16 kgf-m, 1.2 ft-lb)

Fuel Injector

FUEL INJECTION (FUEL SYSTEMS)

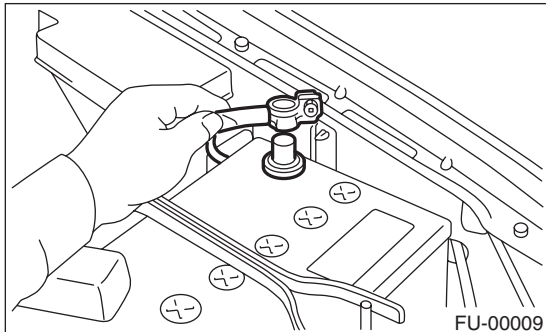
10. Fuel Injector

A: REMOVAL

1. RH SIDE

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-49, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

2) Disconnect the ground cable from the battery.



3) Open the fuel filler flap lid, and remove the fuel filler cap.

4) Remove the collector cover.

5) Remove the air cleaner upper cover and air intake boot. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>

6) Remove the air cleaner element.

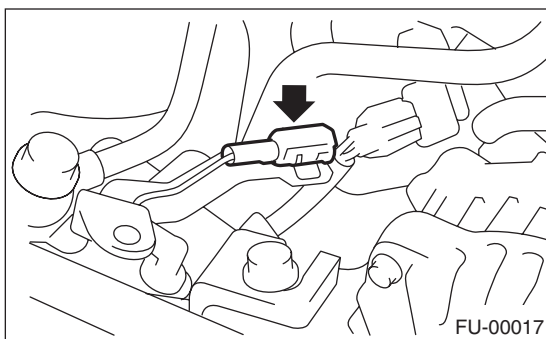
7) Remove the coolant filler tank.

<Ref. to CO(H4SO)-43, REMOVAL, Coolant Filler Tank.>

8) Remove the power steering pump.

(1) Remove the front side of the V-belts. <Ref. to ME(H4DOTC)-40, REMOVAL, V-belt.>

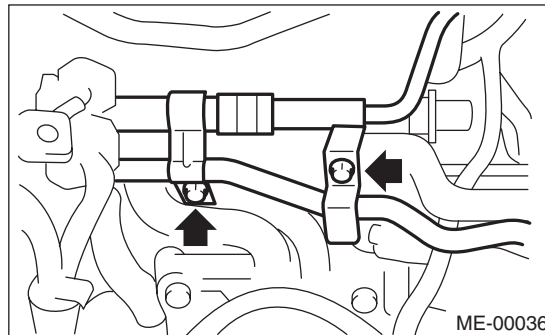
(2) Disconnect the power steering switch connector.



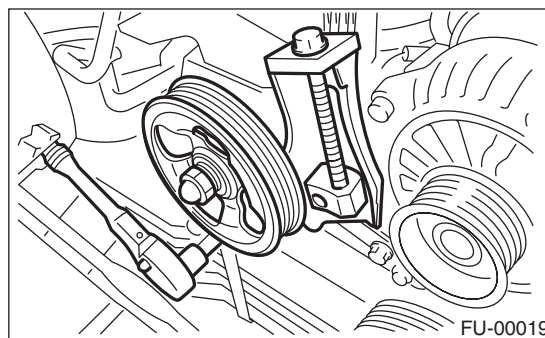
(3) Remove the bolts which install the power steering pipe bracket to the intake manifold.

NOTE:

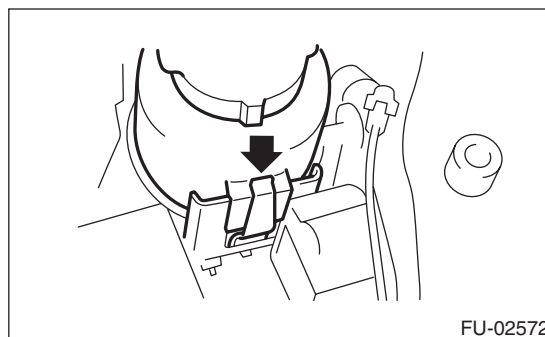
Do not disconnect the power steering hose.



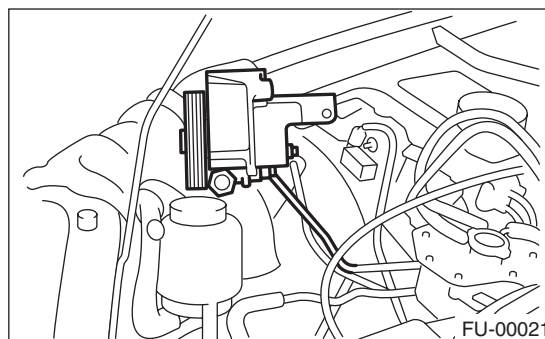
(4) Remove the bolts which install power steering pump bracket.



(5) Remove the reservoir tank from the bracket by pulling it upward.



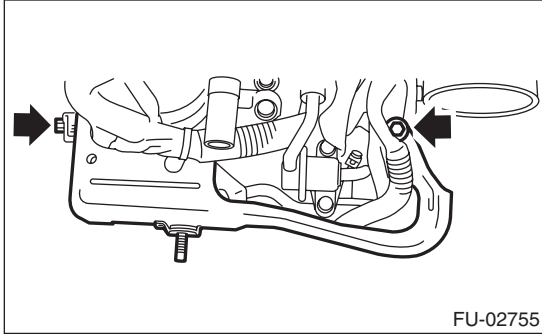
(6) Place the power steering pump on the right side wheel apron.



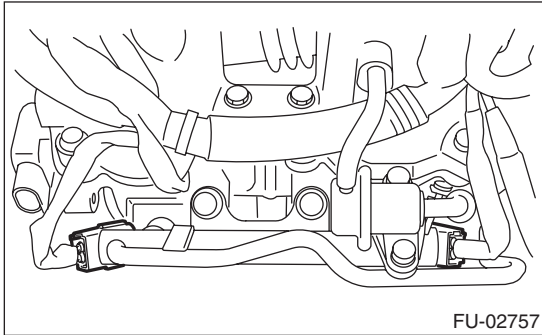
Fuel Injector

FUEL INJECTION (FUEL SYSTEMS)

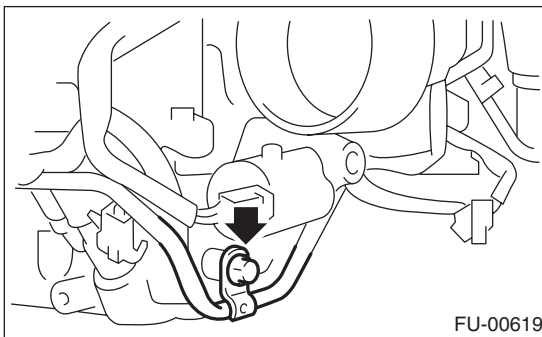
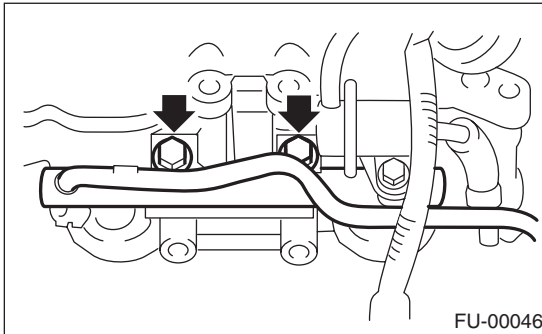
9) Remove the fuel pipe protector RH.



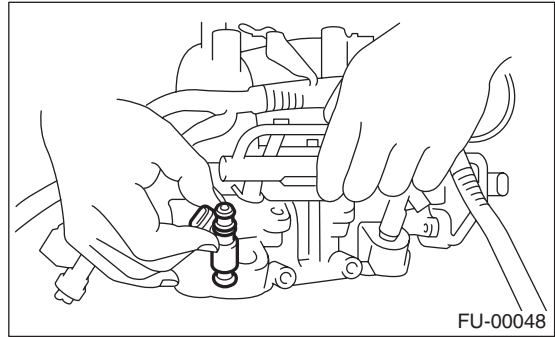
10) Disconnect the connector from fuel injector.



11) Remove the bolt which holds the injector pipe to the intake manifold.



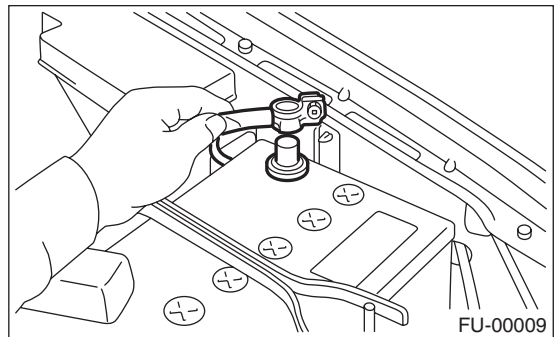
12) Remove the fuel injector while lifting up the fuel injector pipe.



2. LH SIDE

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-49, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

2) Disconnect the ground cable from the battery.



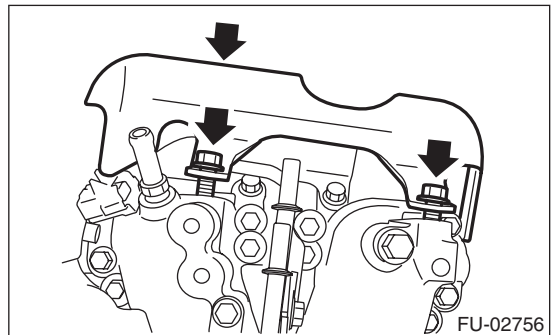
3) Open the fuel filler flap lid, and remove the fuel filler cap.

4) Remove the collector cover.

5) Remove the intake manifold.

<Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>

6) Remove the fuel pipe protector LH.

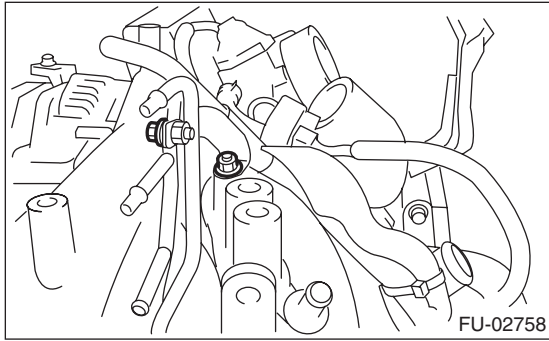


7) Disconnect the connector from fuel injector.

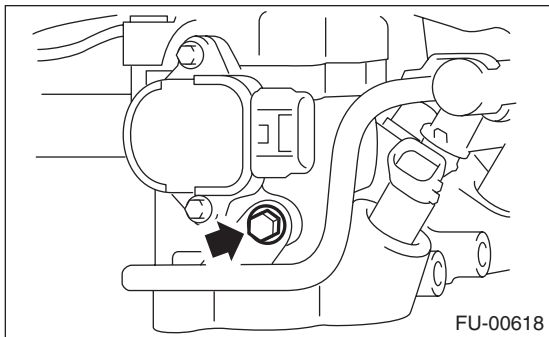
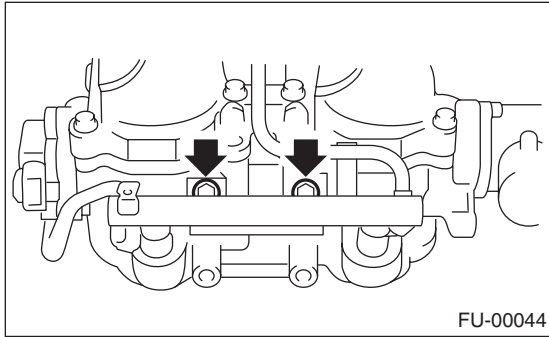
Fuel Injector

FUEL INJECTION (FUEL SYSTEMS)

8) Remove the two bolts which hold fuel pipes on the left side of intake manifold.



9) Remove the bolt which holds fuel injector pipe onto intake manifold.



10) Remove the fuel injector while lifting up the fuel injector pipe.

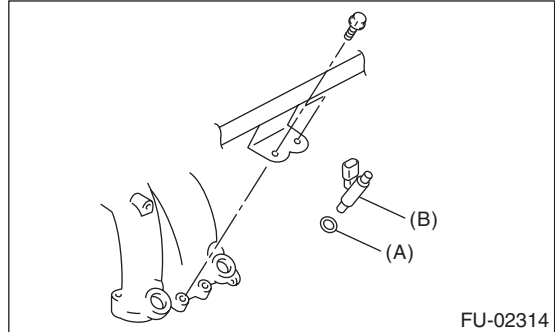
B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

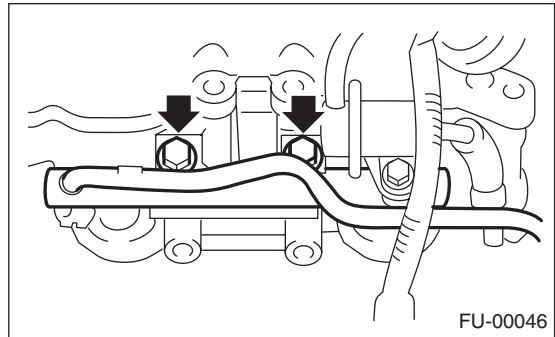
NOTE:

Use new O-rings and insulators.

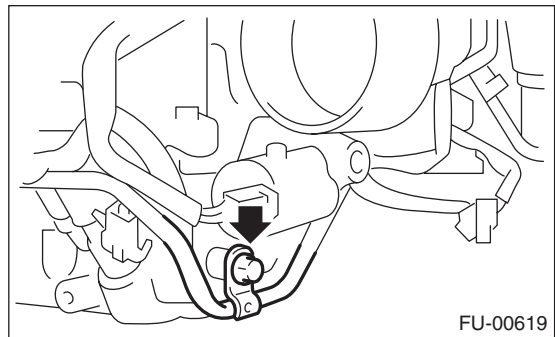


- (A) Insulator
- (B) Fuel injector

Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



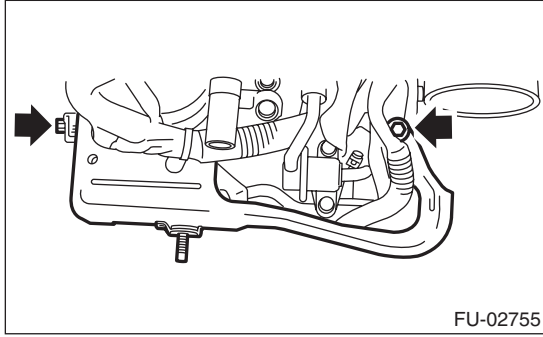
Tightening torque:
19 N·m (1.9 kgf-m, 14.0 ft-lb)



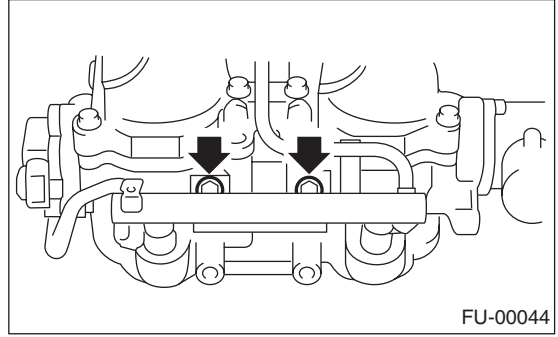
Fuel Injector

FUEL INJECTION (FUEL SYSTEMS)

Tightening torque:
19 N·m (1.9 kgf·m, 14.0 ft·lb)



Tightening torque:
19 N·m (1.9 kgf·m, 14.0 ft·lb)

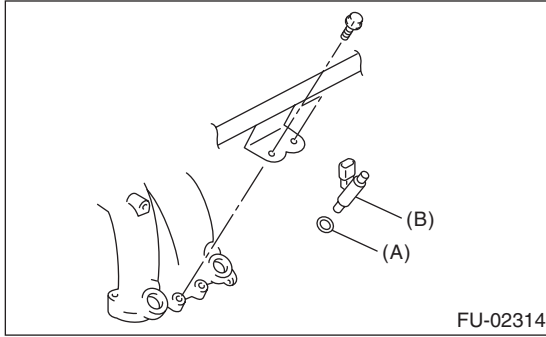


2. LH SIDE

Install in the reverse order of removal.

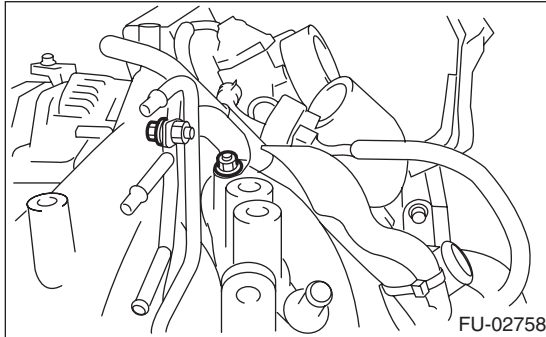
NOTE:

Use new O-rings and insulators.

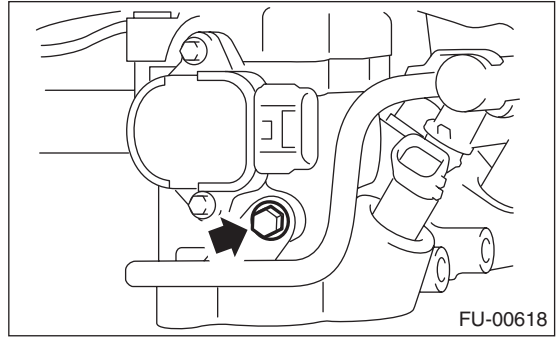


- (A) Insulator
- (B) Fuel injector

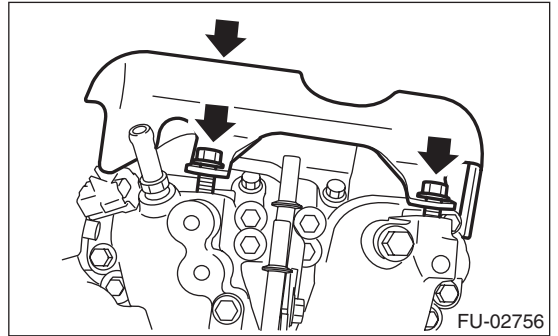
Tightening torque:
6.4 N·m (0.65 kgf·m, 4.7 ft·lb)



Tightening torque:
19 N·m (1.9 kgf·m, 14.0 ft·lb)



Tightening torque:
19 N·m (1.9 kgf·m, 14.0 ft·lb)



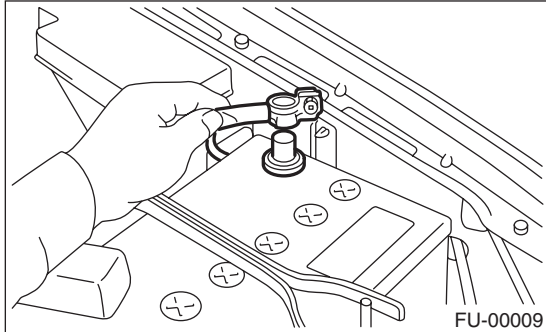
Tumble Generator Valve Assembly

FUEL INJECTION (FUEL SYSTEMS)

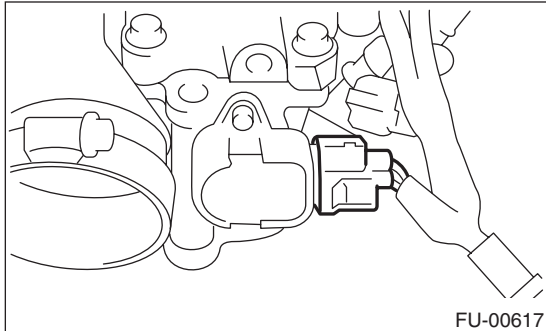
11. Tumble Generator Valve Assembly

A: REMOVAL

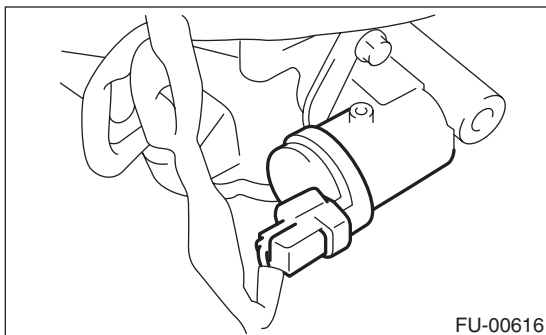
- 1) Release the fuel pressure. <Ref. to FU(H4DOTC)-49, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Disconnect the ground cable from the battery.



- 3) Open the fuel filler flap lid, and remove the fuel filler cap.
- 4) Remove the collector cover.
- 5) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
- 6) Disconnect the connector from tumble generator valve sensor.

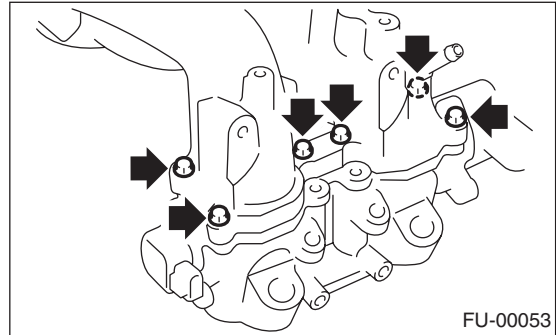


- 7) Disconnect the connector from tumble generator valve actuator.



- 8) Remove the fuel injector. <Ref. to FU(H4DOTC)-32, REMOVAL, Fuel Injector.>

- 9) Remove the tumble generator valve body from intake manifold.



B: INSTALLATION

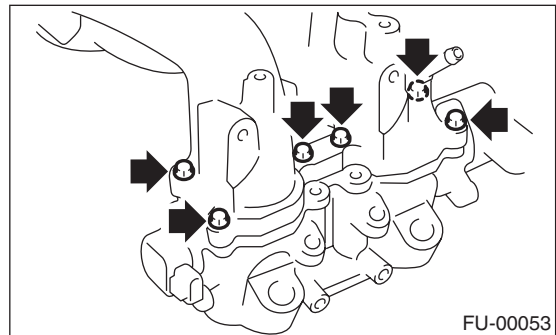
Install in the reverse order of removal.

NOTE:

Use a new gasket.

Tightening torque:

8.25 N·m (0.84 kgf-m, 6.1 ft-lb)

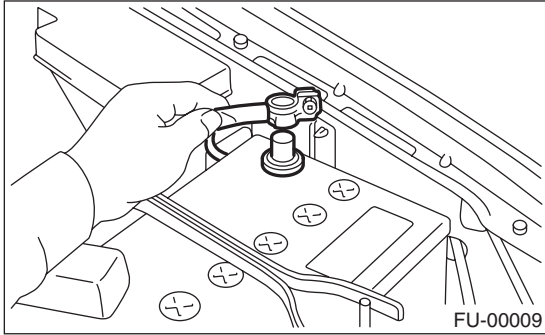


12. Tumble Generator Valve Actuator

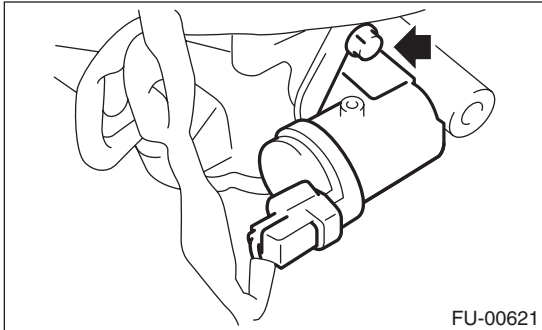
A: REMOVAL

1. RH SIDE

- 1) Release the fuel pressure. <Ref. to FU(H4DOTC)-49, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 2) Disconnect the ground cable from the battery.



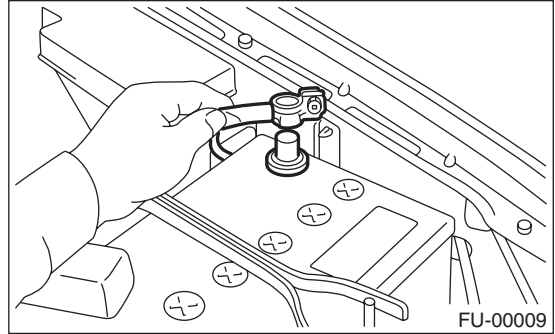
- 3) Open the fuel filler flap lid, and remove the fuel filler cap.
- 4) Remove the collector cover.
- 5) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
- 6) Disconnect the connector from tumble generator valve actuator.
- 7) Remove the tumble generator valve actuator.



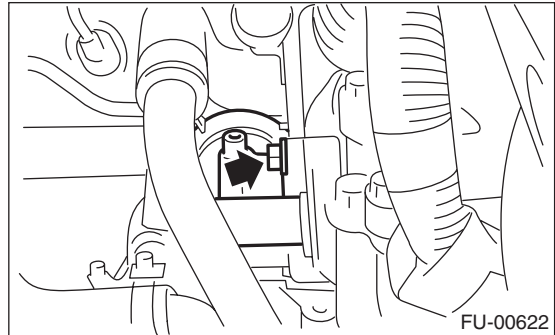
2. LH SIDE

- 1) Release the fuel pressure. <Ref. to FU(H4DOTC)-49, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

- 2) Disconnect the ground cable from the battery.



- 3) Open the fuel filler flap lid, and remove the fuel filler cap.
- 4) Remove the collector cover.
- 5) Remove the secondary air pump. <Ref. to EC (H4DOTC)-9, REMOVAL, Secondary Air Pump.>
- 6) Disconnect the connector from tumble generator valve actuator.
- 7) Remove the tumble generator valve actuator.



B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

2. LH SIDE

Install in the reverse order of removal.

Tumble Generator Valve Position Sensor

FUEL INJECTION (FUEL SYSTEMS)

13. Tumble Generator Valve Position Sensor

A: SPECIFICATION

The tumble generator valve position sensor cannot be adjusted when installed, so it should not be removed from the tumble generator valve assembly. Refer to "Tumble Generator Valve Assembly" for removal and installation procedure. <Ref. to FU(H4DOTC)-36, REMOVAL, Tumble Generator Valve Assembly.> <Ref. to FU(H4DOTC)-36, INSTALLATION, Tumble Generator Valve Assembly.>

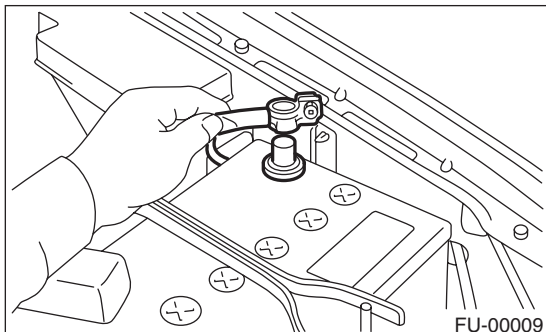
Wastegate Control Solenoid Valve

FUEL INJECTION (FUEL SYSTEMS)

14. Wastegate Control Solenoid Valve

A: REMOVAL

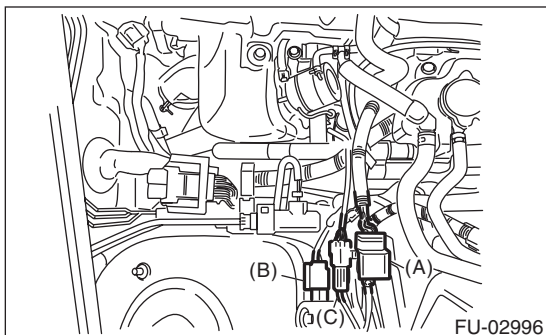
1) Disconnect the ground cable from the battery.



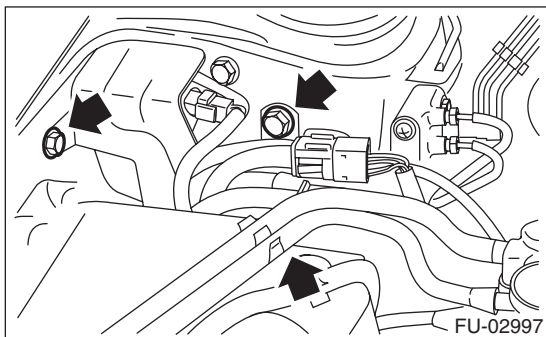
2) Remove the engine harness connector (A) from bracket.

3) Disconnect the connector (B) from wastegate control solenoid valve.

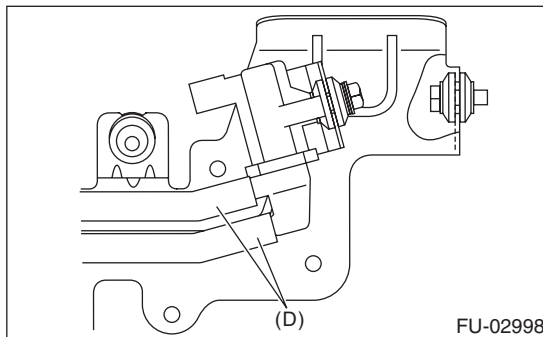
4) Remove the front oxygen (A/F) sensor connector (C) from the bracket.



5) Remove the bracket from vehicle body.



6) Disconnect pressure hose (D) from the wastegate control solenoid valve.



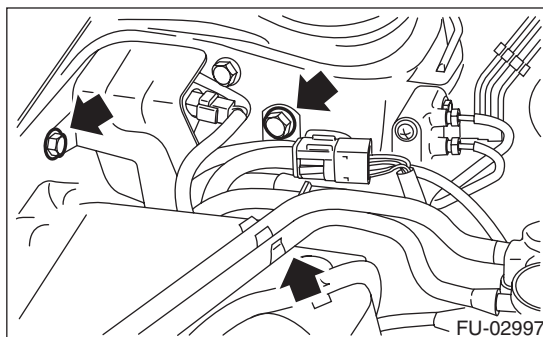
7) Remove the wastegate control solenoid valve from the bracket.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

6.5 N·m (0.66 kgf-m, 4.8 ft-lb)



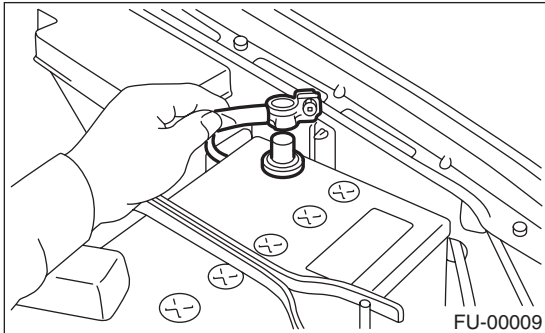
Front Oxygen (A/F) Sensor

FUEL INJECTION (FUEL SYSTEMS)

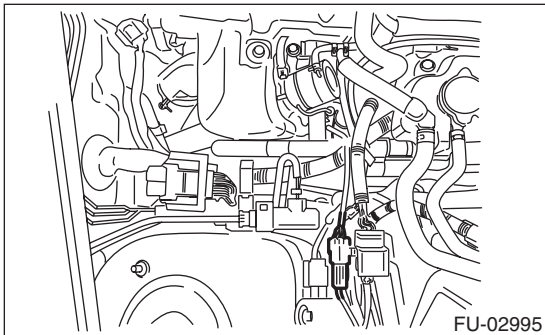
15. Front Oxygen (A/F) Sensor

A: REMOVAL

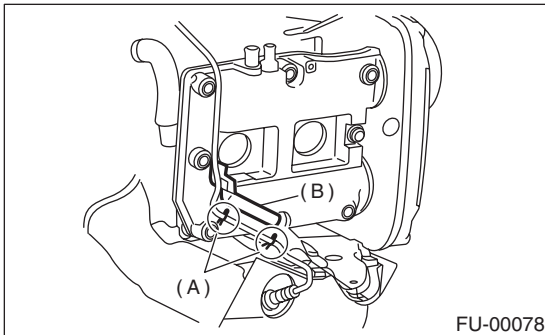
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.



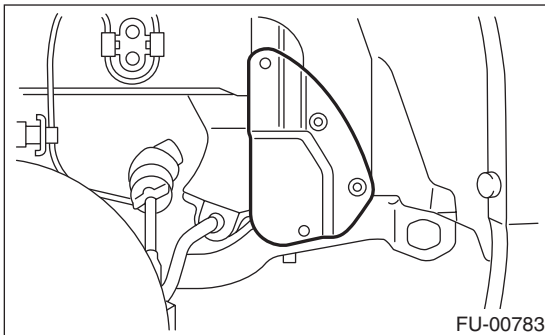
- 3) Disconnect the connector from front oxygen (A/F) sensor.



- 4) Disconnect the engine harness fixed by clip (A) from the bracket (B).



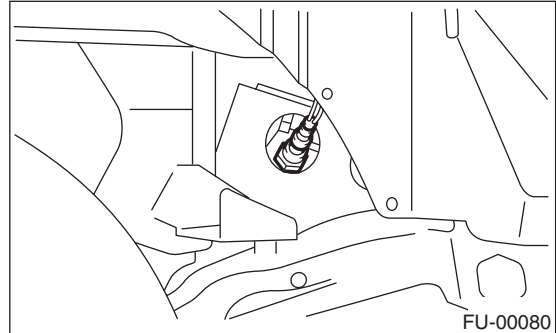
- 5) Remove the front right side wheel.
- 6) Lift-up the vehicle.
- 7) Remove the service hole cover.



- 8) Apply spray-type lubricant to the threaded portion of front oxygen (A/F) sensor, and leave it for one minute or more.
- 9) Remove the front oxygen (A/F) sensor.

CAUTION:

When removing the oxygen (A/F) sensor, wait until exhaust pipe cools, otherwise it will damage the exhaust pipe.



B: INSTALLATION

- 1) Before installing front oxygen (A/F) sensor, apply the anti-seize compound only to the threaded portion of front oxygen (A/F) sensor. This facilitates the next removal.

Anti-seize compound:

NEVER-SEEZ NSN, JET LUBE SS-30 or the equivalent

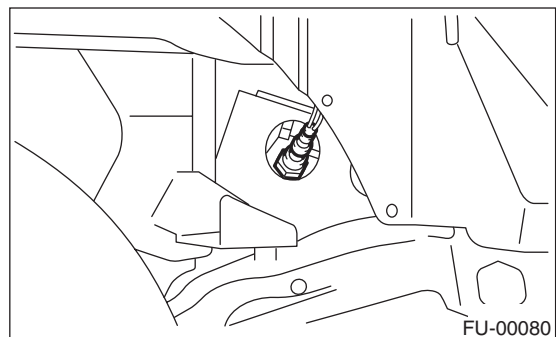
CAUTION:

Never apply anti-seize compound to the protector of front oxygen (A/F) sensor.

- 2) Install the front oxygen (A/F) sensor.

Tightening torque:

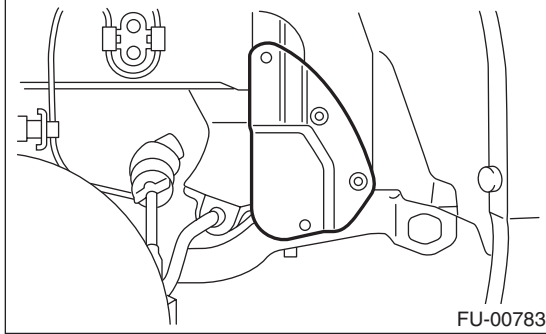
30 N·m (3.1 kgf·m, 22.1 ft·lb)



Front Oxygen (A/F) Sensor

FUEL INJECTION (FUEL SYSTEMS)

3) Install the service hole cover.



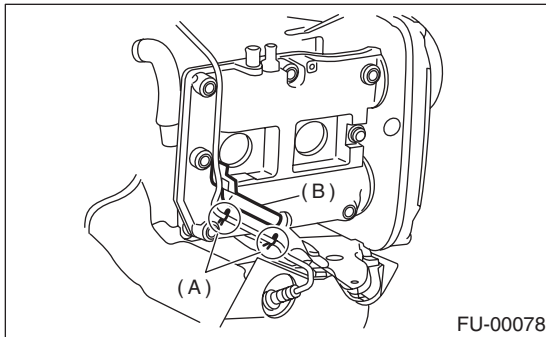
4) Lower the vehicle.

5) Install the front right side wheel.

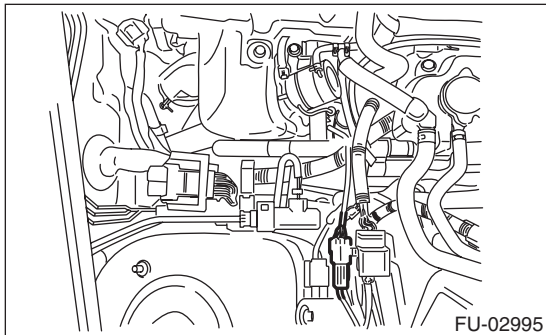
Tightening torque:

100 N·m (10.2 kgf-m, 73.8 ft-lb)

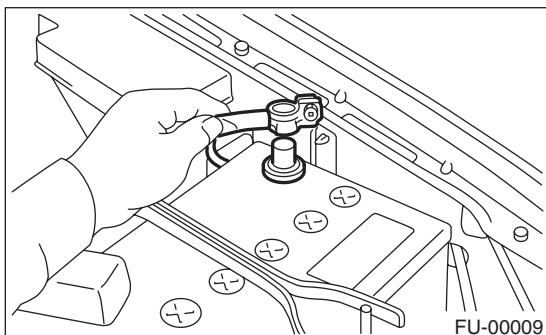
6) Connect the engine harness to the bracket (B) using the clip (A).



7) Connect the connector of front oxygen (A/F) sensor.



8) Connect the ground cable to the battery.



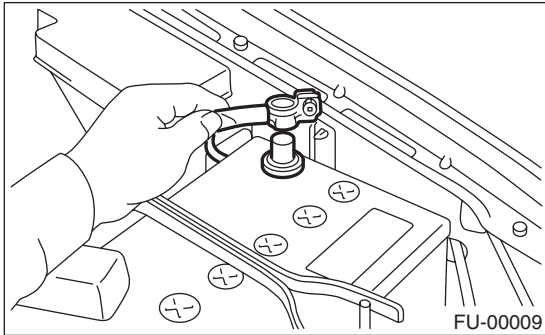
Rear Oxygen Sensor

FUEL INJECTION (FUEL SYSTEMS)

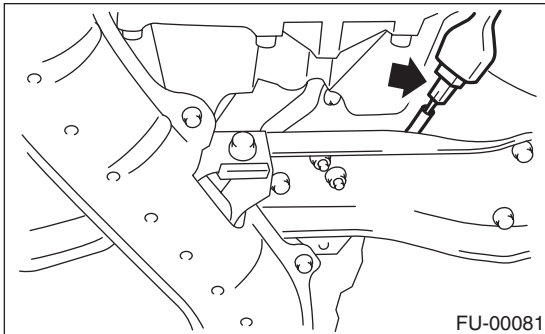
16.Rear Oxygen Sensor

A: REMOVAL

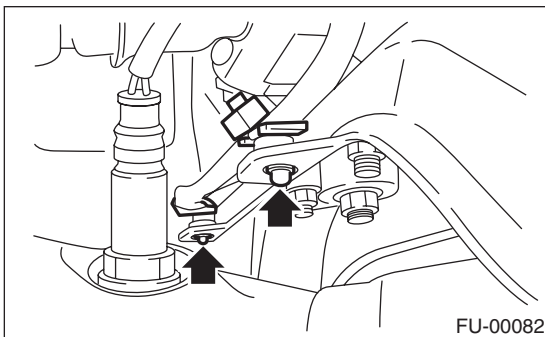
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.



- 3) Lift-up the vehicle.
- 4) Disconnect the connector from the rear oxygen sensor.



- 5) Remove the clip by pulling out from the upper side of crossmember.

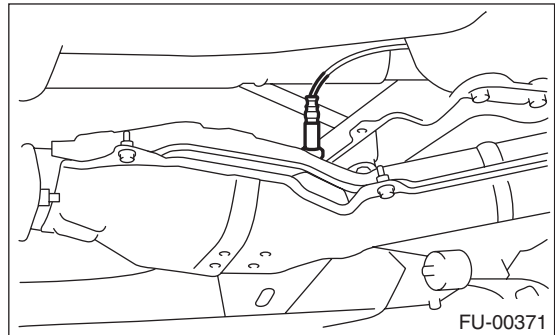


- 6) Apply spray-type lubricant to the threaded portion of rear oxygen sensor, and leave it for one minute or more.

- 7) Remove the rear oxygen sensor.

CAUTION:

When removing the oxygen (A/F) sensor, wait until exhaust pipe cools, because it can damage the exhaust pipe.



B: INSTALLATION

1) Before installing rear oxygen sensor, apply the anti-seize compound only to the threaded portion of rear oxygen sensor. This facilitates the next removal.

Anti-seize compound:

NEVER-SEEZ NSN, JET LUBE SS-30 or the equivalent

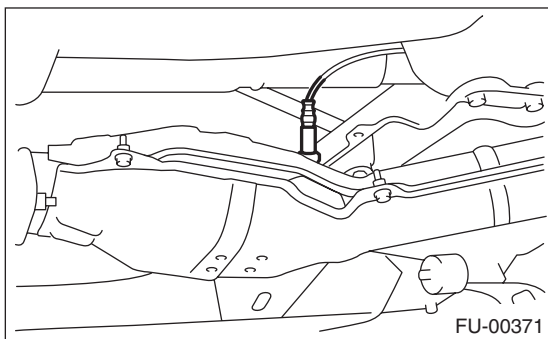
CAUTION:

Never apply anti-seize compound to the protector of rear oxygen sensor.

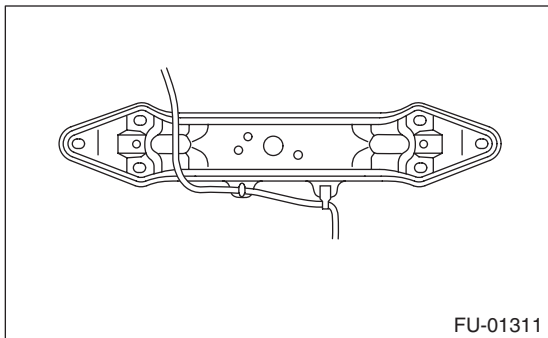
2) Install the rear oxygen sensor.

Tightening torque:

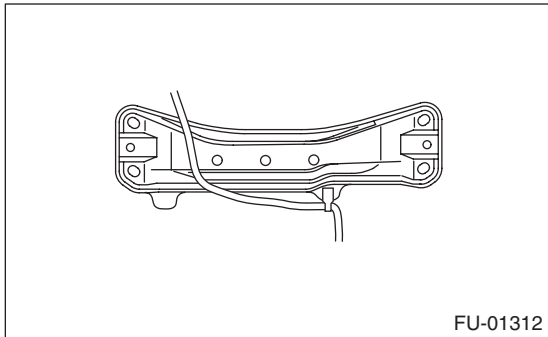
21 N·m (2.1 kgf-m, 15.2 ft-lb)



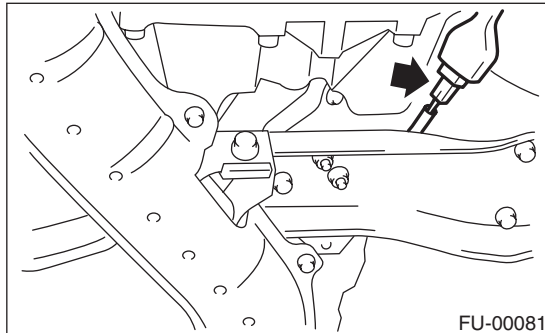
- AT model



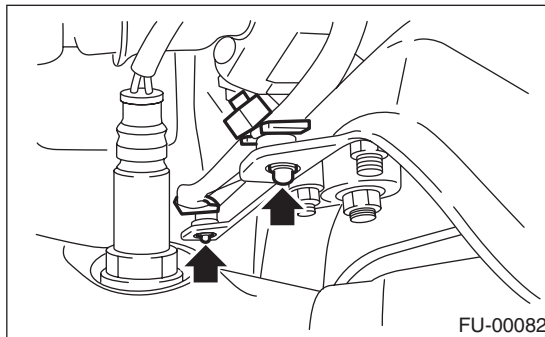
- MT model



3) Connect the rear oxygen sensor connector.

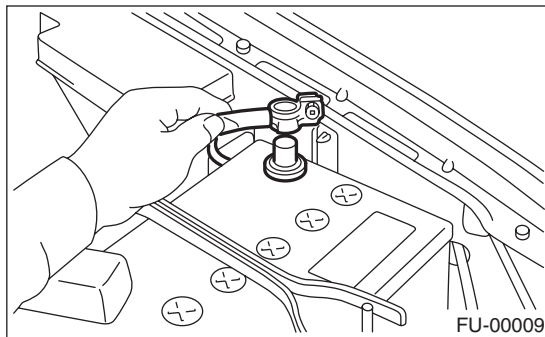


4) Connect the clip to the crossmember.



5) Lower the vehicle.

6) Connect the ground cable to the battery.



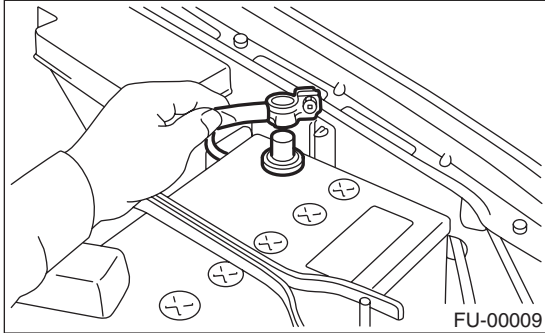
Engine Control Module (ECM)

FUEL INJECTION (FUEL SYSTEMS)

17.Engine Control Module (ECM)

A: REMOVAL

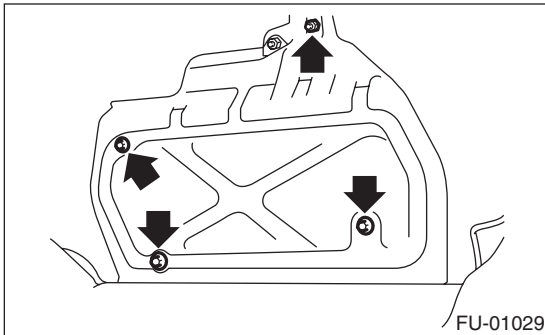
- 1) Disconnect the ground cable from the battery.



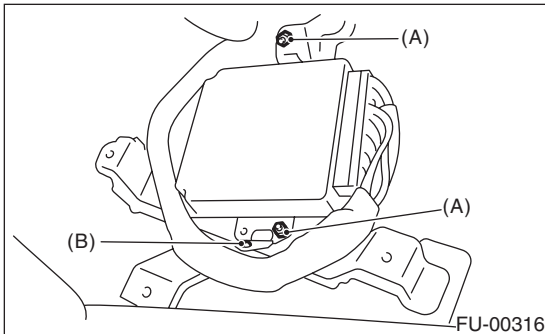
- 2) Remove the lower inner trim of passenger's side.

<Ref. to EI-43, REMOVAL, Lower Inner Trim.>

- 3) Detach the floor mat of passenger's seat.
- 4) Remove the protect cover.



- 5) Remove the nuts (A) which hold ECM to bracket.
- 6) Remove the clip (B) from the bracket.



- 7) Disconnect the ECM connectors, and take out the ECM.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

When replacing the ECM, be careful not to use the wrong spec. ECM to avoid any damage on the fuel injection system.

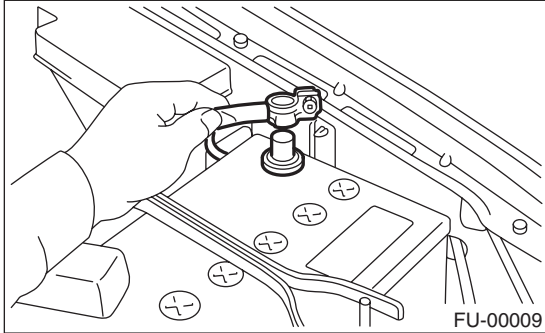
Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

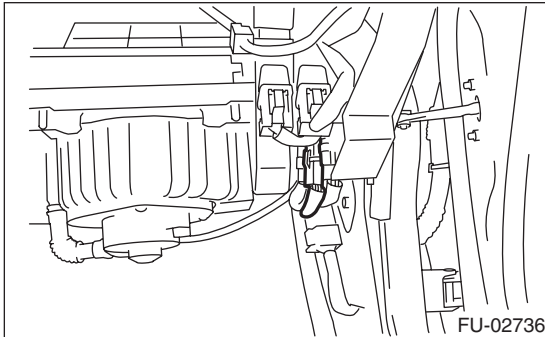
18. Main Relay

A: REMOVAL

- 1) Disconnect the ground cable from the battery.



- 2) Remove the glove box. <Ref. to EI-36, REMOVAL, Glove Box.>
- 3) Remove the passenger's side front side sill cover.
- 4) Disconnect the connectors from main relay.



- 5) Remove the main relay from the mounting bracket.

B: INSTALLATION

Install in the reverse order of removal.

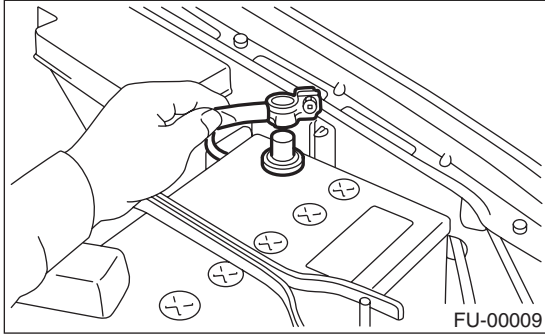
Fuel Pump Relay

FUEL INJECTION (FUEL SYSTEMS)

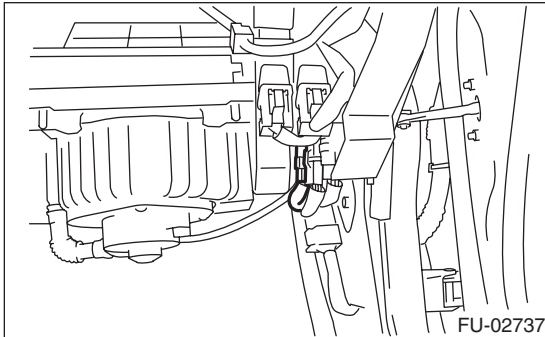
19. Fuel Pump Relay

A: REMOVAL

- 1) Disconnect the ground cable from the battery.



- 2) Remove the glove box. <Ref. to EI-36, REMOVAL, Glove Box.>
- 3) Remove the passenger's side front side sill cover.
- 4) Disconnect the connector from fuel pump relay.



- 5) Remove the fuel pump relay from the mounting bracket.

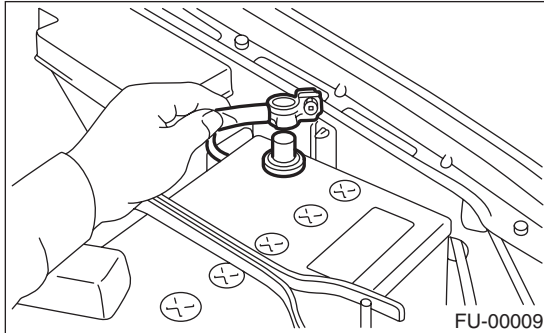
B: INSTALLATION

Install in the reverse order of removal.

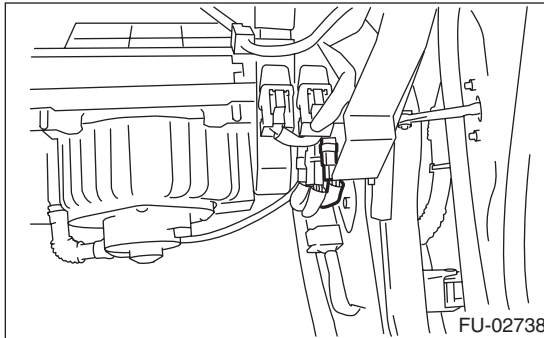
20. Electronic Throttle Control Relay

A: REMOVAL

- 1) Disconnect the ground cable from the battery.



- 2) Remove the glove box. <Ref. to EI-36, REMOVAL, Glove Box.>
- 3) Remove the passenger's side front side sill cover.
- 4) Disconnect the connector from electric throttle control relay.



- 5) Remove the electronic throttle control relay from the mounting bracket.

B: INSTALLATION

Install in the reverse order of removal.

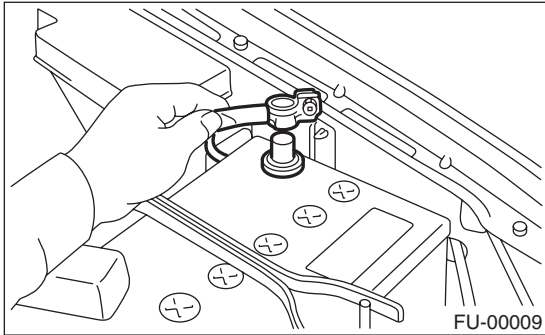
Fuel Pump Control Unit

FUEL INJECTION (FUEL SYSTEMS)

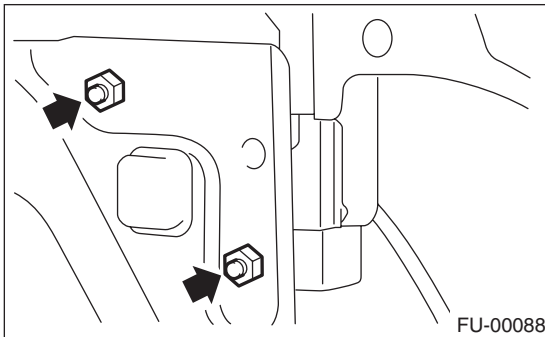
21. Fuel Pump Control Unit

A: REMOVAL

- 1) Disconnect the ground cable from the battery.



- 2) Remove the rear quarter trim. <Ref. to EI-44, REMOVAL, Rear Quarter Trim.>
- 3) Disconnect the connector from fuel pump control unit.
- 4) Remove the fuel pump control unit.



B: INSTALLATION

Install in the reverse order of removal.

22. Fuel

A: PROCEDURE

1. RELEASING OF FUEL PRESSURE

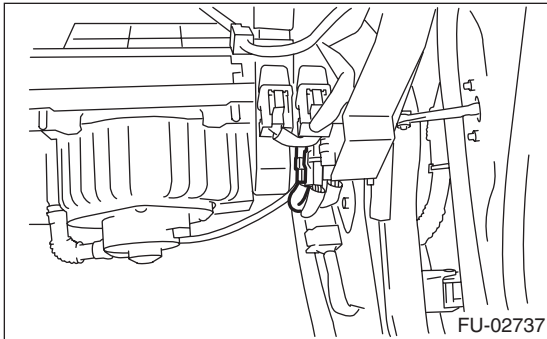
WARNING:

Place "NO FIRE" signs near the working area.

CAUTION:

Be careful not to spill fuel.

- 1) Remove the glove box. <Ref. to EI-36, REMOVAL, Glove Box.>
- 2) Remove the side sill cover on the passenger's side.
- 3) Disconnect the connector from fuel pump relay.



- 4) Start the engine and run it until it stalls.
- 5) After the engine stalls, crank it for five more seconds.
- 6) Turn the ignition switch to OFF.

2. DRAINING FUEL

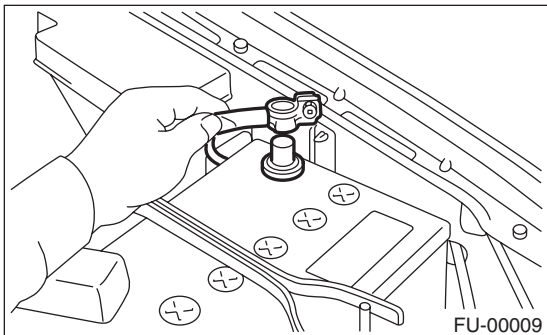
WARNING:

Place "NO FIRE" signs near the working area.

CAUTION:

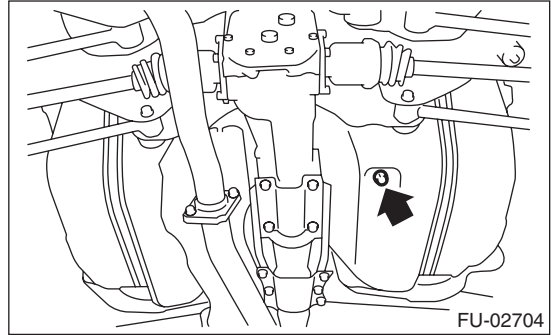
Be careful not to spill fuel.

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.



- 3) Open the fuel filler flap lid, and remove the fuel filler cap.
- 4) Lift-up the vehicle.

- 5) Set a container under the vehicle and remove the drain plug from fuel tank to drain fuel from fuel tank.



- 6) Tighten the fuel drain plugs.

NOTE:

Use a new gasket.

Tightening torque:

26 N·m (2.65 kgf-m, 19.2 ft-lb)

Fuel Tank

FUEL INJECTION (FUEL SYSTEMS)

23. Fuel Tank

A: REMOVAL

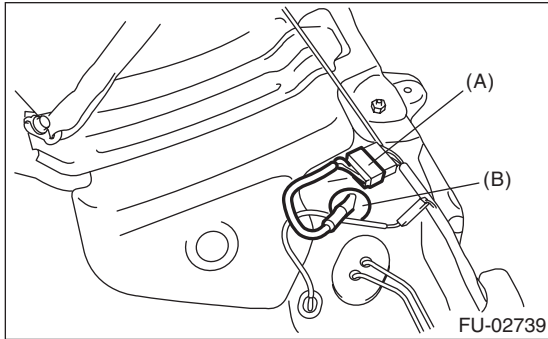
WARNING:

Place "NO FIRE" signs near the working area.

CAUTION:

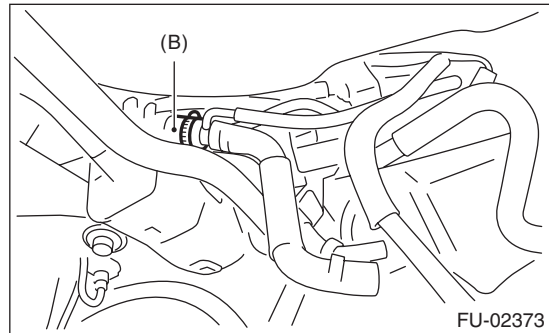
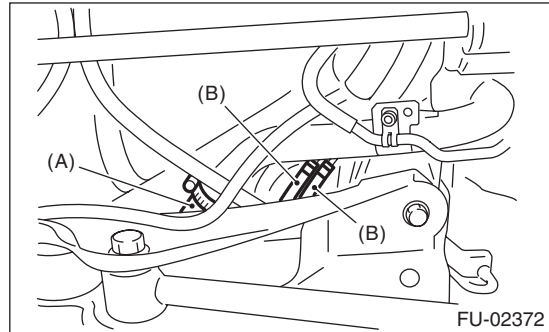
Be careful not to spill fuel.

- 1) Set the vehicle on a lift.
- 2) Release the fuel pressure. <Ref. to FU(H4DOTC)-49, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 3) Drain fuel from fuel tank. <Ref. to FU(H4DOTC)-49, DRAINING FUEL, PROCEDURE, Fuel.>
- 4) Remove the rear seat.
- 5) Disconnect the connector (A) of fuel tank cord to the rear harness.
- 6) Push the grommet (B) which holds the fuel tank cord on the floor panel into under the body.

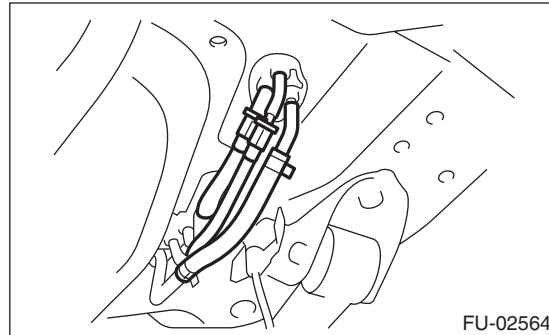


- 7) Remove the rear crossmember. <Ref. to RS-16, REMOVAL, Rear Crossmember.>
- 8) Remove the canisters. <Ref. to EC (H4DOTC)-7, REMOVAL, Canister.>
- 9) Disconnect the connector from the pressure control solenoid valve.

- 10) Loosen the clamp and disconnect the fuel filler hose (A) and evaporation hose (B) from the fuel filler pipe.



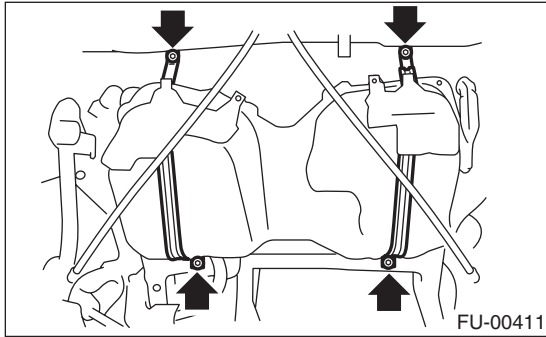
- 11) Move the clips, and disconnect the quick connector. <Ref. to FU(H4DOTC)-64, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
- 12) Disconnect the fuel hoses.



13) Support the fuel tank with transmission jack, remove the bolts from bands and dismount the fuel tank from the vehicle.

WARNING:

- A helper is required to perform this work.
- Fuel may remain undrained in the side of the fuel tank without the drain plug. Be careful not to lose balance and drop the fuel tank when removing it, as this remaining fuel may offset the weight balance of the tank.

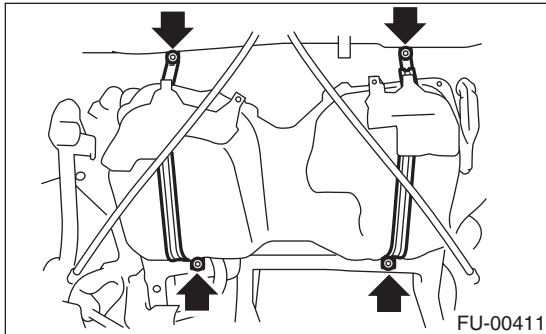


B: INSTALLATION

- 1) Support the fuel tank with transmission jack and push the fuel tank harness into access hole with grommet.
- 2) Set the fuel tank and temporarily tighten the bolts of fuel tank bands.

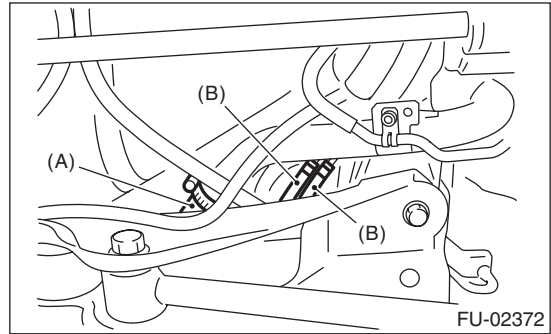
WARNING:

A helper is required to perform this work.



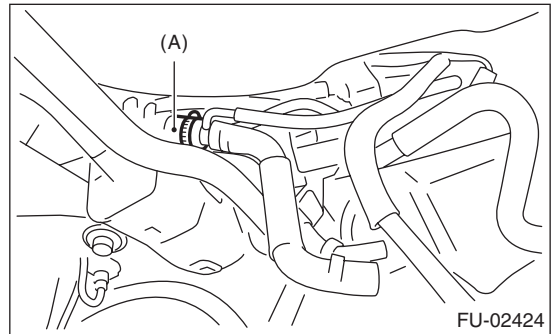
3) Insert the fuel filler hose (A) approx. 35 to 40 mm (1.38 to 1.57 in) over the lower end of fuel filler pipe and tighten the clamp.

4) Insert the evaporation hose (B) into the lower end of evaporation pipe, and secure the clamps and clips.

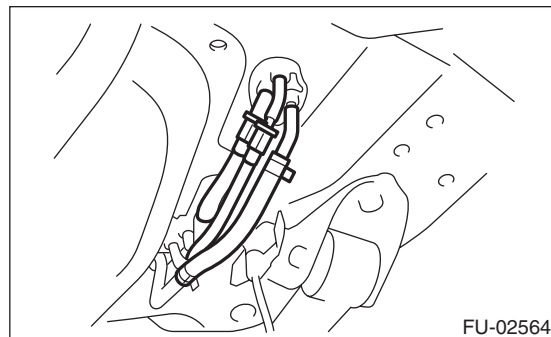


CAUTION:

Do not allow clips to touch hose (A) and rear suspension crossmember.



5) Connect the fuel hoses, and hold them with clips and quick connector. <Ref. to FU(H4DOTC)-65, INSTALLATION, Fuel Delivery, Return and Evaporation Lines.>



- 6) Connect the connector to pressure control solenoid valve.
- 7) Install the canister. <Ref. to EC (H4DOTC)-7, INSTALLATION, Canister.>

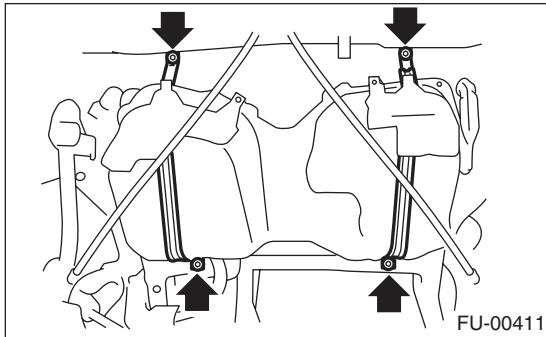
Fuel Tank

FUEL INJECTION (FUEL SYSTEMS)

8) Tighten the band mounting bolts.

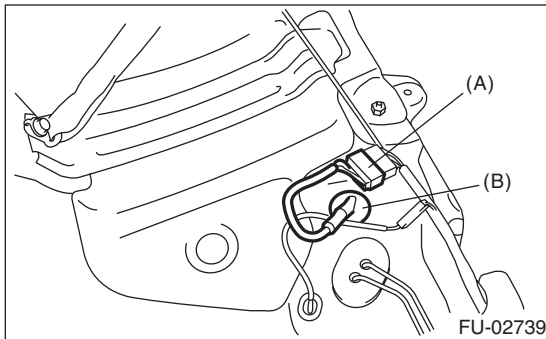
Tightening torque:

33 N·m (3.4 kgf-m, 25 ft-lb)



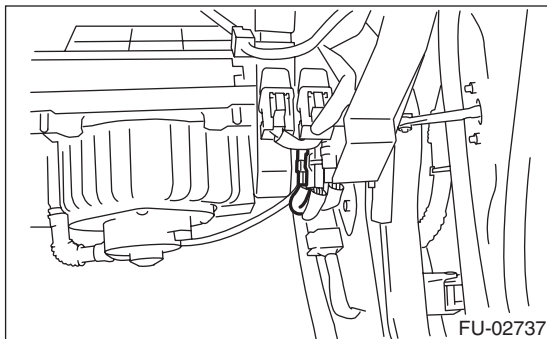
9) Install the rear crossmember. <Ref. to RS-16, INSTALLATION, Rear Crossmember.>

10) Connect the connector (A) to the fuel tank cord and plug the service hole with grommet (B).



11) Set the rear seat and floor mats.

12) Connect the connector to fuel pump relay.



13) Install the passenger's side front side sill cover.

14) Install the glove box. <Ref. to EI-36, INSTALLATION, Glove Box.>

C: INSPECTION

1) Check that there are no cracks, holes, or other damage on the fuel tank.

2) Make sure that the fuel pipe and fuel hose are not cracked and those connections are tight.

24. Fuel Filler Pipe

A: REMOVAL

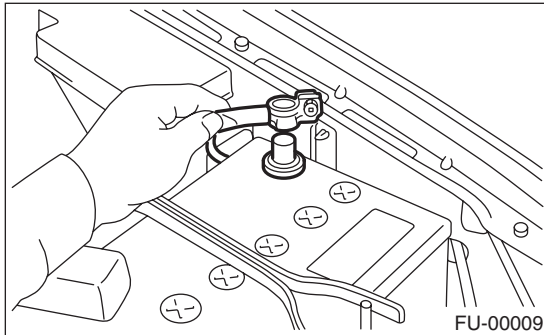
WARNING:

Place "NO FIRE" signs near the working area.

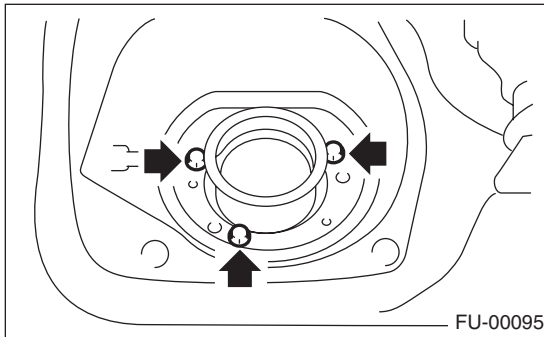
CAUTION:

Be careful not to spill fuel.

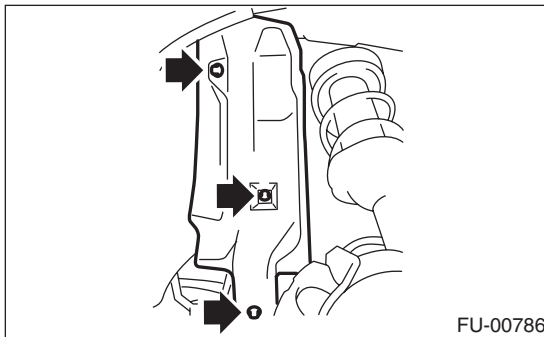
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.



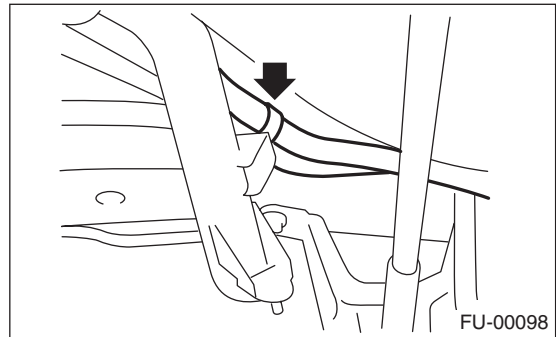
- 3) Open the fuel filler flap lid, and remove the fuel filler cap.
- 4) Remove the screws which secure packing.



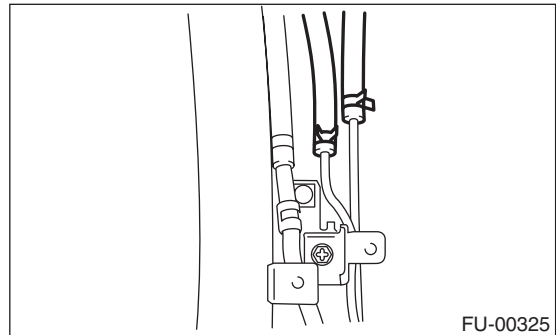
- 5) Remove the rear wheel RH.
- 6) Lift-up the vehicle.
- 7) Drain fuel from fuel tank. <Ref. to FU(H4DOTC)-49, DRAINING FUEL, PROCEDURE, Fuel.>
- 8) Remove the fuel filler pipe protector.



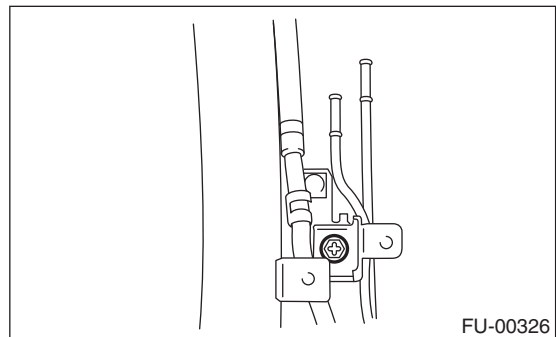
- 9) Disconnect the evaporation hose from the clip of fuel filler pipe.



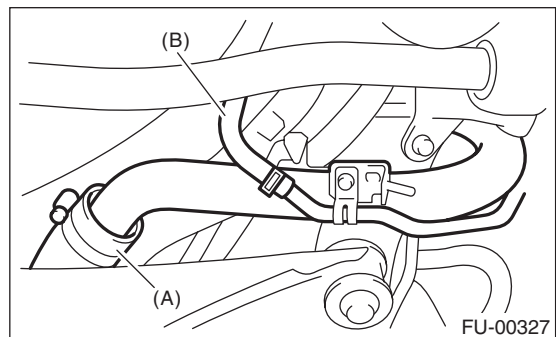
- 10) Disconnect the evaporation hose from the pipe.



- 11) Remove the bolts which hold fuel filler pipe bracket on the body.



- 12) Loosen the clamp and separate the fuel filler hose (A) from the fuel filler pipe.
- 13) Loosen the clip and disconnect the evaporation hose (B).

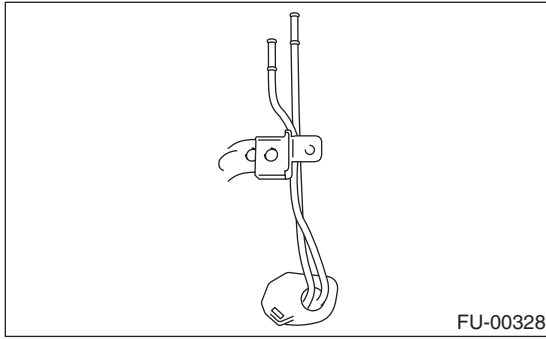


- 14) Remove the fuel filler pipe to the underside of the vehicle.

Fuel Filler Pipe

FUEL INJECTION (FUEL SYSTEMS)

15) Remove the evaporation pipe together with clip from the body.

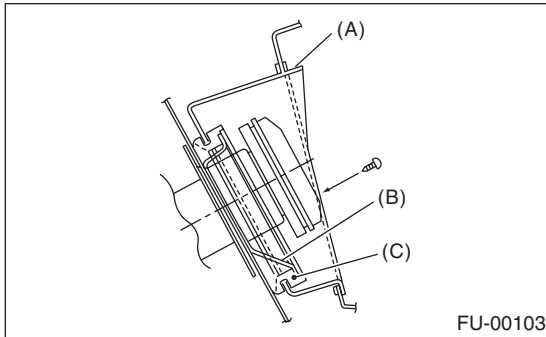


B: INSTALLATION

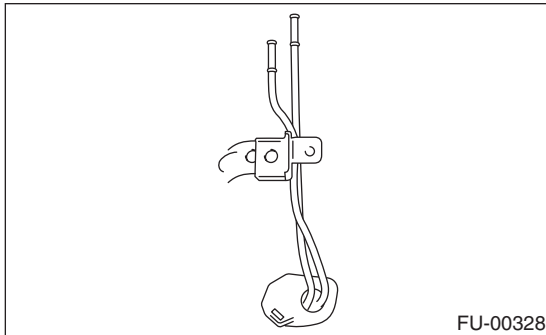
- 1) Open the fuel filler flap lid.
- 2) Set the fuel saucer (A) with rubber packing (C), and insert the fuel filler pipe into hole from the inner side of apron.
- 3) Align the holes in fuel filler pipe neck and set the cup (B), and tighten the screws.

NOTE:

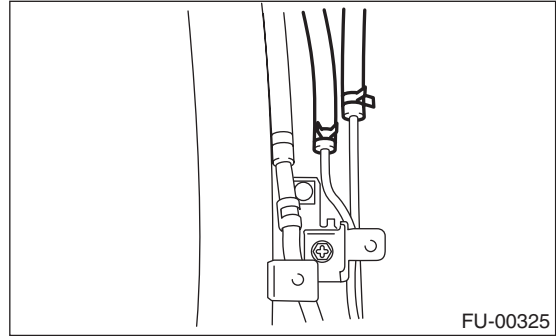
If the edges of rubber packing are folded toward the inside, straighten it with a screwdriver.



4) Install the evaporation pipe.



5) Connect the evaporation hose to the pipe.



6) Connect the fuel filler hose (A) to the pipe with an overlap of 35 to 40 mm (1.38 to 1.57 in).

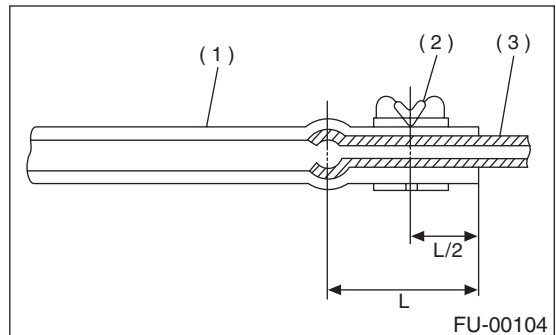
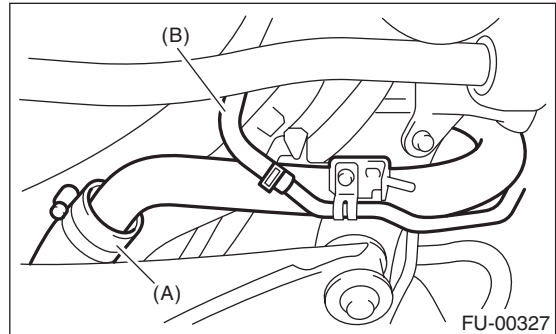
$L = 37.5 \pm 2.5 \text{ mm (1.476} \pm 0.098 \text{ in)}$

7) Connect the evaporation hose (B) to the pipe with an overlap of 25 to 30 mm (0.98 to 1.18 in).

$L = 27.5 \pm 2.5 \text{ mm (1.083} \pm 0.098 \text{ in)}$

CAUTION:

Do not allow clips to touch evaporation hose (B) and rear suspension crossmember.

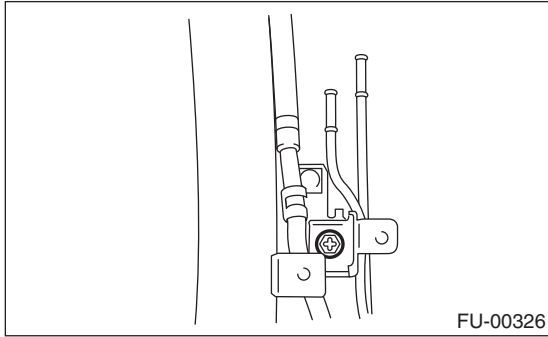


- (1) Hose
- (2) Clip
- (3) Pipe

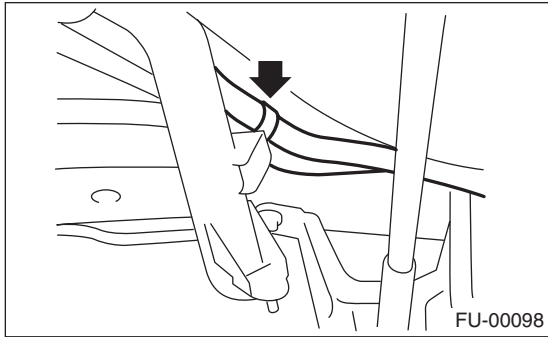
8) Tighten the bolts which hold fuel filler pipe bracket on the body.

Tightening torque:

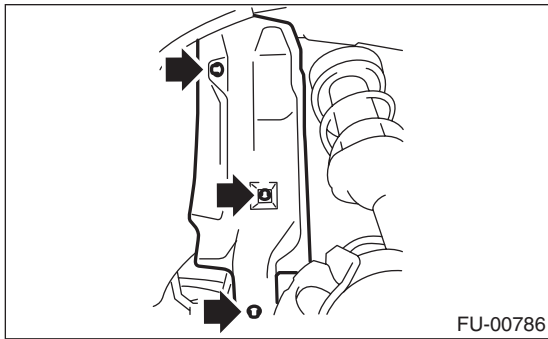
7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



9) Fasten the evaporation hoses to the clip of fuel filler pipe.



10) Install the fuel filler pipe protector.



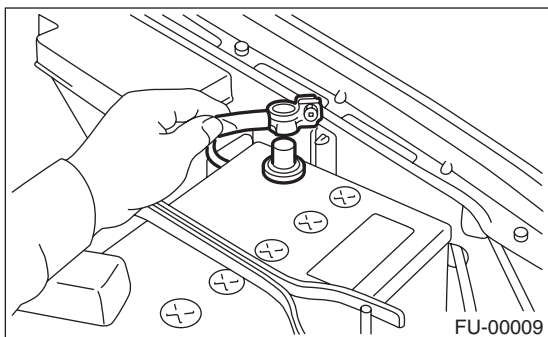
11) Lower the vehicle.

12) Install the rear wheel RH.

Tightening torque:

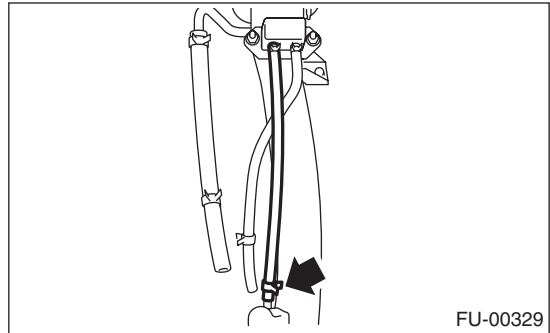
100 N·m (10.2 kgf-m, 73.8 ft-lb)

13) Connect the ground cable to the battery.

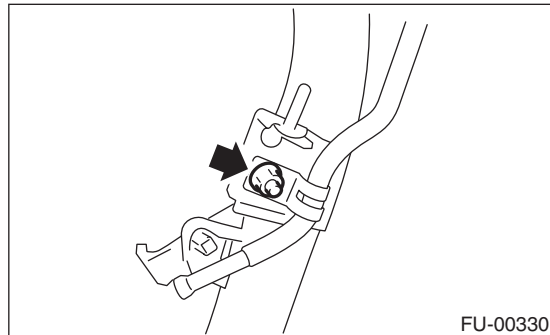


C: DISASSEMBLY

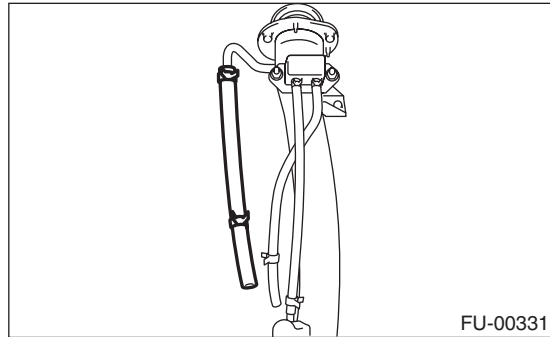
1) Move the clamp and disconnect the evaporation hose from the joint pipe.



2) Remove the bolts which install the joint pipe to the fuel filler pipe.



3) Disconnect the evaporation hose from fuel filler pipe.



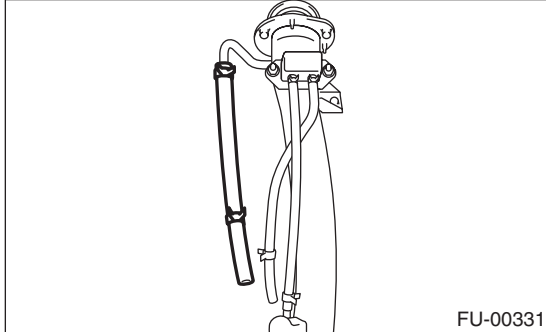
4) Remove the shut valve from the fuel filler pipe.
<Ref. to EC (H4DOTC)-20, REMOVAL, Shut Valve.>

Fuel Filler Pipe

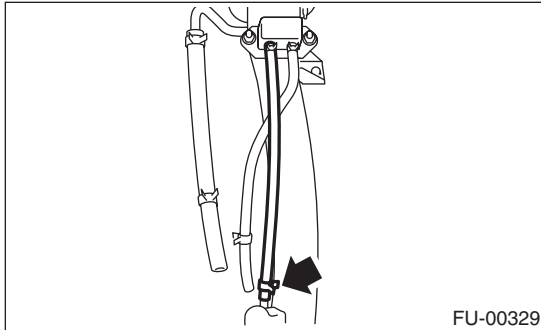
FUEL INJECTION (FUEL SYSTEMS)

D: ASSEMBLY

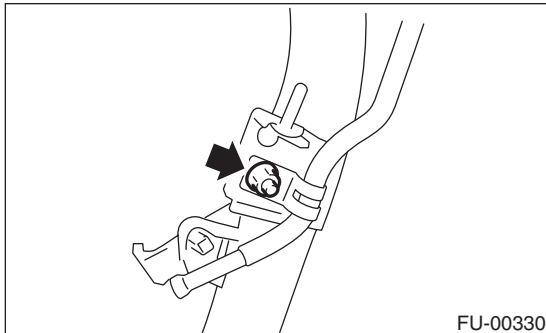
- 1) Install the shut valve to the fuel filler pipe. <Ref. to EC (H4DOTC)-20, INSTALLATION, Shut Valve.>
- 2) Connect the evaporation hose to the fuel filler pipe.



- 3) Connect the evaporation hose to the evaporation pipe.



- 4) Install the evaporation pipe to the fuel filler pipe.



25. Fuel Pump

A: REMOVAL

WARNING:

Place "NO FIRE" signs near the working area.

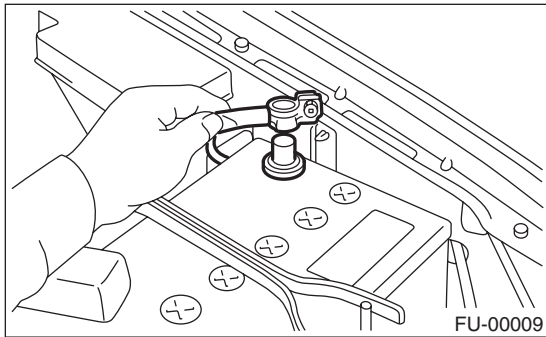
CAUTION:

Be careful not to spill fuel.

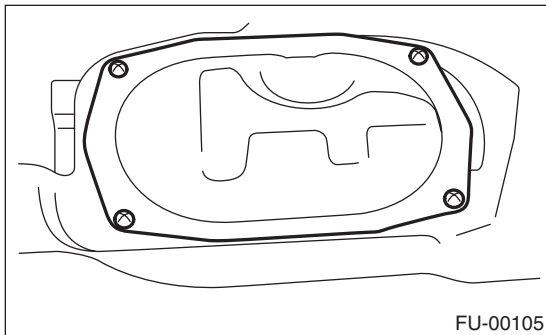
NOTE:

Fuel pump assembly consists of fuel pump, fuel filter and fuel level sensor.

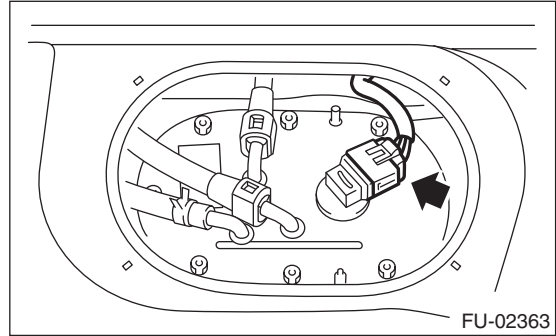
- 1) Set the vehicle on a lift.
- 2) Release the fuel pressure. <Ref. to FU(H4DOTC)-49, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 3) Disconnect the ground cable from the battery.



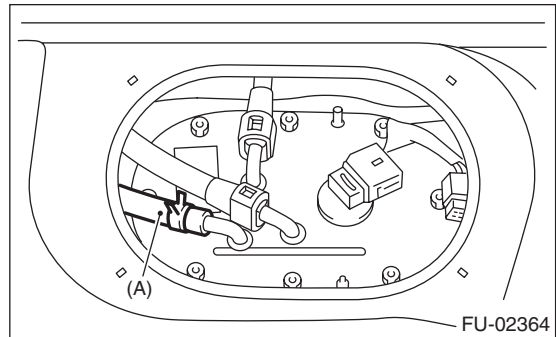
- 4) Open the fuel filler flap lid, and remove the fuel filler cap.
- 5) Lift-up the vehicle.
- 6) Drain fuel from fuel tank. <Ref. to FU(H4DOTC)-49, DRAINING FUEL, PROCEDURE, Fuel.>
- 7) Remove the luggage floor mat. <Ref. to EI-49, REMOVAL, Luggage Floor Mat.>
- 8) Remove the service hole cover.



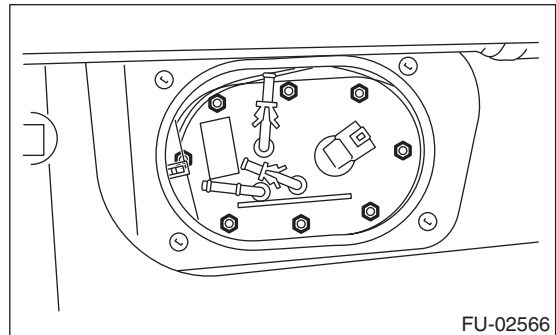
- 9) Disconnect the connector from fuel pump.



- 10) Disconnect the quick connector and then disconnect the fuel delivery hose and return hose. <Ref. to FU(H4DOTC)-64, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>
- 11) Move the clips, and disconnect the jet pump hose (A).



- 12) Remove the nuts which install fuel pump assembly onto fuel tank.



- 13) Remove the fuel pump assembly from the fuel tank.

Fuel Pump

FUEL INJECTION (FUEL SYSTEMS)

B: INSTALLATION

Install in the reverse order of removal while being careful of the following.

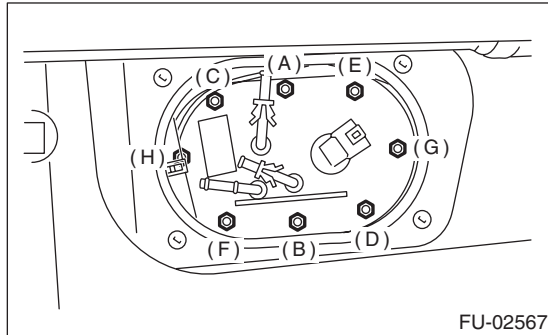
- Make sure the sealing portion is free from fuel or foreign matter before installation.
- Tighten the nuts in alphabetical sequence shown in the figure to the specified torque.

NOTE:

Use a new gasket and retainer.

Tightening torque:

4.4 N·m (0.45 kgf·m, 3.3 ft·lb)

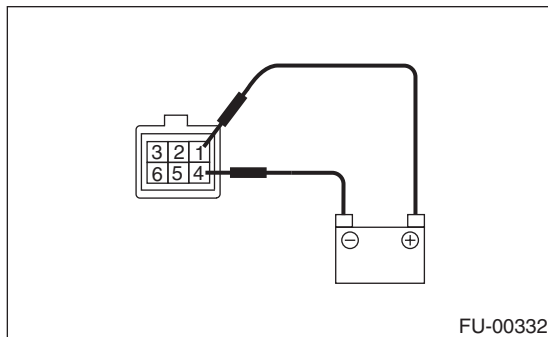


C: INSPECTION

Connect the lead harness to the connector terminal of fuel pump, and apply the battery power supply to check whether the pump operates.

CAUTION:

- Wipe off fuel completely.
- Keep the battery as far apart from fuel pump as possible.
- Turn the battery supply ON and OFF on the battery side.
- Do not run the fuel pump for a long time under non-load condition.



26. Fuel Level Sensor

A: REMOVAL

WARNING:

Place "NO FIRE" signs near the working area.

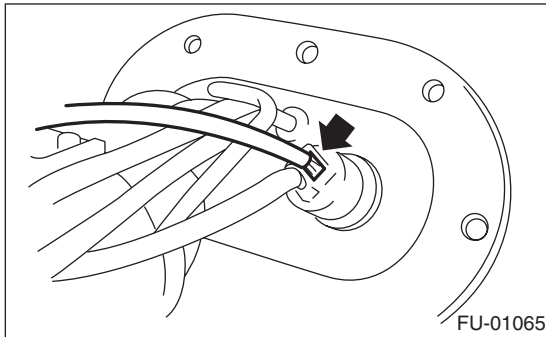
CAUTION:

Be careful not to spill fuel.

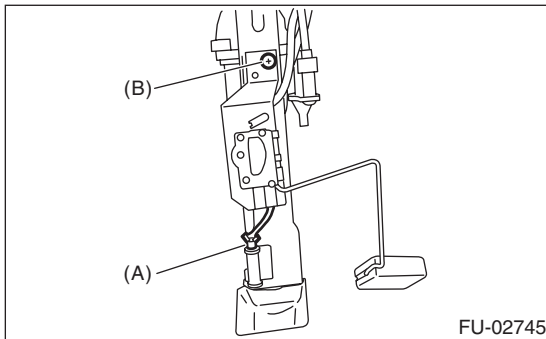
NOTE:

The fuel level sensor is built in fuel pump assembly.

- 1) Remove the fuel pump assembly.
<Ref. to FU(H4DOTC)-57, REMOVAL, Fuel Pump.>
- 2) Disconnect the connector from fuel pump bracket.



- 3) Remove the fuel temperature sensor (A).
- 4) Remove the bolt (B) which installs the fuel level sensor on the mounting bracket.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Use a new gasket.

Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)

Fuel Sub Level Sensor

FUEL INJECTION (FUEL SYSTEMS)

27. Fuel Sub Level Sensor

A: REMOVAL

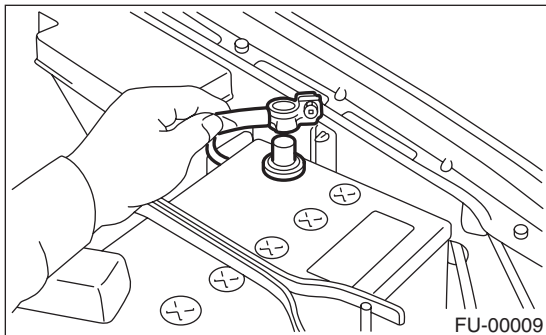
WARNING:

Place "NO FIRE" signs near the working area.

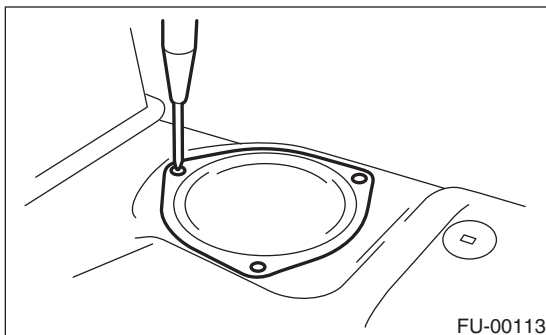
CAUTION:

Be careful not to spill fuel.

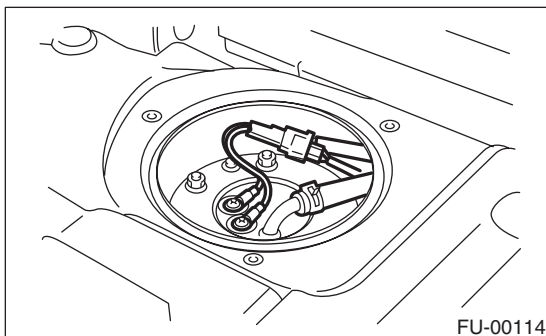
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.



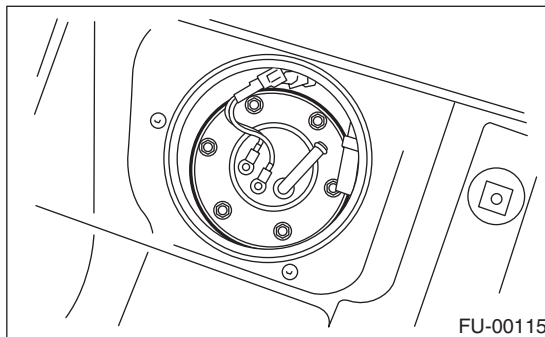
- 3) Lift-up the vehicle.
- 4) Drain fuel from fuel tank. <Ref. to FU(H4DOTC)-49, DRAINING FUEL, PROCEDURE, Fuel.>
- 5) Remove the luggage floor mat. <Ref. to EI-49, REMOVAL, Luggage Floor Mat.>
- 6) Remove the service hole cover.



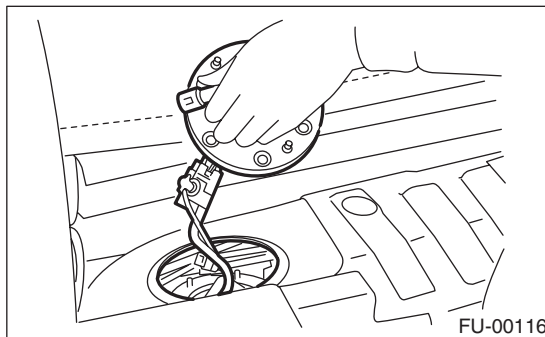
- 7) Disconnect the connector from the fuel sub level sensor.
- 8) Disconnect the fuel jet pump hose.



- 9) Remove the bolts which install fuel sub level sensor on fuel tank.



- 10) Remove the fuel sub level sensor.



B: INSTALLATION

Install in the reverse order of removal while being careful of the following.

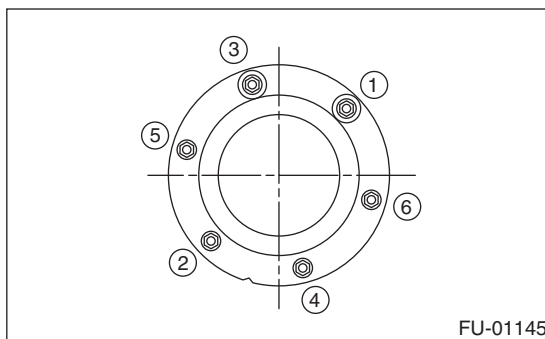
- Make sure the sealing portion is free from fuel or foreign matter before installation.
- Tighten the nuts to the specified torque in the order as shown in the figure.

NOTE:

Use a new gasket.

Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



28. Fuel Filter

A: REMOVAL

WARNING:

Place "NO FIRE" signs near the working area.

CAUTION:

Be careful not to spill fuel.

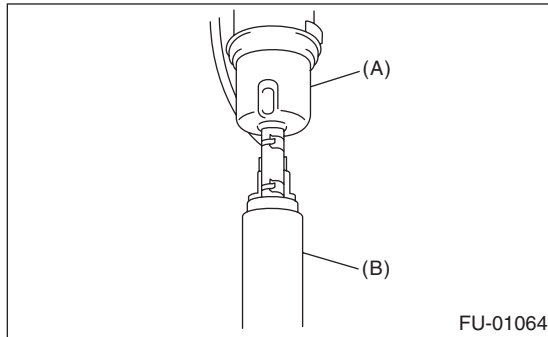
NOTE:

The fuel filter is assembled in fuel pump assembly.

1) Remove the fuel pump assembly.

<Ref. to FU(H4DOTC)-57, REMOVAL, Fuel Pump.>

2) Separate the fuel pump and fuel filter.



(A) Fuel filter

(B) Fuel pump

B: INSTALLATION

CAUTION:

If fuel hoses or clamps are damaged, replace them with new parts.

Install in the reverse order of removal.

C: INSPECTION

1) Check the inside of fuel filter for dirt and water sediment.

2) If it is clogged, or if the replacement interval has been reached, replace it.

Fuel Cut Valve

FUEL INJECTION (FUEL SYSTEMS)

29. Fuel Cut Valve

A: REMOVAL

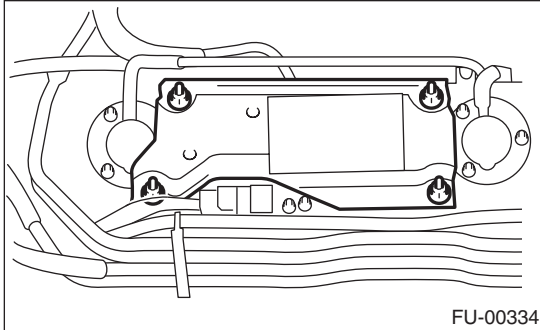
CAUTION:

- Be careful not to spill fuel.
- Catch the fuel from hoses using a container or cloth.

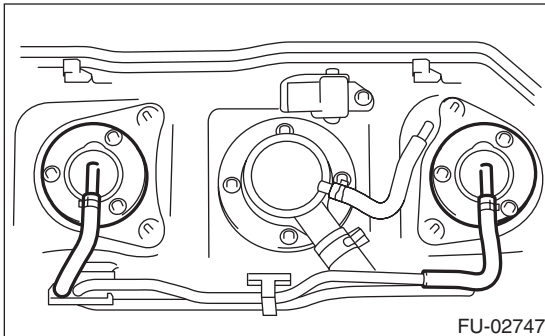
1) Remove the fuel tank.

<Ref. to FU(H4DOTC)-50, REMOVAL, Fuel Tank.>

2) Remove the protect cover.



3) Loosen the clip and disconnect the evaporation hose from the fuel cut valve.



4) Remove the bolts which install the fuel cut valve.

B: INSTALLATION

Install in the reverse order of removal while being careful of the following.

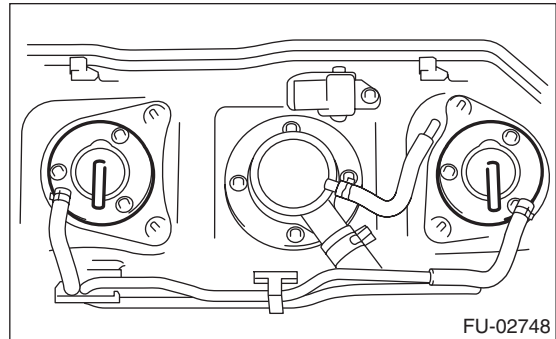
- Make sure the sealing portion is free from fuel or foreign matter before installation.

NOTE:

Use a new gasket.

Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



30. Fuel Damper Valve

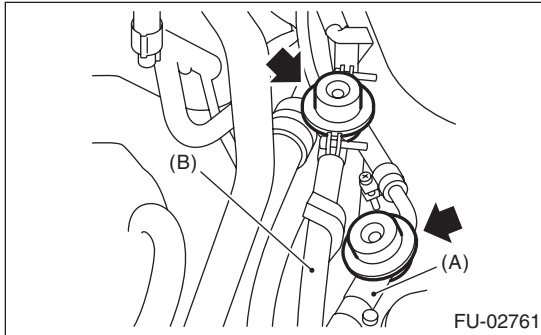
A: REMOVAL

CAUTION:

- Be careful not to spill fuel.
- Catch the fuel from hoses using a container or cloth.

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-49, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

2) Remove the fuel damper valve from the fuel delivery line (A) and the fuel return line (B).



B: INSTALLATION

CAUTION:

If fuel hoses or clamps are damaged, replace them with new parts.

Install in the reverse order of removal.

Tightening torque:

1.25 N·m (0.13 kgf-m, 0.94 ft-lb)

Fuel Delivery, Return and Evaporation Lines

FUEL INJECTION (FUEL SYSTEMS)

31. Fuel Delivery, Return and Evaporation Lines

A: REMOVAL

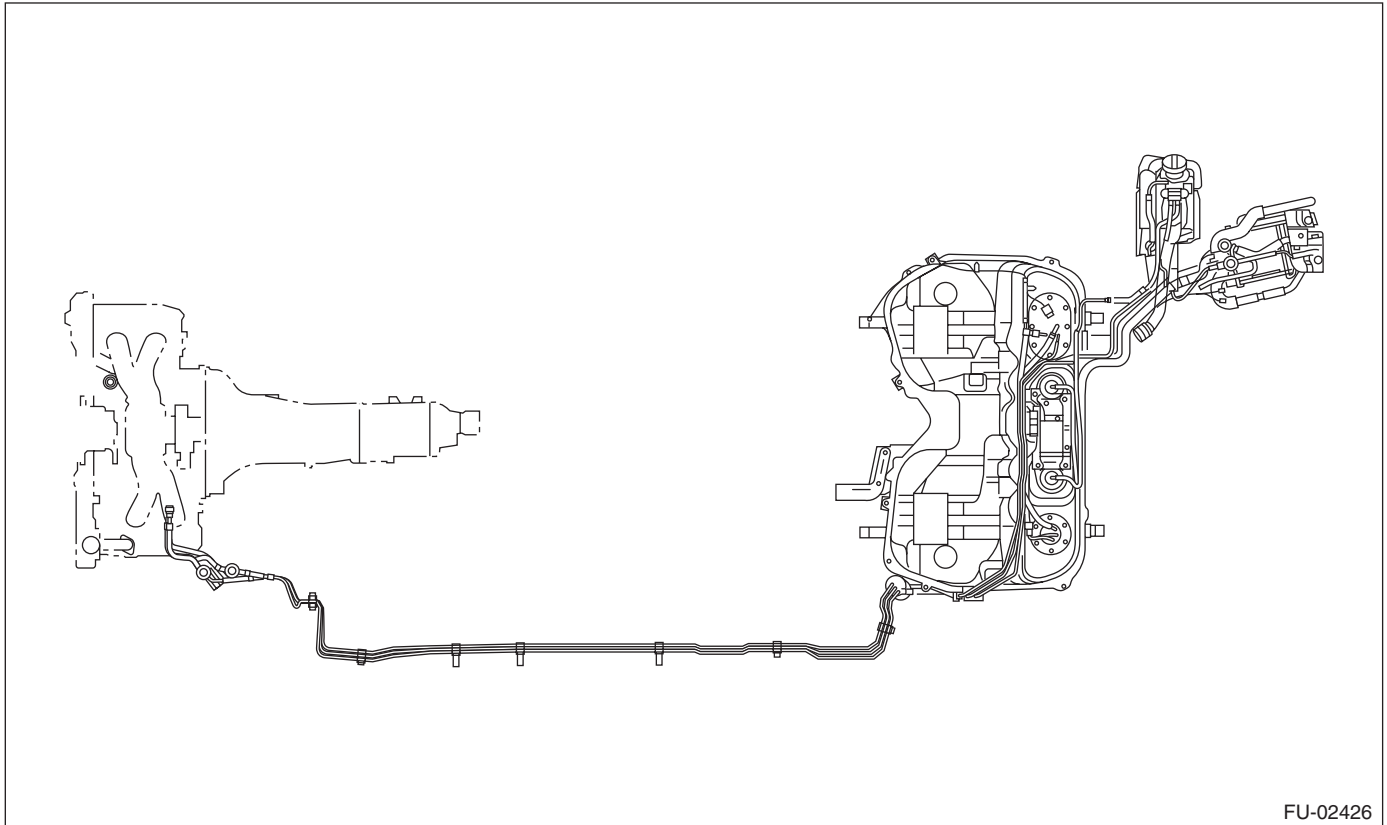
WARNING:

Place "NO FIRE" signs near the working area.

CAUTION:

Be careful not to spill fuel.

- 1) Set the vehicle on a lift.
- 2) Release the fuel pressure. <Ref. to FU(H4DOTC)-49, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 3) Open the fuel filler flap lid, and remove the fuel filler cap.
- 4) Remove the floor mat. <Ref. to EI-48, REMOVAL, Floor Mat.>
- 5) Disconnect the fuel delivery pipes and hoses, and then disconnect the fuel return pipes and hoses, evaporation pipes and hoses.



6) In the engine room, remove the fuel delivery hose (A), return hose (B) and evaporation hose (C).

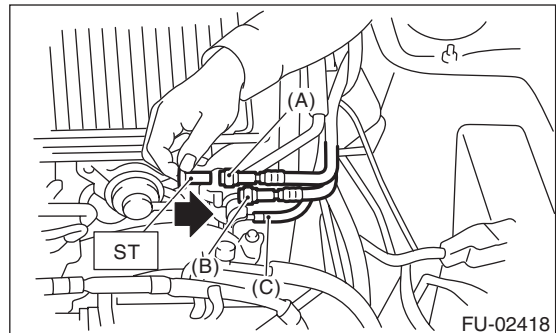
- (1) Disconnect the quick connector on the fuel delivery line and return line by pushing the ST in the direction of the arrow.

ST 42099AE000 CONNECTOR REMOVER

- (2) Remove the clip and disconnect the evaporation hose from the pipe.

CAUTION:

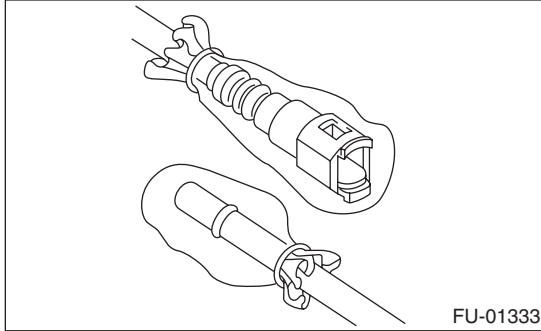
- Be careful not to spill fuel.
- Catch the fuel from hoses using a container or cloth.



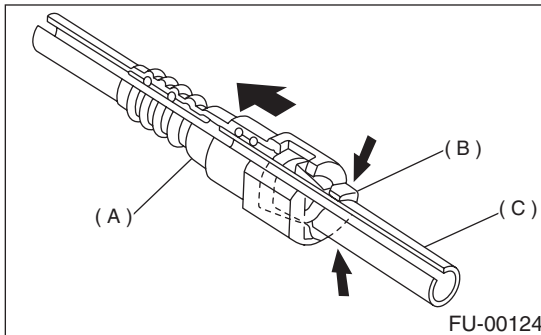
Fuel Delivery, Return and Evaporation Lines

FUEL INJECTION (FUEL SYSTEMS)

- 7) Lift-up the vehicle.
- 8) Disconnect the quick connector on the fuel line.
 - (1) Clean the pipe and connector, if they are covered with dust.
 - (2) To prevent from damaging or entering foreign matter, wrap the pipes and connectors with plastic bag etc.



- (3) Hold the connector (A) and push the retainer (B) down.
- (4) Pull out the connector (A) from the retainer (B).



- (A) Connector
- (B) Retainer
- (C) Pipe

B: INSTALLATION

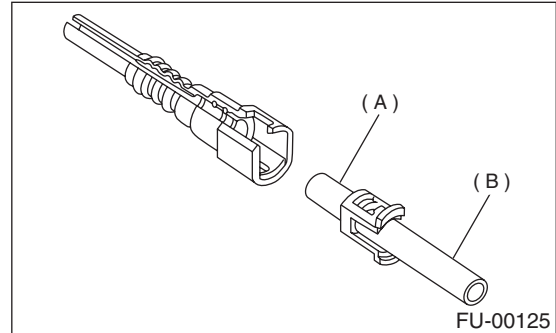
- 1) Connect the quick connector to the fuel delivery line.

CAUTION:

- Replace the retainer other than in the engine room with a new part.
- Make sure there are no damage or dust on connections. If necessary, clean seal surface of pipe.

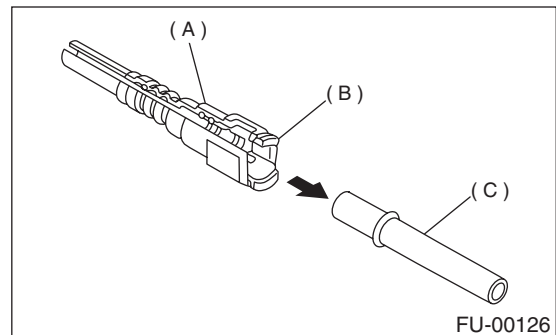
NOTE:

Use a new retainer.



- (A) Seal surface
- (B) Pipe

- (1) Set the new retainer (B) to connector (A).
- (2) Push the pipe into the connector completely.



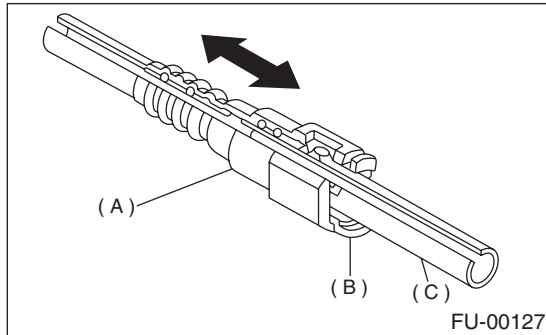
- (A) Connector
- (B) Retainer
- (C) Pipe

Fuel Delivery, Return and Evaporation Lines

FUEL INJECTION (FUEL SYSTEMS)

CAUTION:

- Pull the connector to ensure it is connected securely.
- Make sure the two retainer pawls are engaged in their mating positions in the connector.
- Be sure to inspect hoses and their connections for any leakage of fuel.



- (A) Connector
- (B) Retainer
- (C) Pipe

2) Connect the fuel delivery hose and return hose to the pipe with an overlap of 20 to 25 mm (0.79 to 0.98 in).

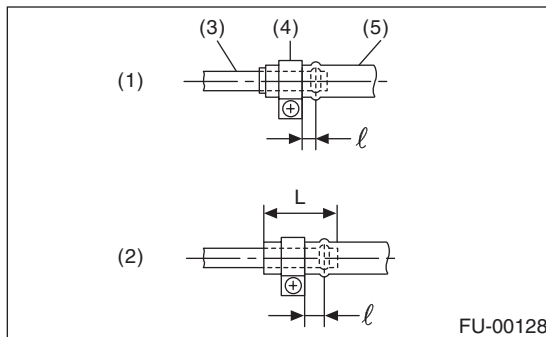
Type A: When the amount of inserting is specified.
Type B: When the amount to be inserted is not specified.

$\varnothing : 2.5 \pm 1.5 \text{ mm } (0.098 \pm 0.059 \text{ in})$

$L : 22.5 \pm 2.5 \text{ mm } (0.886 \pm 0.098 \text{ in})$

CAUTION:

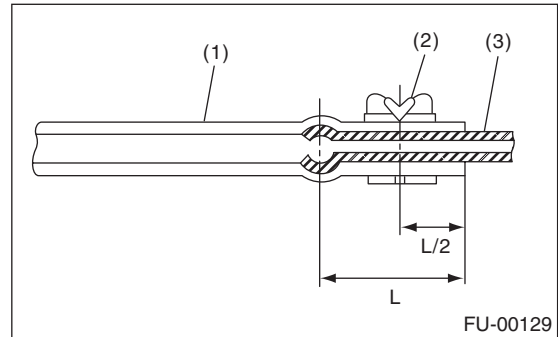
Be sure to inspect hoses and their connections for any leakage of fuel.



- (1) Type A
- (2) Type B
- (3) Pipe
- (4) Clamp
- (5) Hose

3) Connect the evaporation hose to the pipe with an overlap of 15 to 20 mm (0.59 to 0.79 in).

$L = 17.5 \pm 2.5 \text{ mm } (0.689 \pm 0.098 \text{ in})$



- (1) Hose
- (2) Clip
- (3) Pipe

C: INSPECTION

- 1) Make sure that there are no cracks on the fuel pipes and fuel hoses.
- 2) Make sure the fuel pipe and fuel hose connections are tightened firmly.

Fuel System Trouble in General

FUEL INJECTION (FUEL SYSTEMS)

32. Fuel System Trouble in General

A: INSPECTION

Trouble and possible cause		Corrective action
1. Insufficient fuel supply to injector		
1)	Fuel pump does not operate.	
	○ Defective terminal contact	Inspect contact, especially ground, and tighten it securely.
	○ Trouble in electromagnetic or electronic circuit parts	Replace the faulty part.
2)	Decline of fuel pump function	Replace the fuel pump.
3)	Clogged fuel filter	Replace the fuel filter.
4)	Clogged or bent fuel pipe or hose	Clean, correct or replace fuel pipe or hose.
5)	Air is mixed in fuel system	Inspect or retighten each connection part.
6)	Clogged or bent air breather tube or pipe	Clean, correct or replace the air breather tube or pipe.
7)	Damaged diaphragm of pressure regulator	Replace.
2. Leakage or blow out of fuel		
1)	Loose joints of the fuel pipe	Retighten.
2)	Cracked fuel pipe, hose and fuel tank	Replace.
3)	Defective welding part on the fuel tank	Replace.
4)	Defective drain packing of the fuel tank	Replace.
5)	Clogged or bent air breather tube or air vent tube	Clean, correct or replace the air breather tube or air vent tube.
3. Gasoline smell inside of compartment		
1)	Loose joints at air breather tube, air vent tube and fuel filler pipe	Retighten.
2)	Problem in tightening of the fuel saucer packing air	Correct or replace the packing.
3)	Fuel pump trouble	Replace.
4. Defective fuel meter indicator		
1)	Defective operation of fuel level sensor	Replace.
2)	Defective operation of fuel meter	Replace.
5. Noise		
1)	Large operation noise or vibration of fuel pump	Replace.

NOTE:

- When the vehicle is left unattended for an extended period of time, water may accumulate in the fuel tank. Fill fuel fully to prevent the problem.
- In snow-covered areas, mountainous areas, skiing areas, etc. where ambient temperatures drop below 0°C (32°F) throughout the winter season, use a water removing agent in the fuel system to prevent freezing fuel system and accumulating water.
- When water is accumulated in fuel filter, fill the water removing agent in the fuel tank.
- Before using water removing agent, follow the cautions noted on the bottle.

Fuel System Trouble in General

FUEL INJECTION (FUEL SYSTEMS)

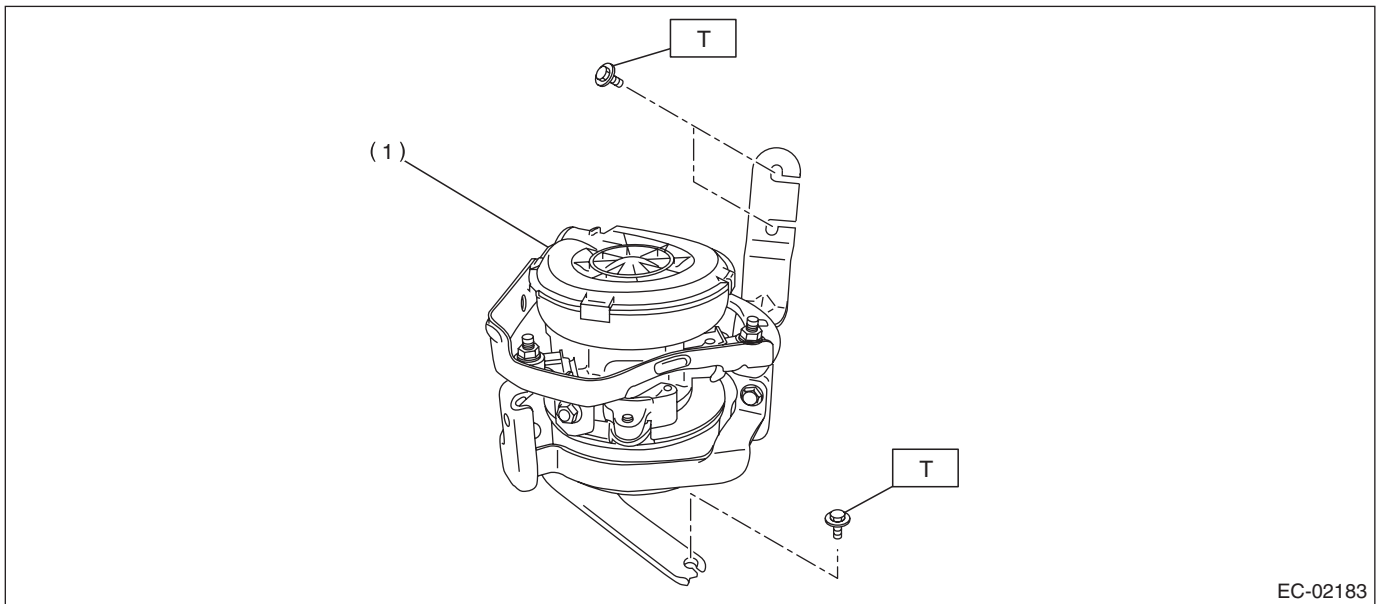
General Description

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

1. General Description

A: COMPONENT

1. SECONDARY AIR PUMP



EC-02183

(1) Secondary air pump

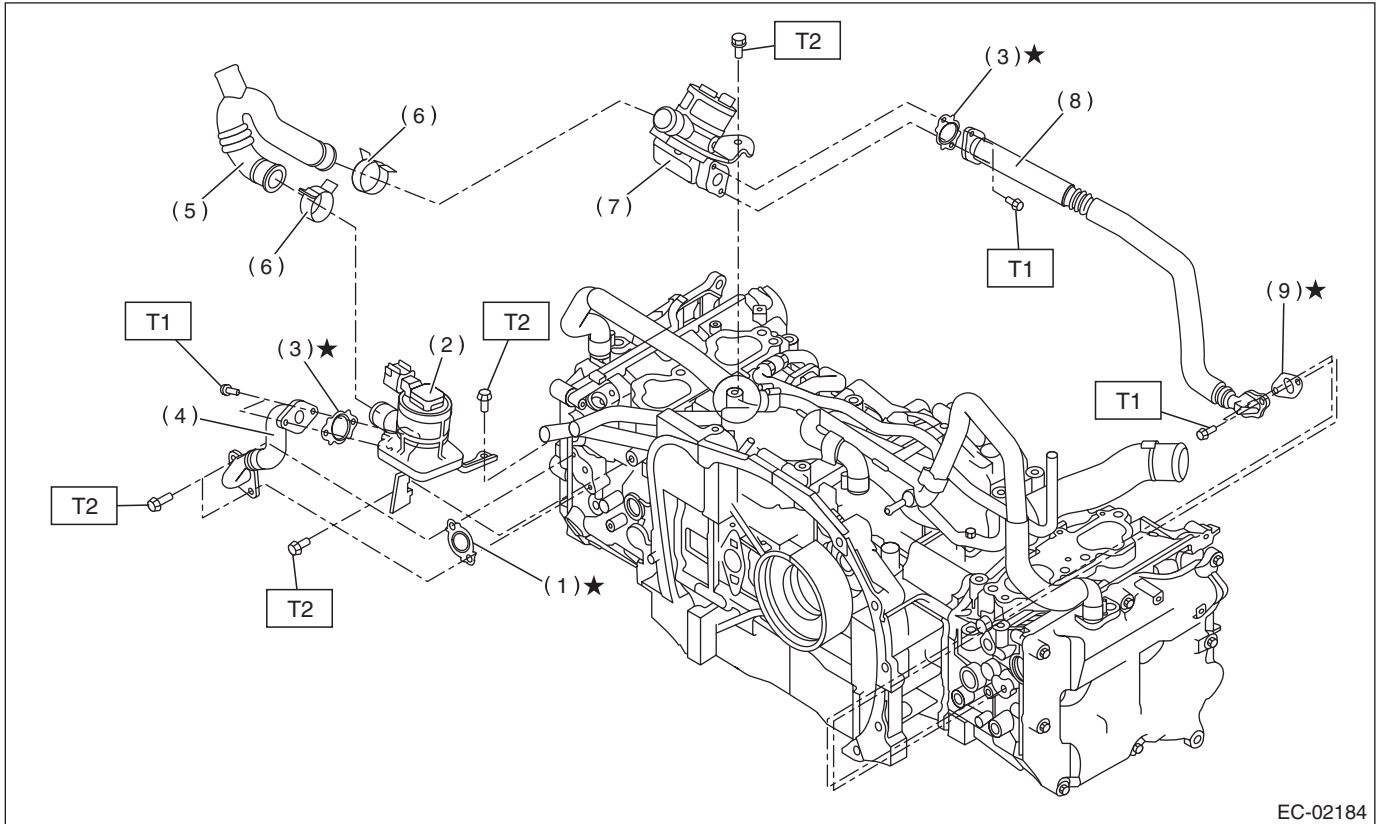
Tightening torque: N·m (kgf·m, ft·lb)

T: 5 (0.5, 3.7)

General Description

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

2. SECONDARY AIR COMBINATION VALVE



EC-02184

- | | | |
|-------------------------------------|-------------------------------------|------------|
| (1) Gasket | (5) Air duct | (9) Gasket |
| (2) Secondary air combination
LH | (6) Clamp | |
| (3) Gasket | (7) Secondary air combination
RH | |
| (4) Pipe LH | (8) Pipe RH | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 9 (0.9, 6.6)

T2: 19 (1.9, 13.7)

General Description

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

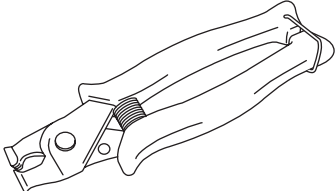
B: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.

- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from the battery.

C: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18353AA000	18353AA000	CLAMP PLIERS	<ul style="list-style-type: none">• Used for removing and installing the PCV hose.• This is a general tool made by the French company CAILLAU. (code) 54.0.000.205 To make this easier to obtain in the same way as genuine Subaru parts, it has been provided with a tool number as an ST.

Front Catalytic Converter

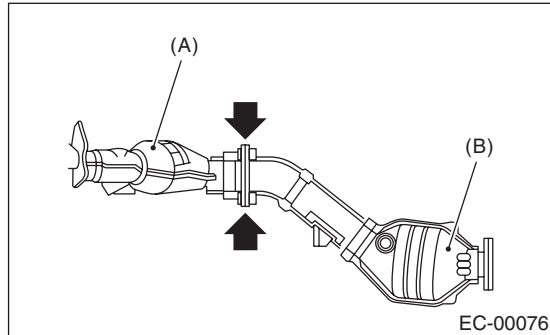
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

2. Front Catalytic Converter

A: REMOVAL

1) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>

2) Disconnect the front catalytic converter (A) from the rear catalytic converter (B).



B: INSTALLATION

NOTE:

- Use a new gasket.
- Install in the reverse order of removal.

C: INSPECTION

- 1) Check the connections and welds for exhaust leaks.
- 2) Make sure there are no holes or rusting.

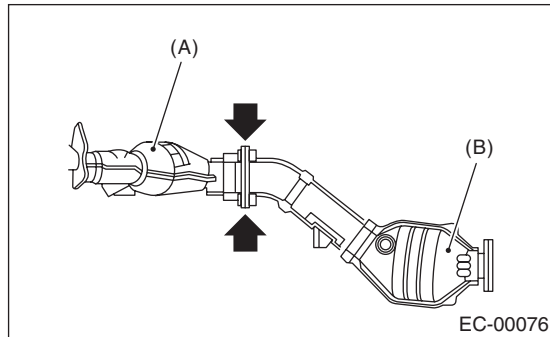
Rear Catalytic Converter

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

3. Rear Catalytic Converter

A: REMOVAL

- 1) Remove the center exhaust pipe.
<Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
- 2) Disconnect the rear catalytic converter (B) from the front catalytic converter (A).



B: INSTALLATION

NOTE:

- Use a new gasket.
- Install in the reverse order of removal.

C: INSPECTION

- 1) Check the connections and welds for exhaust leaks.
- 2) Make sure there are no holes or rusting.

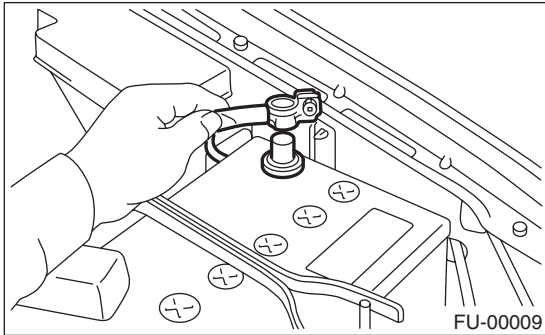
Canister

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

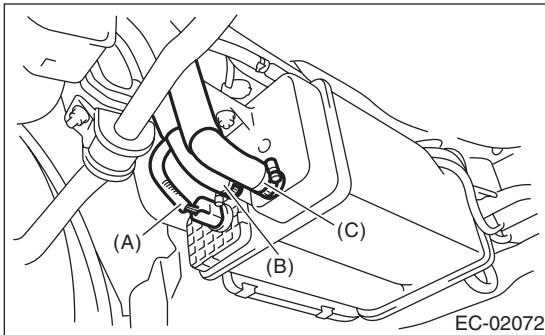
4. Canister

A: REMOVAL

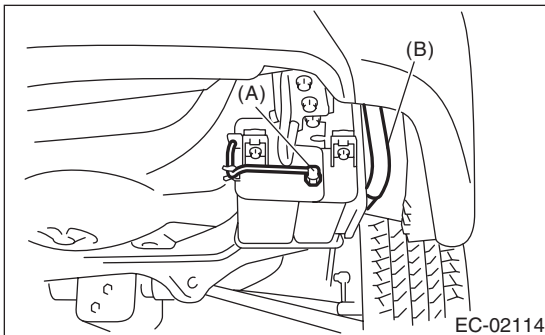
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.



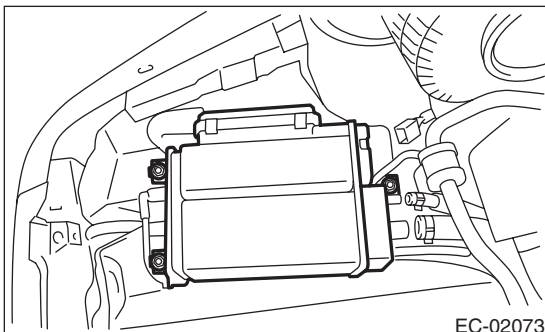
- 3) Lift-up the vehicle.
- 4) Disconnect the connector (A) from drain valve.
- 5) Disconnect the evaporation hoses (B) and (C) from the canister.



- 6) Disconnect the quick connector (A) from the canister.
- 7) Disconnect the drain hose (B) from the canister.



- 8) Remove the canister from the body.



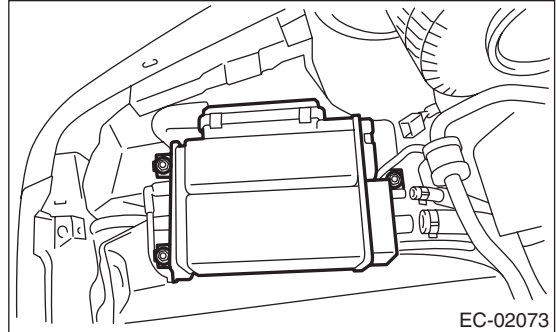
B: INSTALLATION

NOTE:

- Replace the retainer of quick connector with a new part.
- Install in the reverse order of removal.

Tightening torque:

23 N·m (2.3 kgf-m, 17 ft-lb)



C: INSPECTION

Make sure the canister and canister hoses are not cracked or loose.

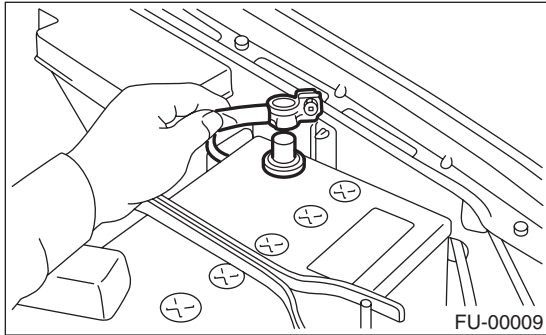
Purge Control Solenoid Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

5. Purge Control Solenoid Valve

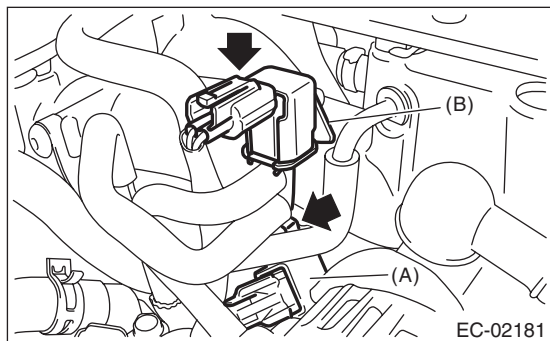
A: REMOVAL

1) Disconnect the ground cable from the battery.



2) Disconnect the connector and hoses from purge control solenoid valve.

3) Loosen the bolt and remove the purge control solenoid valve from the intake manifold.



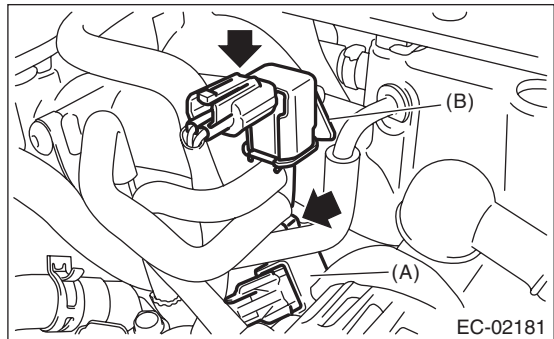
- (A) Purge control solenoid valve 1
- (B) Purge control solenoid valve 2

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

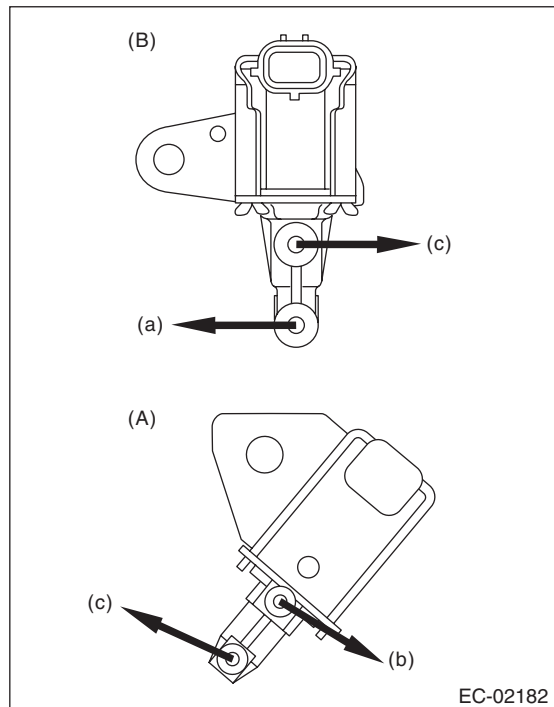
19 N·m (1.9 kgf·m, 13.7 ft·lb)



- (A) Purge control solenoid valve 1
- (B) Purge control solenoid valve 2

NOTE:

Connect the evaporation hose as shown in the figure.



- (A) Purge control solenoid valve 1
- (B) Purge control solenoid valve 2
- (a) To intake duct
- (b) To intake manifold
- (c) To splitter and then to fuel pipe

C: INSPECTION

Make sure the hoses are not cracked or loose.

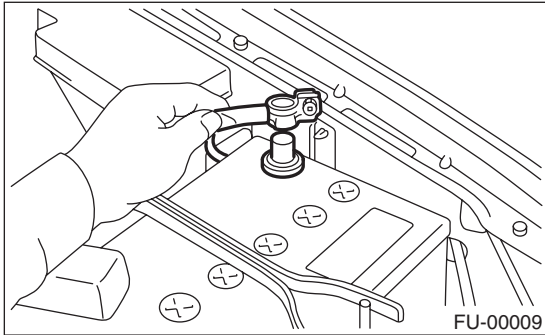
Secondary Air Pump

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

6. Secondary Air Pump

A: REMOVAL

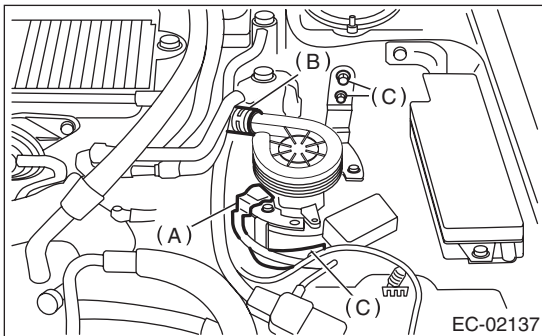
1) Disconnect the ground cable from the battery.



2) Disconnect the connector (A) from secondary air pump.

3) Disconnect the hose (B) from secondary air pump.

4) Remove the bolt (C) which secures the secondary air pump to the body.

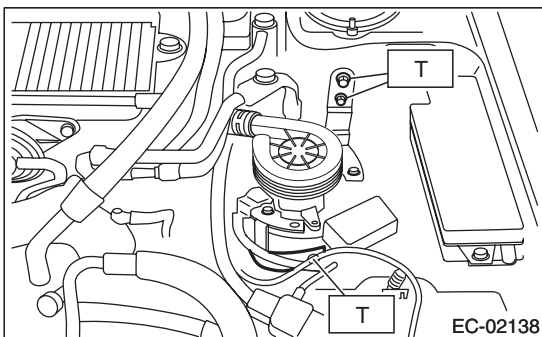


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

5 N·m (0.5 kgf·m, 3.7 ft·lb)



C: INSPECTION

Make sure the hoses are not cracked or loose.

Secondary Air Combi Valve

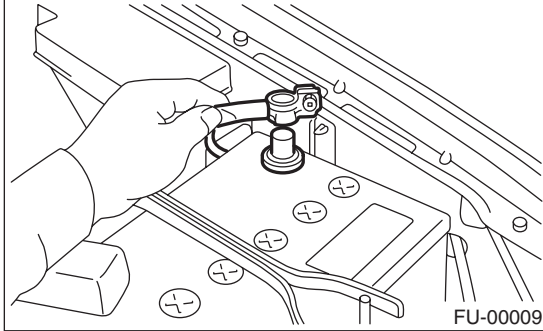
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

7. Secondary Air Combi Valve

A: REMOVAL

1. SECONDARY AIR COMBINATION VALVE LH

1) Disconnect the ground cable from the battery.



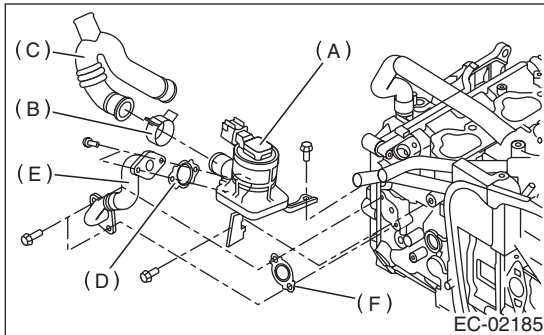
2) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>

3) Disconnect the connector from the secondary air combination valve LH.

4) Disconnect the air duct.

5) Disconnect the pipe LH.

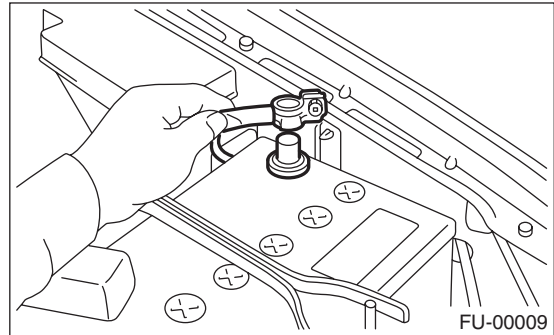
6) Remove the secondary air combination valve LH.



- (A) Secondary air combination valve LH
- (B) Clamp
- (C) Air duct
- (D) Gasket
- (E) Pipe LH
- (F) Gasket

2. SECONDARY AIR COMBINATION VALVE RH

1) Disconnect the ground cable from the battery.



2) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>

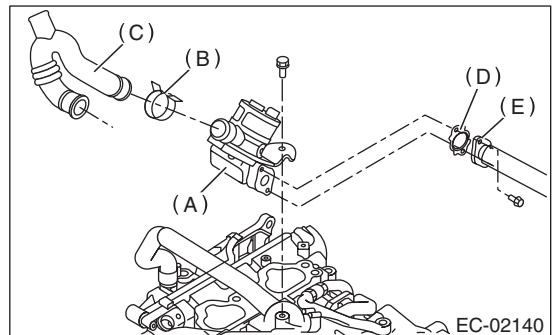
3) Remove the secondary air combination valve LH. <Ref. to EC (H4DOTC)-10, SECONDARY AIR COMBINATION VALVE LH, REMOVAL, Secondary Air Combi Valve.>

4) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>

5) Disconnect the connector from the secondary air combination valve RH.

6) Disconnect the pipe RH.

7) Remove the secondary air combination valve RH.



- (A) Secondary air combination valve RH
- (B) Clamp
- (C) Air duct
- (D) Gasket
- (E) Pipe RH

Secondary Air Combi Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

B: INSTALLATION

1. SECONDARY AIR COMBINATION VALVE LH

Install in the reverse order of removal.

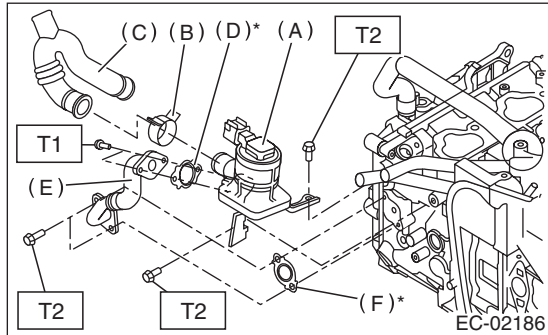
NOTE:

Use a new gasket.

Tightening torque:

T1: 9 N·m (0.9 kgf-m, 6.6 ft-lb)

T2: 19 N·m (1.9 kgf-m, 13.7 ft-lb)



- (A) Secondary air combination valve LH
- (B) Clamp
- (C) Air duct
- (D) Gasket
- (E) Pipe LH
- (F) Gasket

2. SECONDARY AIR COMBINATION VALVE RH

Install in the reverse order of removal.

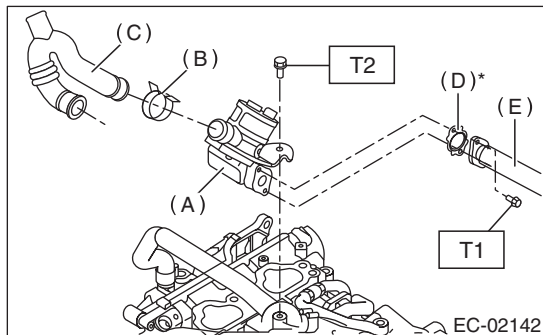
NOTE:

Use a new gasket.

Tightening torque:

T1: 9 N·m (0.9 kgf-m, 6.6 ft-lb)

T2: 19 N·m (1.9 kgf-m, 13.7 ft-lb)



- (A) Secondary air combination valve RH
- (B) Clamp
- (C) Air duct
- (D) Gasket
- (E) Pipe RH

C: INSPECTION

Check the air duct and pipe for looseness.

Fuel Level Sensor

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

8. Fuel Level Sensor

A: REMOVAL

Refer to the FU (H4DOTC) section for removal procedure. <Ref. to FU(H4DOTC)-59, REMOVAL, Fuel Level Sensor.>

B: INSTALLATION

Refer to the FU (H4DOTC) section for installation procedure. <Ref. to FU(H4DOTC)-59, INSTALLATION, Fuel Level Sensor.>

Fuel Temperature Sensor

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

9. Fuel Temperature Sensor

A: REMOVAL

The fuel temperature sensor and fuel level sensor are integrated into one unit; therefore, refer to “Fuel Level Sensor” for removal procedure. <Ref. to FU(H4DOTC)-59, REMOVAL, Fuel Level Sensor.>

B: INSTALLATION

The fuel temperature sensor and fuel level sensor are integrated into one unit; therefore, refer to “Fuel Level Sensor” for installation procedure. <Ref. to FU(H4DOTC)-59, INSTALLATION, Fuel Level Sensor.>

Fuel Sub Level Sensor

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

10. Fuel Sub Level Sensor

A: REMOVAL

Refer to the FU (H4DOTC) section for removal procedure. <Ref. to FU(H4DOTC)-60, REMOVAL, Fuel Sub Level Sensor.>

B: INSTALLATION

Refer to the FU (H4DOTC) section for installation procedure. <Ref. to FU(H4DOTC)-60, INSTALLATION, Fuel Sub Level Sensor.>

Fuel Tank Pressure Sensor

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

11. Fuel Tank Pressure Sensor

A: REMOVAL

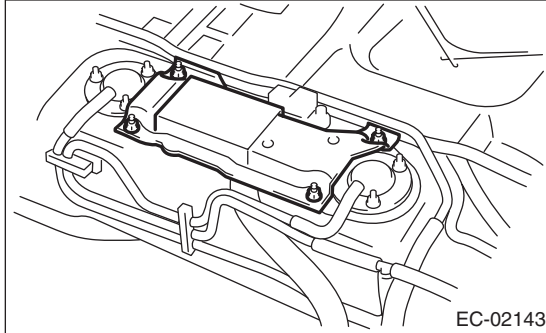
WARNING:

Place "NO FIRE" signs near the working area.

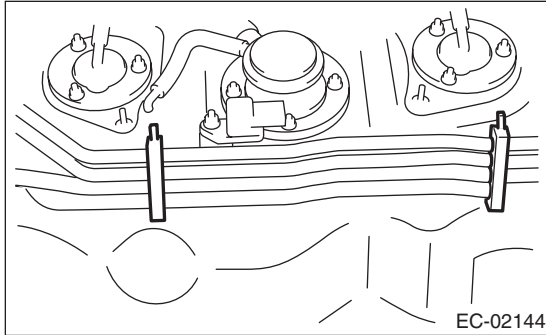
CAUTION:

Be careful not to spill fuel.

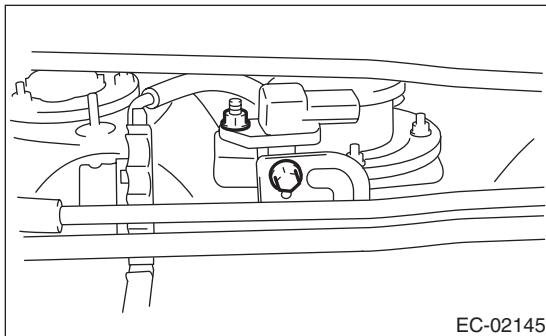
- 1) Remove the fuel tank. <Ref. to FU(H4DOTC)-50, REMOVAL, Fuel Tank.>
- 2) Remove the protect cover.



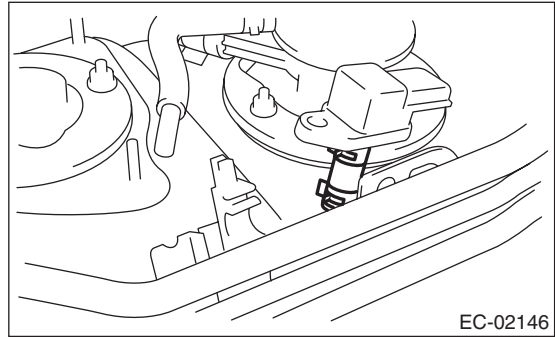
- 3) Disconnect the connector from the fuel pressure sensor.
- 4) Remove the clip which holds the fuel pipe to the fuel tank.



- 5) Remove the bolt and nut which secures the fuel tank pressure sensor to the bracket.



- 6) Disconnect the pressure hose from the fuel tank pressure sensor.

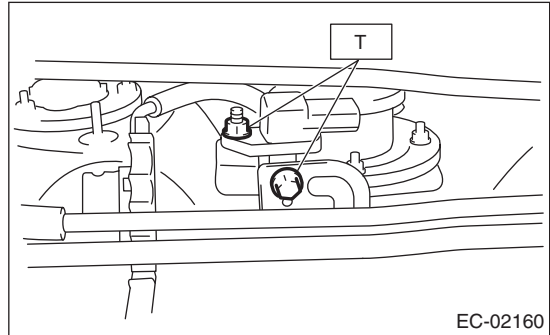


B: INSTALLATION

Install in the reverse order of removal.

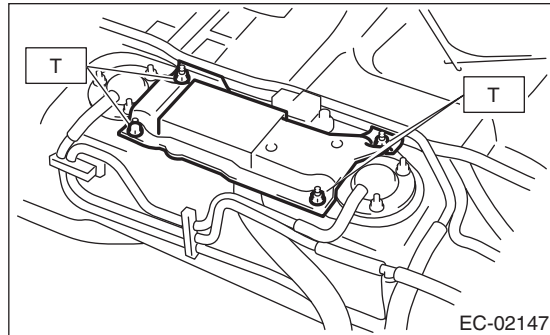
Tightening torque:

7.4 N·m (0.75 kgf-m, 5.4 ft-lb)



Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



C: INSPECTION

Make sure the hoses are not cracked or loose.

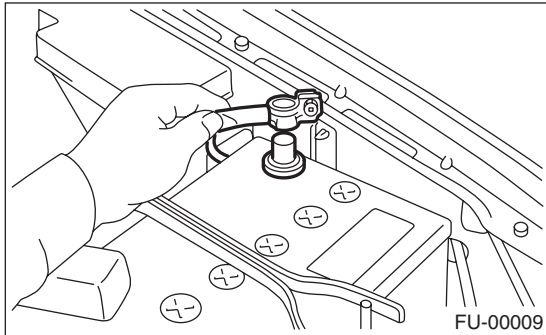
Pressure Control Solenoid Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

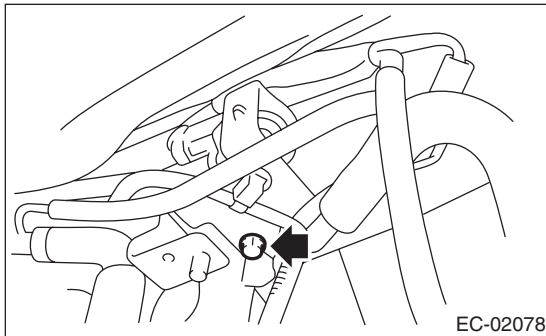
12. Pressure Control Solenoid Valve

A: REMOVAL

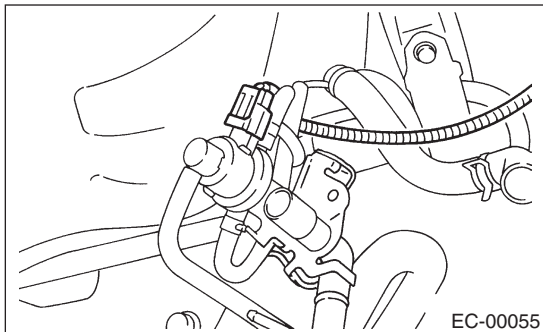
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.



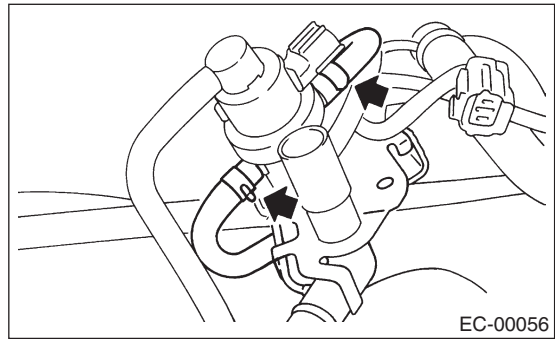
- 3) Lift-up the vehicle.
- 4) Remove the canisters. <Ref. to EC (H4DOTC)-7, REMOVAL, Canister.>
- 5) Remove the bolt which installs the pressure control solenoid valve holding bracket to the body.



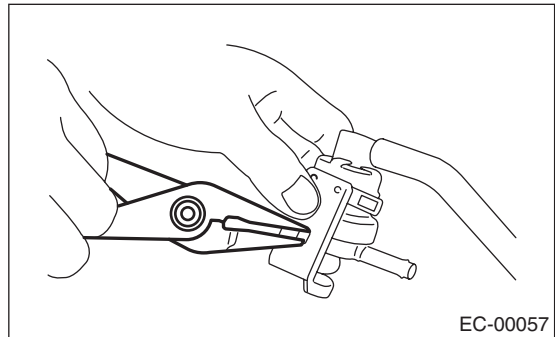
- 6) Disconnect the connector from the pressure control solenoid valve.



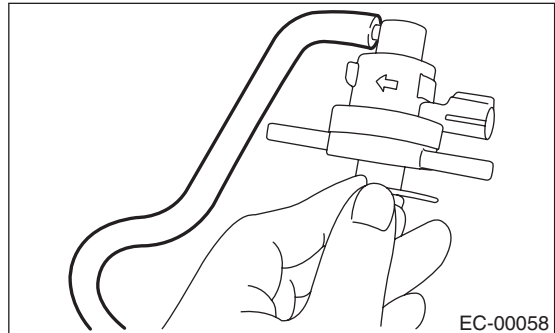
- 7) Disconnect the two evaporation hoses from the pressure control solenoid valve.



- 8) Remove the pressure control solenoid valve from the bracket.



- 9) Disconnect the hose from the pressure control solenoid valve.



Pressure Control Solenoid Valve

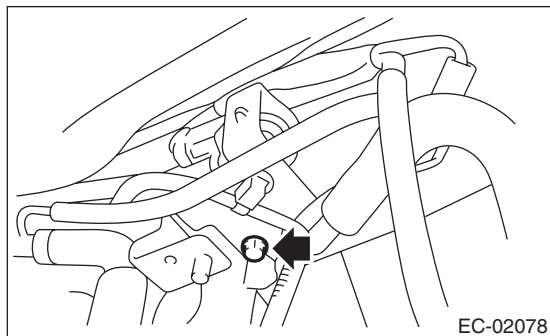
EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

25 N·m (2.5 kgf-m, 18.4 ft-lb)



C: INSPECTION

Make sure the hoses are not cracked or loose.

Drain Filter

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

13.Drain Filter

A: SPECIFICATION

The drain filter is embedded in the canister and therefore cannot be disassembled.

Vent Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

14. Vent Valve

A: REMOVAL

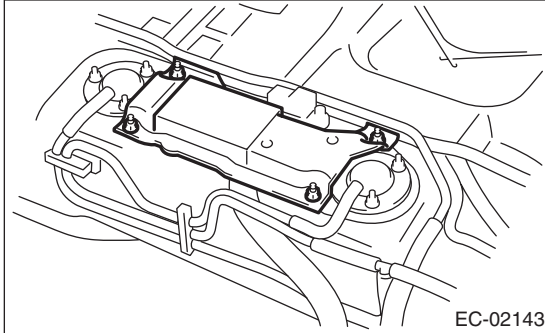
WARNING:

Place "NO FIRE" signs near the working area.

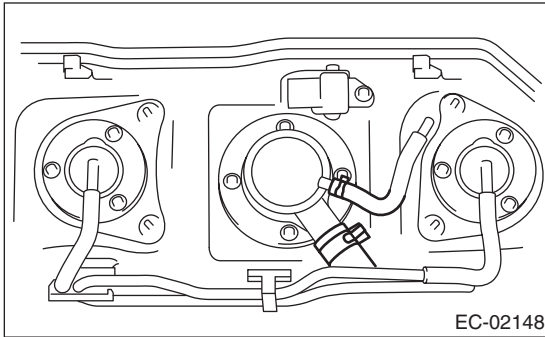
CAUTION:

Be careful not to spill fuel.

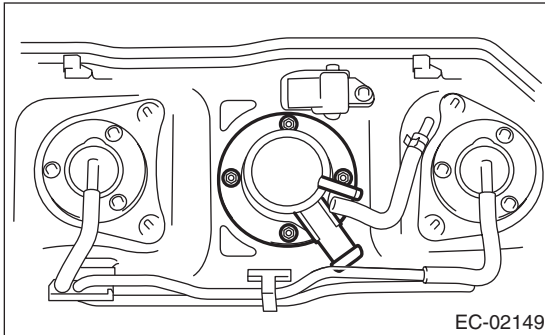
- 1) Remove the fuel tank. <Ref. to FU(H4DOTC)-50, REMOVAL, Fuel Tank.>
- 2) Remove the protect cover.



- 3) Remove the clip and disconnect the hose from the vent valve.



- 4) Remove the nut and then remove the vent valve.



B: INSTALLATION

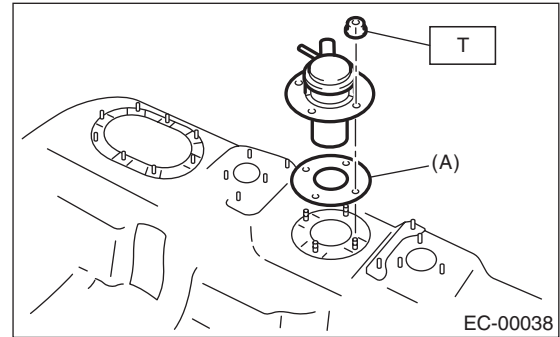
Install in the reverse order of removal.

NOTE:

Use a new gasket.

Tightening torque:

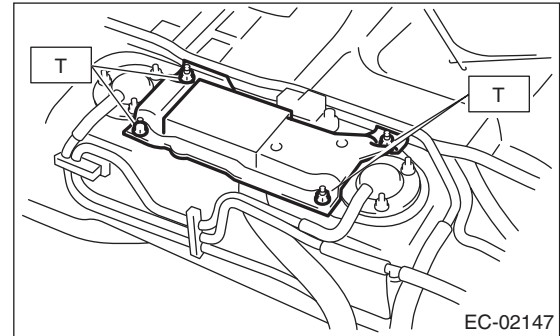
4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



(A) Gasket

Tightening torque:

4.4 N·m (0.45 kgf-m, 3.3 ft-lb)



C: INSPECTION

Make sure the hoses are not cracked or loose.

Shut Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

15.Shut Valve

A: REMOVAL

WARNING:

Place "NO FIRE" signs near the working area.

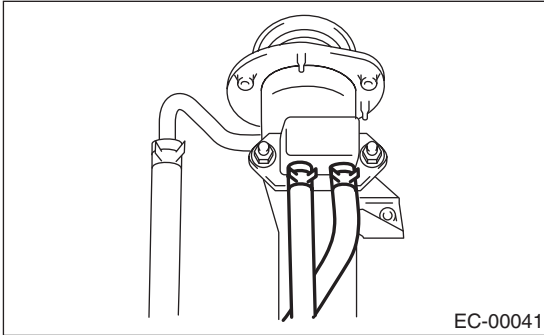
CAUTION:

Be careful not to spill fuel.

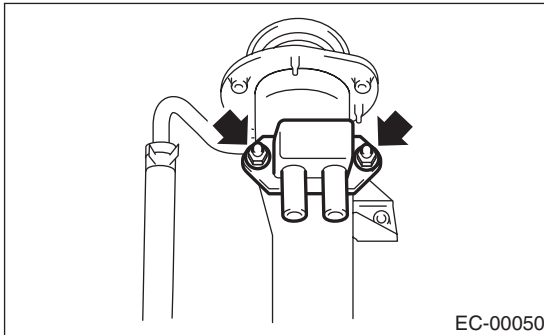
1) Remove the fuel filler pipe.

<Ref. to FU(H4DOTC)-53, REMOVAL, Fuel Filler Pipe.>

2) Disconnect the evaporation hose from shut valve.



3) Remove the shut valve from the fuel filler pipe.

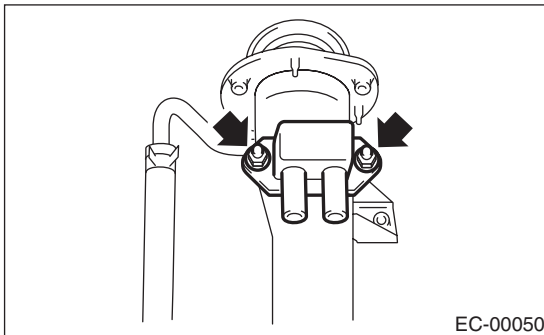


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

4.5 N·m (0.46 kgf-m, 3.3 ft-lb)



C: INSPECTION

Make sure the hoses are not cracked or loose.

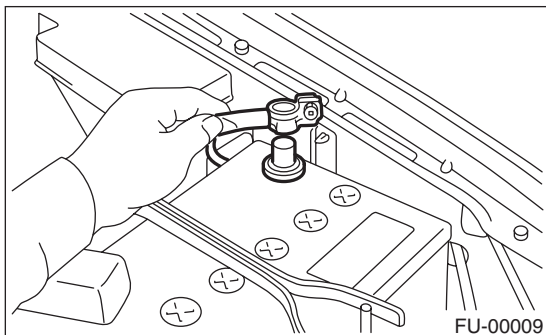
Drain Valve

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

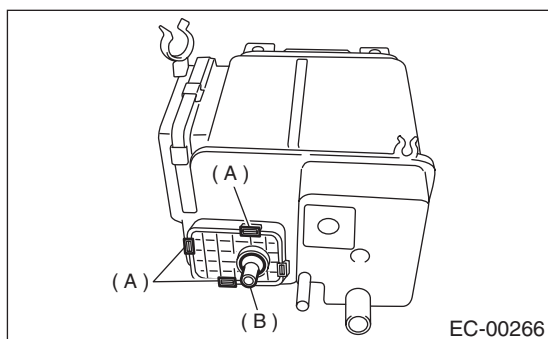
16. Drain Valve

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.



- 3) Lift-up the vehicle.
- 4) Remove the canisters. <Ref. to EC (H4DOTC)-7, REMOVAL, Canister.>
- 5) Disengage the clip, then remove the drain valve from the canister.



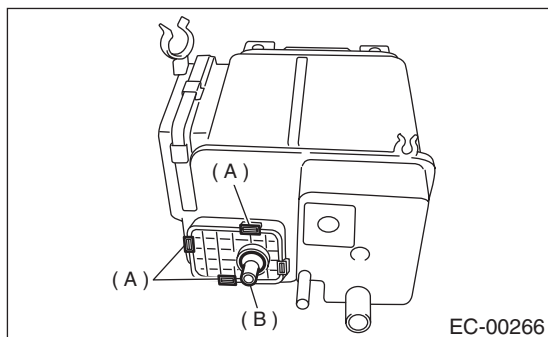
- (A) Clip
- (B) Drain valve

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Use a new clip.



- (A) Clip
- (B) Drain valve

PCV Hose Assembly

EMISSION CONTROL (AUX. EMISSION CONTROL DEVICES)

17.PCV Hose Assembly

A: REMOVAL

CAUTION:

Do not remove if the PCV hose, diagnostics connector and PCV valve are not damaged.

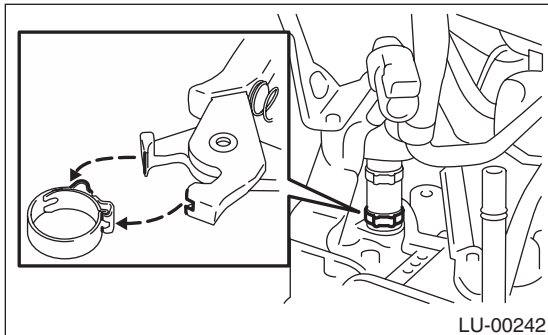
1) Remove the intake manifold.

<Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>

2) Fit the depression in the ST with the protrusion on the clamp to unlock.

3) Remove the PCV hose assembly.

ST 18353AA000 CLAMP PLIERS



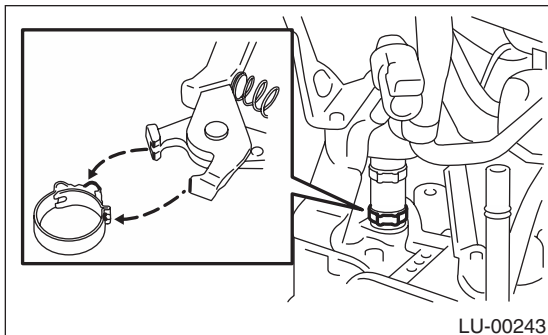
B: INSTALLATION

NOTE:

Use a new clamp.

1) Install the PCV hose assembly, then lock by fitting the ST on the clamp protrusion.

ST 18353AA000 CLAMP PLIERS



2) Install the intake manifold.

<Ref. to FU(H4DOTC)-17, INSTALLATION, Intake Manifold.>

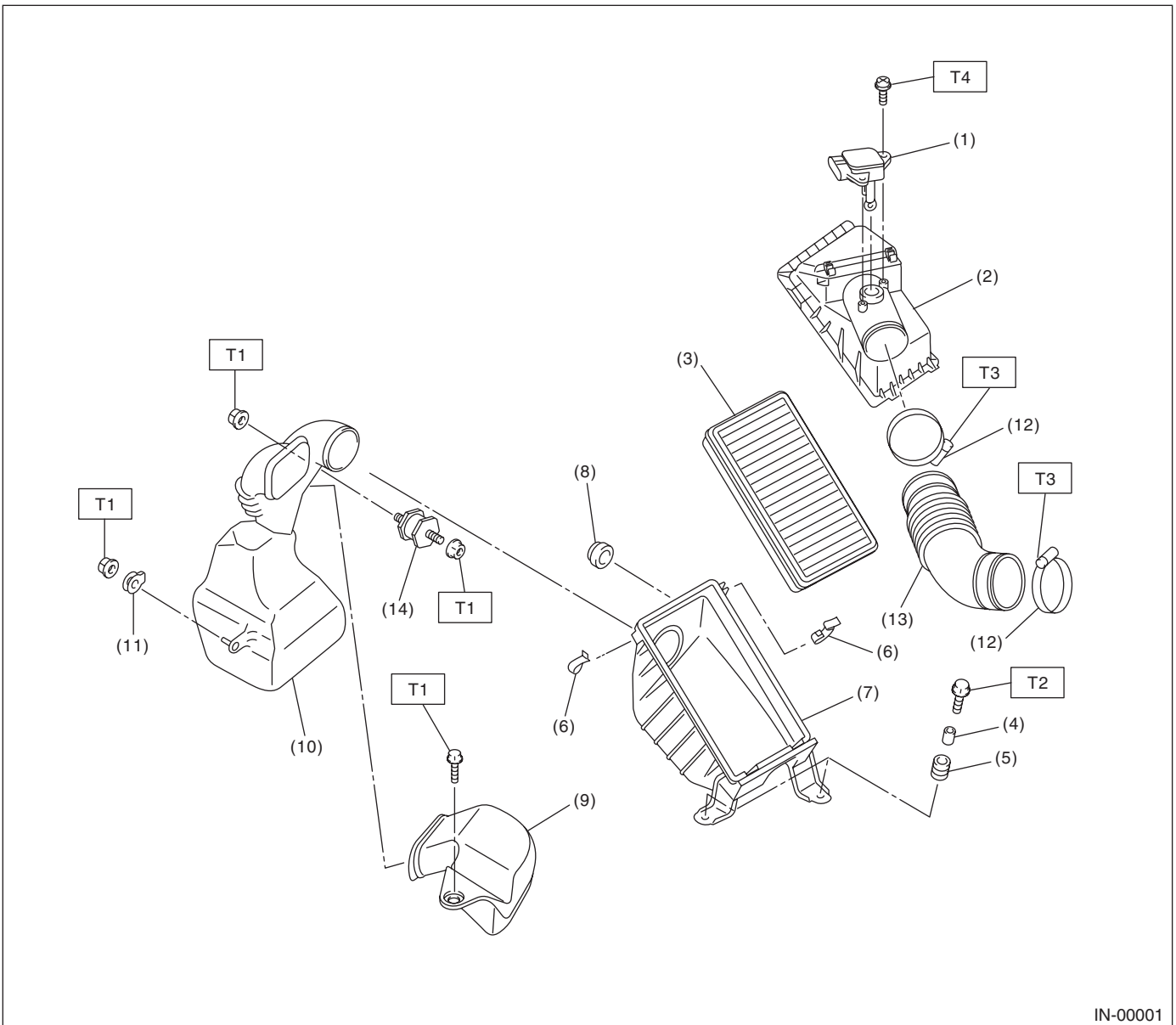
General Description

INTAKE (INDUCTION)

1. General Description

A: COMPONENT

1. AIR CLEANER



IN-00001

- | | | |
|---|-----------------------------|--------------|
| (1) Mass air flow and intake air temperature sensor | (7) Air cleaner lower case | (14) Cushion |
| (2) Air cleaner upper cover | (8) Cushion rubber | |
| (3) Air cleaner element | (9) Air intake duct | |
| (4) Spacer | (10) Resonator chamber ASSY | |
| (5) Bushing | (11) Cushion rubber | |
| (6) Clip | (12) Clamp | |
| | (13) Air intake boot | |

Tightening torque: N·m (kgf·m, ft·lb)

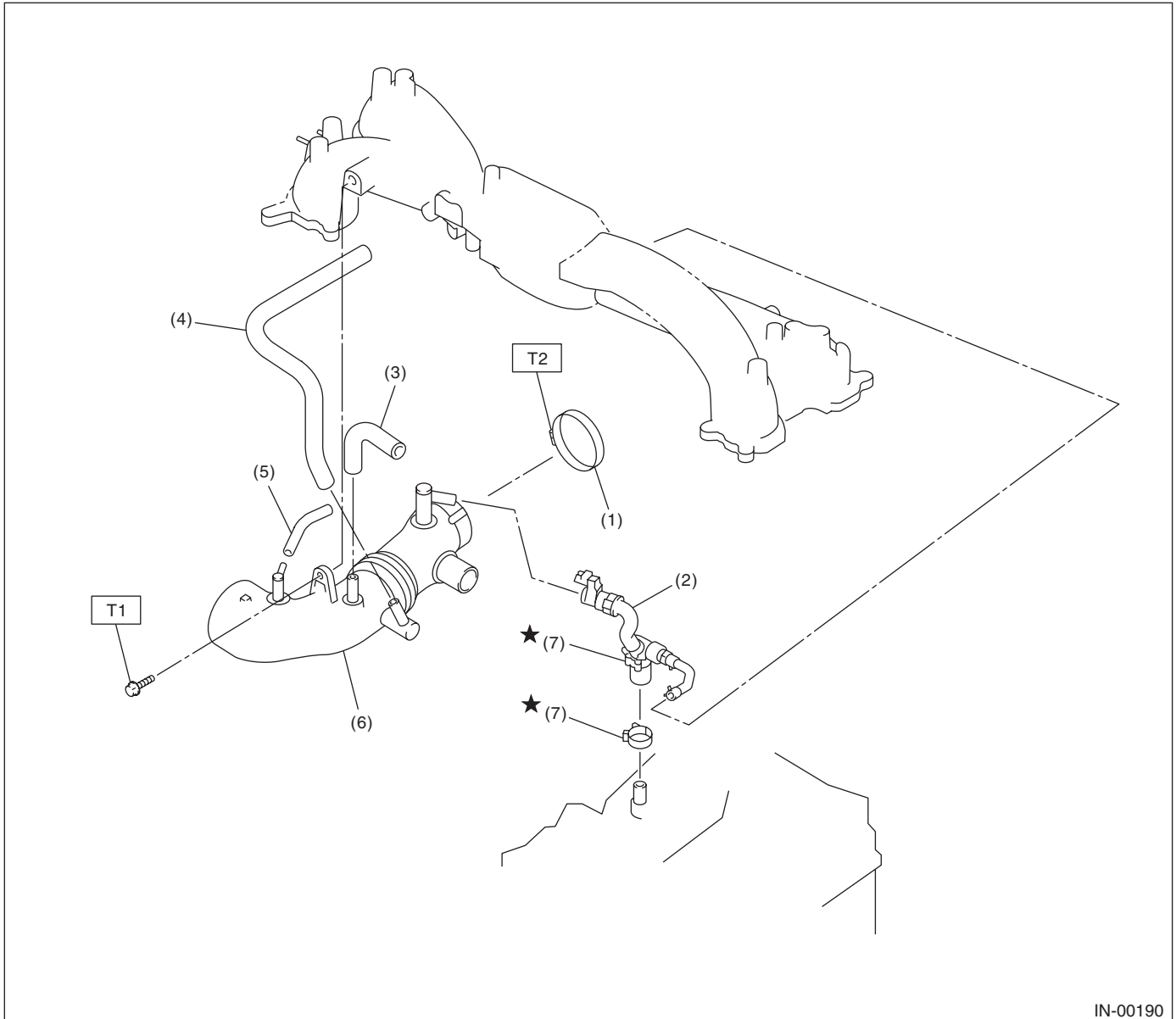
T1: 7.5 (0.76, 5.5)

T2: 33 (3.4, 24.6)

T3: 2.5 (0.25, 1.8)

T4: 1.0 (0.1, 0.7)

2. INTAKE DUCT



IN-00190

- | | |
|------------------------|------------------------|
| (1) Clamp | (5) Air by-pass hose C |
| (2) PCV hose ASSY | (6) Intake duct |
| (3) Air by-pass hose A | (7) Clamp |
| (4) Air by-pass hose B | |

Tightening torque: N·m (kgf·m, ft·lb)

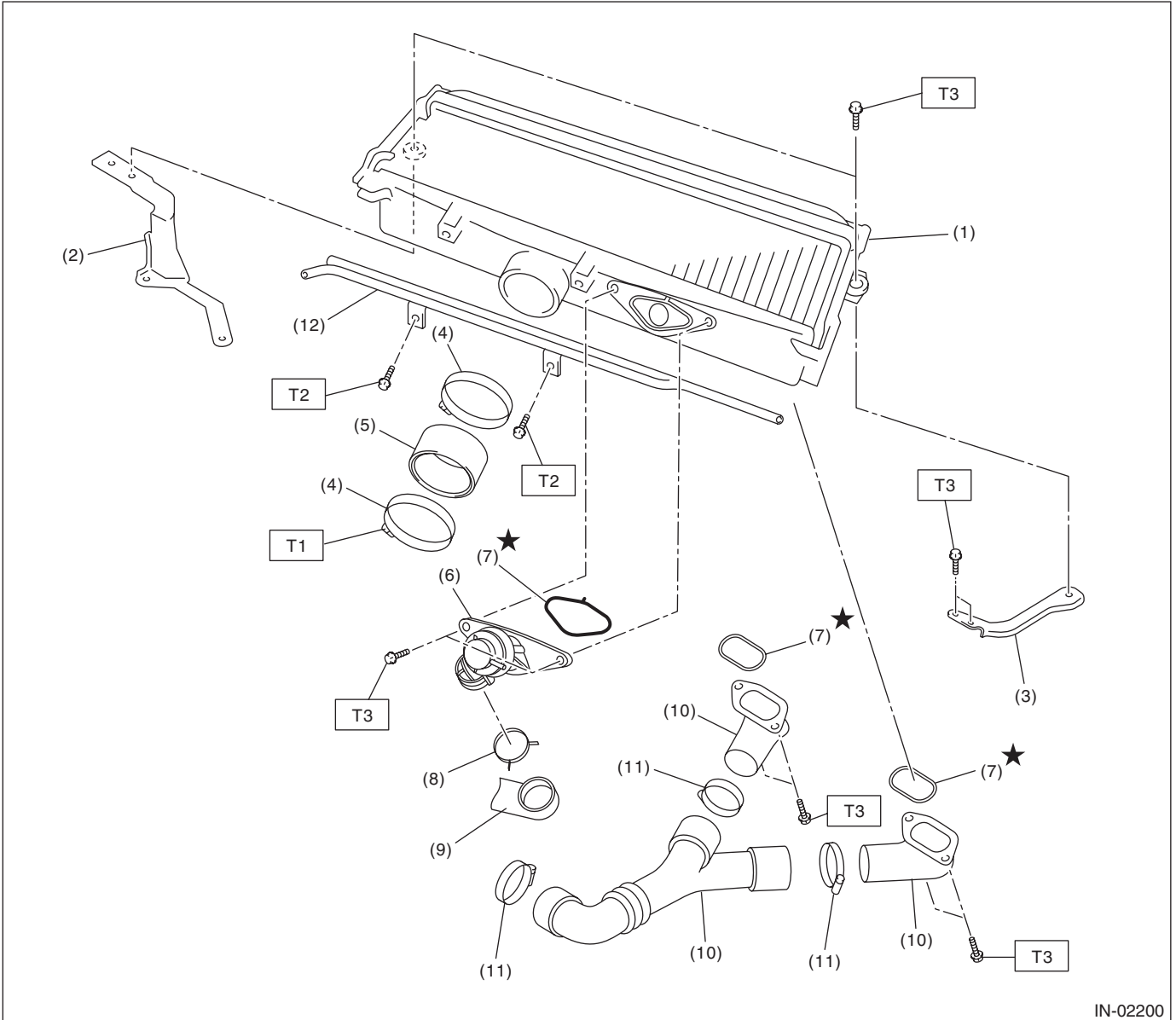
T1: 19 (1.9, 13.7)

T2: 3 (0.3, 2.2)

General Description

INTAKE (INDUCTION)

3. INTERCOOLER



IN-02200

- | | |
|----------------------------|------------------------|
| (1) Intercooler | (7) O-ring |
| (2) Intercooler bracket RH | (8) Clamp |
| (3) Intercooler bracket LH | (9) Air by-pass hose A |
| (4) Clamp | (10) Intercooler duct |
| (5) Air intake duct | (11) Clamp |
| (6) Air by-pass valve | (12) PCV pipe |

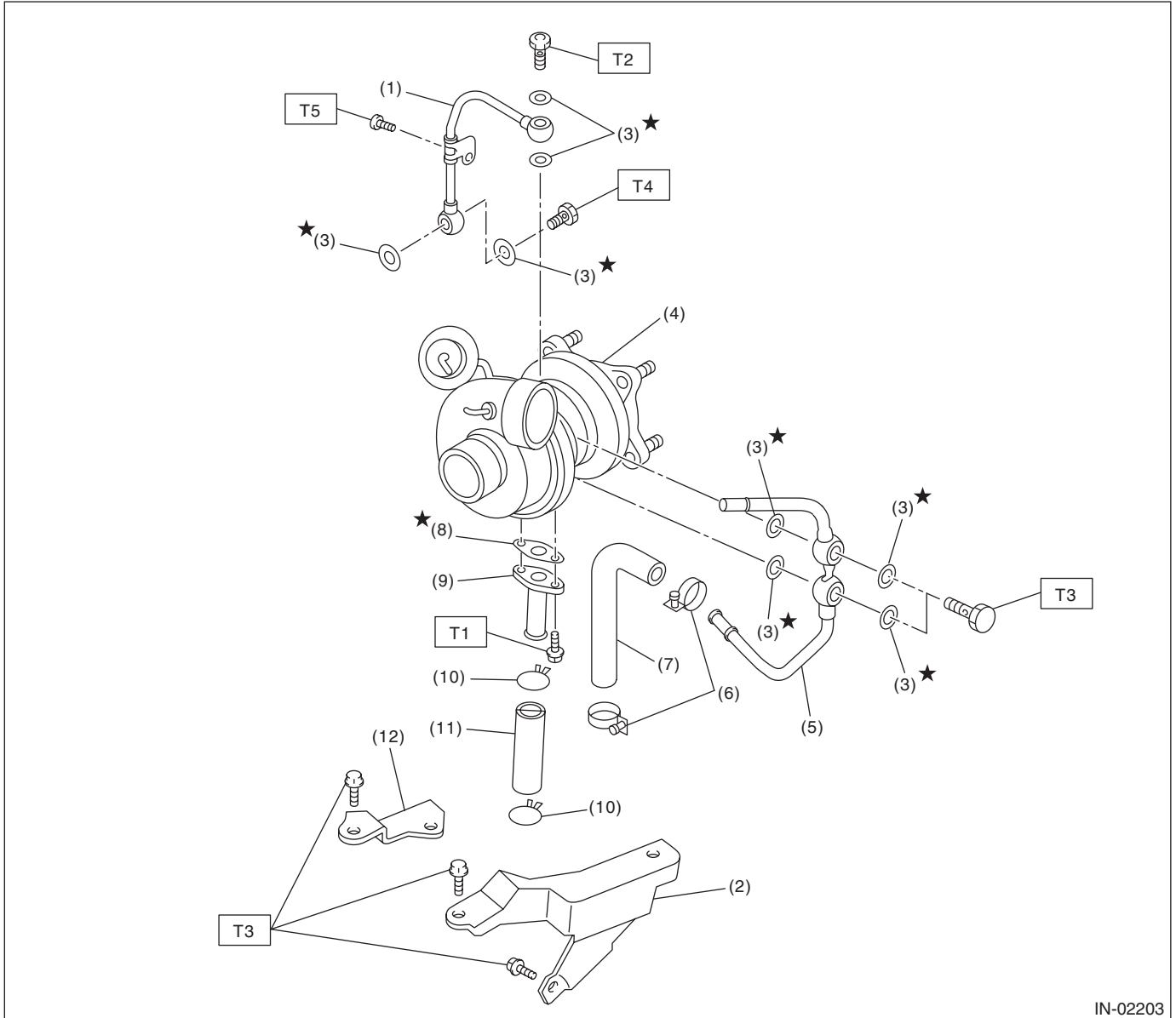
Tightening torque: N·m (kgf·m, ft·lb)

T1: 3 (0.3, 2.2)

T2: 6.3 (0.64, 4.6)

T3: 16 (1.6, 11.6)

4. TURBOCHARGER



IN-02203

- | | |
|-----------------------------|------------------------------|
| (1) Oil inlet pipe A | (7) Engine coolant hose |
| (2) Turbocharger bracket LH | (8) Gasket |
| (3) Metal gasket | (9) Oil outlet pipe |
| (4) Turbocharger | (10) Clip |
| (5) Water pipe | (11) Oil outlet hose |
| (6) Clamp | (12) Turbocharger bracket RH |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 4.4 (0.45, 3.3)

T2: 16 (1.6, 11.6)

T3: 33 (3.4, 24.6)

T4: 29 (3.0, 21.7)

T5: 4.9 (0.50, 3.6)

General Description

INTAKE (INDUCTION)

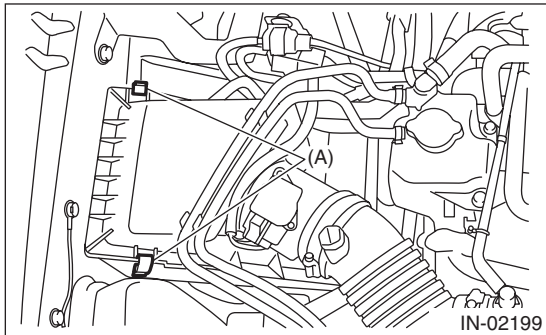
B: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from the battery.

2. Air Cleaner Element

A: REMOVAL

1) Remove the clip (A) from the air cleaner upper cover.



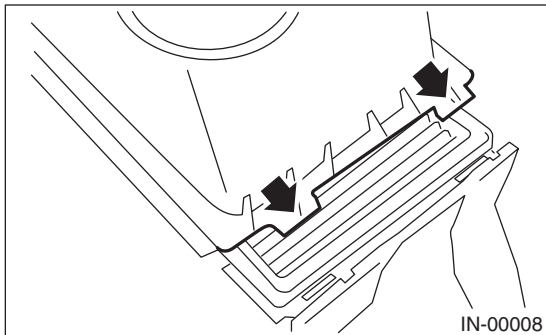
2) Remove the air cleaner element.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Before installing the air cleaner upper cover, align the protrusion with the hole of air cleaner lower case, and then secure the upper cover and lower case.



C: INSPECTION

Replace if excessively damaged or dirty.

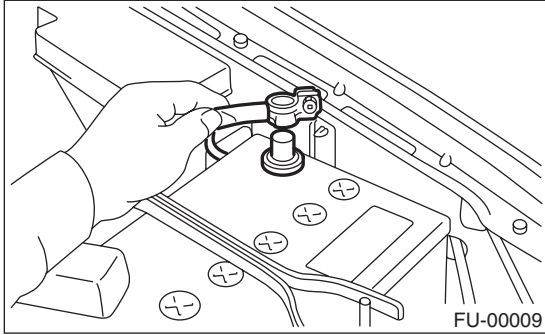
Air Cleaner Case

INTAKE (INDUCTION)

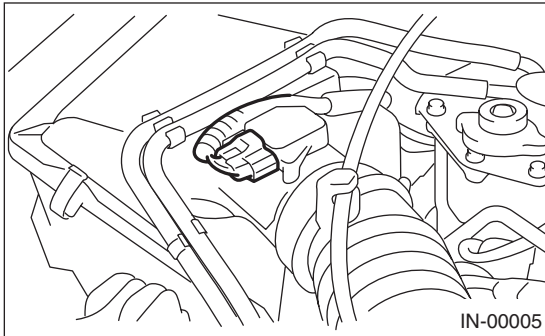
3. Air Cleaner Case

A: REMOVAL

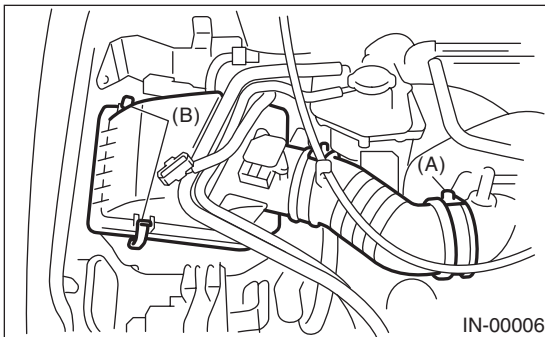
- 1) Disconnect the ground cable from the battery.



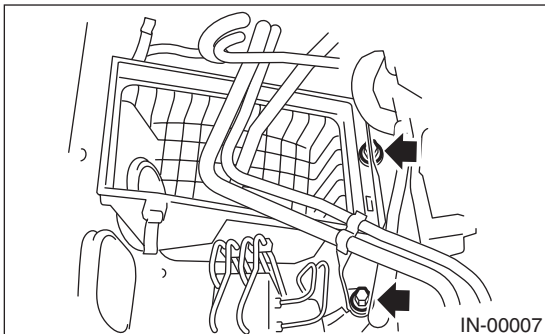
- 2) Disconnect the connector from mass air flow and intake air temperature sensor.



- 3) Loosen the clamps (A) which connect the air intake boot and the intake duct.
- 4) Remove the clip (B) from air cleaner upper cover.



- 5) Remove the air cleaner upper cover.
- 6) Remove the air cleaner element.
- 7) Remove the air cleaner lower case.

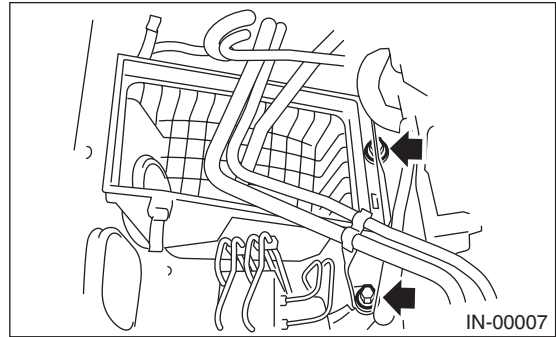


B: INSTALLATION

Install in the reverse order of removal.

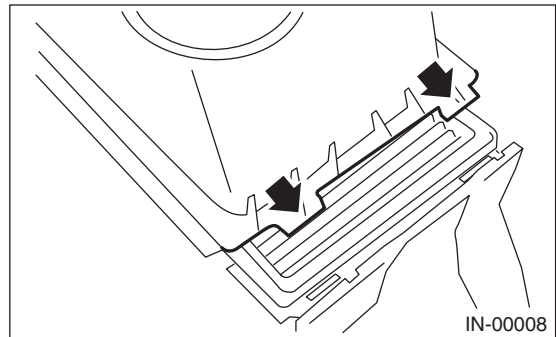
Tightening torque:

33 N·m (3.4 kgf-m, 24.6 ft-lb)



NOTE:

Before installing the air cleaner upper cover, align the protrusion with the hole of air cleaner lower case, and then secure the upper cover and lower case.



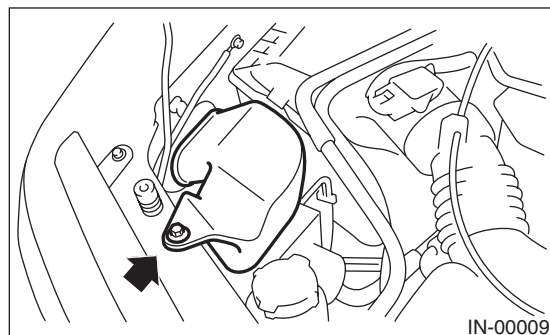
C: INSPECTION

Replace if excessively damaged or dirty.

4. Air Intake Duct

A: REMOVAL

Remove the bolts which install the air intake duct on the front side of body.

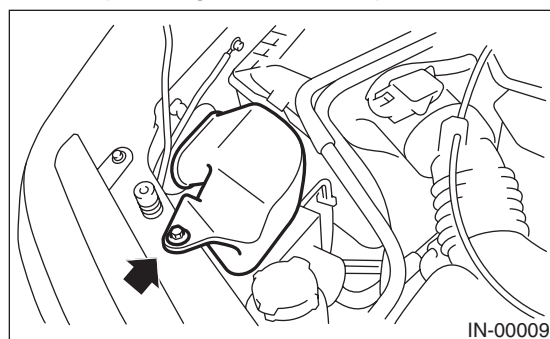


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



C: INSPECTION

- 1) Check for cracks or loose connection.
- 2) Inspect that no foreign objects in the air intake duct.

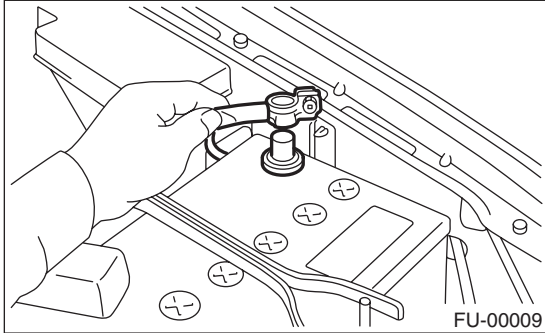
Intake Duct

INTAKE (INDUCTION)

5. Intake Duct

A: REMOVAL

1) Disconnect the ground cable from the battery.



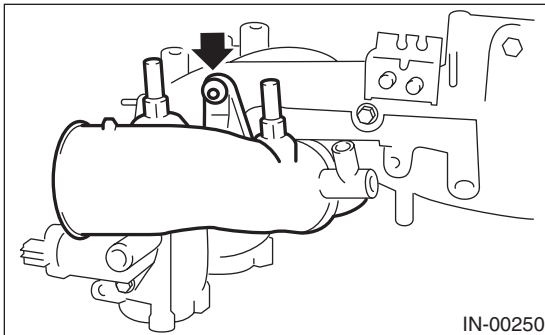
2) Remove the collector cover.

3) Remove the intake manifold.

<Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>

4) Remove the sensor, engine harness and fuel pipe attached to the intake manifold. <Ref. to FU(H4DOTC)-19, DISASSEMBLY, Intake Manifold.>

5) Remove the intake duct from intake manifold.

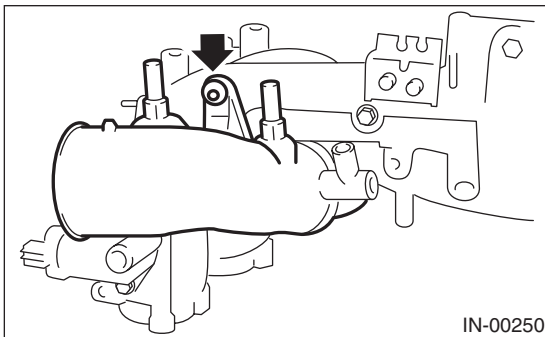


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

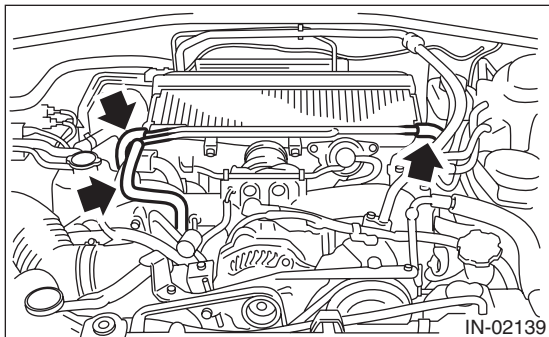
19 N·m (1.9 kgf·m, 13.7 ft·lb)



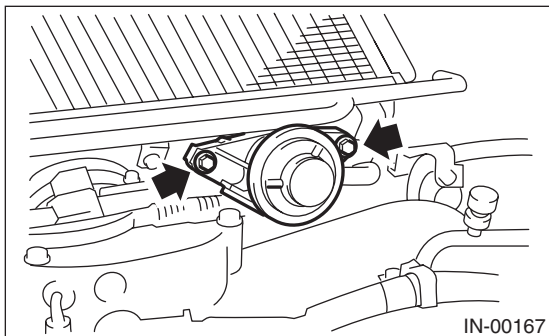
6. Intercooler

A: REMOVAL

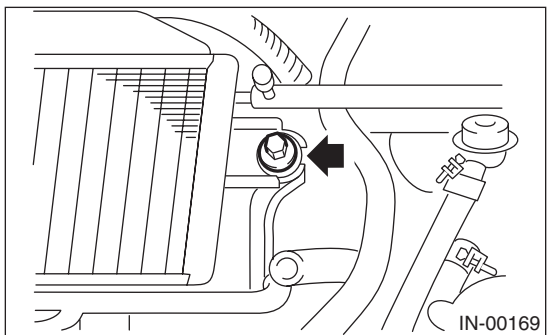
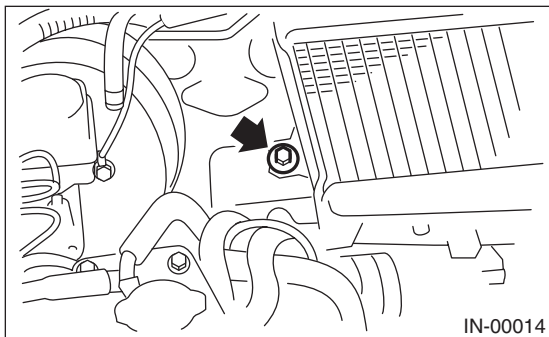
- 1) Remove the collector cover.
- 2) Disconnect the PCV hose from PCV pipe.



- 3) Remove the air by-pass valve from intercooler.

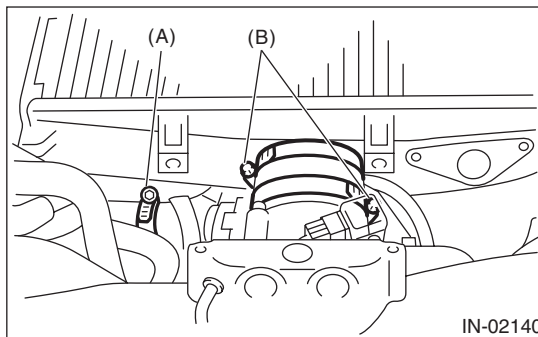


- 4) Remove the bolts which secure the intercooler to the bracket.



- 5) Loosen the clamps (A) which connect the turbocharger and intercooler duct.

- 6) Loosen the clamps (B) which connect the throttle body and intercooler.



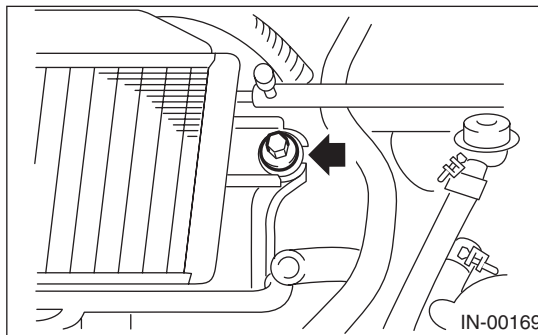
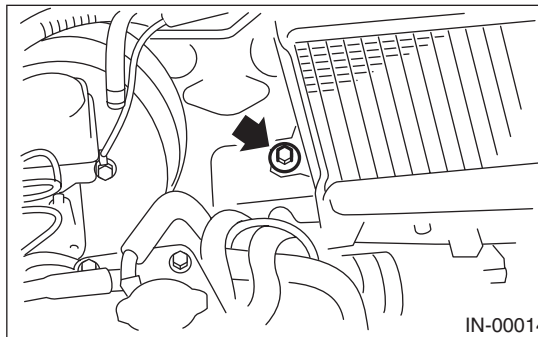
- 7) Separate the intercooler duct from turbocharger.
- 8) Remove the intercooler from throttle body.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

16 N·m (1.6 kgf-m, 11.6 ft-lb)

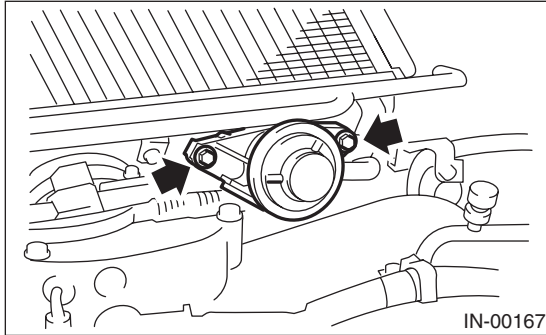


Intercooler

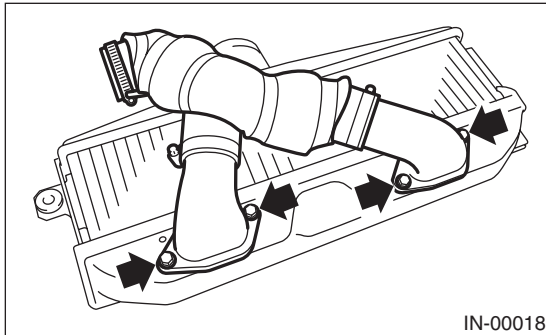
INTAKE (INDUCTION)

C: DISASSEMBLY

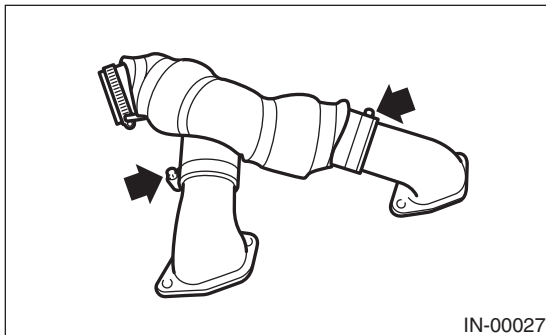
- 1) Remove the air by-pass valve from intercooler.



- 2) Remove the intercooler ducts from intercooler.



- 3) Separate the duct.



D: ASSEMBLY

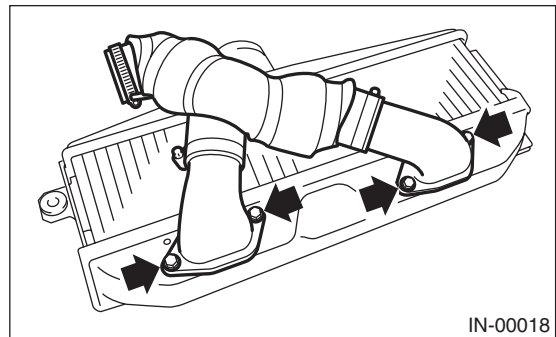
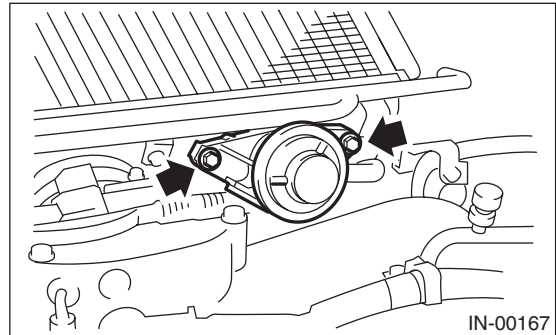
Assemble in the reverse order of disassembly.

NOTE:

Be careful not to pinch the O-ring.

Tightening torque:

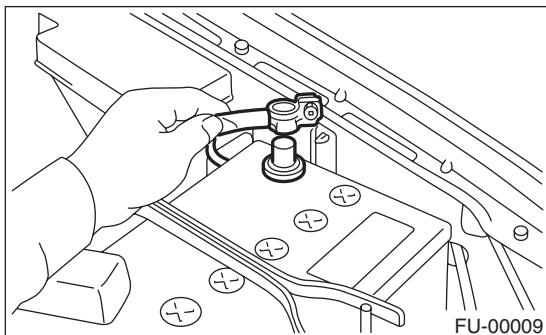
16 N·m (1.6 kgf-m, 11.6 ft-lb)



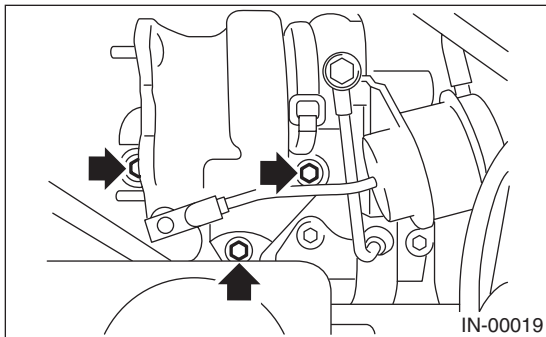
7. Turbocharger

A: REMOVAL

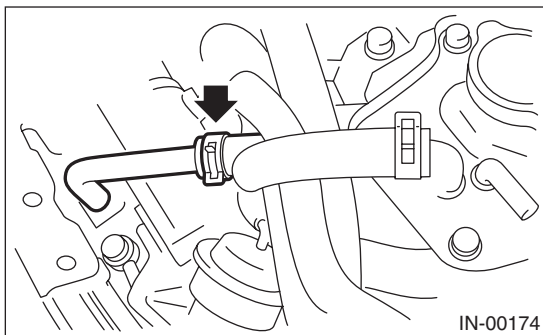
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.



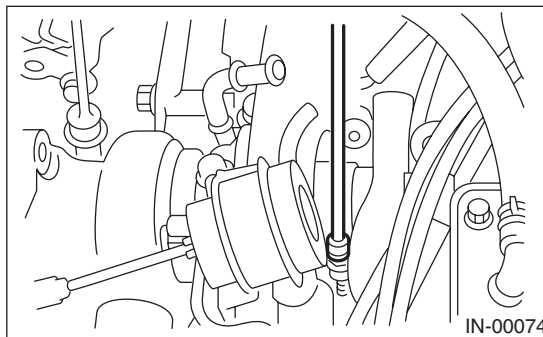
- 3) Remove the collector cover.
- 4) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
- 5) Lower the vehicle.
- 6) Separate the turbocharger joint pipe from turbocharger.



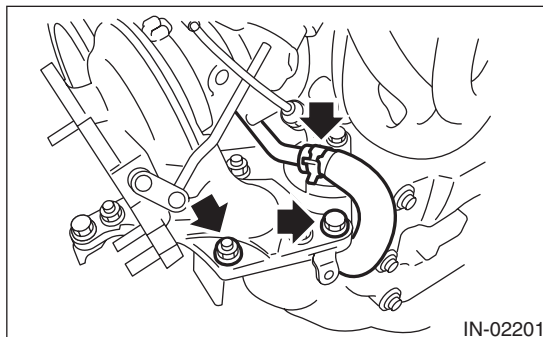
- 7) Disconnect the engine coolant hose which is connected to coolant filler tank.



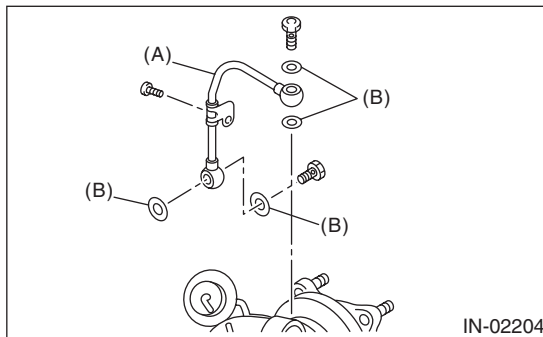
- 8) Loosen the clamp which secures turbocharger to intake duct.



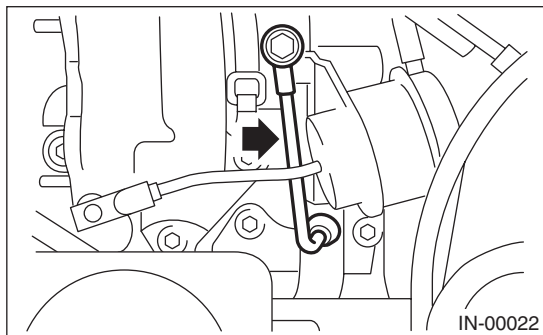
- 9) Disconnect the engine coolant hoses from pipe, and remove the turbocharger bracket RH.



- 10) Remove the oil inlet pipe from turbocharger.



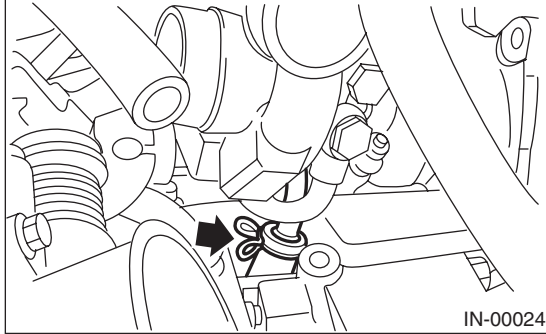
- (A) Oil inlet pipe
- (B) Metal gasket



Turbocharger

INTAKE (INDUCTION)

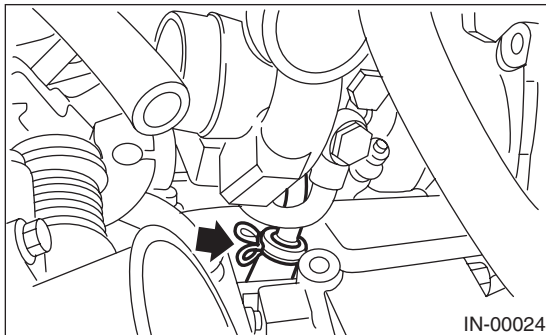
- 11) Disconnect the oil outlet hose from pipe.



- 12) Take out the turbocharger from engine compartment.

B: INSTALLATION

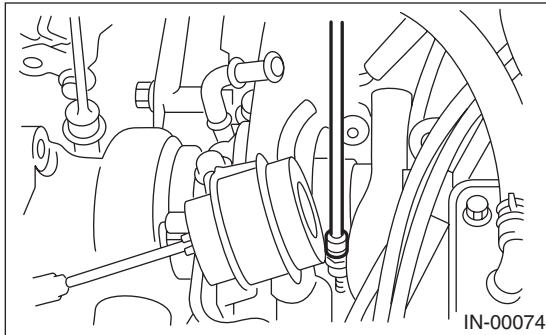
- 1) Connect the oil outlet hose to outlet pipe.



- 2) Install the turbocharger to intake duct.

Tightening torque:

3 N·m (0.3 kgf-m, 2.2 ft-lb)



- 3) Install the oil inlet pipe to turbocharger.

NOTE:

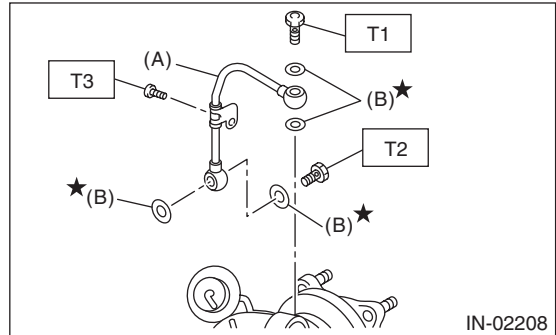
Use a new gasket.

Tightening torque:

T1: 16 N·m (1.6 kgf-m, 11.6 ft-lb)

T2: 29 N·m (3.0 kgf-m, 21.7 ft-lb)

T3: 4.9 N·m (0.50 kgf-m, 3.6 ft-lb)



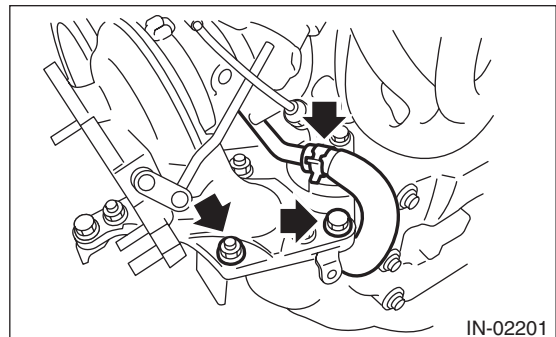
(A) Oil inlet pipe

(B) Metal gasket

- 4) Install the turbocharger bracket RH and connect the engine coolant hoses to the pipe.

Tightening torque:

33 N·m (3.4 kgf-m, 24.6 ft-lb)



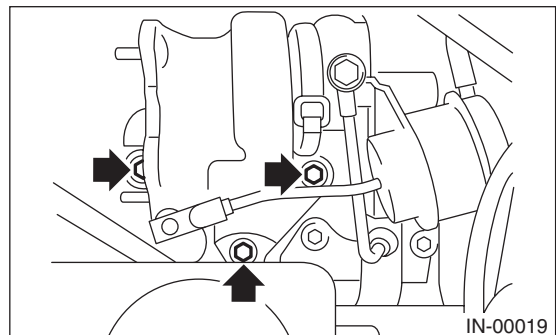
- 5) Install the joint pipe to turbocharger.

NOTE:

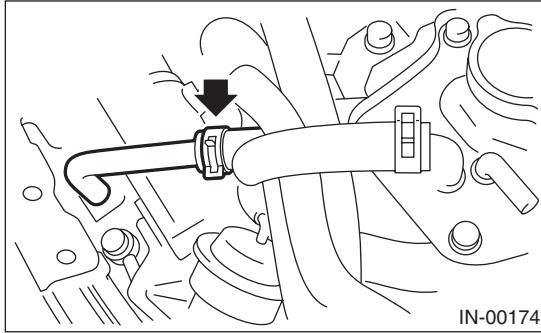
Use a new gasket.

Tightening torque:

35 N·m (3.6 kgf-m, 25.8 ft-lb)



- 6) Connect the engine coolant hose which is connected to the coolant filler tank.



- 7) Lift-up the vehicle.
8) Install the center exhaust pipe. <Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.>

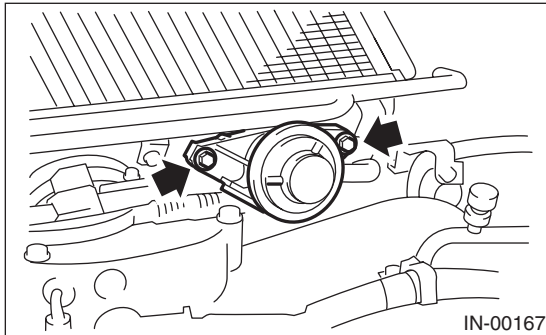
Air By-pass Valve

INTAKE (INDUCTION)

8. Air By-pass Valve

A: REMOVAL

- 1) Remove the collector cover.
- 2) Remove the air by-pass valve from intercooler.



- 3) Disconnect the air by-pass hoses from air valve.

B: INSTALLATION

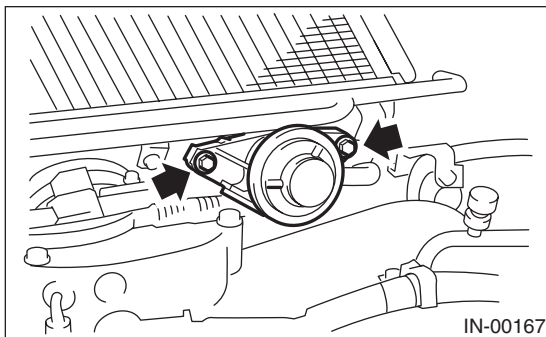
Install in the reverse order of removal.

NOTE:

Be careful not to pinch the O-ring.

Tightening torque:

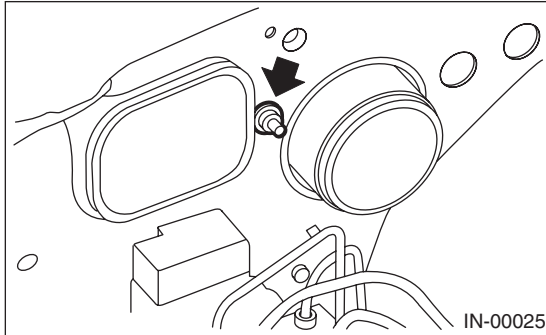
16 N·m (1.6 kgf·m, 11.6 ft·lb)



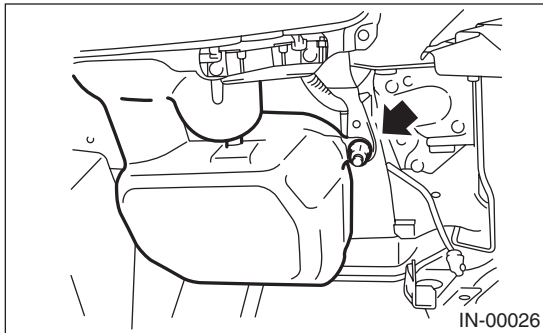
9. Resonator Chamber

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Remove the collector cover.
- 3) Remove the air intake duct. <Ref. to IN(H4DOTC)-9, REMOVAL, Air Intake Duct.>
- 4) Remove the air cleaner lower case. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
- 5) Remove the resonator chamber mounting bolt on the right of engine compartment.



- 6) Remove the front tire RH, and lift-up the vehicle.
- 7) Remove the front mudguard RH.
- 8) Remove the resonator chamber from the inside front fender.

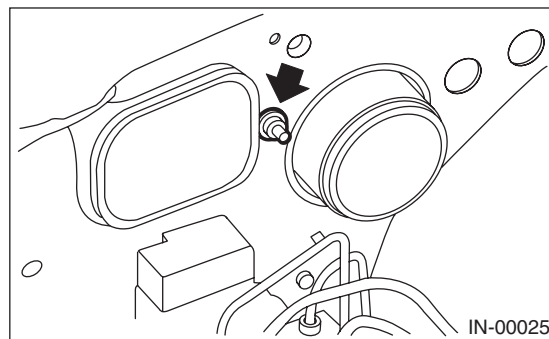
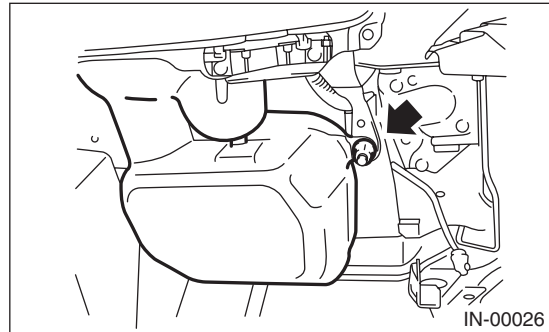


B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



C: INSPECTION

Check for cracks or loose connection. Check that no foreign objects are mixed in the resonator chamber.

Resonator Chamber

INTAKE (INDUCTION)

General Description

MECHANICAL

1. General Description

A: SPECIFICATION

Engine	Model		2.5 L	
	Cylinder arrangement		Horizontally opposed, liquid cooled, 4-cylinder, 4-stroke gasoline engine	
	Valve system mechanism		Belt driven, double overhead camshaft, 4-valve/cylinder	
	Bore × Stroke		mm (in)	99.5 × 79.0 (3.92 × 3.11)
	Piston displacement		cm ³ (cu in)	2,457 (149.94)
	Compression ratio		8.4	
	Compression pressure (at 350 rpm)		kPa (kgf/cm ² , psi)	981 — 1,177 (10 — 12, 142 — 171)
	Number of piston rings		Pressure ring: 2, Oil ring: 1	
	Intake valve timing	Open	Max.retard	5° ATDC
			Min. advance	35° BTDC
		Close	Max.retard	65° ABDC
			Min. advance	25° ABDC
	Exhaust valve timing	Open	55° BBDC	
		Close	5° ATDC	
	Valve clearance	Intake	mm (in)	0.20±0.02 (0.0079±0.0008)
		Exhaust	mm (in)	0.35±0.02 (0.0138±0.0008)
Idle speed [At neutral position on MT, or “P” or “N” range on AT]	No Load	rpm		
		MT: 700±100 AT: 700±100		
	A/C ON	A/C refrigerant pressure is low	MT: 725±100 AT: 750±100	
		A/C refrigerant pressure is high	MT: 800±100 AT: 825±100	
Ignition order		1 → 3 → 2 → 4		
Ignition timing	BTDC/rpm	MT Model	17°±10°/700	
		AT Model	17°±10°/700	

NOTE:

OS: Oversize US: Undersize

Belt tension adjuster	Protrusion of adjuster rod		5.2 — 6.2 mm (0.204 — 0.244 in)
Belt tensioner	Spacer O.D.		17.955 — 17.975 mm (0.7069 — 0.7077 in)
	Tensioner bushing I.D.		18.0 — 18.08 mm (0.7087 — 0.7118 in)
	Clearance between spacer and bushing	Standard	0.025 — 0.125 mm (0.0010 — 0.0049 in)
		Limit	0.175 mm (0.069 in)
	Side clearance of spacer	Standard	0.2 — 0.55 mm (0.0079 — 0.0217 in)
Limit		0.81 mm (0.0319 in)	

General Description

MECHANICAL

Camshaft	Bend limit			0.020 mm (0.0079 in)	
	Thrust clearance		Standard	0.068 — 0.116 mm (0.0027 — 0.0046 in)	
			Limit	0.14 mm (0.0055 in)	
	Cam lobe height		Intake	Standard	46.55 — 46.65 mm (1.833 — 1.837 in)
				Limit	46.45 mm (1.829 in)
			Exhaust	Standard	46.75 — 46.85 mm (1.841 — 1.844 in)
				Limit	46.65 mm (1.837 in)
	Camshaft journal O.D.		Standard	Front	37.946 — 37.963 mm (1.4939 — 1.4946 in)
				Center rear	29.946 — 29.963 mm (1.1790 — 1.1796 in)
	Oil clearance			Standard	0.037 — 0.072 mm (0.0015 — 0.0028 in)
Limit				0.10 mm (0.0039 in)	
Cylinder head	Surface warpage limit (Mating surface with cylinder block)			0.035 mm (0.0014 in)	
	Grinding limit			0.3 mm (0.012 in)	
	Standard height			127.5 mm (5.02 in)	
Valve seat	Seating angle			90°	
	Contacting width		Intake	Standard	0.6 — 1.4 mm (0.024 — 0.055 in)
				Limit	1.7 mm (0.067 in)
			Exhaust	Standard	1.2 — 1.8 mm (0.047 — 0.071 in)
				Limit	2.2 mm (0.087 in)
Valve guide	Inside diameter			6.000 — 6.012 mm (0.2362 — 0.2367 in)	
	Protrusion above head			15.8 — 16.2 mm (0.622 — 0.638 in)	
Valve	Head edge thickness		Intake	Standard	1.0 — 1.4 mm (0.039 — 0.055 in)
				Limit	0.8 mm (0.031 in)
			Exhaust	Standard	1.3 — 1.7 mm (0.051 — 0.067 in)
				Limit	0.8 mm (0.031 in)
	Stem outer diameter			Intake	5.955 — 5.970 mm (0.2344 — 0.2350 in)
				Exhaust	5.945 — 5.960 mm (0.2341 — 0.2346 in)
	Valve stem gap		Standard	Intake	0.030 — 0.057 mm (0.0012 — 0.0022 in)
				Exhaust	0.040 — 0.067 mm (0.0016 — 0.0026 in)
			Limit	—	0.15 mm (0.0059 in)
Overall length			Intake	104.4 mm (4.110 in)	
			Exhaust	104.65 mm (4.120 in)	
Valve spring	Free length			47.32 mm (1.863 in)	
	Squareness			2.5°, 2.1 mm (0.083 in) or less	
	Tension/spring height		Set	205 — 235 N (20.9 — 24.0 kgf, 46.1 — 52.8 lb)/ 36.0 mm (1.417 in)	
			Lift	426 — 490 N (43.4 — 50.0 kgf, 95.8 — 110 lb)/ 26.50 mm (1.043 in)	
Valve lifter	Outer diameter			34.959 — 34.975 mm (1.3763 — 1.3770 in)	
	Inner diameter (cylinder head)			34.994 — 35.016 mm (1.3777 — 1.3786 in)	
	Valve lifter clearance		Standard	0.019 — 0.057 mm (0.0007 — 0.0022 in)	
			Limit	0.100 mm (0.0039 in)	

General Description

MECHANICAL

Cylinder block	Surface warpage limit (Mating surface with cylinder head)			0.025 mm (0.0098 in)
	Grinding limit			0.1 mm (0.004 in)
	Standard height			201.0 mm (7.91 in)
	Cylinder inner diameter	Standard	A	99.505 — 99.515 mm (3.9175 — 3.9179 in)
			B	99.495 — 99.505 mm (3.9171 — 3.9175 in)
	Taper	Standard		0.015 mm (0.0006 in)
		Limit		0.050 mm (0.0020 in)
	Out-of-roundness	Standard		0.010 mm (0.0004 in)
		Limit		0.050 mm (0.0020 in)
Piston clearance	Standard		-0.010 — 0.010 mm (-0.0004 — 0.0004 in)	
	Limit		0.030 mm (0.0012 in)	
Cylinder inner boring limit (diameter)			100.005 mm (3.9372 in)	
Piston	Outer diameter	Standard	A	99.505 — 99.515 mm (3.9175 — 3.9179 in)
			B	99.495 — 99.505 mm (3.9171 — 3.9175 in)
		0.25 mm (0.0098 in) OS		99.745 — 99.765 mm (3.9270 — 3.9278 in)
		0.50 mm (0.0197 in) OS		99.995 — 100.015 mm (3.9368 — 3.9376 in)
Piston pin	Standard clearance between piston and piston pin		Standard	0.004 — 0.008 mm (0.0002 — 0.0003 in)
			Limit	0.020 mm (0.0008 in)
	Degree of fit			Piston pin must be fitted into position with thumb at 20°C (68°F).
Piston ring	Ring closed gap	Top ring	Standard	0.20 — 0.25 mm (0.0079 — 0.0098 in)
			Limit	1.0 mm (0.039 in)
		Second ring	Standard	0.37 — 0.52 mm (0.015 — 0.020 in)
			Limit	1.0 mm (0.039 in)
	Ring groove gap	Oil ring	Standard	0.20 — 0.50 mm (0.0079 — 0.0197 in)
			Limit	1.5 mm (0.059 in)
		Top ring	Standard	0.040 — 0.080 mm (0.0016 — 0.0031 in)
			Limit	0.15 mm (0.0059 in)
Second ring	Standard	0.030 — 0.070 mm (0.0012 — 0.0028 in)		
	Limit	0.15 mm (0.0059 in)		
Connecting rod	Bend or twist per 100 mm (3.94 in) in length		Limit	0.10 mm (0.0039 in)
	Side clearance of large end		Standard	0.070 — 0.330 mm (0.0028 — 0.0130 in)
			Limit	0.4 mm (0.016 in)
Bearing of large end	Oil clearance		Standard	0.017 — 0.045 mm (0.0007 — 0.0018 in)
			Limit	0.05 mm (0.0020 in)
	Thickness at center portion		Standard	1.490 — 1.502 mm (0.0587 — 0.0591 in)
			0.03 mm (0.0012 in) US	1.504 — 1.512 mm (0.0592 — 0.0595 in)
			0.05 mm (0.0020 in) US	1.514 — 1.522 mm (0.0596 — 0.0599 in)
			0.25 mm (0.0098 in) US	1.614 — 1.622 mm (0.0635 — 0.0639 in)
Bushing of small end	Clearance between piston pin and bushing		Standard	0 — 0.022 mm (0 — 0.0009 in)
			Limit	0.030 mm (0.0012 in)

General Description

MECHANICAL

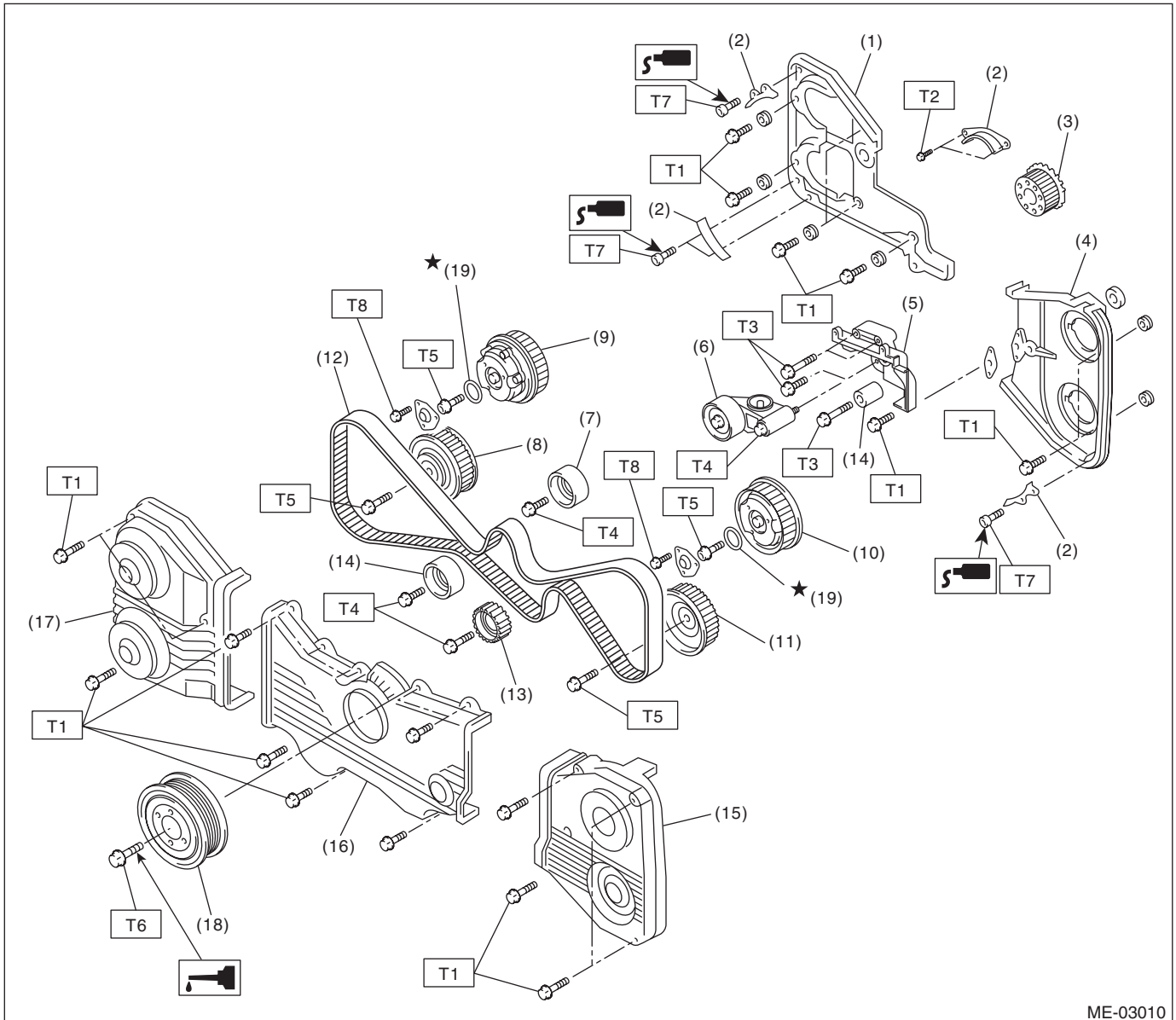
Crankshaft	Bending limit		0.035 mm (0.0014 in)	
	Crank pin	Out-of-roundness	0.003 mm (0.0001 in)	
		Cylindricality	0.004 mm (0.0002 in)	
		Grinding limit (dia.)	To 51.750 mm (2.0374 in)	
	Crank journal	Out-of-roundness	0.005 mm (0.0002 in)	
		Cylindricality	0.006 mm (0.0002 in)	
		Grinding limit (dia.)	To 59.758 mm (2.3527 in)	
	Crank pin outer diameter	Standard	51.984 — 52.000 mm (2.0466 — 2.0472 in)	
		0.03 mm (0.0012 in) US	51.954 — 51.970 mm (2.0454 — 2.0461 in)	
		0.05 mm (0.0020 in) US	51.934 — 51.950 mm (2.0447 — 2.0453 in)	
		0.25 mm (0.0098 in) US	51.734 — 51.750 mm (2.0368 — 2.0374 in)	
	Crank journal outer diameter	Standard	59.992 — 60.008 mm (2.3619 — 2.3625 in)	
		0.03 mm (0.0012 in) US	59.962 — 59.978 mm (2.3607 — 2.3613 in)	
		0.05 mm (0.0020 in) US	59.942 — 59.958 mm (2.3599 — 2.3605 in)	
		0.25 mm (0.0098 in) US	59.742 — 59.758 mm (2.3520 — 2.3527 in)	
	Thrust clearance	Standard	0.030 — 0.115 mm (0.0012 — 0.0045 in)	
		Limit	0.25 mm (0.0098 in)	
	Oil clearance	Standard	0.010 — 0.030 mm (0.0004 — 0.0012 in)	
		Limit	0.040 mm (0.0016 in)	
	Main bearing	Thickness of main bearing	#1, #3	Standard
0.03 mm (0.0012 in) US				2.017 — 2.020 mm (0.0794 — 0.0795 in)
0.05 mm (0.0020 in) US				2.027 — 2.030 mm (0.0798 — 0.0799 in)
0.25 mm (0.0098 in) US				2.127 — 2.130 mm (0.0837 — 0.0839 in)
#2, #4, #5		Standard	2.000 — 2.013 mm (0.0787 — 0.0793 in)	
		0.03 mm (0.0012 in) US	2.019 — 2.022 mm (0.0795 — 0.0796 in)	
		0.05 mm (0.0020 in) US	2.029 — 2.032 mm (0.0799 — 0.0800 in)	
		0.25 mm (0.0098 in) US	2.129 — 2.132 mm (0.0838 — 0.0839 in)	

General Description

MECHANICAL

B: COMPONENT

1. TIMING BELT



ME-03010

- | | |
|--|--------------------------------|
| (1) Timing belt cover No. 2 (RH) | (10) Intake cam sprocket (LH) |
| (2) Timing belt guide (MT model) | (11) Exhaust cam sprocket (LH) |
| (3) Crank sprocket | (12) Timing belt |
| (4) Timing belt cover No. 2 (LH) | (13) Belt idler No. 2 |
| (5) Tensioner bracket | (14) Belt idler |
| (6) Automatic belt tension adjuster ASSY | (15) Timing belt cover (LH) |
| (7) Belt idler | (16) Front belt cover |
| (8) Exhaust cam sprocket (RH) | (17) Timing belt cover (RH) |
| (9) Intake cam sprocket (RH) | (18) Crank pulley |
| | (19) O-ring |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 5 (0.5, 3.6)

T2: 9.75 (1.0, 7.2)

T3: 24.5 (2.5, 18.1)

T4: 39 (4.0, 28.9)

T5: <Ref. to ME(H4DOTC)-52, INSTALLATION, Cam Sprocket.>

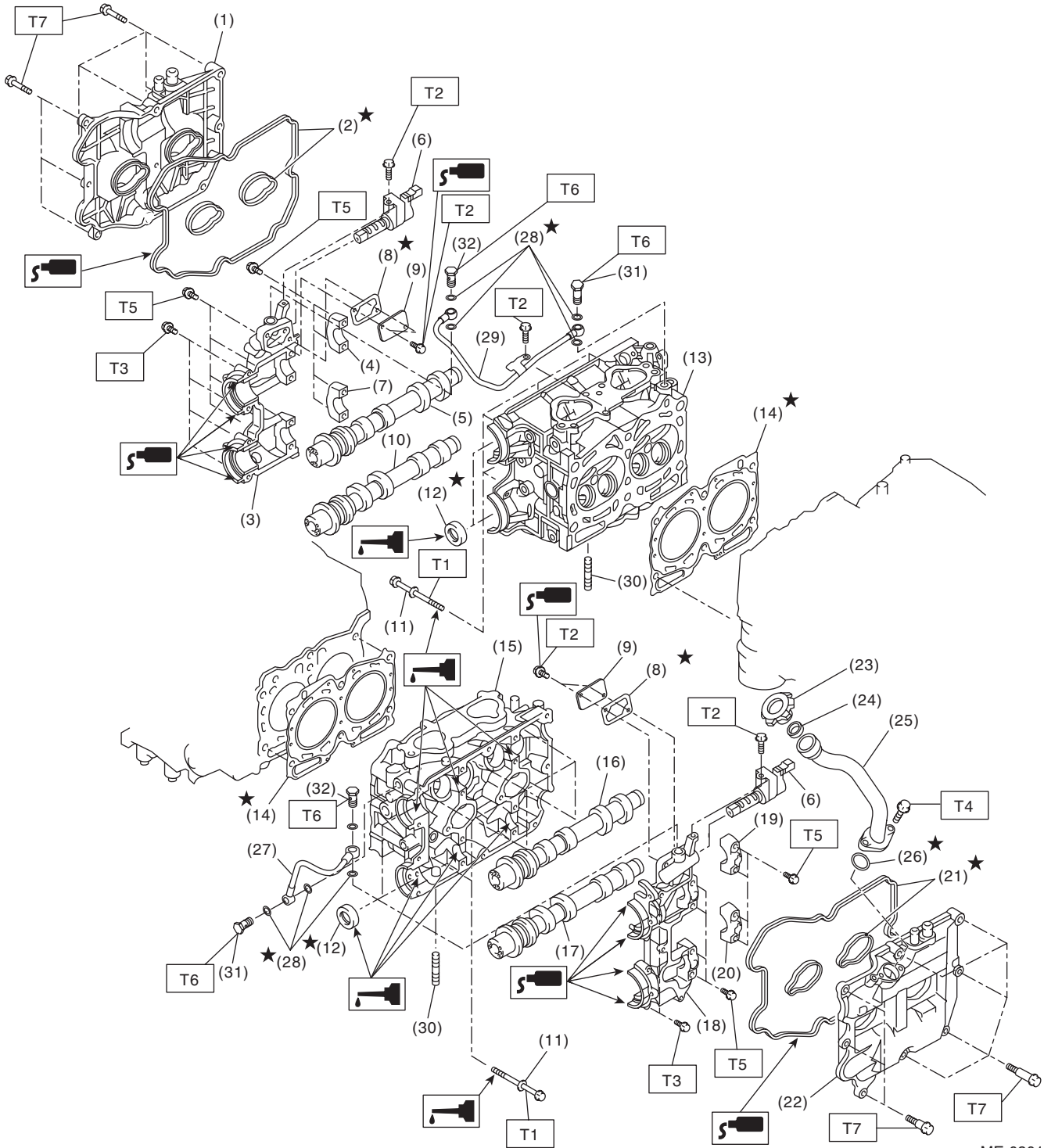
T6: <Ref. to ME(H4DOTC)-42, INSTALLATION, Crank Pulley.>

T7: 6.4 (0.65, 4.7)

T8: 3.4 (0.35, 2.5)

ME(H4DOTC)-6

2. CYLINDER HEAD AND CAMSHAFT



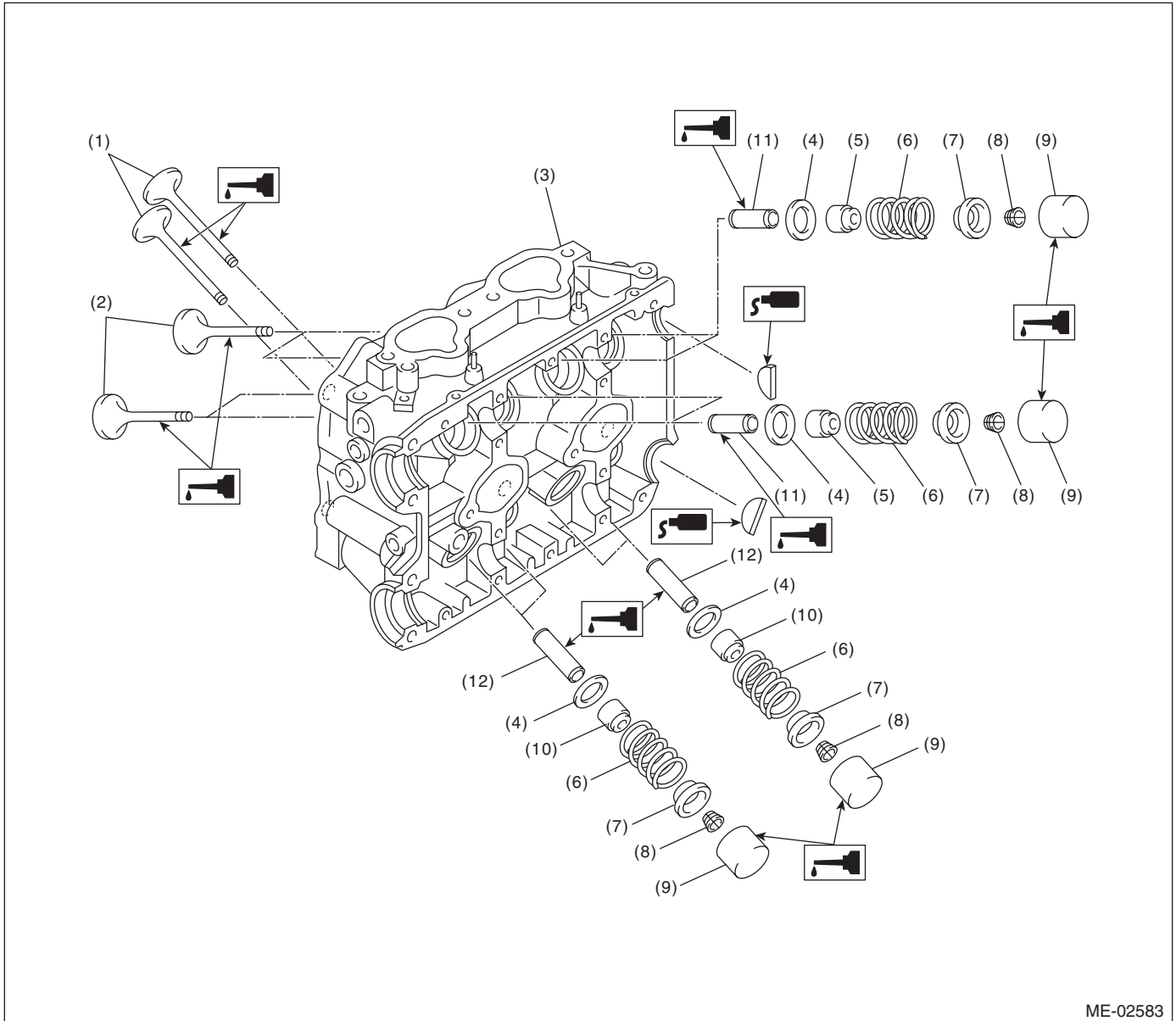
ME-03011

General Description

MECHANICAL

(1) Rocker cover (RH)	(17) Exhaust camshaft (LH)	(32) Union screw without filter (Without protrusion)
(2) Rocker cover gasket (RH)	(18) Camshaft cap (Front LH)	
(3) Camshaft cap (Front RH)	(19) Intake camshaft cap (Rear LH)	
(4) Intake camshaft cap (Rear RH)	(20) Exhaust camshaft cap (Rear LH)	<hr/>
(5) Intake camshaft (RH)	(21) Rocker cover gasket (LH)	Tightening torque:N·m (kgf-m, ft-lb)
(6) Oil flow control solenoid valve	(22) Rocker cover (LH)	T1: <Ref. to ME(H4DOTC)-60, INSTALLATION, Cylinder Head.>
(7) Exhaust camshaft cap (Rear RH)	(23) Oil filler cap	
(8) Gasket	(24) Gasket	T2: 8 (0.8, 5.9)
(9) Oil return cover	(25) Oil filler duct	T3: 9.75 (1.0, 7.2)
(10) Exhaust camshaft (RH)	(26) O-ring	T4: 6.4 (0.65, 4.7)
(11) Cylinder head bolt	(27) Oil pipe (LH)	T5: 20 (2.0, 14.5)
(12) Oil seal	(28) Gasket	T6: 29 (3.0, 21.4)
(13) Cylinder head (RH)	(29) Oil pipe (RH)	T7: <Ref. to ME(H4DOTC)-55, INSTALLATION, Camshaft.>
(14) Cylinder head gasket	(30) Stud bolt	<hr/>
(15) Cylinder head (LH)	(31) Union screw with filter (With protrusion)	
(16) Intake camshaft (LH)		

3. CYLINDER HEAD AND VALVE ASSEMBLY



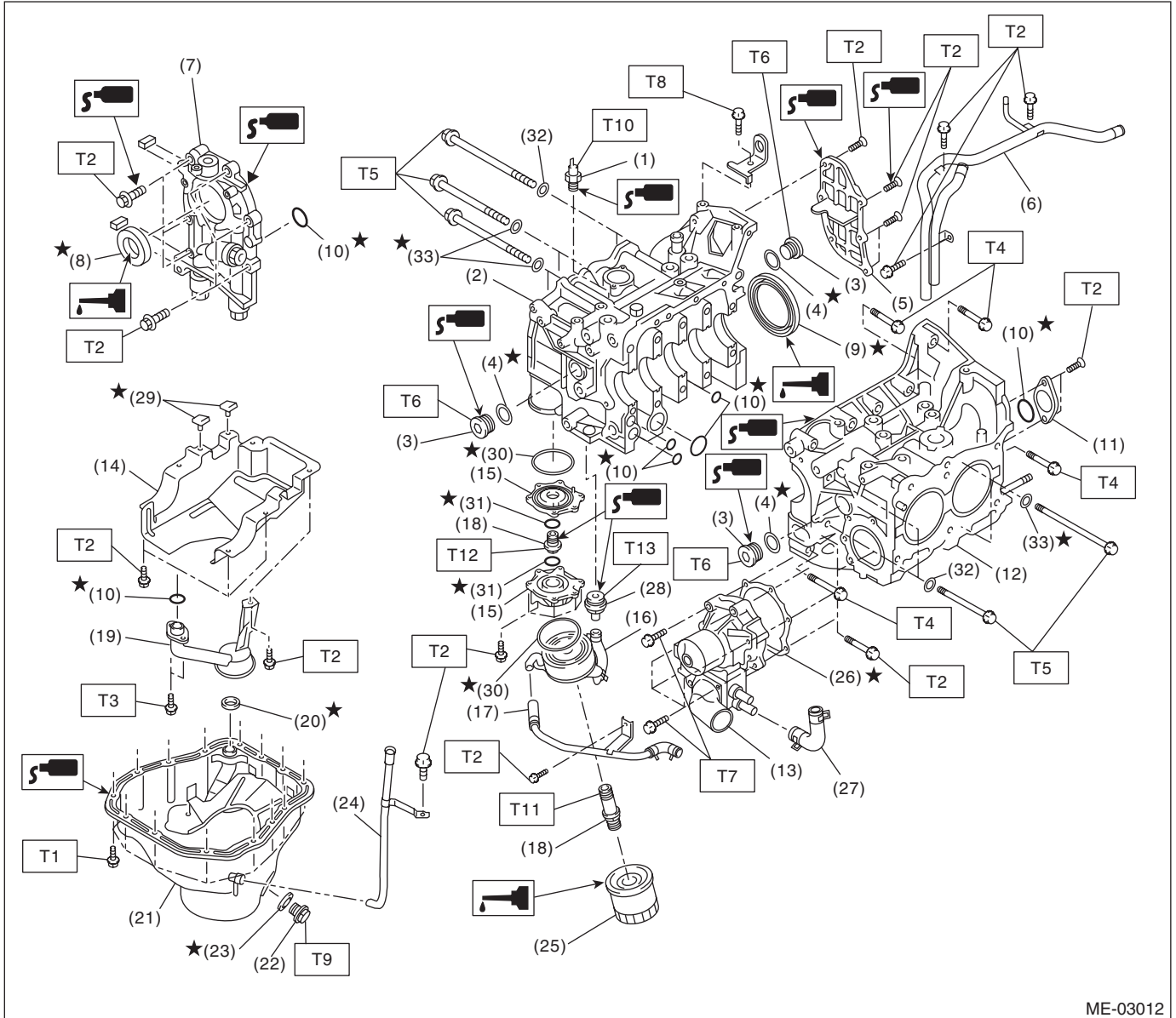
ME-02583

- | | | |
|-----------------------|---------------------------|-----------------------------|
| (1) Exhaust valve | (5) Intake valve oil seal | (9) Valve lifter |
| (2) Intake valve | (6) Valve spring | (10) Exhaust valve oil seal |
| (3) Cylinder head | (7) Retainer | (11) Intake valve guide |
| (4) Valve spring seat | (8) Retainer key | (12) Exhaust valve guide |

General Description

MECHANICAL

4. CYLINDER BLOCK



ME-03012

General Description

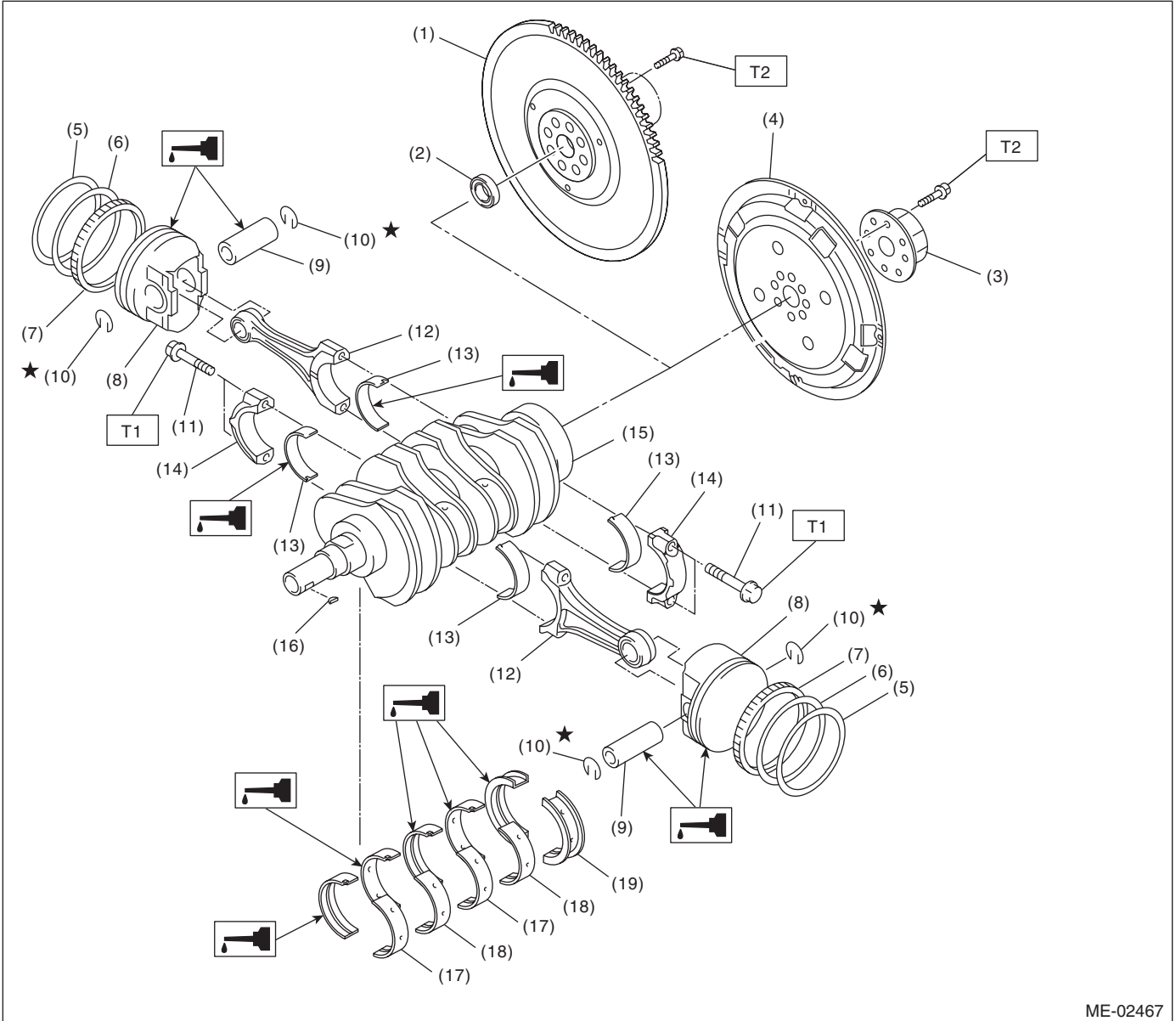
MECHANICAL

(1) Oil pressure switch	(18) Connector	Tightening torque:N·m (kgf-m, ft-lb)
(2) Cylinder block (RH)	(19) Oil strainer	T1: 5 (0.5, 3.6)
(3) Service hole plug	(20) Gasket	T2: 6.4 (0.65, 4.7)
(4) Gasket	(21) Oil pan	T3: 10 (1.0, 7.2)
(5) Oil separator cover	(22) Drain plug	T4: 25 (2.5, 18.1)
(6) Water by-pass pipe	(23) Metal gasket	T5: <Ref. to ME(H4DOTC)-71, INSTALLATION, Cylinder Block.>
(7) Oil pump	(24) Oil level gauge guide	
(8) Front oil seal	(25) Oil filter	T6: 70 (7.1, 50.6)
(9) Rear oil seal	(26) Gasket	T7: First 12 (1.2, 8.7) Second 12 (1.2, 8.7)
(10) O-ring	(27) Water pump hose	
(11) Service hole cover	(28) Plug	T8: 16 (1.6, 11.6)
(12) Cylinder block (LH)	(29) Seal	T9: 44 (4.5, 33)
(13) Water pump	(30) Gasket	T10: 25 (2.5, 18.1)
(14) Baffle plate	(31) O-ring	T11: 54 (5.3, 39)
(15) Adapter	(32) Washer	T12: 45 (4.6, 33)
(16) Oil cooler	(33) Seal washer	T13: 69 (7.0, 50.9)
(17) Water by-pass pipe		

General Description

MECHANICAL

5. CRANKSHAFT AND PISTON



ME-02467

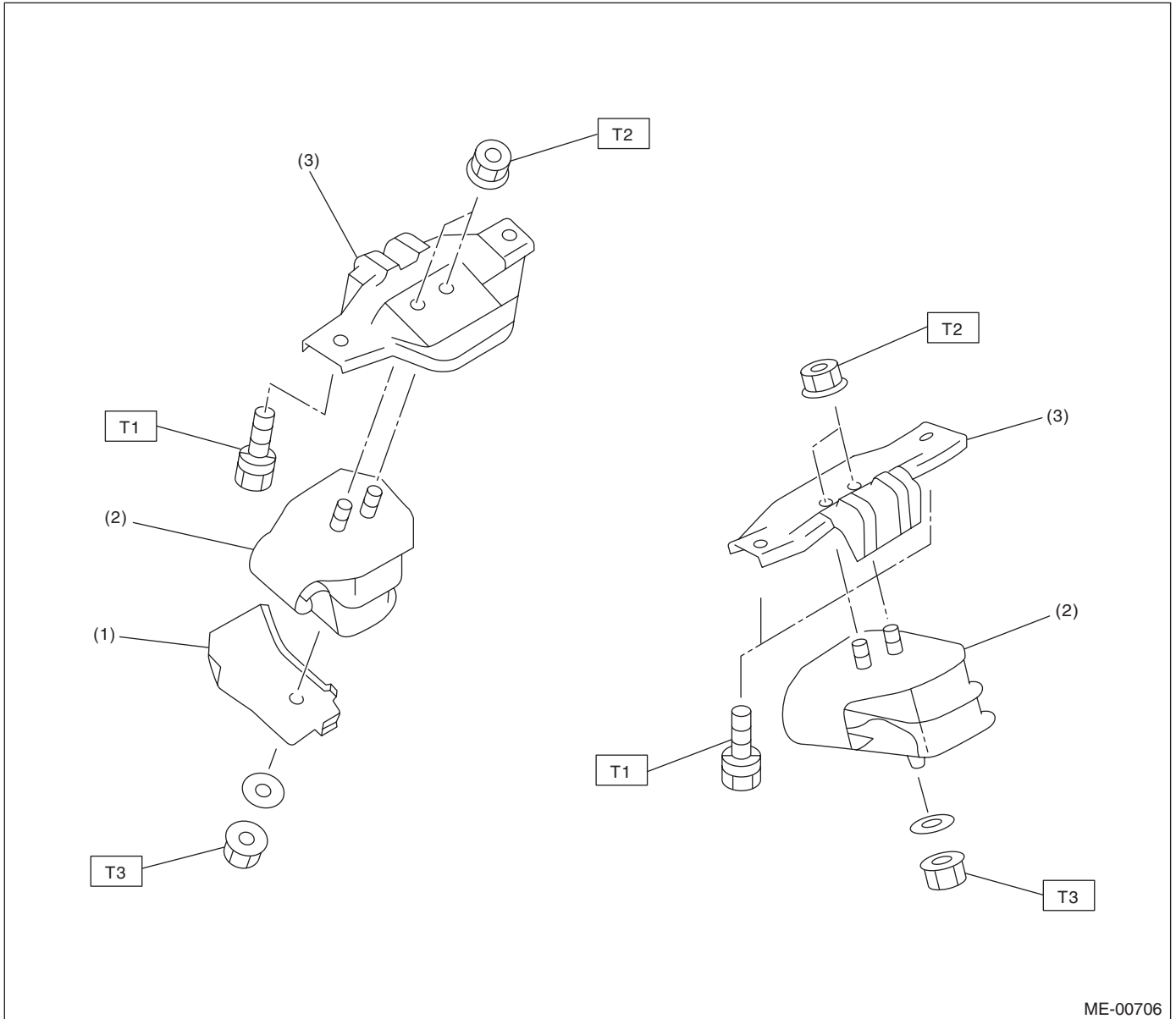
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|------------------------------|-----------------------------|--------------------------------|
| (1) Flywheel (MT model) | (9) Piston pin | (17) Crankshaft bearing #1, #3 |
| (2) Ball bearing (MT model) | (10) Snap ring | (18) Crankshaft bearing #2, #4 |
| (3) Reinforcement (AT model) | (11) Connecting rod bolt | (19) Crankshaft bearing #5 |
| (4) Drive plate (AT model) | (12) Connecting rod | |
| (5) Top ring | (13) Connecting rod bearing | |
| (6) Second ring | (14) Connecting rod cap | |
| (7) Oil ring | (15) Crankshaft | |
| (8) Piston | (16) Woodruff key | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 52 (5.3, 38.4)

T2: 72 (7.3, 52.8)

6. ENGINE MOUNTING



ME-00706

- (1) Heat shield cover
- (2) Front cushion rubber

- (3) Front engine mounting bracket

Tightening torque: N·m (kgf·m, ft·lb)

T1: 35 (3.6, 25.8)

T2: 42 (4.3, 30.9)

T3: 85 (8.7, 62.7)

General Description

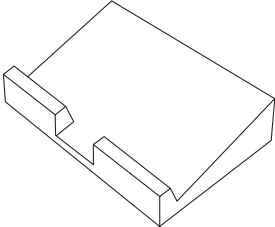
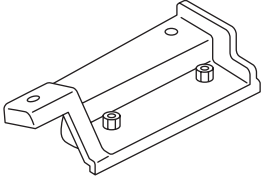
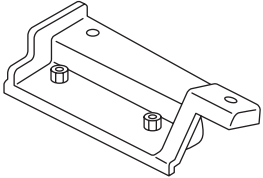
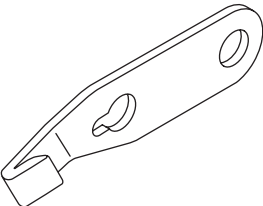
MECHANICAL

C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting electrical connectors of sensors or units, be sure to disconnect the ground cable from battery.
- All parts should be thoroughly cleaned, paying special attention to engine oil passages, pistons and bearings.
- Rotating parts and sliding parts such as piston, bearing and gear should be coated with oil prior to assembly.
- Be careful not to let oil, grease or coolant contact the timing belt, clutch disc and flywheel.
- All removed parts, if to be reused, should be reinstalled in the original positions and directions.
- Bolts, nuts and washers should be replaced with new parts as required.
- Even if necessary inspections have been made in advance, proceed with assembly work while making rechecks.
- Remove or install the engine in an area where chain hoists, lifting devices, etc. are available for ready use.
- Be sure not to damage coated surfaces of body panels with tools or stain seats and windows with coolant or oil. Place a cover over fender, as required, for protection.
- Prior to starting work, prepare the following:
Service tools, clean cloth, containers to catch coolant and oil, wire ropes, chain hoist, transmission jacks, etc.
- Lift-up or lower the vehicle when necessary. Make sure to support the correct positions.

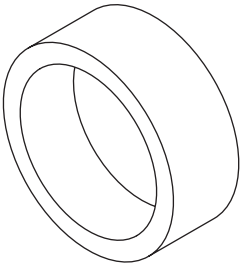
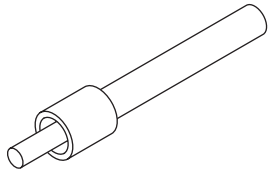
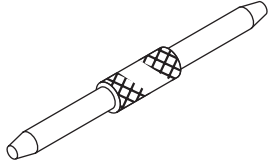
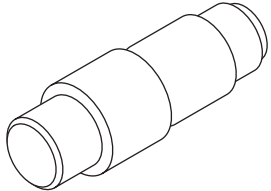
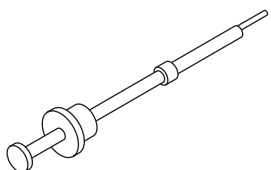
D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-498267600</p>	498267600	CYLINDER HEAD TABLE	<ul style="list-style-type: none"> • Used for replacing valve guides. • Used for removing and installing valve spring.
 <p style="text-align: center;">ST-498457000</p>	498457000	ENGINE STAND ADAPTER RH	Used together with ENGINE STAND (499817100).
 <p style="text-align: center;">ST-498457100</p>	498457100	ENGINE STAND ADAPTER LH	Used together with ENGINE STAND (499817100).
 <p style="text-align: center;">ST-498497100</p>	498497100	CRANKSHAFT STOPPER	Used for removing and installing the flywheel and the drive plate.

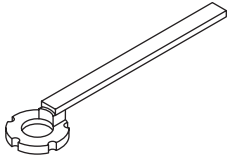
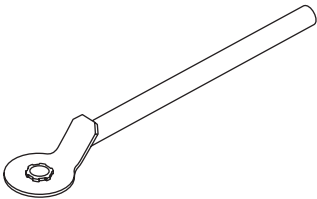
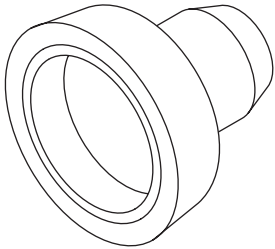
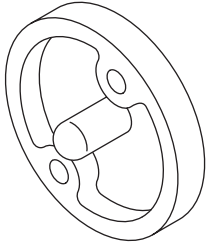
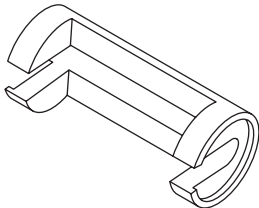
General Description

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-498747300</p>	498747300	PISTON GUIDE	Used for installing piston in cylinder. (2.5 L model)
 <p style="text-align: center;">ST-498857100</p>	498857100	VALVE OIL SEAL GUIDE	Used for press-fitting of intake and exhaust valve guide oil seals.
 <p style="text-align: center;">ST-499017100</p>	499017100	PISTON PIN GUIDE	Used for installing piston pin, piston and connecting rod.
 <p style="text-align: center;">ST-499037100</p>	499037100	CONNECTING ROD BUSHING REMOVER AND INSTALLER	Used for removing and installing connecting rod bushing.
 <p style="text-align: center;">ST-499097700</p>	499097700	PISTON PIN REMOVER ASSY	Used for removing piston pin.

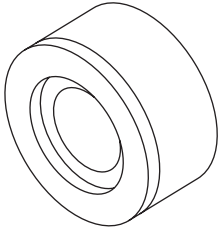
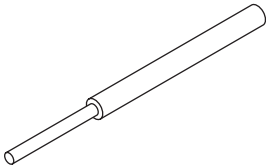
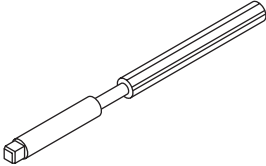
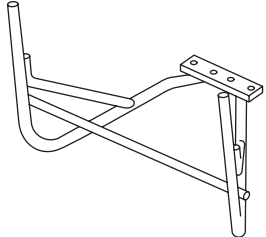
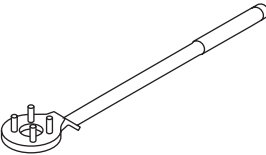
General Description

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST-499207400</p>	499207400	CAM SPROCKET WRENCH	Used for removing and installing cam sprocket. (Exhaust side)
 <p>ST-499977500</p>	499977500	CAM SPROCKET WRENCH	Used for removing and installing cam sprocket. (Intake side)
 <p>ST-499587200</p>	499587200	CRANKSHAFT OIL SEAL INSTALLER	<ul style="list-style-type: none"> • Used for installing crankshaft oil seal. • Used together with CRANKSHAFT OIL SEAL GUIDE (499597100).
 <p>ST-499597100</p>	499597100	CRANKSHAFT OIL SEAL GUIDE	<ul style="list-style-type: none"> • Used for installing crankshaft oil seal. • Used together with CRANKSHAFT OIL SEAL INSTALLER (499587200).
 <p>ST-499718000</p>	499718000	VALVE SPRING REMOVER	Used for removing and installing valve spring.

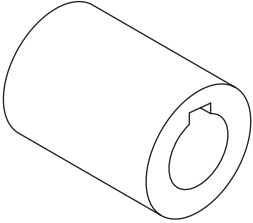
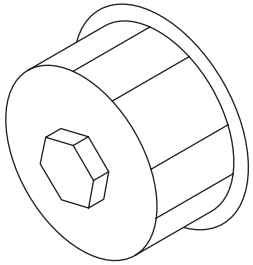
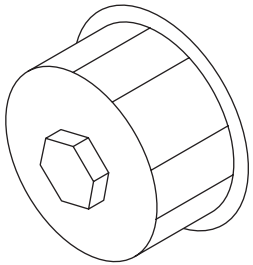
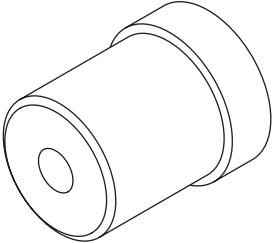
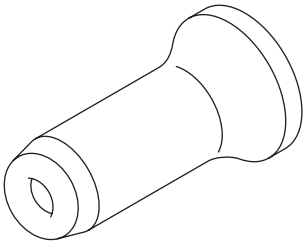
General Description

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST18251AA020</p>	18251AA020	VALVE GUIDE ADJUSTER	Used for installing intake and exhaust valve guides.
 <p style="text-align: center;">ST-499767200</p>	499767200	VALVE GUIDE REMOVER	Used for removing valve guides.
 <p style="text-align: center;">ST-499767400</p>	499767400	VALVE GUIDE REAMER	Used for reaming valve guides.
 <p style="text-align: center;">ST-499817100</p>	499817100	ENGINE STAND	<ul style="list-style-type: none"> • Stand used for engine disassembly and assembly. • Used together with ENGINE STAND ADAPTER RH (498457000) & LH (498457100).
 <p style="text-align: center;">ST-499977100</p>	499977100	CRANK PULLEY WRENCH	Used for stopping rotation of crank pulley when loosening/tightening crank pulley bolt.

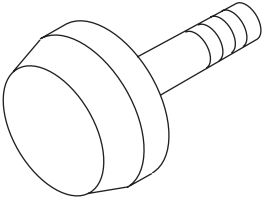
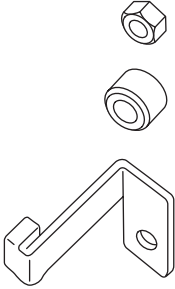
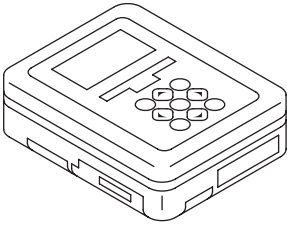
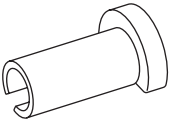
General Description

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST-499987500</p>	499987500	CRANKSHAFT SOCKET	Used for rotating crankshaft.
 <p>ST18332AA000</p>	18332AA000	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 68 mm (2.68 in))
 <p>ST18332AA010</p>	18332AA010	OIL FILTER WRENCH	Used for removing and installing oil filter. (Outer diameter: 65 mm (2.56 in))
 <p>ST-499587100</p>	499587100	OIL SEAL INSTALLER	Used for installing oil pump oil seal.
 <p>ST-499587600</p>	499587600	OIL SEAL INSTALLER	Used for installing camshaft oil seal for DOHC engine.

General Description

MECHANICAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-499597200</p>	499597200	OIL SEAL GUIDE	<ul style="list-style-type: none"> Used for installing camshaft oil seal for DOHC engine. Used together with OIL SEAL INSTALLER (499587600).
 <p style="text-align: center;">ST-498277200</p>	498277200	STOPPER SET	Used for installing automatic transmission assembly to engine.
 <p style="text-align: center;">ST1B020XU0</p>	1B020XU0	SUBARU SELECT MONITOR KIT	Used for troubleshooting the electrical system.
 <p style="text-align: center;">ST42099AE000</p>	42099AE000	CONNECTOR REMOVER	Used for removing the quick connector in engine compartment.

2. GENERAL TOOL

TOOL NAME	REMARKS
Compression gauge	Used for measuring compression.
Vacuum gauge	Used for measuring negative pressure.
Oil pressure gauge	Used for measuring oil pressure.
Fuel pressure gauge	Used for measuring fuel pressure.
Timing light	Used for measuring ignition timing.

E: PROCEDURE

It is possible to conduct the following service procedures with engine on the vehicle, however, the procedures described in this section are based on the condition that the engine is removed from the vehicle.

- V-belt
- Timing belt
- Camshaft
- Cylinder head

2. Compression

A: INSPECTION

CAUTION:

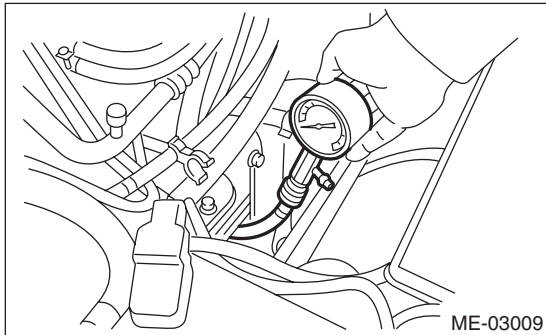
After warming-up, engine becomes very hot. Be careful not to burn yourself at measurement.

- 1) After warming-up the engine, turn the ignition switch to OFF.
- 2) Make sure that the battery is fully charged.
- 3) Release the fuel pressure. <Ref. to FU(H4DOTC)-49, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 4) Remove all the spark plugs. <Ref. to IG(H4DOTC)-4, REMOVAL, Spark Plug.>
- 5) Fully open the throttle valve.
- 6) Check the starter motor for satisfactory performance and operation.
- 7) Hold the compression gauge tightly against the spark plug hole.

NOTE:

The screw of a screw-in type compression gauge should be less than 18 mm (0.71 in) in length.

- 8) Crank the engine by means of the starter motor, and read the maximum value on the gauge when the pointer is steady.



- 9) Perform at least two measurements per cylinder, and make sure that the values are correct.

Compression (350 rpm and fully open throttle):

Standard:

981 — 1,177 kPa (10 — 12 kgf/cm², 142 — 171 psi)

Service limit:

882 kPa (9.0 kgf/cm², 128 psi)

Difference between cylinders:

49 kPa (0.5 kgf/cm², 7 psi), or less

3. Idle Speed

A: INSPECTION

1) Before checking the idle speed, check the following item:

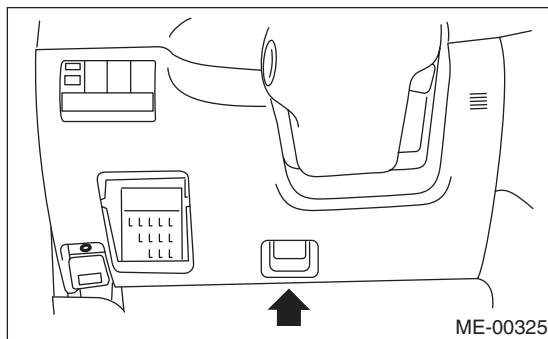
(1) Check the air cleaner element is free from clogging, ignition timing is correct, spark plugs are in good condition, and hoses are connected properly.

(2) Check the malfunction indicator light does not illuminate.

2) Warm up the engine.

3) Stop the engine, and turn the ignition switch to OFF.

4) Connect the Subaru Select Monitor to the data link connector.



5) Turn the ignition switch to ON and run the Subaru Select Monitor.

6) Select {Each System Check} in Main Menu.

7) Select {Engine Control System} in Selection Menu.

8) Select {Current Data Display & Save} in Engine Control System Diagnosis.

9) Select {Data Display} in Data Display Menu.

10) Start the engine, and read the engine idle speed.

11) Check the idle speed when no-loaded. (Headlight, heater fan, rear defroster, radiator fan, A/C, etc. are OFF.)

Idle speed [No load and gears in neutral]:

700±100 rpm

12) Check the idle speed when loaded. (Turn the air conditioning switch to "ON" and operate the compressor for at least one minute before measurement.)

Idle speed [A/C "ON" and gears in neutral]:

When A/C refrigerant pressure is low.

MT: 725±100 rpm

AT: 750±100 rpm

When A/C refrigerant pressure is low.

MT: 800±100 rpm

AT: 825±100 rpm

NOTE:

Idle speed cannot be adjusted manually, because the idle speed is automatically adjusted. If the prescribed idle speed cannot be maintained, refer to the General On-board Diagnosis Table under "Engine Control System". <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>

4. Ignition Timing

A: INSPECTION

CAUTION:

After warming-up, engine becomes very hot. Be careful not to burn yourself at measurement.

1. METHOD WITH SUBARU SELECT MONITOR

1) Before checking the ignition timing, check the following item:

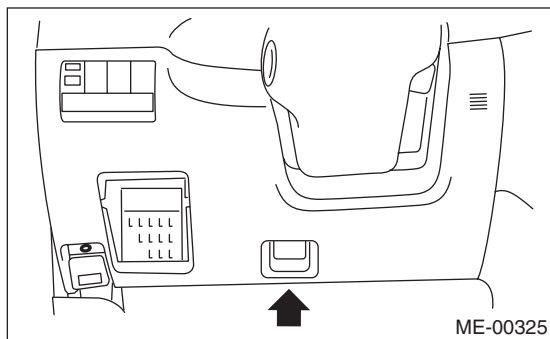
(1) Check the air cleaner element is free from clogging, spark plugs are in good condition, and hoses are connected properly.

(2) Check the malfunction indicator light does not illuminate.

2) Warm up the engine.

3) Stop the engine, and turn the ignition switch to OFF.

4) Connect the Subaru Select Monitor to the data link connector.



5) Turn the ignition switch to ON and run the Subaru Select Monitor.

6) Select {Each System Check} in Main Menu.

7) Select {Engine Control System} in Selection Menu.

8) Select {Current Data Display & Save} in Engine Control System Diagnosis.

9) Select {Data Display} in Data Display Menu.

10) Start the engine and check the ignition timing at idle speed.

Ignition timing [BTDC/rpm]:

$17^{\circ} \pm 10^{\circ} / 700$

If the timing is not correct, check the ignition control system. Refer to "Engine Control System". <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>

2. METHOD WITH TIMING LIGHT

1) Before checking the ignition timing, check the following item:

(1) Check the air cleaner element is free from clogging, spark plugs are in good condition, and hoses are connected properly.

(2) Make sure that the malfunction indicator light does not illuminate.

2) Warm-up the engine.

3) Stop the engine, and turn the ignition switch to OFF.

4) Remove the air intake duct.

5) Disconnect the connector from the mass air flow and intake air temperature sensor.

6) Remove the air cleaner cover and element.

7) Connect the timing light to the power wire of #1 ignition coil.

8) Connect the connectors of air cleaner cover, element, and the mass air flow and intake air temperature sensor.

9) Start the engine, turn the timing light to the crank pulley, and check the ignition timing by means of crank pulley indicator.

Ignition timing [BTDC/rpm]:

$17^{\circ} \pm 10^{\circ} / 700$

If the timing is not correct, check the ignition control system. Refer to "Engine Control System". <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>

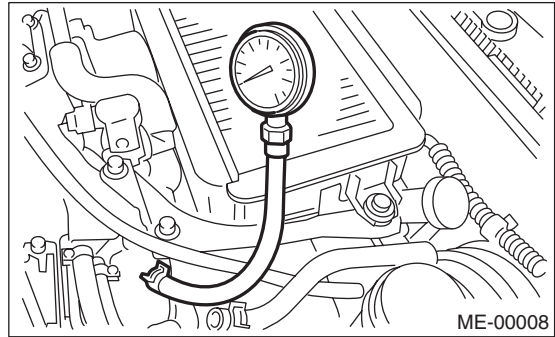
5. Intake Manifold Vacuum

A: INSPECTION

- 1) Remove the collector cover.
- 2) Warm up the engine.
- 3) Disconnect the brake vacuum hose from the brake vacuum hose, and then install the vacuum gauge.

4) Keep the engine at idle speed and read the vacuum gauge indication.

By observing the gauge needle movement, internal condition of the engine can be diagnosed as described below.



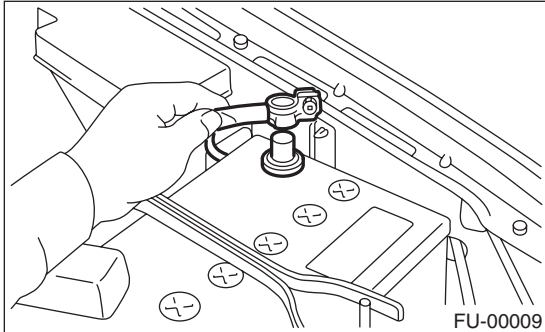
Vacuum pressure (at idling, A/C "OFF"):
-60.0 kPa (-450 mmHg, -17.72 inHg) or less

Diagnosis of engine condition by measurement of manifold vacuum	
Vacuum gauge indication	Possible engine condition
1. Needle is steady but lower than normal position. This tendency becomes more evident as engine temperature rises.	Leakage around intake manifold gasket, or disconnected or damaged vacuum hose
2. Needle intermittently drops to position lower than normal position.	Leakage around cylinder
3. Needle drops suddenly and intermittently from normal position.	Sticky valve
4. When engine speed is gradually increased, needle begins to vibrate rapidly at certain speed, and then vibration increases as engine speed increases.	Weak or broken valve springs
5. Needle vibrates above and below normal position in narrow range.	Defective ignition system or throttle chamber idle adjustment

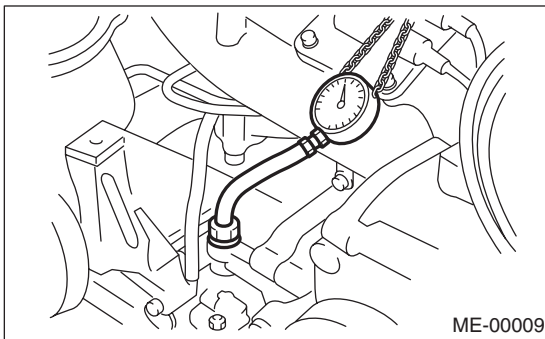
6. Engine Oil Pressure

A: INSPECTION

- 1) Remove the collector cover.
- 2) Remove the oil pressure switch. <Ref. to LU (H4SO)-21, REMOVAL, Oil Pressure Switch.>
- 3) Connect the oil pressure gauge hose to cylinder block.
- 4) Connect the ground cable to the battery.



- 5) Start the engine, and measure the oil pressure.



Oil pressure:

98 kPa (1.0 kgf/cm², 14 psi) or more at 600 rpm

294 kPa (3.0 kgf/cm², 43 psi) or more at 5,000 rpm

CAUTION:

- If the oil pressure is out of standard values, check the oil pump, oil filter and lubrication line. <Ref. to LU (H4SO)-25, INSPECTION, Engine Lubrication System Trouble in General.>
- If the oil pressure warning light is turned on and oil pressure is in the specified range, check the oil pressure switch. <Ref. to LU (H4SO)-25, INSPECTION, Engine Lubrication System Trouble in General.>

NOTE:

The specified data is based on an engine oil temperature of 80°C (176°F).

- 6) After measuring the oil pressure, install the oil pressure switch. <Ref. to LU (H4SO)-21, INSTALLATION, Oil Pressure Switch.>

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)

7. Fuel Pressure

A: INSPECTION

CAUTION:

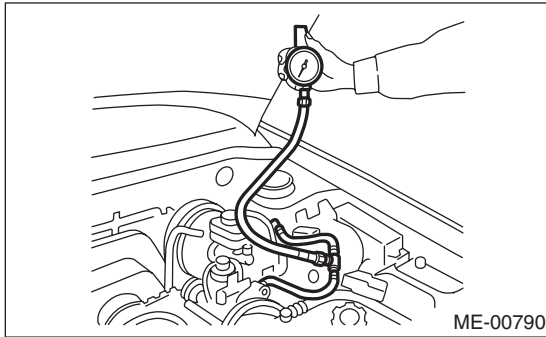
Before removing the fuel pressure gauge, release the fuel pressure.

NOTE:

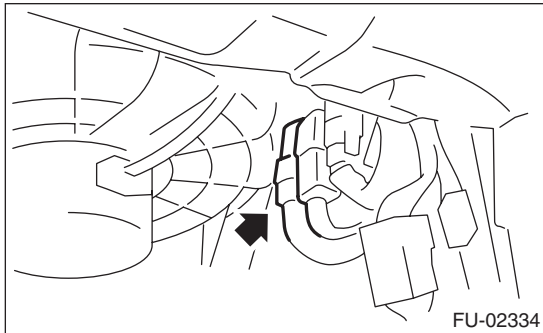
If out of specification, check or replace the pressure regulator and pressure regulator vacuum hose.

1) Release the fuel pressure. <Ref. to FU(H4DOTC)-49, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

2) Disconnect the fuel delivery hose from fuel damper, and connect fuel pressure gauge.



3) Connect the connector of fuel pump relay.



4) Start the engine.

5) After warming up, disconnect the pressure regulator vacuum hose from the intake manifold, and measure the fuel pressure.

Fuel pressure:

Standard:

284 — 314 kPa (2.9 — 3.2 kgf/cm², 41 — 46 psi)

6) Connect the pressure regulator vacuum hose and measure the fuel pressure.

Fuel pressure:

Standard:

230 — 260 kPa (2.35 — 2.65 kgf/cm², 33 — 38 psi)

NOTE:

The fuel pressure gauge registers 10 to 20 kPa (0.1 to 0.2 kgf/cm², 1 to 3 psi) higher than standard values during high-altitude operations.

Valve Clearance

MECHANICAL

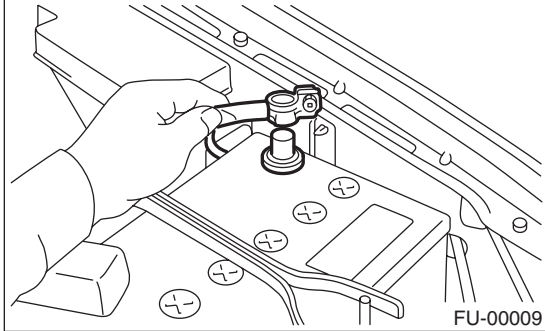
8. Valve Clearance

A: INSPECTION

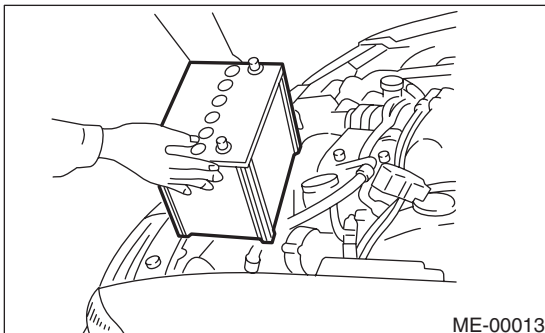
NOTE:

Inspection and adjustment of valve clearance should be performed while engine is cold.

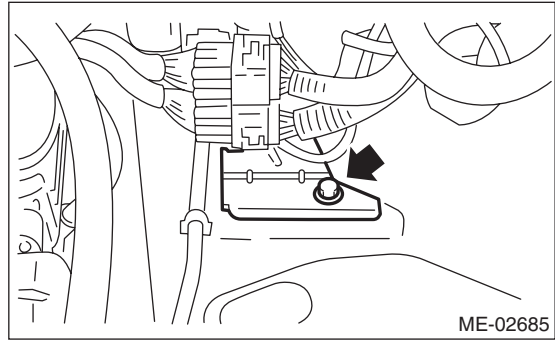
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.



- 3) Remove the collector cover.
- 4) Remove the air intake duct. <Ref. to IN(H4DOTC)-9, REMOVAL, Air Intake Duct.>
- 5) Remove a bolt which secures timing belt cover (RH).
- 6) Lift-up the vehicle.
- 7) Remove the under cover.
- 8) Loosen the remaining bolts which secure timing belt cover (RH), then remove the timing belt cover.
- 9) Lower the vehicle.
- 10) When inspecting #1 and #3 cylinders:
 - (1) Remove the air cleaner case. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
 - (2) Disconnect the connector of ignition coil.
 - (3) Remove the ignition coil.
 - (4) Place a suitable container under the vehicle.
 - (5) Disconnect the PCV hose from rocker cover (RH).
 - (6) Remove the bolts, then remove the rocker cover (RH).
- 11) When inspecting #2 and #4 cylinders:
 - (1) Disconnect the battery cable, and then remove the battery and battery carrier.



- (2) Remove the bolt which holds the engine harness bracket on the body.

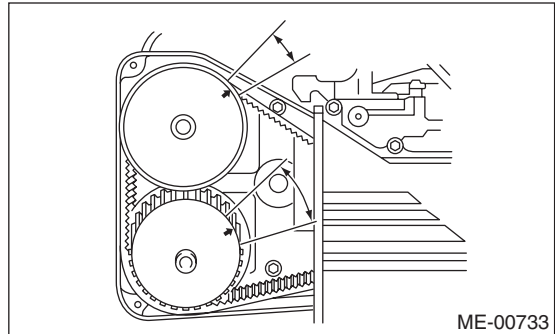


- (3) Remove the secondary air pump. <Ref. to EC (H4DOTC)-9, REMOVAL, Secondary Air Pump.>
- (4) Disconnect the connector of ignition coil.
- (5) Remove the ignition coil.
- (6) Place a suitable container under the vehicle.
- (7) Disconnect the PCV hose from rocker cover (LH).
- (8) Remove the bolts, then remove the rocker cover (LH).

- 12) Turn the crank pulley clockwise until arrow mark on the camshaft sprocket is set to position shown in the figure.

NOTE:

Turn the crankshaft using socket wrench.



- 13) Measure the #1 cylinder intake valve and #3 cylinder exhaust valve clearance by using thickness gauge (A).

NOTE:

- Insert a thickness gauge in a direction as horizontal as possible with respect to the valve lifter.
- Lift-up the vehicle and measure the exhaust valve clearance.

Valve clearance:

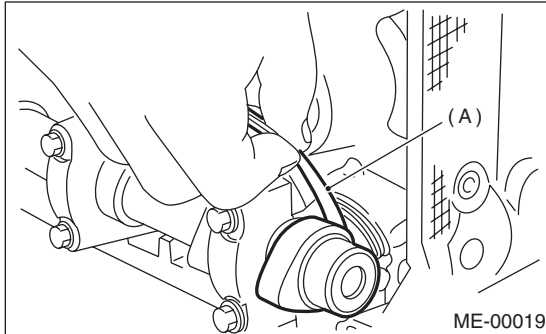
Intake

$0.20 \pm 0.02 \text{ mm (0.0079} \pm 0.0008 \text{ in)}$

Exhaust

$0.35 \pm 0.02 \text{ mm (0.0138} \pm 0.0008 \text{ in)}$

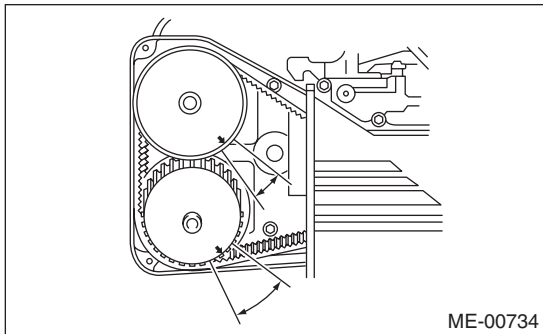
- If the measured value is not within specification, take notes of the value in order to adjust the valve clearance later on.



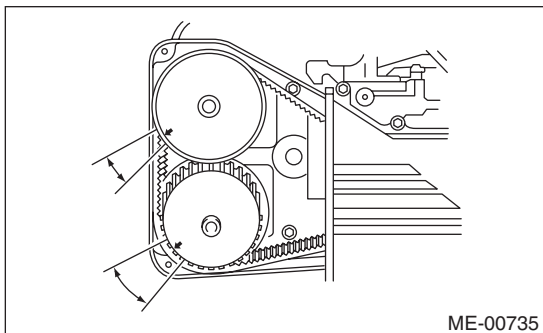
14) If necessary, adjust the valve clearance. <Ref. to ME(H4DOTC)-30, ADJUSTMENT, Valve Clearance.>

15) Further turn the crank pulley clockwise. Using the same procedures described previously, then measure valve clearances again.

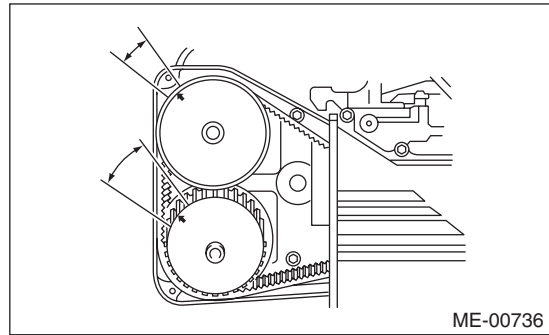
- (1) Set the arrow mark on cam sprocket to the position shown in the figure, and measure the #2 cylinder exhaust valve and #3 cylinder intake valve clearances.



- (2) Set the arrow mark on cam sprocket to the position shown in the figure, and measure the #2 cylinder intake valve and #4 cylinder exhaust valve clearances.



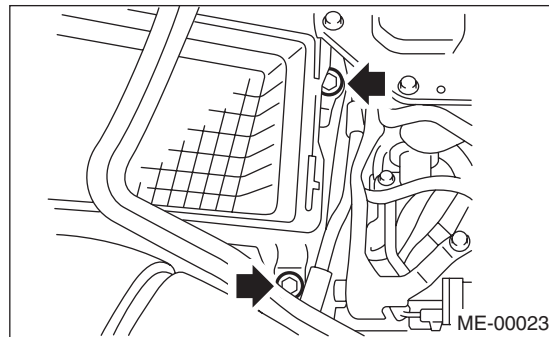
- (3) Set the arrow mark on cam sprocket to the position shown in the figure, and measure the #1 cylinder exhaust valve and #4 cylinder intake valve clearances.



16) After inspection, install the related parts in the reverse order of removal.

Tightening torque:

33 N·m (3.4 kgf·m, 25 ft·lb)



Valve Clearance

MECHANICAL

B: ADJUSTMENT

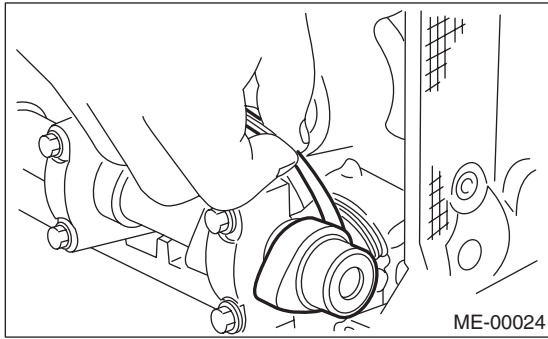
NOTE:

Adjustment of valve clearance should be performed while engine is cold.

1) Measure all the valve clearances. <Ref. to ME(H4DOTC)-28, INSPECTION, Valve Clearance.>

NOTE:

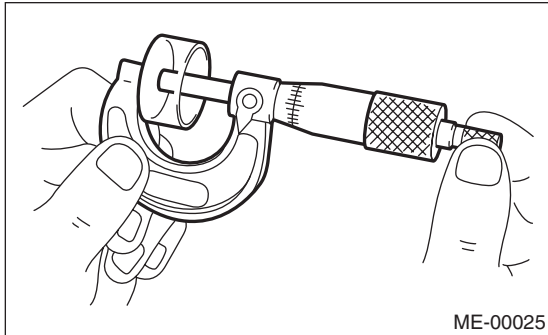
Record each valve clearance after measurement.



2) Remove the camshaft. <Ref. to ME(H4DOTC)-54, REMOVAL, Camshaft.>

3) Remove the valve lifter.

4) Measure the thickness of valve lifter using micrometer.



5) Select a valve lifter of suitable thickness from the following table using the measured valve clearance and valve lifter thickness.

Unit: (mm)
Intake valve: $S = (V + T) - 0.20$
Exhaust valve: $S = (V + T) - 0.35$
S: Required thickness of valve lifter
V: Measured valve clearance
T: Used valve lifter thickness

Part No.	Thickness mm (in)
13228 AB102	4.68 (0.1843)
13228 AB112	4.69 (0.1846)
13228 AB122	4.70 (0.1850)
13228 AB132	4.71 (0.1854)
13228 AB142	4.72 (0.1858)
13228 AB152	4.73 (0.1862)
13228 AB162	4.74 (0.1866)

Part No.	Thickness mm (in)
13228 AB172	4.75 (0.1870)
13228 AB182	4.76 (0.1874)
13228 AB192	4.77 (0.1878)
13228 AB202	4.78 (0.1882)
13228 AB212	4.79 (0.1886)
13228 AB222	4.80 (0.1890)
13228 AB232	4.81 (0.1894)
13228 AB242	4.82 (0.1898)
13228 AB252	4.83 (0.1902)
13228 AB262	4.84 (0.1906)
13228 AB272	4.85 (0.1909)
13228 AB282	4.86 (0.1913)
13228 AB292	4.87 (0.1917)
13228 AB302	4.88 (0.1921)
13228 AB312	4.89 (0.1925)
13228 AB322	4.90 (0.1929)
13228 AB332	4.91 (0.1933)
13228 AB342	4.92 (0.1937)
13228 AB352	4.93 (0.1941)
13228 AB362	4.94 (0.1945)
13228 AB372	4.95 (0.1949)
13228 AB382	4.96 (0.1953)
13228 AB392	4.97 (0.1957)
13228 AB402	4.98 (0.1961)
13228 AB412	4.99 (0.1965)
13228 AB422	5.00 (0.1969)
13228 AB432	5.01 (0.1972)
13228 AB442	5.02 (0.1976)
13228 AB452	5.03 (0.1980)
13228 AB462	5.04 (0.1984)
13228 AB472	5.05 (0.1988)
13228 AB482	5.06 (0.1992)
13228 AB492	5.07 (0.1996)
13228 AB502	5.08 (0.2000)
13228 AB512	5.09 (0.2004)
13228 AB522	5.10 (0.2008)
13228 AB532	5.11 (0.2012)
13228 AB542	5.12 (0.2016)
13228 AB552	5.13 (0.2020)
13228 AB562	5.14 (0.2024)
13228 AB572	5.15 (0.2028)
13228 AB582	5.16 (0.2031)
13228 AB592	5.17 (0.2035)
13228 AB602	5.18 (0.2039)
13228 AB612	5.19 (0.2043)
13228 AB622	5.20 (0.2047)
13228 AB632	5.21 (0.2051)
13228 AB642	5.22 (0.2055)
13228 AB652	5.23 (0.2059)
13228 AB662	5.24 (0.2063)

Valve Clearance

MECHANICAL

Part No.	Thickness mm (in)
13228 AB672	5.25 (0.2067)
13228 AB682	5.26 (0.2071)
13228 AB692	5.27 (0.2075)
13228 AB702	4.38 (0.1724)
13228 AB712	4.40 (0.1732)
13228 AB722	4.42 (0.1740)
13228 AB732	4.44 (0.1748)
13228 AB742	4.46 (0.1756)
13228 AB752	4.48 (0.1764)
13228 AB762	4.50 (0.1771)
13228 AB772	4.52 (0.1780)
13228 AB782	4.54 (0.1787)
13228 AB792	4.56 (0.1795)
13228 AB802	4.58 (0.1803)
13228 AB812	4.60 (0.1811)
13228 AB822	4.62 (0.1819)
13228 AB832	4.64 (0.1827)
13228 AB842	4.66 (0.1835)
13228 AB852	5.29 (0.2083)
13228 AB862	5.31 (0.2091)
13228 AB872	5.33 (0.2098)
13228 AB882	5.35 (0.2106)
13228 AB892	5.37 (0.2114)
13228 AB902	5.39 (0.2122)
13228 AB912	5.41 (0.2123)
13228 AB922	5.43 (0.2138)
13228 AB932	5.45 (0.2146)
13228 AB942	5.47 (0.2154)
13228 AB952	5.49 (0.2161)
13228 AB962	5.51 (0.2169)
13228 AB972	5.53 (0.2177)
13228 AB982	5.55 (0.2185)
13228 AB992	5.57 (0.2193)
13228 AC002	5.59 (0.2201)
13228 AC012	5.61 (0.2209)
13228 AC022	5.63 (0.2217)
13228 AC032	5.65 (0.2224)

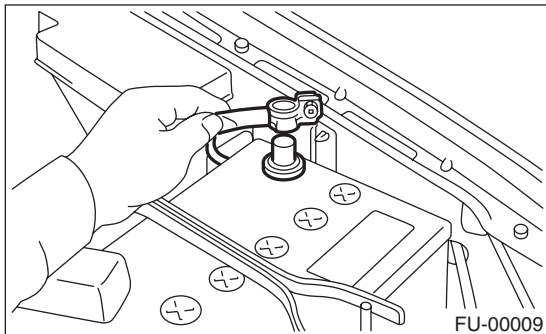
6) Inspect all valves for clearance again at this stage. If the valve clearance is not correct, repeat the procedure over again from the first step.

7) After inspection, install the related parts in the reverse order of removal.

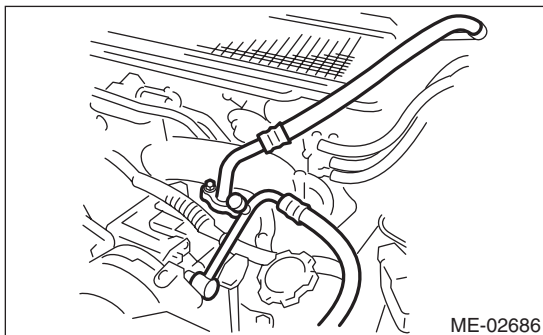
9. Engine Assembly

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Open the front hood fully and support with the front food stay.
- 3) Remove the collector cover.
- 4) Collect the refrigerant from A/C system. <Ref. to AC-19, Refrigerant Recovery Procedure.>
- 5) Release the fuel pressure. <Ref. to FU(H4SO)-44, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>
- 6) Disconnect the ground cable from the battery.

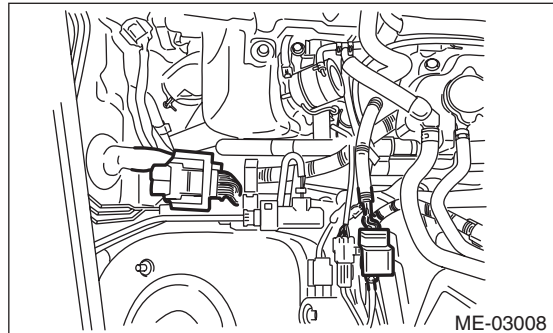


- 7) Open the fuel filler flap lid, and remove the filler cap.
- 8) Remove the air cleaner case and air intake boot. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
- 9) Remove the under cover.
- 10) Remove the radiator from the vehicle. <Ref. to CO(H4SO)-27, REMOVAL, Radiator.>
- 11) Remove the coolant filler tank. <Ref. to CO(H4SO)-43, REMOVAL, Coolant Filler Tank.>
- 12) Remove the secondary air pump. <Ref. to EC (H4DOTC)-9, INSPECTION, Secondary Air Pump.>
- 13) Disconnect the A/C pressure hoses from A/C compressor.

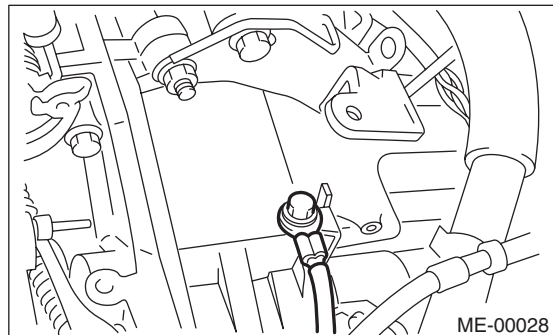


- 14) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 15) Disconnect the following connectors and cables.

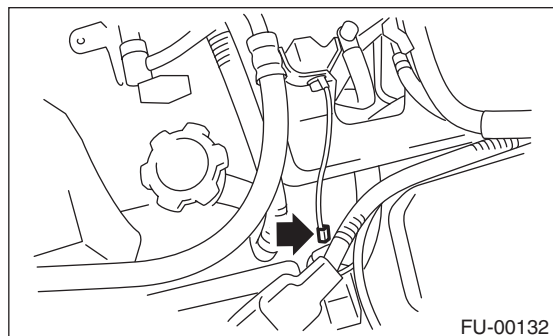
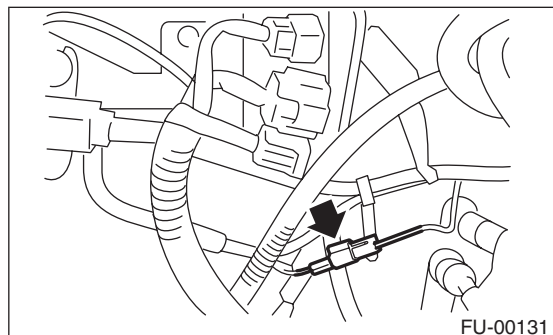
(1) Engine harness connectors



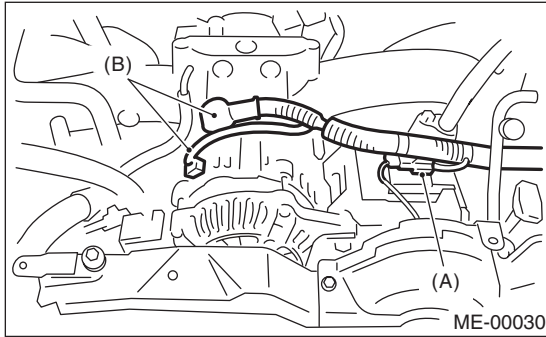
(2) Engine ground terminal



(3) Right and left engine ground cables

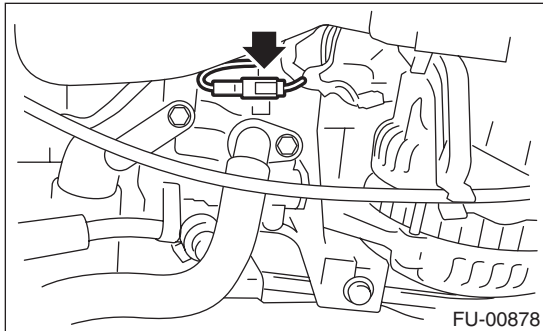


(4) Generator connector, terminal and A/C compressor connector



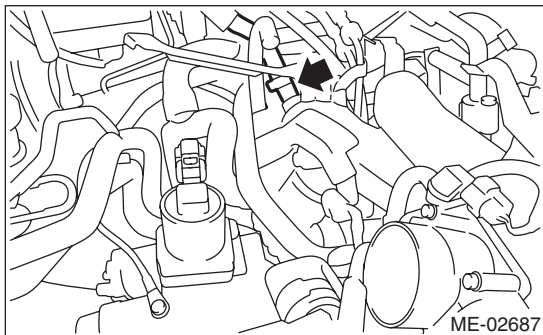
- (A) A/C compressor connector
- (B) Generator connector and terminal

(5) Power steering switch connector



16) Disconnect the following hoses.

(1) Brake booster vacuum hose

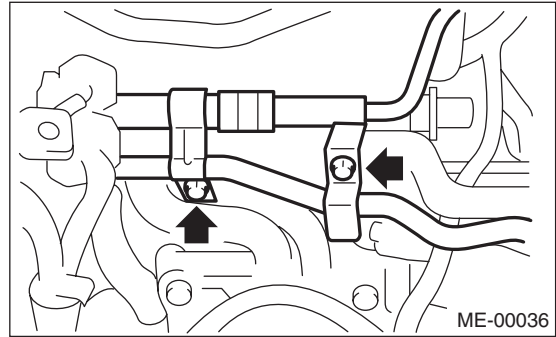


(2) Heater inlet and outlet hoses

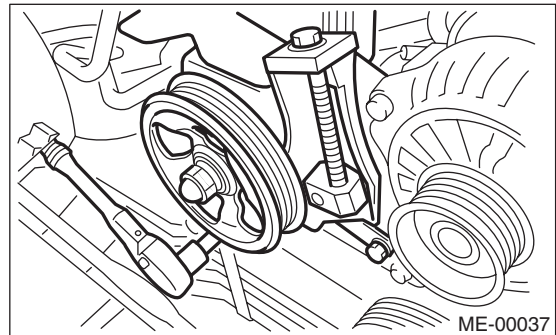
17) Remove the power steering pump.

(1) Remove the front side V-belt. <Ref. to ME(H4DOTC)-40, FRONT SIDE BELT, REMOVAL, V-belt.>

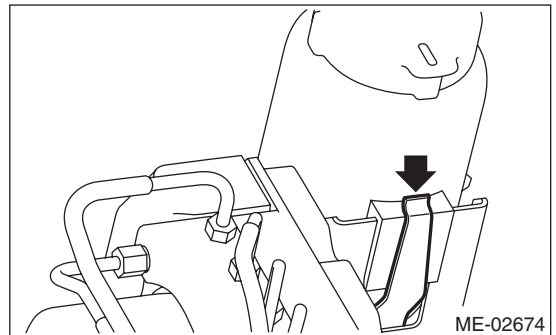
(2) Remove the power steering pipe from the fuel pip protector RH along with the bracket.



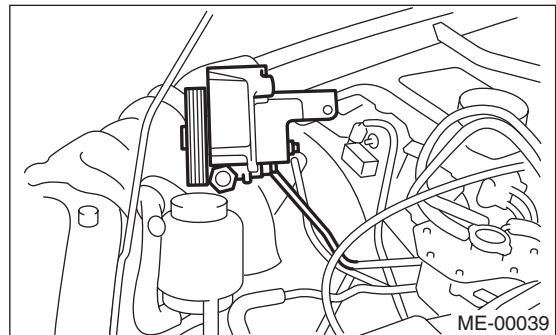
(3) Remove the power steering pump.



(4) Remove the reservoir tank from the bracket by pulling it upwards.



(5) Place the power steering pump on the right side wheel apron.



18) Lift-up the vehicle.

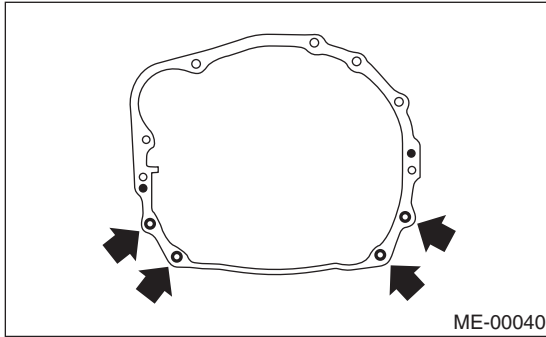
19) Remove the center exhaust pipe.

<Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>

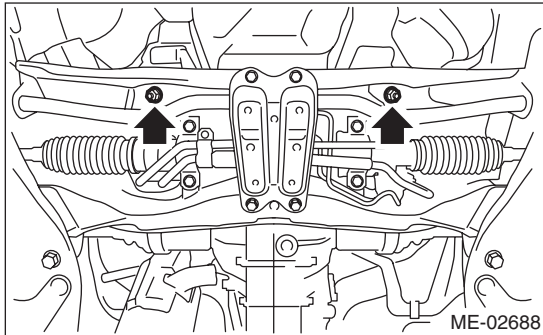
Engine Assembly

MECHANICAL

20) Remove the bolts and nuts which hold lower side of transmission to engine.

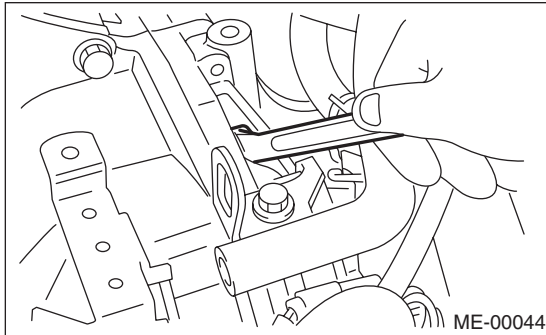


21) Remove the nuts which install front cushion rubber onto front crossmember.

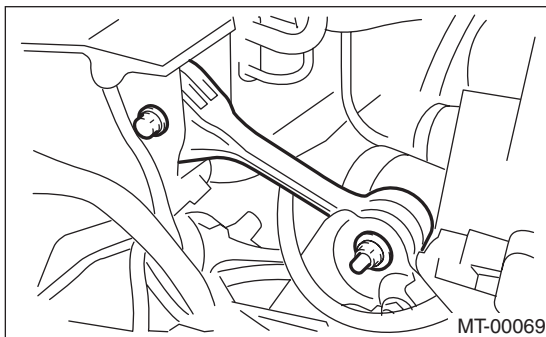


22) Separate the torque converter clutch from drive plate. (AT model)

- (1) Lower the vehicle.
- (2) Remove the service hole plug.
- (3) Remove the bolts which hold torque converter clutch to drive plate.
- (4) Remove other bolts while rotating the crankshaft using socket wrench.



23) Remove the pitching stopper.

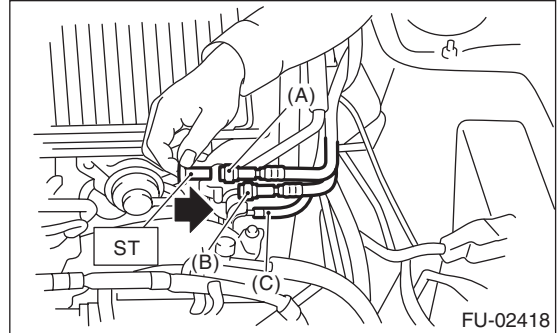


24) Using the ST to remove the fuel hose from each fuel pipe. <Ref. to FU(H4DOTC)-64, REMOVAL, Fuel Delivery, Return and Evaporation Lines.>

CAUTION:

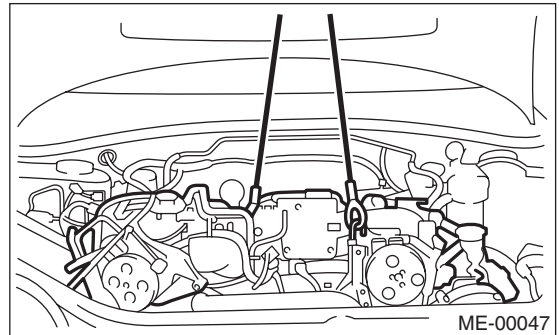
- Be careful not to spill fuel.
- Catch the fuel from hoses using a container or cloth.

ST 42099AE000 CONNECTOR REMOVER



- (A) Fuel delivery hose
- (B) Return hose
- (C) Evaporation hose

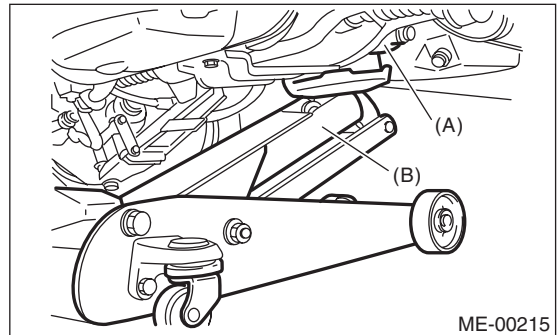
25) Support the engine with a lifting device and wire ropes.



26) Support the transmission with a garage jack.

CAUTION:

Be sure to always perform this work, in order to prevent the transmission from lowering for its own weight.



- (A) Transmission
- (B) Garage jack

CAUTION:

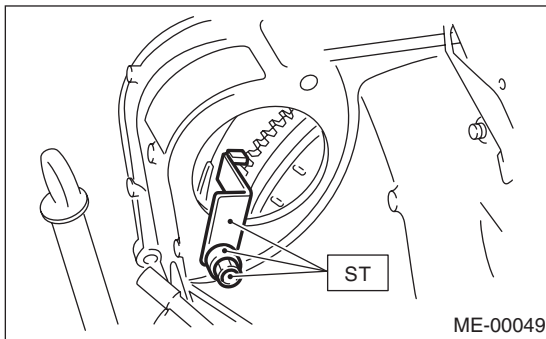
Before removing the engine away from transmission, check to be sure no work has been overlooked.

27) Separation of engine and transmission.

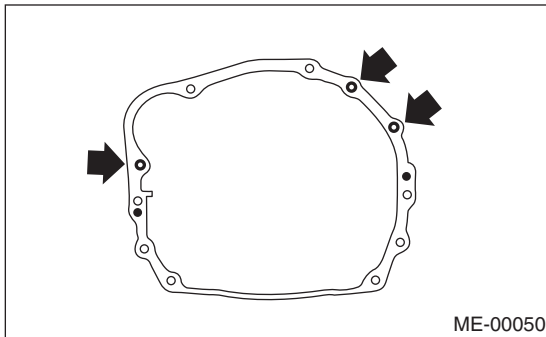
(1) Remove the starter. <Ref. to SC (H4SO)-6, REMOVAL, Starter.>

(2) Set the ST to torque converter clutch case. (AT model)

ST 498277200 STOPPER SET



(3) Remove the bolts which hold upper side of transmission to engine.



28) Remove the engine from vehicle.

(1) Slightly raise the engine.

(2) Raise the transmission with garage jack.

(3) Move the engine horizontally until main shaft is withdrawn from clutch cover.

(4) Slowly move the engine away from engine compartment.

NOTE:

Be careful not to damage adjacent parts or body panels with crank pulley, oil level gauge, etc.

29) Remove the front cushion rubbers.

B: INSTALLATION

1) Install the front cushion rubbers.

Tightening torque:

35 N·m (3.6 kgf·m, 25.8 ft·lb)

2) Apply a small amount of grease to splines of mainshaft. (MT model)

3) Position the engine in engine compartment and connect the engine to the transmission.

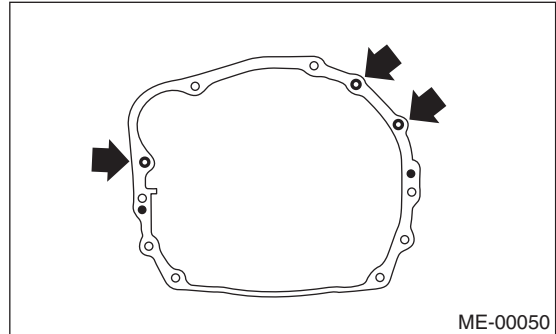
NOTE:

Be careful not to damage adjacent parts or body panels with crank pulley, oil level gauge, etc.

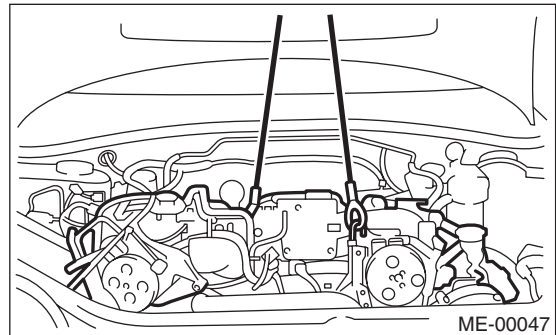
4) Tighten the bolts which hold upper side of transmission to engine.

Tightening torque:

50 N·m (5.1 kgf·m, 36.9 ft·lb)



5) Remove the lifting device and wire ropes.



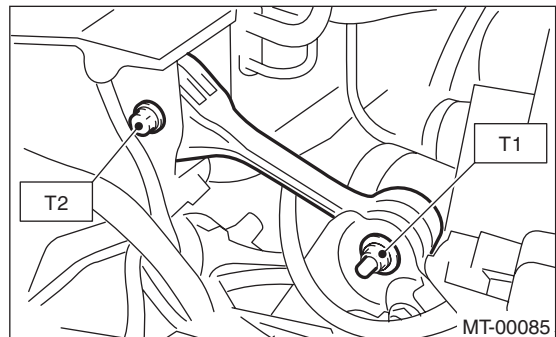
6) Remove the garage jack.

7) Install the pitching stopper.

Tightening torque:

T1: 50 N·m (5.1 kgf·m, 37 ft·lb)

T2: 58 N·m (5.9 kgf·m, 43 ft·lb)



8) Remove the ST from converter case. (AT model)

NOTE:

Be careful not to drop the ST into the converter case when removing the ST.

ST 498277200 STOPPER SET

9) Install the starter. <Ref. to SC (H4SO)-6, INSTALLATION, Starter.>

Engine Assembly

MECHANICAL

10) Install the torque converter clutch to drive plate.
(AT model)

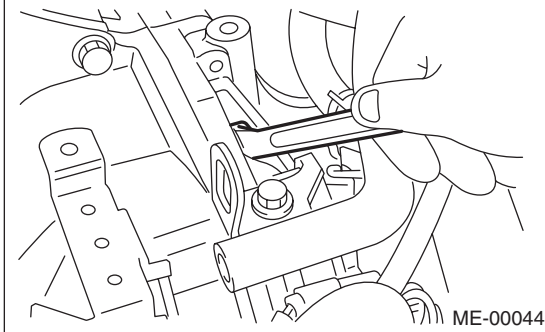
- (1) Tighten the bolts which hold torque converter clutch to drive plate.
- (2) Tighten other bolts while rotating the crankshaft using socket wrench.

NOTE:

Be careful not to drop bolts into the torque converter clutch housing.

Tightening torque:

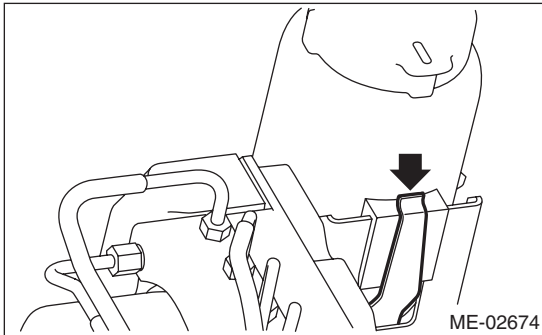
25 N·m (2.5 kgf-m, 18.1 ft-lb)



(3) Install the service hole plug.

11) Install the power steering pump.

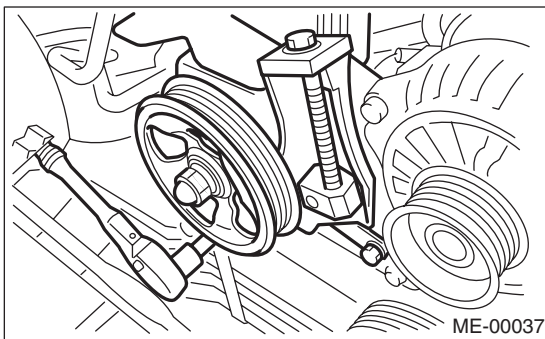
(1) Install the reservoir tank to the bracket.



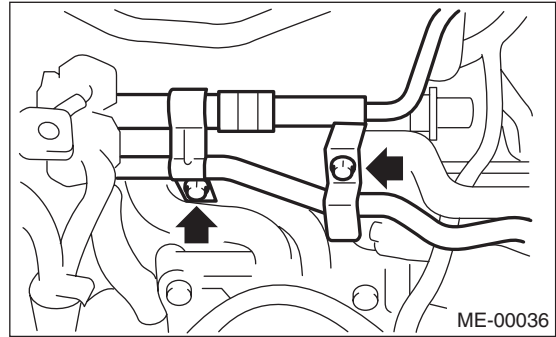
(2) Install the power steering pump.

Tightening torque:

20.1 N·m (2.05 kgf-m, 14.8 ft-lb)



(3) Install the power steering pipes onto the fuel pipe protector RH.



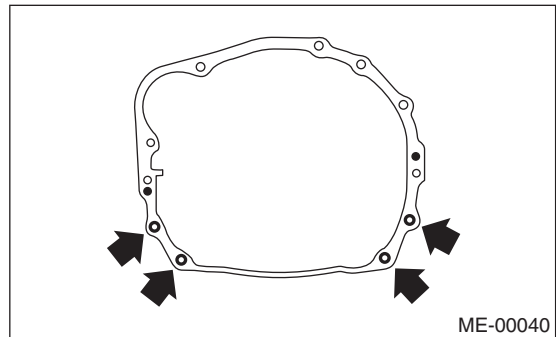
(4) Install the front side V-belt and adjust it.
<Ref. to ME(H4DOTC)-40, FRONT SIDE BELT, INSTALLATION, V-belt.>

12) Lift-up the vehicle.

13) Tighten the nuts and bolts which hold lower side of transmission to engine.

Tightening torque:

50 N·m (5.1 kgf-m, 36.9 ft-lb)



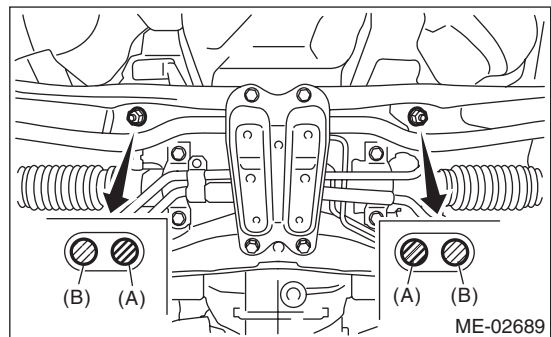
14) Tighten the nuts which install the front cushion rubber onto crossmember.

Tightening torque:

85 N·m (8.7 kgf-m, 62.7 ft-lb)

NOTE:

Make sure the front cushion rubber mounting bolts (A) and locator (B) are securely installed.



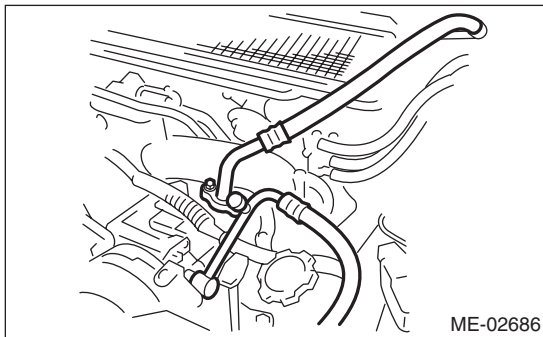
- 15) Install the center exhaust pipe.
<Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.>
- 16) Lower the vehicle.
- 17) Connect the following hoses.
 - (1) Fuel delivery hose, return hose and evaporation hose
 - (2) Heater inlet and outlet hoses
 - (3) Brake booster vacuum hose
- 18) Connect the following connectors and terminals.
 - (1) Engine ground terminal
 - (2) Engine harness connectors
 - (3) Generator connector and terminal
 - (4) A/C compressor connector
 - (5) Power steering switch connector
- 19) Install the air intake system.
 - (1) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>
 - (2) Install the air cleaner case and air intake boot. <Ref. to IN(H4DOTC)-8, INSTALLATION, Air Cleaner Case.>
- 20) Install the A/C pressure hoses.

NOTE:

Use new O-rings.

Tightening torque:

15 N·m (1.5 kgf·m, 10.8 ft·lb)



- 21) Install the radiator. <Ref. to CO(H4SO)-29, INSTALLATION, Radiator.>
- 22) Install the under cover.
- 23) Install the coolant filler tank.
<Ref. to CO(H4SO)-43, INSTALLATION, Coolant Filler Tank.>
- 24) Install the secondary air pump. <Ref. to EC(H4DOTC)-9, INSTALLATION, Secondary Air Pump.>
- 25) Install the battery in the vehicle, and connect cables.
- 26) Refill engine coolant.
<Ref. to CO(H4SO)-18, FILLING OF ENGINE COOLANT, REPLACEMENT, Engine Coolant.>

- 27) Charge the A/C system with refrigerant.
<Ref. to AC-20, PROCEDURE, Refrigerant Charging Procedure.>
- 28) Install the collector cover.
- 29) Remove the front hood stay, and close the front hood.
- 30) Lower the vehicle from lift.

C: INSPECTION

- 1) Check that the pipes and hoses are correctly installed.
- 2) Check that the engine coolant and ATF are at specified levels. (AT model)
- 3) Start the engine and check for exhaust gas, engine coolant, leaks of fuel, etc. Also check for noise and vibrations.

10.Engine Mounting

A: REMOVAL

- 1) Remove the engine unit. <Ref. to ME(H4DOTC)-32, REMOVAL, Engine Assembly.>
- 2) Remove the engine mounting from engine assembly.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

Engine mounting:

35 N·m (3.6 kgf-m, 25.8 ft-lb)

C: INSPECTION

Make sure that no crack or other damage do not exists.

11. Preparation for Overhaul

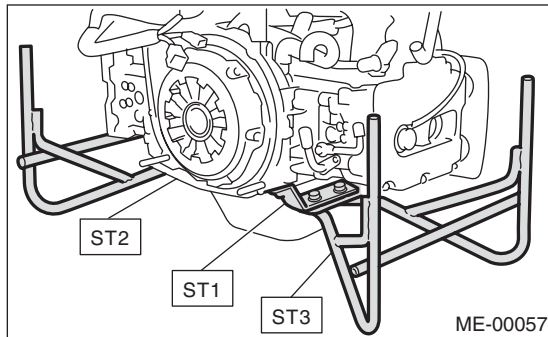
A: PROCEDURE

1) After removing the engine from body, secure it to ST in the following procedure.

ST1 498457000 ENGINE STAND ADAPTER
RH

ST2 498457100 ENGINE STAND ADAPTER
LH

ST3 499817100 ENGINE STAND



2) In this section the procedures described under each index are all connected and stated in order. The procedure for overhauling of the engine will be completed when you go through all steps in the process.

Therefore, in this section, to conduct the particular procedure within the flow of a section, you need to go back and conduct the procedure described previously in order to do that particular procedure.

12.V-belt

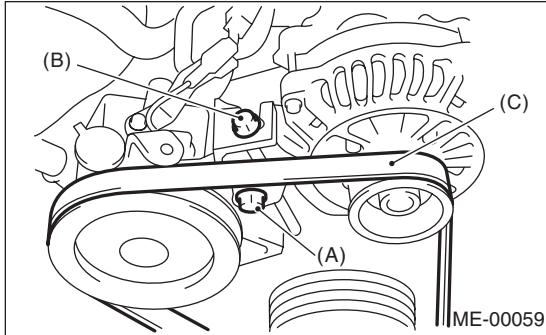
A: REMOVAL

NOTE:

Perform the work with the engine installed to body when replacing a single part.

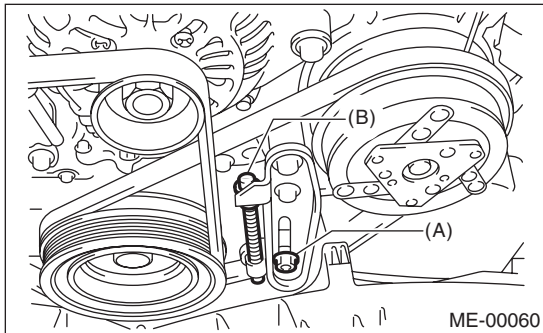
1. FRONT SIDE BELT

- 1) Remove the collector cover.
- 2) Loosen the lock bolt (A).
- 3) Loosen the slider bolt (B).
- 4) Remove the front side belt (C).

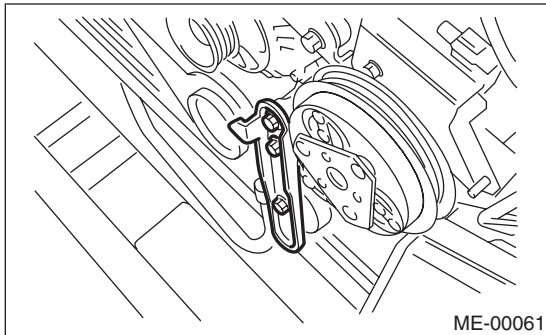


2. REAR SIDE BELT

- 1) Loosen the lock nut (A).
- 2) Loosen the slider bolt (B).



- 3) Remove the rear side belt.
- 4) Remove the belt tensioner.



B: INSTALLATION

CAUTION:

Wipe off any oil and water on the belt and pulley.

1. FRONT SIDE BELT

- 1) Install the front side belt (C), and tighten the slider bolt so as to obtain the specified belt tension. <Ref. to ME(H4DOTC)-41, INSPECTION, V-belt.>
- 2) Tighten the lock bolt (A).
- 3) Tighten the slider bolt (B).

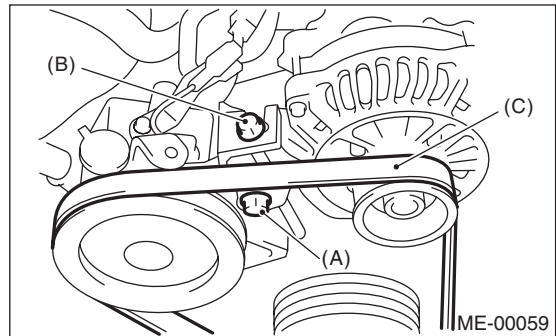
Tightening torque:

Lock bolt through bolt:

25 N·m (2.5 kgf-m, 18.1 ft-lb)

Slider bolt

8 N·m (0.8 kgf-m, 5.5 ft-lb)



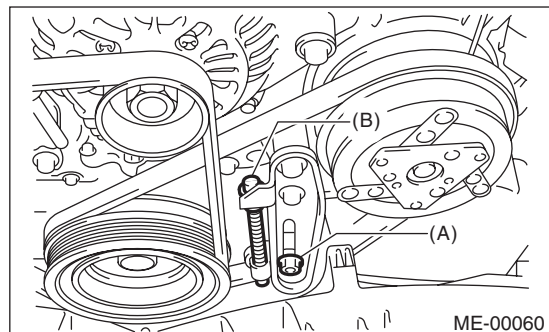
2. REAR SIDE BELT

- 1) Install the belt tensioner.
- 2) Install a rear side belt, and tighten the slider bolt (B) so as to obtain the specified belt tension. <Ref. to ME(H4DOTC)-41, INSPECTION, V-belt.>
- 3) Tighten the lock nut (A).

Tightening torque:

Lock nut (A)

22.6 N·m (2.3 kgf-m, 16.6 ft-lb)



C: INSPECTION

- 1) Replace the belts, if crack, fraying or wear is found.
- 2) Check the V-belt tension and adjust it if necessary by changing generator installing position and/or idler pulley installing position.

Belt tension (with belt tension gauge):

(A)

When installing new parts

640 — 780 N (65 — 80 kgf, 144 — 175 lb)

At inspection:

490 — 640 N (50 — 65 kgf, 110 — 144 lb)

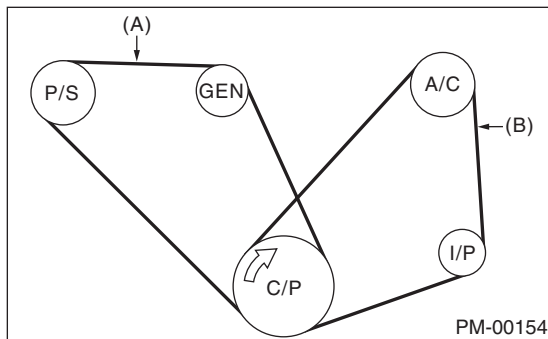
(B)

When installing new parts

650 — 750 N (66 — 76 kgf, 146 — 169 lb)

At inspection

350 — 450 N (36 — 46 kgf, 78 — 101 lb)



- (A) Front side belt
- (B) Rear side belt
- C/P Crank pulley
- GEN Generator
- P/S Power steering oil pump pulley
- A/C A/C compressor pulley
- I/P Idler pulley

Belt tension (without belt tension gauge):

(A)

When installing new parts

7 — 9 mm (0.276 — 0.354 in)

At inspection

9 — 11 mm (0.354 — 0.433 in)

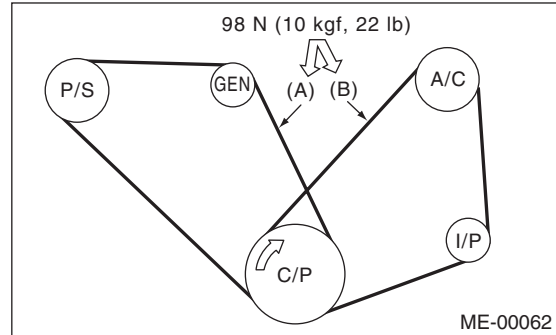
(B)

When installing new parts

7.5 — 8.5 mm (0.295 — 0.335 in)

At inspection

9.0 — 10.0 mm (0.354 — 0.394 in)



- (A) Front side belt
- (B) Rear side belt
- C/P Crank pulley
- GEN Generator
- P/S Power steering oil pump pulley
- A/C Air conditioning compressor pulley
- I/P Idler pulley

13.Crank Pulley

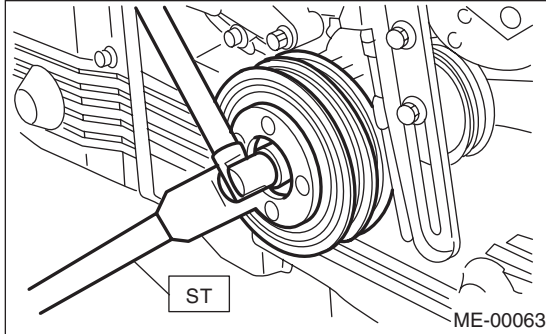
A: REMOVAL

NOTE:

Perform the work with the engine installed to body when replacing a single part.

- 1) Remove the V-belts. <Ref. to ME(H4DOTC)-40, REMOVAL, V-belt.>
- 2) Remove the crank pulley bolt. To lock the crankshaft, use ST.

ST 499977100 CRANK PULLEY WRENCH



- 3) Remove the crank pulley.

B: INSTALLATION

- 1) Install the crank pulley.
- 2) Install the pulley bolt.

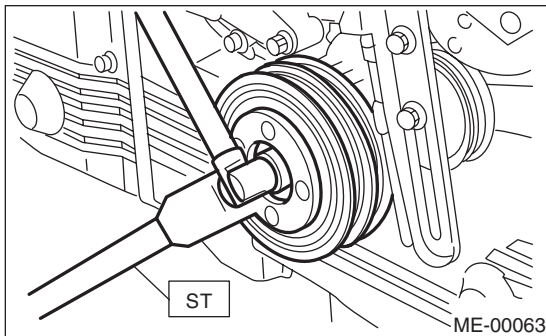
To lock the crankshaft, use ST.

ST 499977100 CRANK PULLEY WRENCH

- (1) Clean the crank pulley thread using compressed air.
- (2) Apply engine oil to the crank pulley bolt seat and thread.
- (3) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
- (4) Tighten the crank pulley bolts.

Tightening torque:

180 N·m (18.3 kgf-m, 132.7 ft-lb)



- 3) Check that the tightening angle of the clamp pulley bolt is a minimum of 65°. Perform the following procedure when less than 65°.

CAUTION:

If the tightening angle of crank pulley bolt is less than 65°, the bolt is damaged. In this case, the bolt must be replaced.

- (1) Replace the crank pulley bolts and clean them.

Crank pulley bolt:

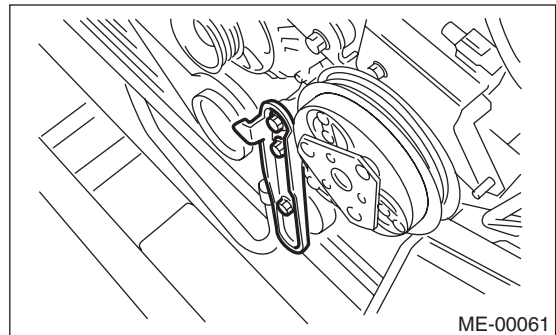
Part No. 12369AA011

- (2) Clean the crankshaft thread using compressed air.
- (3) Apply engine oil to the crank pulley bolt seat and thread.
- (4) Tighten the bolts temporarily with tightening torque of 44 N·m (4.5 kgf-m, 33 ft-lb).
- (5) Tighten the crank pulley bolts 65° to 75°.

NOTE:

Conduct the tightening procedures by confirming the turning angle of crank pulley bolt referring to the gauge indicated on timing belt cover.

- 4) Install the belt tensioner.



- 5) Install the V-belts. <Ref. to ME(H4DOTC)-40, INSTALLATION, V-belt.>

C: INSPECTION

- 1) Check the V-belt is not worn or otherwise damaged.
- 2) Check the tension of the belt. <Ref. to ME(H4DOTC)-41, INSPECTION, V-belt.>

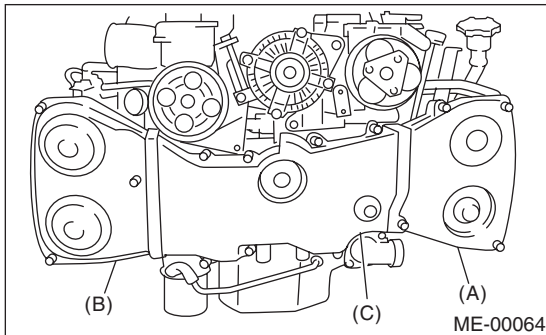
14. Timing Belt Cover

A: REMOVAL

NOTE:

Perform the work with the engine installed to body when replacing a single part.

- 1) Remove the V-belts. <Ref. to ME(H4DOTC)-40, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4DOTC)-42, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover (LH) (A).
- 4) Remove the timing belt cover (RH) (B).
- 5) Remove the front timing belt cover (C).



B: INSTALLATION

- 1) Install the front timing belt cover (C).

Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)

- 2) Install the timing belt cover (RH) (B).

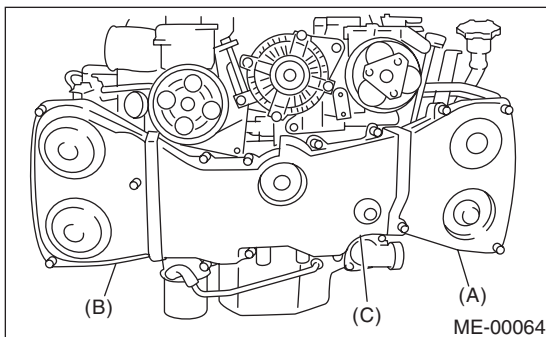
Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)

- 3) Install the timing belt cover (LH) (A).

Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)



- 4) Install the crank pulley. <Ref. to ME(H4DOTC)-42, INSTALLATION, Crank Pulley.>
- 5) Install the V-belts. <Ref. to ME(H4DOTC)-40, INSTALLATION, V-belt.>

C: INSPECTION

Make sure the cover is not damaged.

Timing Belt

MECHANICAL

15. Timing Belt

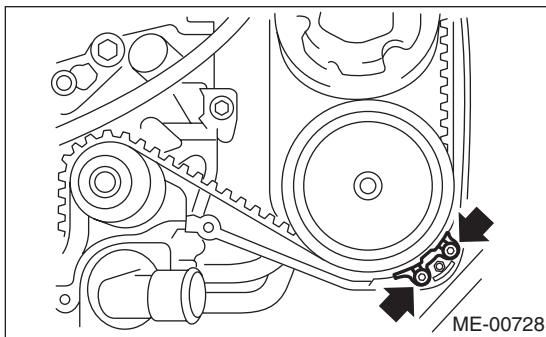
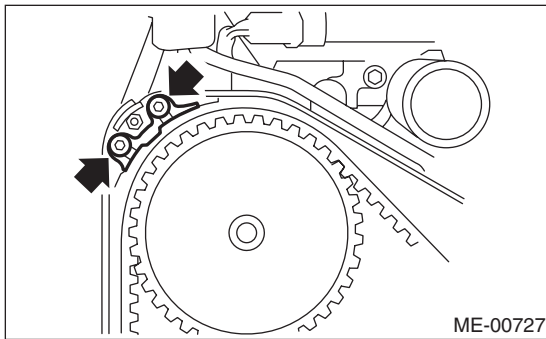
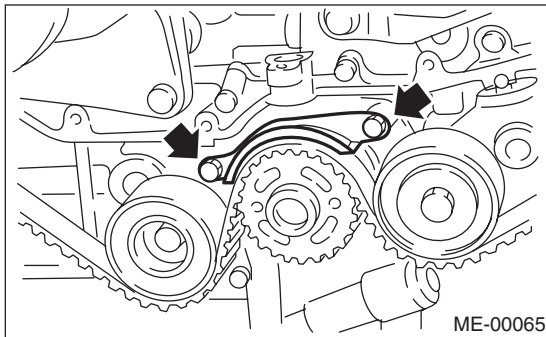
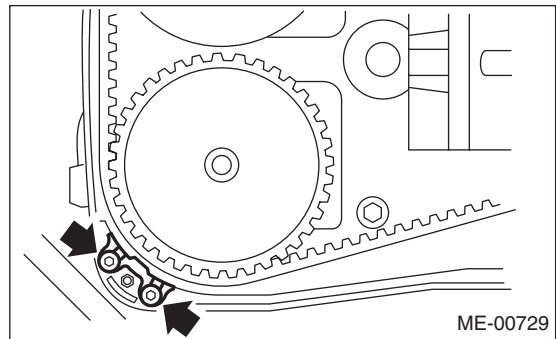
A: REMOVAL

NOTE:

Perform the work with the engine installed to body when replacing a single part. For operation procedures, refer to "Timing Belt" of the PM section. <Ref. to PM-12, Timing Belt.>

1. TIMING BELT

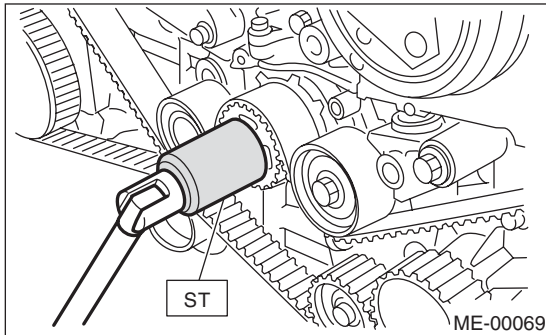
- 1) Remove the V-belts. <Ref. to ME(H4DOTC)-40, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4DOTC)-42, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-43, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt guide. (MT model)



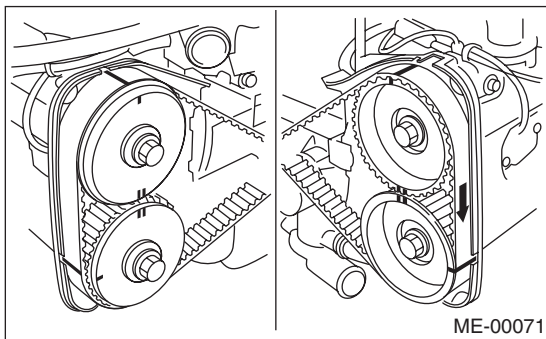
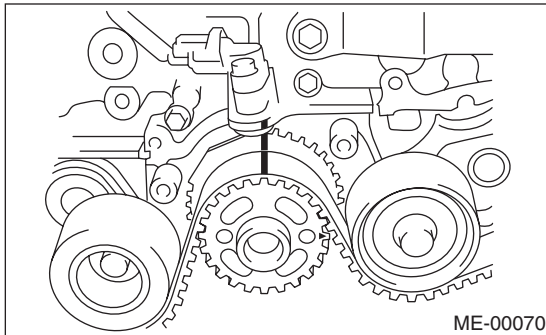
5) If the alignment mark or arrow mark (which indicates the direction of rotation) on timing belt fade away, put new marks before removing the timing belt as shown in procedures below.

(1) Turn the crankshaft using ST, and align the alignment marks on crank sprocket, intake cam sprocket (LH), exhaust cam sprocket (LH), intake cam sprocket (RH) and exhaust cam sprocket (RH) with notches of timing belt cover and cylinder block.

ST 499987500 CRANKSHAFT SOCKET



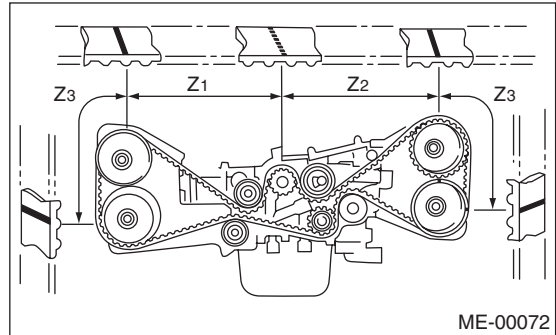
(2) Using white paint, put alignment and/or arrow marks on timing belts in relation to the cam sprockets.



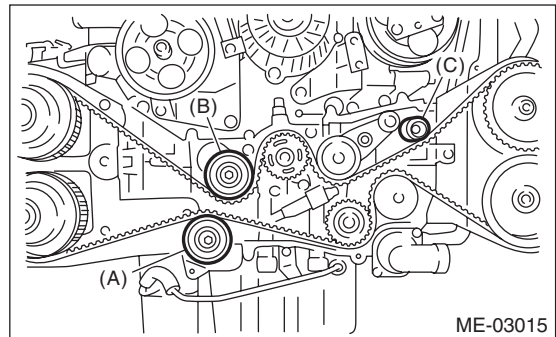
Z₁: 54.5-teeth length

Z₂: 51-teeth length

Z₃: 28-teeth length



6) Remove the belt idler (A).



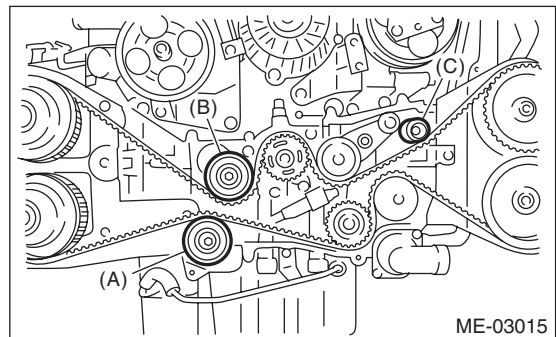
7) Remove the timing belt.

CAUTION:

After the timing belt has been removed, never rotate the intake and exhaust sprocket. If the cam sprocket is rotated, the intake and exhaust valve heads strike together and valve stems are bent.

2. AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER

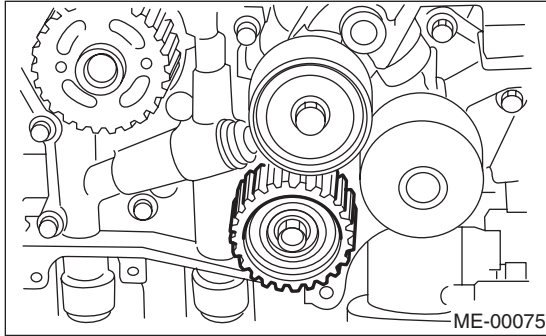
1) Remove the belt idler (B) and (C).



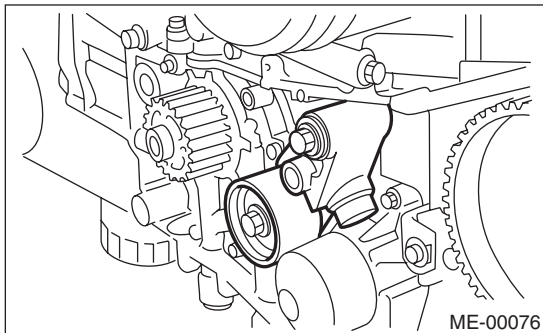
Timing Belt

MECHANICAL

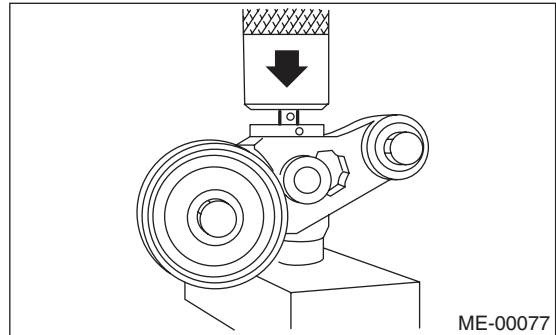
2) Remove the belt idler No. 2.



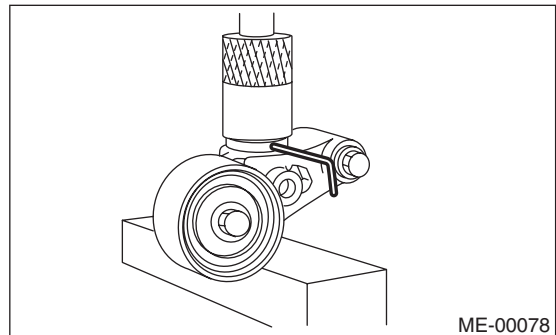
3) Remove the automatic belt tension adjuster assembly.



(2) Slowly move the adjuster rod down with a pressure of more than 294 N (30 kgf, 66 lb) until the adjuster rod is aligned with the stopper pin hole in the cylinder.



(3) With a 2 mm (0.08 in) dia. stopper pin or a 2 mm (0.08 in) (nominal) dia. hex bar wrench inserted into the stopper pin hole in the cylinder, secure the adjuster rod.



B: INSTALLATION

1. AUTOMATIC BELT TENSION ADJUST-ER ASSEMBLY AND BELT IDLER

1) Preparation for installation of automatic belt tension adjuster assembly.

CAUTION:

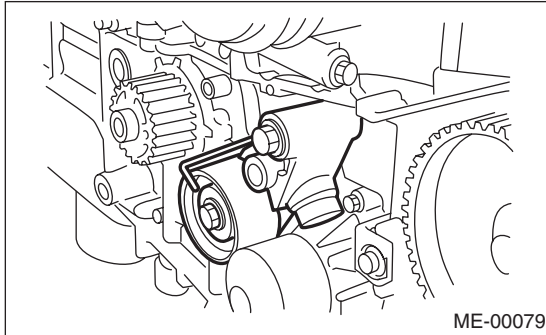
- Always use a vertical type pressing tool to move the adjuster rod down.
- Do not use a lateral type vise.
- Push the adjuster rod vertically.
- Press-in the push adjuster rod gradually taking more than three minutes.
- Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
- Press the adjuster rod as far as the end surface of the cylinder. Do not press the adjuster rod into cylinder. Doing so may damage the cylinder.
- Do not release the press pressure until stopper pin is completely inserted.

(1) Attach the automatic belt tension adjuster assembly to vertical pressing tool.

2) Install the automatic belt tension adjuster assembly.

Tightening torque:

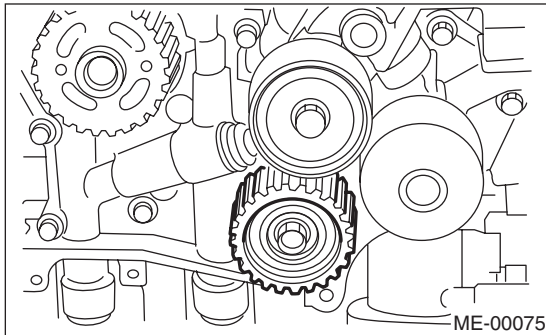
39 N·m (4.0 kgf-m, 28.9 ft-lb)



3) Install the belt idler No. 2.

Tightening torque:

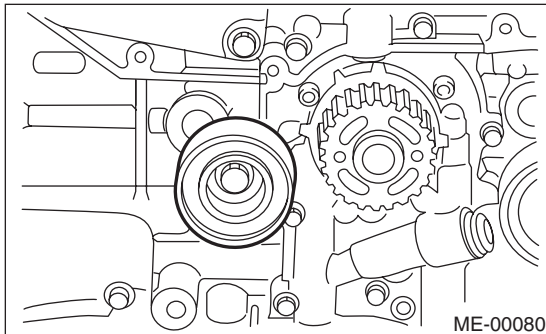
39 N·m (4.0 kgf-m, 28.9 ft-lb)



4) Install the belt idlers.

Tightening torque:

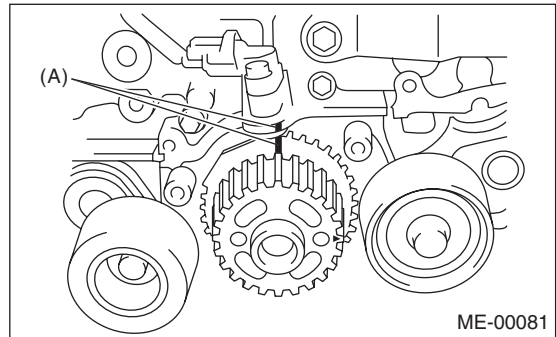
39 N·m (4.0 kgf-m, 28.9 ft-lb)



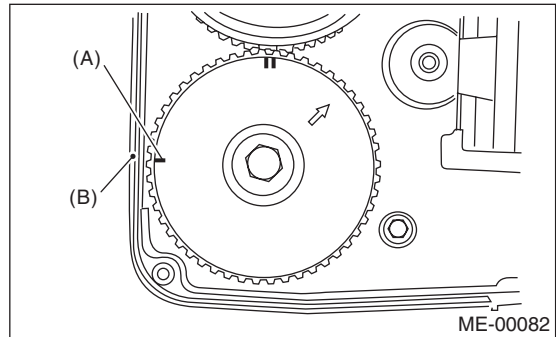
2. TIMING BELT

1) Preparation for installation of automatic belt tension adjuster assembly. <Ref. to ME(H4DOTC)-46, AUTOMATIC BELT TENSION ADJUSTER ASSEMBLY AND BELT IDLER, INSTALLATION, Timing Belt.>

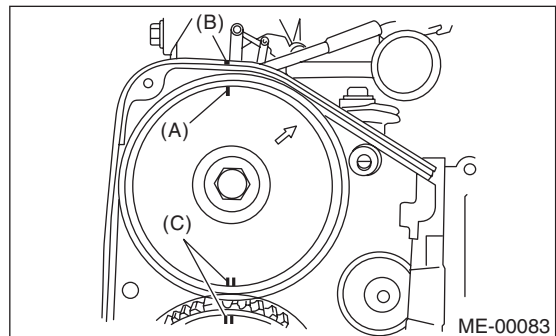
2) Align the mark (A) on crank sprocket with the mark on oil pump cover at cylinder block.



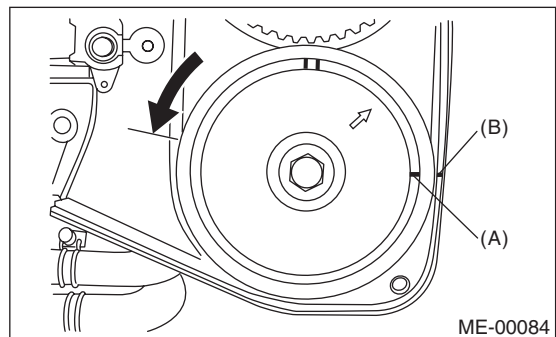
3) Align single line mark (A) on the exhaust cam sprocket (RH) with notch (B) on timing belt cover.



4) Align single line mark (A) on the intake cam sprocket (RH) with notch (B) on timing belt cover. (Ensure double lines (C) on intake and exhaust camshaft sprockets are aligned.)



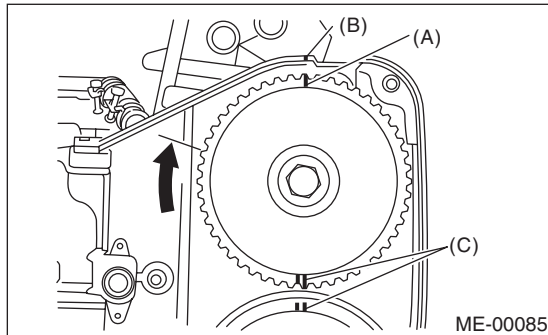
5) Align the single line mark (A) on exhaust cam sprocket (LH) with notch (B) on timing belt cover by turning the sprocket counterclockwise (as viewed from front of engine).



Timing Belt

MECHANICAL

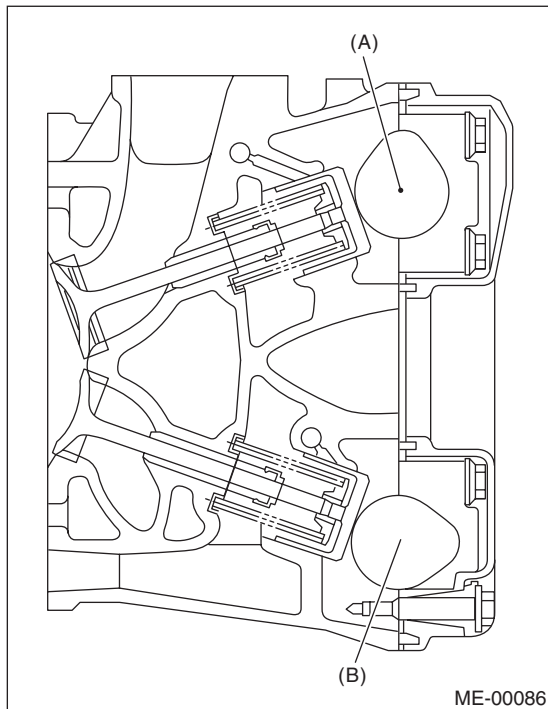
6) Align the single line mark (A) on intake cam sprocket (LH) with notch (B) on timing belt cover by turning the sprocket clockwise (as viewed from front of engine). (Make sure the double line marks (C) on intake and exhaust cam sprockets are aligned.)



7) Make sure that the cam and crank sprockets are positioned properly.

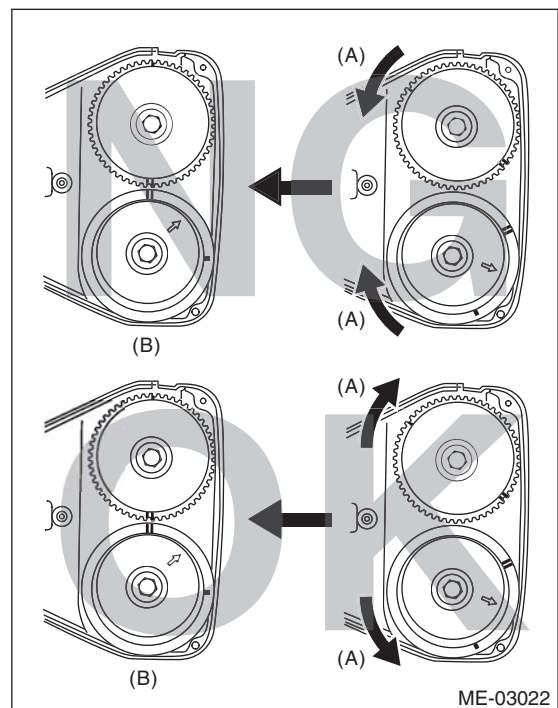
CAUTION:

- Intake and exhaust camshafts for this DOHC engine can be independently rotated with the timing belts removed. As can be seen from the figure, if the intake and exhaust valves are lifted simultaneously, the valve heads will interfere with each other, resulting in bent valves.



- (A) Intake camshaft
- (B) Exhaust camshaft

- When the camshafts are rotated to install the timing belts, #2 intake and #4 exhaust cam of camshafts (LH) are held to push their corresponding valves down. (Under this condition, these valves are held lifted.) Right-side camshafts are held so that their cams do not push valves down.
- Camshafts (LH) must be rotated from the “zero-lift” position to the position where the timing belt is to be installed with the smallest possible angle, in order to prevent mutual interference of intake and exhaust valve heads.
- Do not allow the camshafts to rotate in the direction shown in the upper figure. Doing this may cause both the intake and exhaust valves to lift simultaneously, resulting in mutual interference of valve heads.



- (A) Direction of rotation
- (B) Timing belt installation position

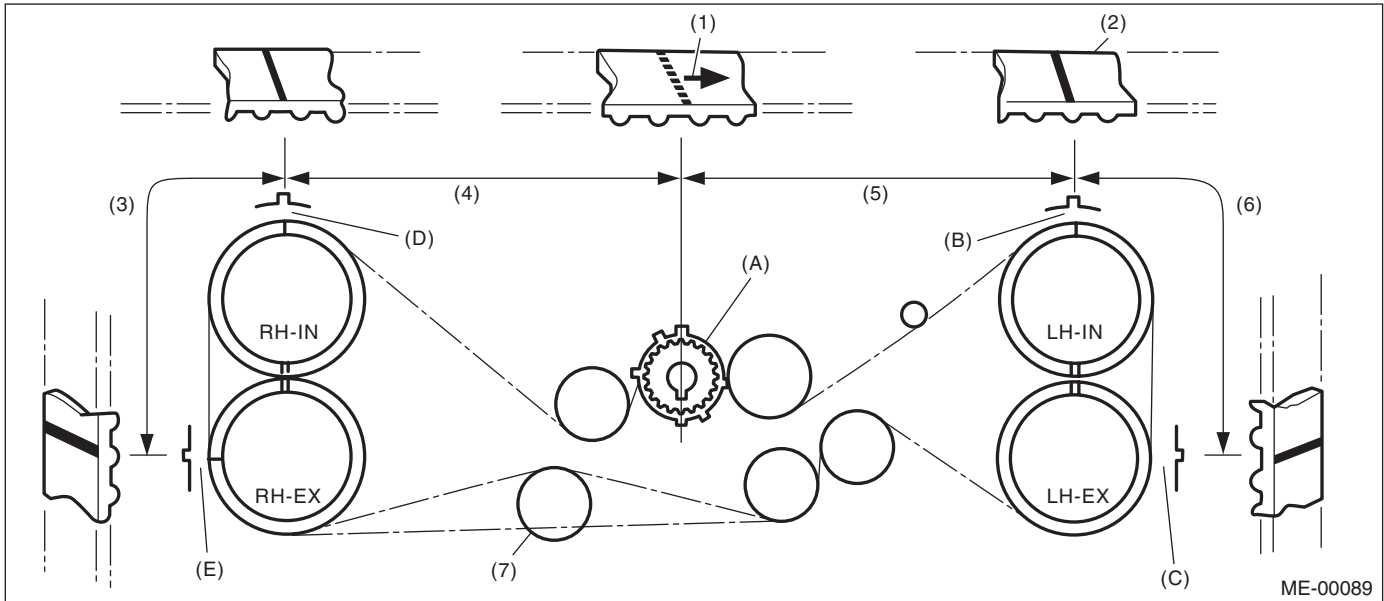
- When the timing belts are not installed, four camshafts are held at the “zero-lift” position, where all cams on camshafts do not push the intake and exhaust valves down. (Under this condition, all valves remain unlifted.)

8) Installation of timing belt:

Align the alignment mark on the timing belt with marks on the sprockets in the alphabetical order shown in the figure. While aligning marks, position the timing belt properly.

CAUTION:

- Disengagement of more than three timing belt teeth may result in interference between the valve and piston.
- Make sure that the direction of belt rotation is correct.



- | | | |
|------------------------|--------------------------|---------------------------|
| (1) Arrow mark | (4) Length of 54.5-teeth | (7) Install it in the end |
| (2) Timing belt | (5) Length of 51-teeth | |
| (3) Length of 28-teeth | (6) Length of 28-teeth | |

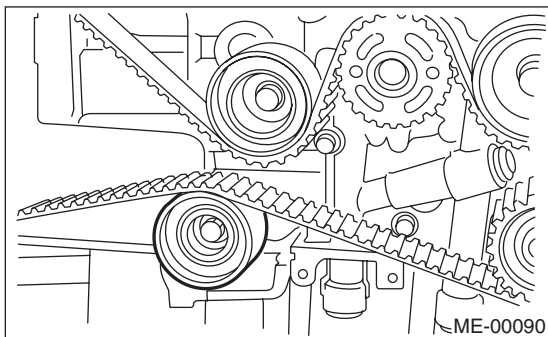
9) Install the belt idlers.

Tightening torque:

39 N·m (4.0 kgf·m, 28.9 ft·lb)

NOTE:

Make sure that the marks on the timing belt and sprockets are aligned.



10) After ensuring that the marks on the timing belt and sprockets are aligned, remove the stopper pin from tensioner adjuster.

11) Install the timing belt guide. (MT model)

NOTE:

- Clean the timing belt cover screw holes before installing bolts.
- Apply liquid gasket to the bolt threads. (Cam sprocket side only)

Liquid gasket

THREE BOND 1324 (Part No. 004403042) or the equivalent

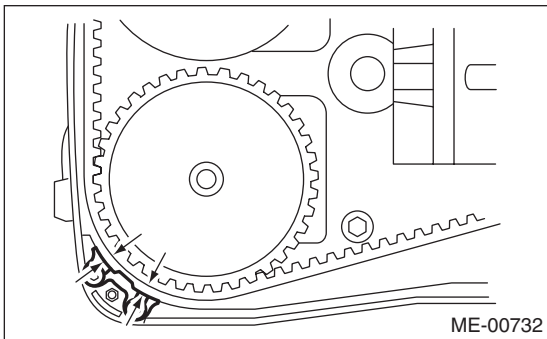
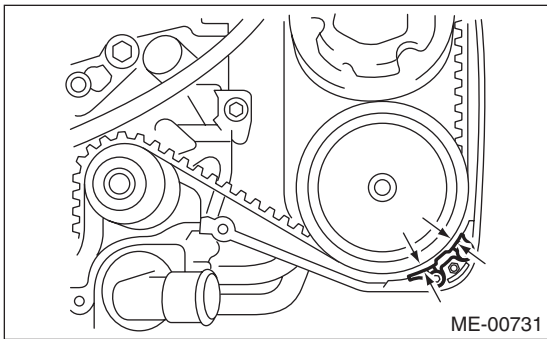
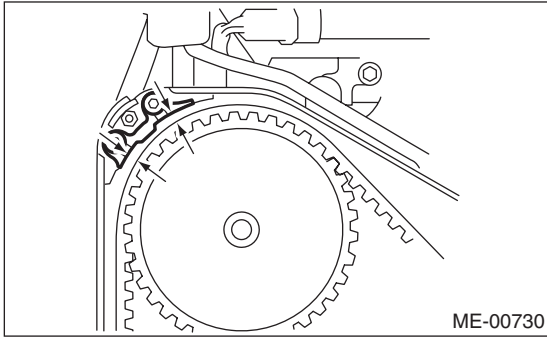
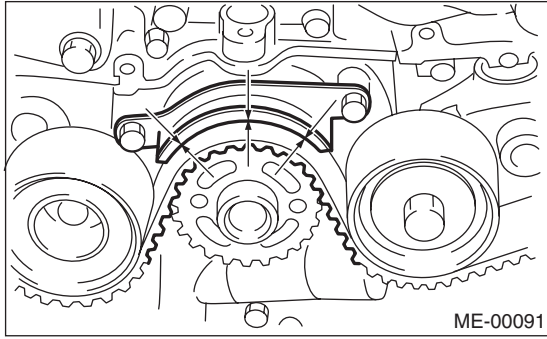
- (1) Temporarily tighten the bolts mounting the timing belt guide.
- (2) Check and adjust the clearance between timing belt and timing belt guide.

Timing Belt

MECHANICAL

Clearance:

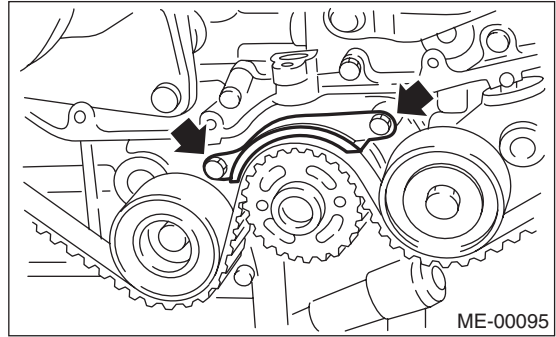
$1.0 \pm 0.5 \text{ mm}$ ($0.039 \pm 0.020 \text{ in}$)



(3) Tighten the bolts mounting the timing belt guide.

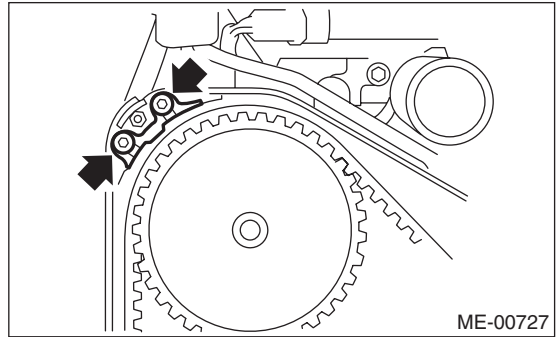
Tightening torque:

$9.75 \text{ N}\cdot\text{m}$ ($1.0 \text{ kgf}\cdot\text{m}$, $7.2 \text{ ft}\cdot\text{lb}$)



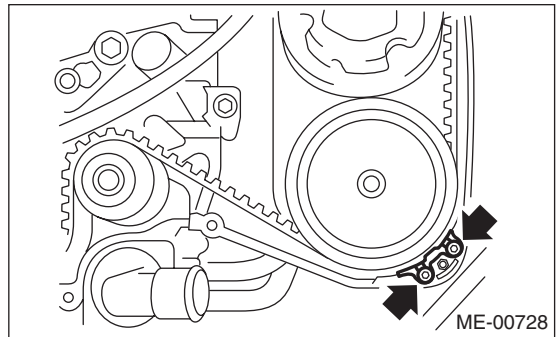
Tightening torque:

$6.4 \text{ N}\cdot\text{m}$ ($0.65 \text{ kgf}\cdot\text{m}$, $4.7 \text{ ft}\cdot\text{lb}$)



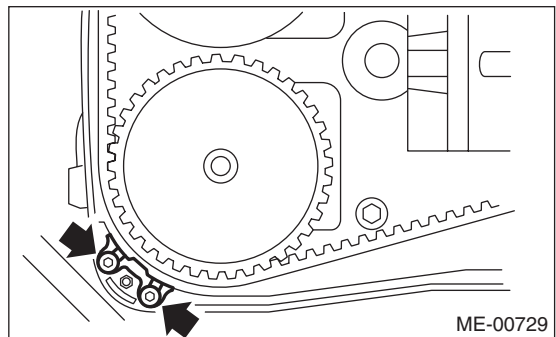
Tightening torque:

$6.4 \text{ N}\cdot\text{m}$ ($0.65 \text{ kgf}\cdot\text{m}$, $4.7 \text{ ft}\cdot\text{lb}$)



Tightening torque:

$6.4 \text{ N}\cdot\text{m}$ ($0.65 \text{ kgf}\cdot\text{m}$, $4.7 \text{ ft}\cdot\text{lb}$)



- 12) Install the timing belt cover.
 <Ref. to ME(H4DOTC)-43, INSTALLATION, Timing Belt Cover.>
- 13) Install the crank pulley.
 <Ref. to ME(H4DOTC)-42, INSTALLATION, Crank Pulley.>
- 14) Install the V-belts. <Ref. to ME(H4DOTC)-40, INSTALLATION, V-belt.>

C: INSPECTION

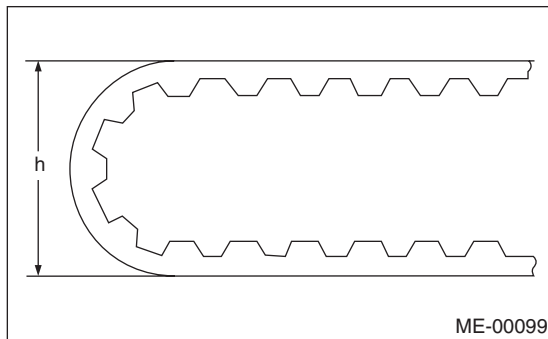
1. TIMING BELT

- 1) Check the timing belt teeth for breaks, cracks or wear. If any fault is found, replace the belt.
- 2) Check the condition of the backside of belt. If cracks are found, replace the belt.

CAUTION:

- Be careful not to let oil, grease or engine coolant contact the belt. Remove quickly and thoroughly if this happens.
- Do not bend the belt sharply.

Bending diameter: h
60 mm (2.36 in) or more



2. AUTOMATIC BELT TENSION ADJUSTER

- 1) Visually check the oil seals for leaks, and rod ends for uneven wear and scratches. If necessary, replace the automatic belt tension adjuster assembly.

NOTE:

- Slight traces of oil at rod's oil seal does not indicate a problem.
- 2) Check that the adjuster rod does not move when a pressure of 294 N (30 kgf, 66 lb) is applied to it. This is to check the adjuster rod stiffness.

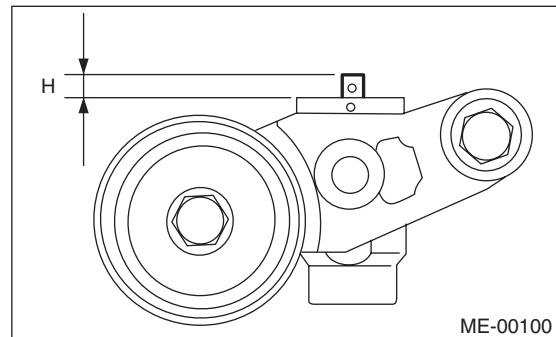
- 3) If the adjuster rod is not stiff and moves freely when applying 294 N (30 kgf, 66 lb), check it using the following procedures:

- (1) Slowly press the adjuster rod down to the end surface of cylinder. Repeat this operation two to three times.
- (2) With the adjuster rod extended all the way up, apply a pressure of 294 N (30 kgf, 66 lb) to it to inspect the stiffness of the adjuster rod.
- (3) If the adjuster rod is not stiff and compresses, replace the automatic belt tension adjuster assembly with a new part.

CAUTION:

- Always use a vertical type pressing tool to move the adjuster rod down.
 - Do not use a lateral type vise.
 - Push the adjuster rod vertically.
 - Press-in the push adjuster rod gradually taking more than three minutes.
 - Do not allow press pressure to exceed 9,807 N (1,000 kgf, 2,205 lb).
 - Press the adjuster rod to the end surface of the cylinder. Do not press the adjuster rod into cylinder. Doing so may damage the cylinder.
- 4) Measure the rod protrusion amount "H" from the body edge. If it is not within specifications, replace with new part.

Amount of rod protrusion: H
5.2 — 6.2 mm (0.204 — 0.244 in)



3. BELT TENSION PULLEY

- 1) Check the mating surfaces of timing belt and contact point of adjuster rod for uneven wear or scratches. Replace the automatic belt tension adjuster assembly if faulty.
- 2) Check the belt tension pulley for smooth rotation. Replace if noise or excessive play occurs.
- 3) Check the belt tension pulley for grease leakage.

4. BELT IDLER

- 1) Check the belt idler for smooth rotation. Replace if noise or excessive play occurs.
- 2) Check the outer contacting surfaces of idler pulley for abnormal wear and scratches.
- 3) Check the belt idler for grease leakage.

Cam Sprocket

MECHANICAL

16. Cam Sprocket

A: REMOVAL

NOTE:

Perform the work with the engine installed to body when replacing a single part.

1) Remove the V-belts. <Ref. to ME(H4DOTC)-40, REMOVAL, V-belt.>

2) Remove the crank pulley.

<Ref. to ME(H4DOTC)-42, REMOVAL, Crank Pulley.>

3) Remove the timing belt cover.

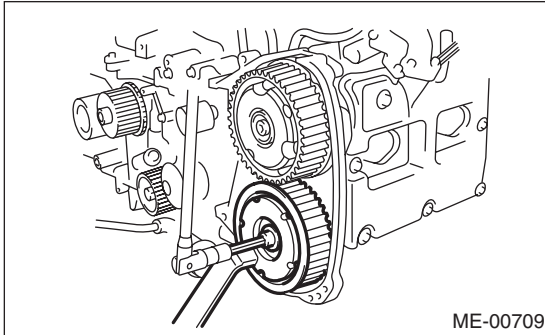
<Ref. to ME(H4DOTC)-43, REMOVAL, Timing Belt Cover.>

4) Remove the timing belt.

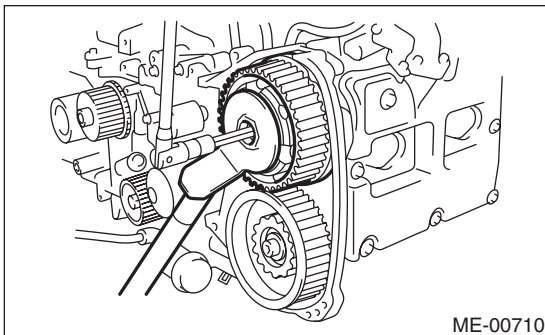
<Ref. to ME(H4DOTC)-44, REMOVAL, Timing Belt.>

5) Fasten the cam sprocket and remove from the cam shaft using ST.

ST 499207400 CAM SPROCKET WRENCH



ST 499977500 CAM SPROCKET WRENCH



B: INSTALLATION

1) Fasten the cam sprocket and install to the cam shaft using ST.

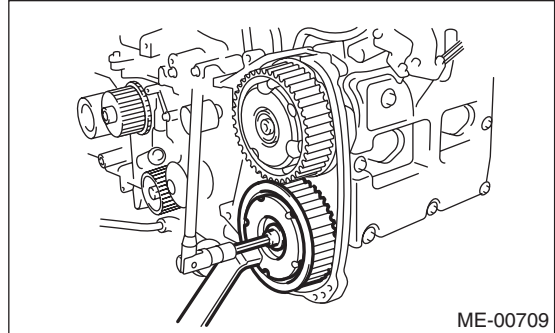
NOTE:

Do not confuse left and right side cam sprockets during installation.

ST 499207400 CAM SPROCKET WRENCH

Tightening torque:

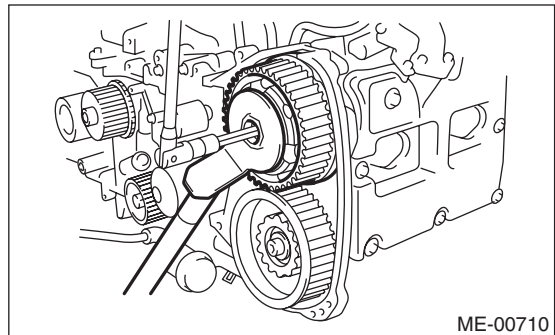
Tighten to 30 N·m (3.0 kgf·m, 21.8 ft·lb), and then tighten further by 45°.



ST 499977500 CAM SPROCKET WRENCH

Tightening torque:

Tighten to 30 N·m (3.0 kgf·m, 21.8 ft·lb), and then tighten further by 45°.



2) Install the timing belt. <Ref. to ME(H4DOTC)-46, INSTALLATION, Timing Belt.>

3) Install the timing belt cover.

<Ref. to ME(H4DOTC)-43, INSTALLATION, Timing Belt Cover.>

4) Install the crank pulley.

<Ref. to ME(H4DOTC)-42, INSTALLATION, Crank Pulley.>

5) Install the V-belts. <Ref. to ME(H4DOTC)-40, INSTALLATION, V-belt.>

C: INSPECTION

1) Check the sprocket teeth for uneven wear or scratches.

2) Make sure there is no free play between sprocket and key.

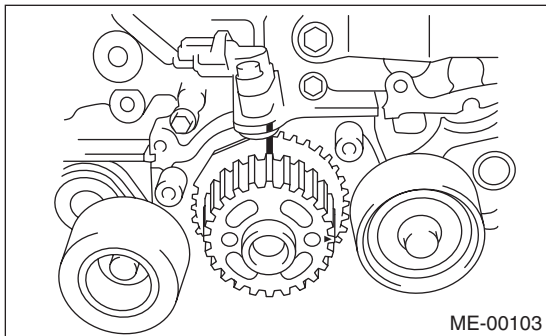
17.Crank Sprocket

A: REMOVAL

NOTE:

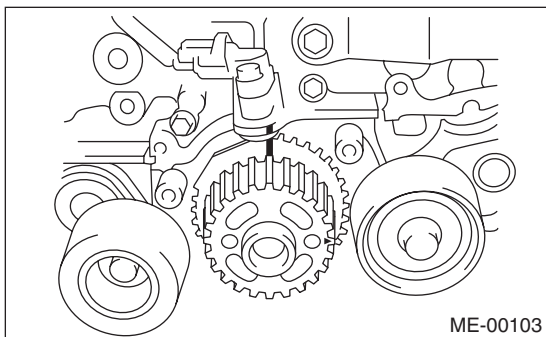
Perform the work with the engine installed to body when replacing a single part.

- 1) Remove the V-belts. <Ref. to ME(H4DOTC)-40, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4DOTC)-42, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-43, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt. <Ref. to ME(H4DOTC)-44, REMOVAL, Timing Belt.>
- 5) Remove the crank sprocket.



B: INSTALLATION

- 1) Install the crank sprocket.



- 2) Install the timing belt. <Ref. to ME(H4DOTC)-46, INSTALLATION, Timing Belt.>
- 3) Install the timing belt cover. <Ref. to ME(H4DOTC)-43, INSTALLATION, Timing Belt Cover.>
- 4) Install the crank pulley. <Ref. to ME(H4DOTC)-42, INSTALLATION, Crank Pulley.>
- 5) Install the V-belts. <Ref. to ME(H4DOTC)-40, INSTALLATION, V-belt.>

C: INSPECTION

- 1) Check the sprocket teeth for uneven wear or scratches.
- 2) Make sure there is no free play between sprocket and key.
- 3) Check the protrusion of crank sprocket used for sensor for damage and contamination of foreign matter.

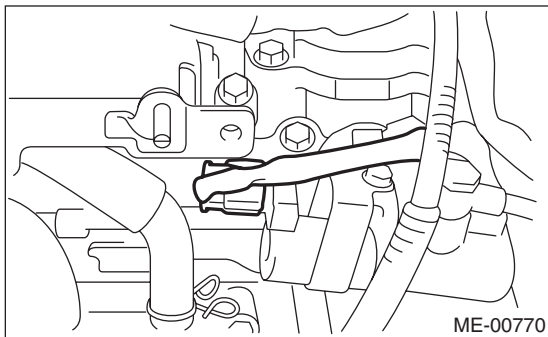
18. Camshaft

A: REMOVAL

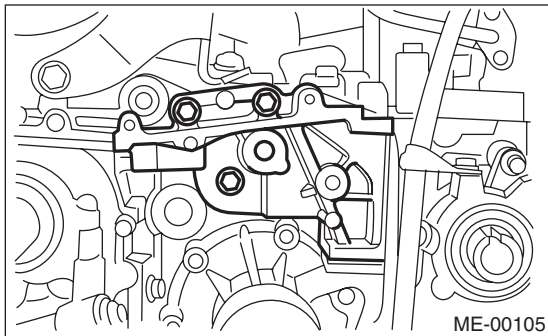
NOTE:

Perform the work with the engine installed to body when replacing a single part. Refer to "Valve Clearance" for preparation. <Ref. to ME(H4DOTC)-28, INSPECTION, Valve Clearance.>

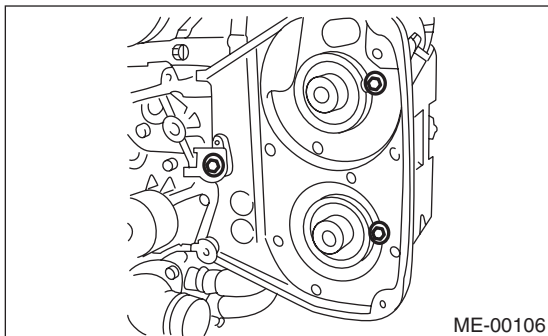
- 1) Remove the V-belts. <Ref. to ME(H4DOTC)-40, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4DOTC)-42, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-43, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt. <Ref. to ME(H4DOTC)-44, REMOVAL, Timing Belt.>
- 5) Remove the cam sprocket. <Ref. to ME(H4DOTC)-52, REMOVAL, Cam Sprocket.>
- 6) Disconnect the oil flow control solenoid valve assembly connector.



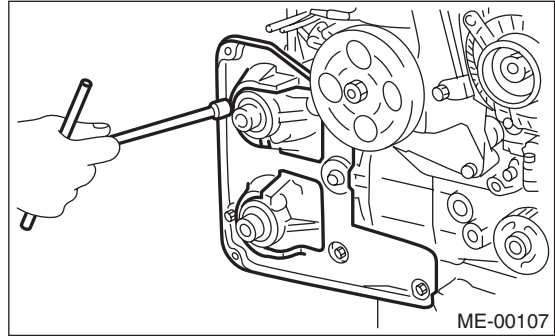
- 7) Remove the tensioner bracket.



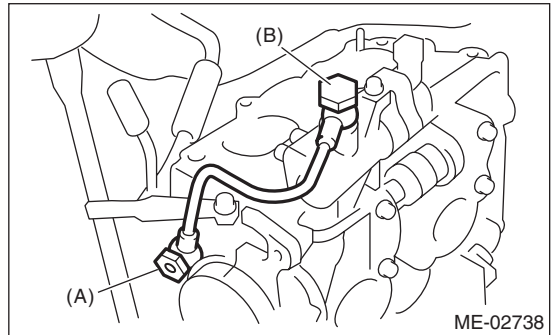
- 8) Remove the timing belt cover No. 2 (LH).



- 9) Remove the timing belt cover No. 2 (RH).

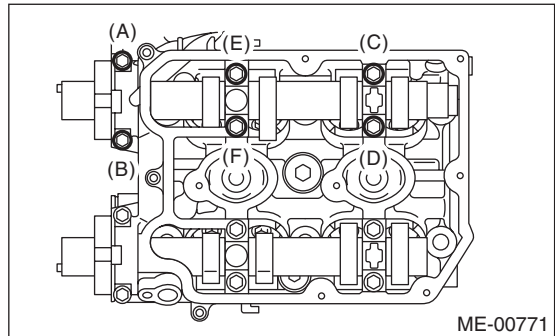


- 10) Remove the oil level gauge guide. (LH side)
- 11) Remove the rocker cover and gasket.
- 12) Remove the oil pipe.

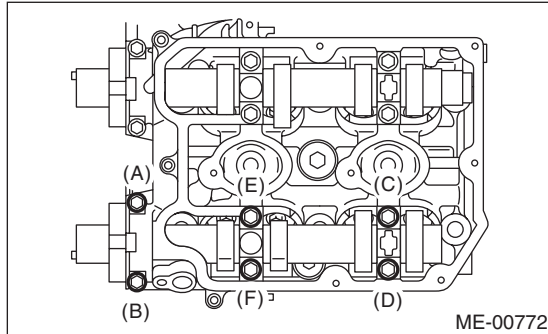


- (A) Union screw with filter (With protrusion)
 (B) Union screw without filter (Without protrusion)

- 13) Loosen the oil flow control solenoid valve assembly and intake camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



14) Loosen the exhaust camshaft cap bolts equally, a little at a time in alphabetical sequence shown in the figure.



15) Remove the oil flow control solenoid valve assembly, intake camshaft cap and camshaft.

16) Remove the exhaust camshaft caps and camshaft.

NOTE:

Arrange camshaft caps in order so that they can be installed in their original positions.

17) Similarly, remove the camshafts (RH) and related parts.

B: INSTALLATION

1) Camshaft installation:

Apply engine oil to the cylinder head at camshaft bearing installation location before installing the camshaft. Install the camshaft so that each valve is close to or in contact with base circle of the cam.

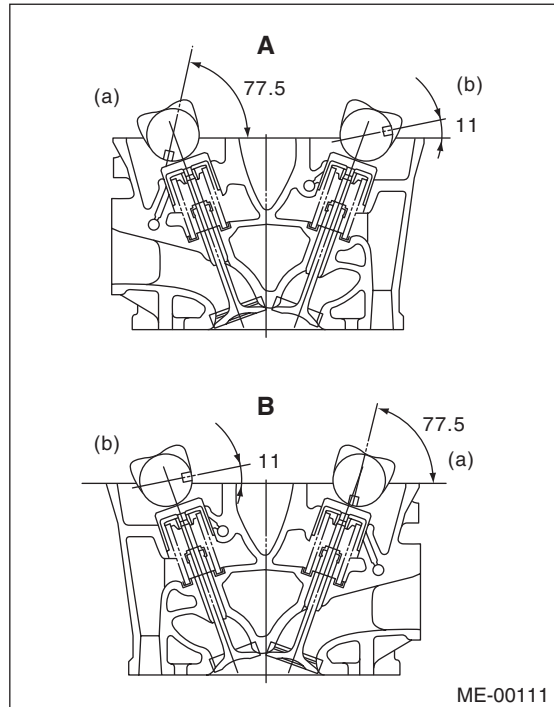
NOTE:

- Set the cam shaft to the position shown in the figure. It is necessary to rotate the cam shaft (LH) slightly when installing the timing belt.

- Camshaft RH must be rotated when set at the position shown in the figure.

Intake camshaft LH: Rotate 80° clockwise.

Exhaust camshaft LH: Rotate 45° clockwise.



- A Cylinder head (LH)
- B Cylinder head (RH)
- (a) Intake camshaft
- (b) Exhaust camshaft

2) Camshaft cap and oil flow control solenoid valve assembly installation:

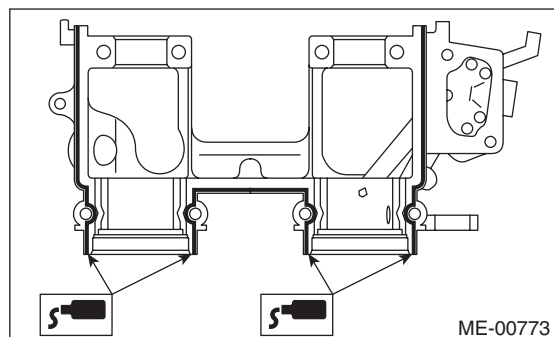
(1) Apply small amount of liquid gasket to the mating surface of cap.

NOTE:

Do not apply liquid gasket excessively. Applying excessively may cause excess gasket to come out and flow toward oil seal, resulting in oil leak.

Liquid gasket:

THREE BOND 1215 (Part No. 004403007) or equivalent



(2) Apply a thin coat of engine oil to cap bearing surface, and install the cap to the camshaft.

Camshaft

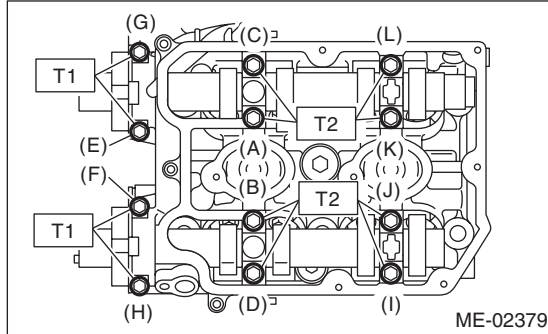
MECHANICAL

(3) Gradually tighten the camshaft cap and oil control valve assembly in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque.

Tightening torque:

T1: 9.75 N·m (1.0 kgf-m, 7.2 ft-lb)

T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)



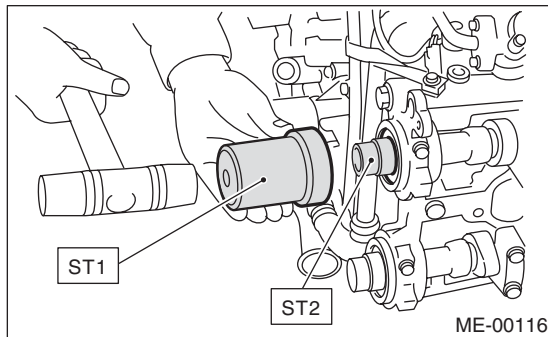
(4) After tightening the camshaft cap, ensure the camshaft rotates only slightly while holding it at base circle.

3) Apply a coat of engine oil to the oil seal periphery and oil seal lip, then install the oil seal on camshaft using ST1 and ST2.

NOTE:

Use a new oil seal.

ST1 499587600 OIL SEAL INSTALLER
ST2 499597200 OIL SEAL GUIDE



4) Rocker cover installation:

(1) Install the gasket on rocker cover. Install the peripheral gasket and ignition coil unit gasket.

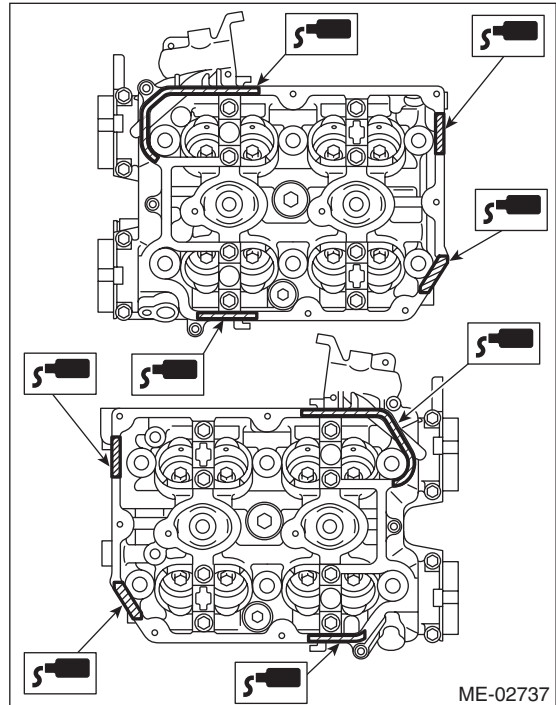
NOTE:

Use a new gasket.

(2) Apply liquid gasket to the specified point of the cylinder head. Apply extra amount of liquid gasket around plugs 5 mm (0.2 in) or more.

Liquid gasket:

THREE BOND 1215 (Part No. 004403007) or equivalent

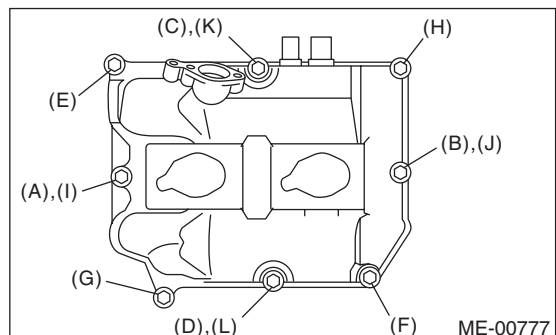


(3) Install the rocker cover on cylinder head. Ensure the gasket is properly positioned during installation.

(4) Temporarily tighten the rocker cover tightening bolts in alphabetical sequence shown in the figure, and then tighten to specified torque in alphabetical sequence.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



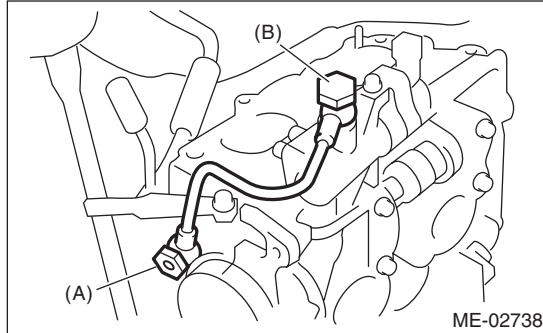
5) Install the oil pipe.

NOTE:

Make sure not to mix up the union screws with filter and without filter as their installation positions are different.

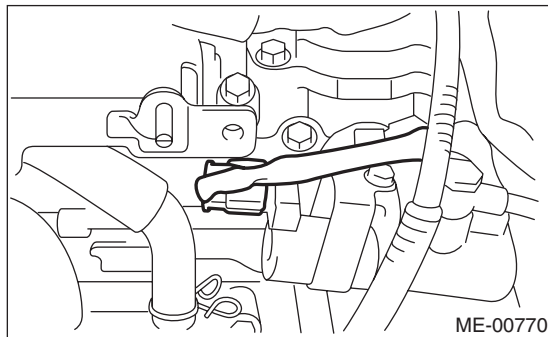
Tightening torque:

29 N·m (3.0 kgf·m, 21.4 ft·lb)



- (A) Union screw with filter (With protrusion)
- (B) Union screw without filter (Without protrusion)

6) Connect the oil flow control solenoid valve connector.

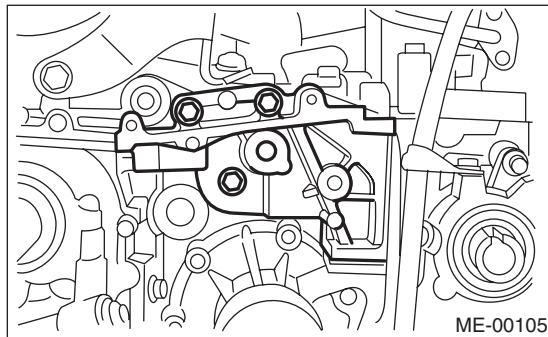


7) Similarly, install the parts on right-hand side.

8) Install the tensioner bracket.

Tightening torque:

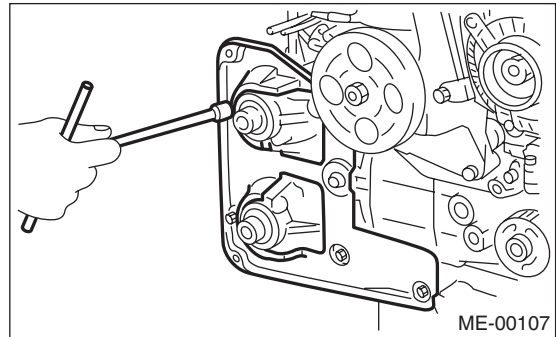
24.5 N·m (2.5 kgf·m, 18.1 ft·lb)



9) Install the timing belt cover No. 2 (RH).

Tightening torque:

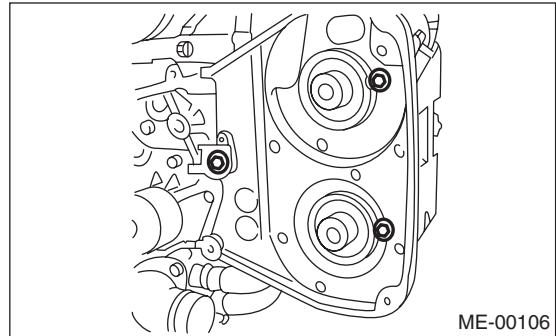
5 N·m (0.5 kgf·m, 3.6 ft·lb)



10) Install the timing belt cover No. 2 (LH).

Tightening torque:

5 N·m (0.5 kgf·m, 3.6 ft·lb)



11) Install the cam sprocket.

<Ref. to ME(H4DOTC)-52, INSTALLATION, Cam Sprocket.>

12) Install the timing belt. <Ref. to ME(H4DOTC)-46, INSTALLATION, Timing Belt.>

13) Install the timing belt cover.

<Ref. to ME(H4DOTC)-43, INSTALLATION, Timing Belt Cover.>

14) Install the crank pulley.

<Ref. to ME(H4DOTC)-42, INSTALLATION, Crank Pulley.>

15) Install the V-belts. <Ref. to ME(H4DOTC)-40, INSTALLATION, V-belt.>

Camshaft

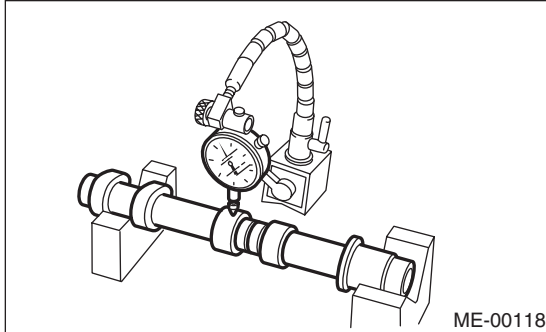
MECHANICAL

C: INSPECTION

1) Measure the bend, and repair or replace if necessary.

Service limit:

0.020 mm (0.0008 in)



2) Check the journal for damage and wear. Replace if faulty.

3) Check the cutout portion used for camshaft sensor for damage. Replace if faulty.

4) Measure the outside diameter of camshaft journal. If the journal diameter is not within the standard, check the oil clearance.

	Camshaft journal	
	Front	Center, rear
Standard	37.946 — 37.963 mm (1.4939 — 1.4946 in)	29.946 — 29.963 mm (1.1790 — 1.1796 in)

5) Measurement of the camshaft journal oil clearance:

(1) Clean the bearing caps and camshaft journals.

(2) Place the camshafts on cylinder head. (Without installing the valve lifter.)

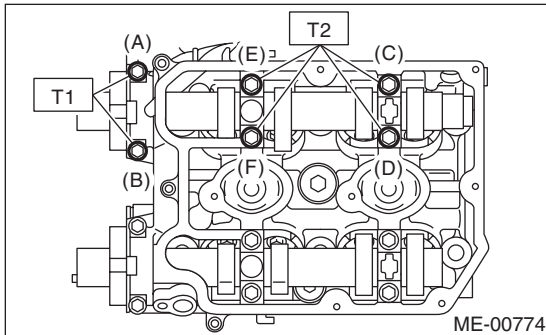
(3) Place a plastigauge across each camshaft journals.

(4) Gradually tighten the cap in at least two stages in alphabetical sequence shown in the figure, and then tighten to specified torque. Do not turn the camshaft.

Tightening torque:

T1: 9.75 N·m (1.0 kgf-m, 7.2 ft-lb)

T2: 20 N·m (2.0 kgf-m, 14.5 ft-lb)



(5) Remove the bearing caps.

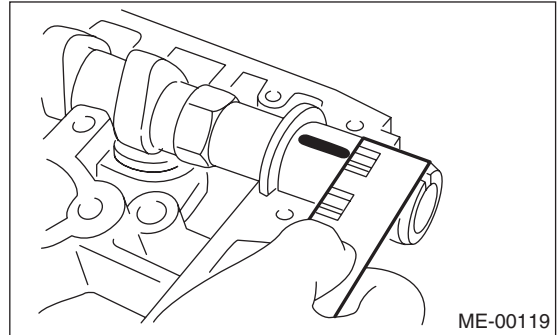
(6) Measure the widest point of the plastigauge on each journal. If the oil clearance exceeds the limit, replace the camshaft. If necessary, replace the camshaft caps and cylinder head as a set.

Standard:

0.037 — 0.072 mm (0.0015 — 0.0028 in)

Service limit:

0.10 mm (0.0039 in)



(7) Completely remove the plastigauge.

6) Check the cam face condition; remove the minor faults by grinding with oil stone. Measure the cam height H. Replace if it exceeds the limit.

Cam height H:

Standard:

Intake

46.55 — 46.65 mm (1.833 — 1.837 in)

Exhaust

46.75 — 46.85 mm (1.841 — 1.844 in)

Service limit:

Intake

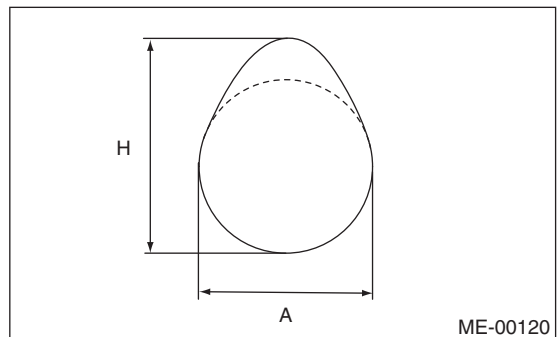
46.45 mm (1.829 in)

Exhaust

46.65 mm (1.837 in)

Cam base circle diameter A:

37.0 mm (1.457 in)



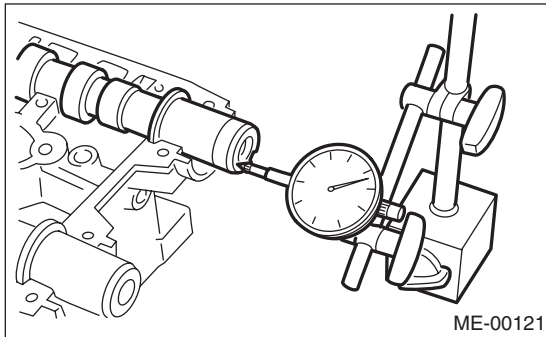
7) Measure the thrust clearance of camshaft with setting the dial gauge at end of camshaft. If the thrust clearance exceeds the limit, replace the caps and cylinder head as a set. If necessary replace the camshaft.

Standard:

0.068 — 0.116 mm (0.0027 — 0.0046 in)

Service limit:

0.14 mm (0.0055 in)



Cylinder Head

MECHANICAL

19. Cylinder Head

A: REMOVAL

NOTE:

Perform the work with the engine installed to body when replacing a single part. Refer to "Valve Clearance" for preparation. <Ref. to ME(H4DOTC)-28, INSPECTION, Valve Clearance.>

1) Remove the V-belts. <Ref. to ME(H4DOTC)-40, REMOVAL, V-belt.>

2) Remove the crank pulley. <Ref. to ME(H4DOTC)-42, REMOVAL, Crank Pulley.>

3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-43, REMOVAL, Timing Belt Cover.>

4) Remove the timing belt. <Ref. to ME(H4DOTC)-44, REMOVAL, Timing Belt.>

5) Remove the cam sprocket. <Ref. to ME(H4DOTC)-52, REMOVAL, Cam Sprocket.>

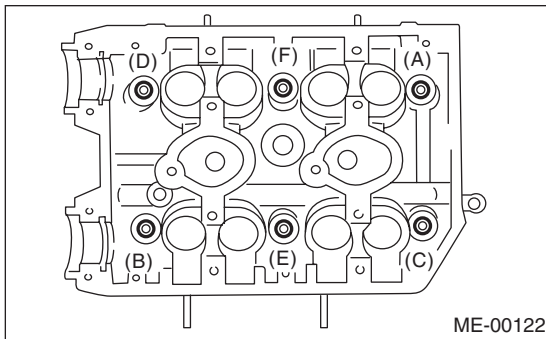
6) Remove the intake manifold. <Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>

7) Remove the bolt which installs the A/C compressor bracket on cylinder head.

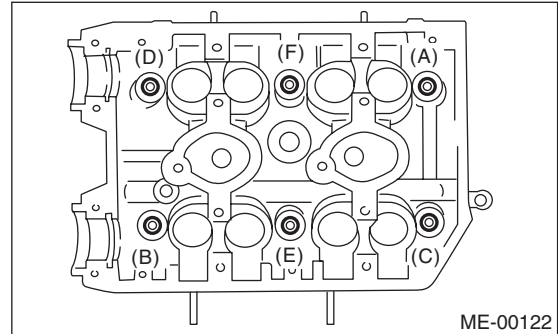
8) Remove the camshaft. <Ref. to ME(H4DOTC)-54, REMOVAL, Camshaft.>

9) Remove the cylinder head bolts in alphabetical sequence shown in the figure.

Leave the bolts (A) and (D) engaged by three or four threads to prevent the cylinder head from falling.



10) While tapping the cylinder head with a plastic hammer, separate it from cylinder block. Remove the bolts (A) and (D) to remove cylinder head.



11) Remove the cylinder head gasket.

CAUTION:

Be careful not to scratch the mating surface of cylinder block and cylinder head.

12) Similarly, remove the cylinder head (RH).

B: INSTALLATION

1) Install the cylinder head and gaskets on cylinder block.

CAUTION:

Be careful not to scratch the mating surface of cylinder block and cylinder head.

NOTE:

Use new cylinder head gaskets.

2) Tighten the cylinder head bolts.

(1) Apply a thin coat of engine oil to washer and bolt thread.

(2) Tighten all bolts to 29 N·m (3.0 kgf·m, 22 ft·lb) in alphabetical sequence.

(3) Tighten all bolts to 69 N·m (7.0 kgf·m, 51 ft·lb) in alphabetical sequence.

(4) Loosen all the bolts by 180° in the reverse order of tightening, and loosen again by 180°.

(5) Tighten all bolts to 49 N·m (5.0 kgf·m, 36 ft·lb) in alphabetical sequence.

(6) Tighten all bolts by 80 to 90° in alphabetical sequence.

(7) Tighten all bolts by 40 to 45° in alphabetical sequence.

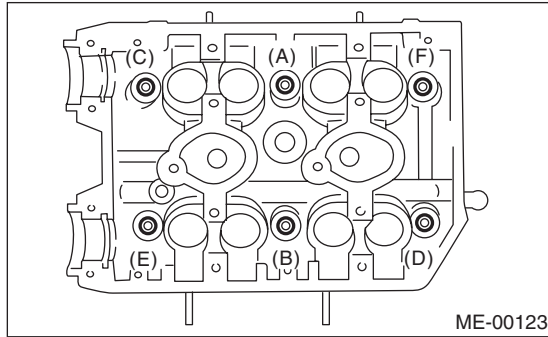
CAUTION:

Do not tighten the bolts more than 45°.

(8) Further tighten the bolts (A) and (B) by 40 to 45°.

CAUTION:

Make sure that the total “re-tightening angle” of the previous steps (7) and (8) does not exceed 90°.



- 3) Install the camshaft. <Ref. to ME(H4DOTC)-55, INSTALLATION, Camshaft.>
- 4) Install the A/C compressor bracket on cylinder head.
- 5) Install the intake manifold. <Ref. to FU(H4DOTC)-17, INSTALLATION, Intake Manifold.>
- 6) Install the cam sprocket. <Ref. to ME(H4DOTC)-52, INSTALLATION, Cam Sprocket.>
- 7) Install the timing belt. <Ref. to ME(H4DOTC)-46, INSTALLATION, Timing Belt.>
- 8) Install the timing belt cover. <Ref. to ME(H4DOTC)-43, INSTALLATION, Timing Belt Cover.>
- 9) Install the crank pulley. <Ref. to ME(H4DOTC)-42, INSTALLATION, Crank Pulley.>
- 10) Install the V-belts. <Ref. to ME(H4DOTC)-40, INSTALLATION, V-belt.>

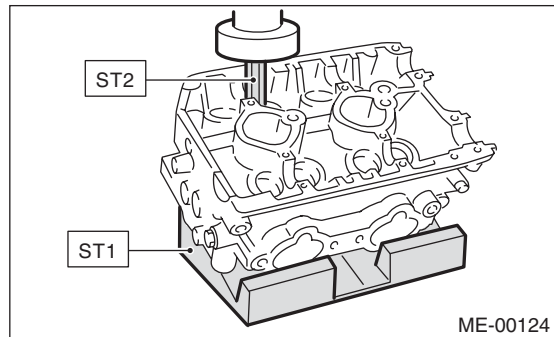
C: DISASSEMBLY

- 1) Remove the valve lifter.
- 2) Compress the valve spring and remove the valve spring retainer key. Remove each valve and valve spring.

ST1 498267600 CYLINDER HEAD TABLE
 ST2 499718000 VALVE SPRING REMOVER

NOTE:

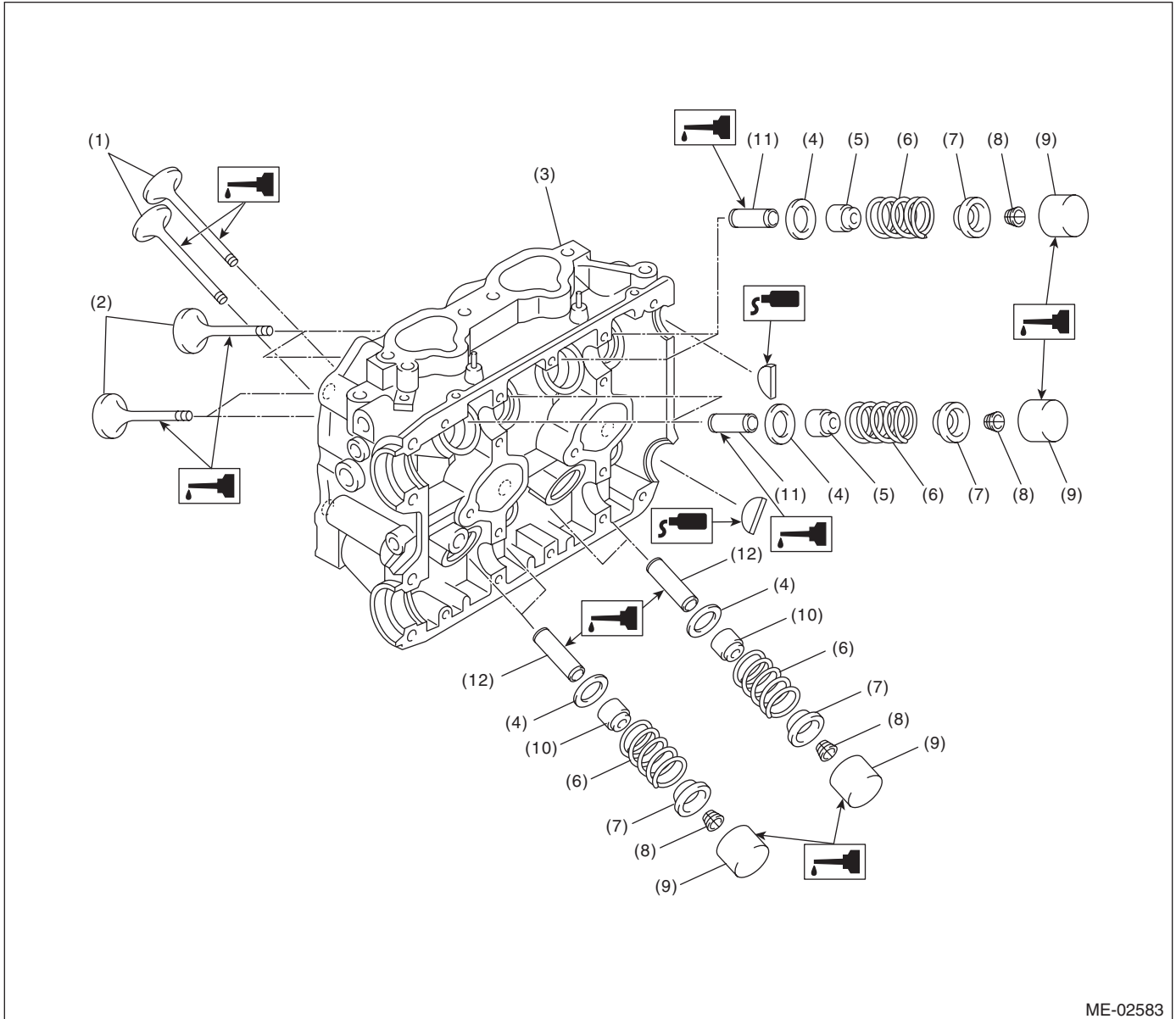
- Mark each valve to prevent confusion.
- Pay careful attention not to damage the lips of intake valve oil seals and exhaust valve oil seals.
- Keep all the removed parts in order for re-installing in their original positions.



Cylinder Head

MECHANICAL

D: ASSEMBLY



ME-02583

- | | | |
|-----------------------|---------------------------|-----------------------------|
| (1) Exhaust valve | (5) Intake valve oil seal | (9) Valve lifter |
| (2) Intake valve | (6) Valve spring | (10) Exhaust valve oil seal |
| (3) Cylinder head | (7) Retainer | (11) Intake valve guide |
| (4) Valve spring seat | (8) Retainer key | (12) Exhaust valve guide |

- 1) Installation of valve spring and valve:
(1) Coat the stem of each valve with engine oil and insert the valve into valve guide.

NOTE:

When inserting the valve into valve guide, use special care not to damage the oil seal lip.

(2) Set the cylinder head on ST1.

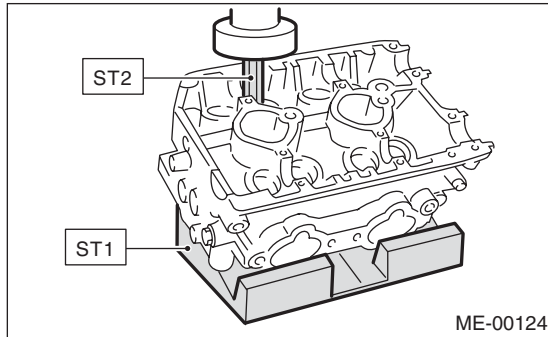
(3) Install the valve spring and retainer using ST2.

ST1 498267600 CYLINDER HEAD TABLE

ST2 499718000 VALVE SPRING REMOVER

NOTE:

Be sure to install the valve spring with its close-coiled end facing the seat on cylinder head.



(4) Compress the valve spring and install the retainer key.

(5) After installing, tap the valve spring retainers lightly with a wooden hammer for better seating.

2) Apply oil to the surfaces of the valve lifter.

3) Install the valve lifter.

E: INSPECTION

1. CYLINDER HEAD

1) Visually check for cracks and damage. Use liquid penetrant tester on the important sections to check for fissures.

2) Measure the warping of the cylinder head surface that mates with crankcase using a straight edge (A) and thickness gauge (B).

If the warping exceeds 0.035 mm (0.0014 in), re-grind the surface with a surface grinder.

Warping limit:

0.035 mm (0.0014 in)

Grinding limit:

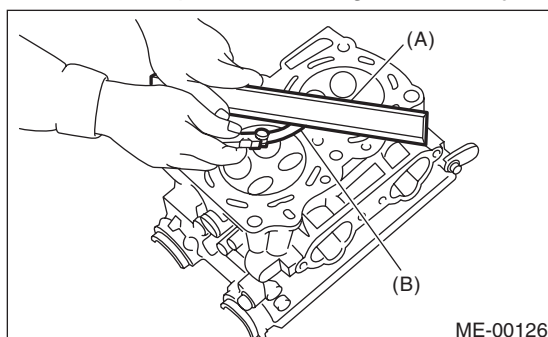
0.3 mm (0.012 in)

Standard height of cylinder head:

127.5 mm (5.02 in)

NOTE:

Uneven torque for the cylinder head bolts can cause warping. When reinstalling, pay special attention to the torque so as to tighten evenly.



2. VALVE SEAT

Inspect the intake and exhaust valve seats, and correct the contact surfaces with a valve seat cutter if they are defective or when valve guides are replaced.

Valve seat width: *W*

Intake

Standard:

0.6 — 1.4 mm (0.024 — 0.055 in)

Service limit:

1.7 mm (0.067 in)

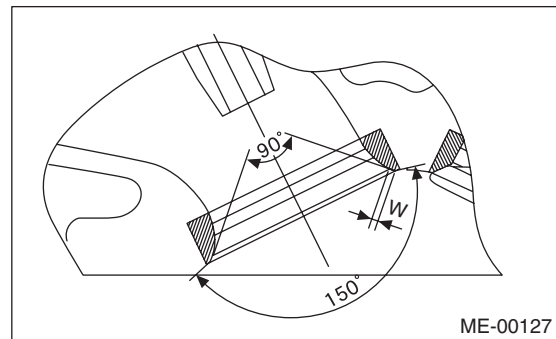
Exhaust

Standard:

1.2 — 1.8 mm (0.047 — 0.071 in)

Service limit:

2.2 mm (0.087 in)



3. VALVE GUIDE

1) Check the clearance between valve guide and stem. The clearance can be checked by measuring respectively the outer diameter of valve stem with a micrometer and the inner diameter of valve guide with a caliper gauge.

Clearance between the valve guide and valve stem:

Standard:

Intake

0.030 — 0.057 mm (0.0012 — 0.0022 in)

Exhaust

0.040 — 0.067 mm (0.0016 — 0.0026 in)

Service limit:

0.15 mm (0.0059 in)

Cylinder Head

MECHANICAL

2) If the clearance between valve guide and valve stem exceeds the limit, replace the valve guide or valve itself whichever shows greater amount of wear. See the following procedure for valve guide replacement.

Valve guide inner diameter:

6.000 — 6.012 mm (0.2362 — 0.2367 in)

Valve stem outer diameters:

Intake

5.955 — 5.970 mm (0.2344 — 0.2350 in)

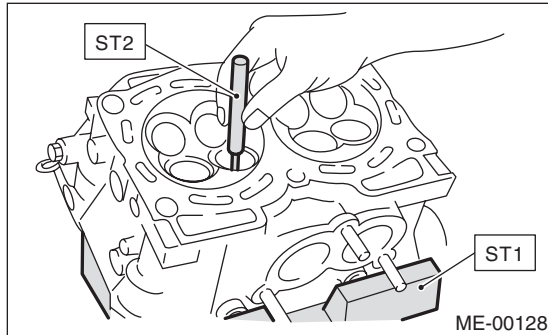
Exhaust

5.945 — 5.960 mm (0.2341 — 0.2346 in)

(1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides fit the holes in ST1.

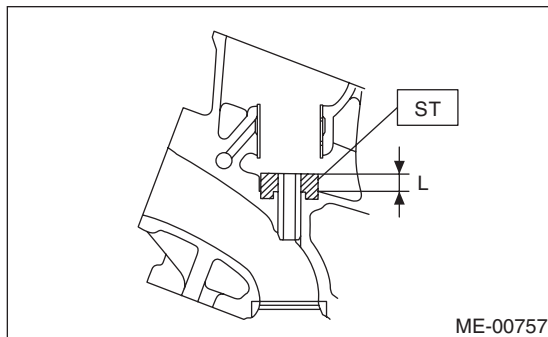
(2) Insert the ST2 into valve guide and press it down to remove the valve guide.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499767200 VALVE GUIDE REMOVER



(3) Turn the cylinder head upside down and place the ST as shown in the figure.

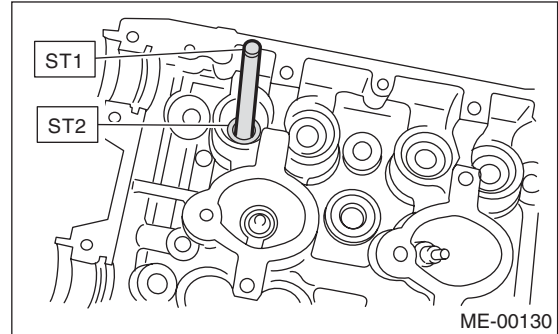
ST 18251AA020 VALVE GUIDE ADJUSTER



(4) Before installing a new valve guide, make sure that neither scratches nor damages exist on the inner surface of valve guide holes in cylinder head.

(5) Put a new valve guide, coated with sufficient oil, in the cylinder head, and insert the ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

ST1 499767200 VALVE GUIDE REMOVER
ST2 18251AA020 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

Valve guide protrusion: L

15.8 — 16.2 mm (0.622 — 0.638 in)

(7) Insert the ST in valve guide, and rotate the ST slowly clockwise while pushing it lightly. Bring the ST back while rotating it clockwise. (Reaming Work)

(8) After reaming, clean the valve guide to remove chips.

ST 499767400 VALVE GUIDE REAMER

NOTE:

- Apply engine oil to the ST when reaming.
- If the inner surface of valve guide is damaged, the edge of ST should be slightly ground with oil stone.
- If the inner surface of valve guide becomes lustrous and the ST does not chip, use a new ST or remedy the ST.

(9) Recheck the contact condition between valve face and valve seat after replacing the valve guide.

4. INTAKE AND EXHAUST VALVE

1) Inspect the flange and stem of valve, and replace if damaged, worn, or deformed. If "H" is less than the specified limit, replace with a new valve.

H:

Intake (A)

Standard:

1.0 — 1.4 mm (0.039 — 0.055 in)

Service limit:

0.8 mm (0.031 in)

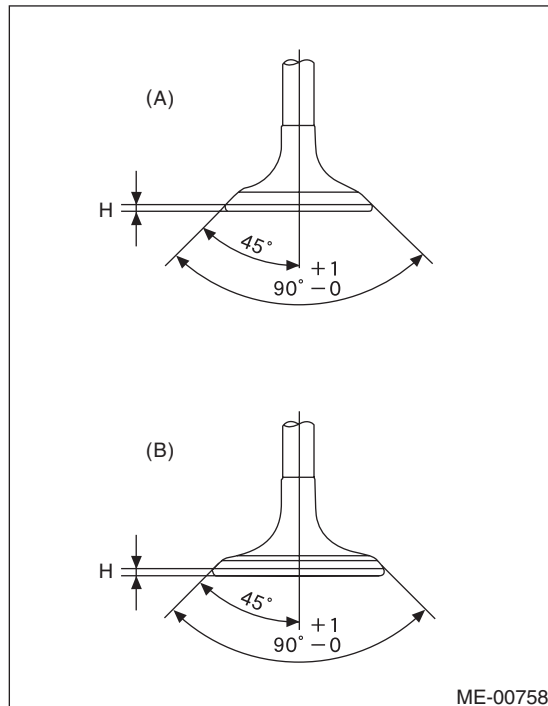
Exhaust (B)

Standard:

1.3 — 1.7 mm (0.057 — 0.067 in)

Service limit:

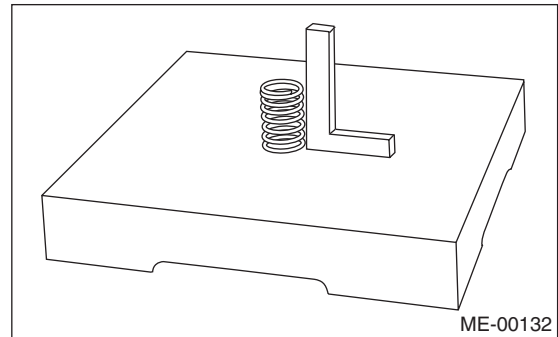
0.8 mm (0.031 in)



5. VALVE SPRING

1) Check the valve springs for damage, free length, and spring constant. Replace the valve spring if it is not within standard values presented in the table.
2) To measure the squareness of the valve spring, stand the spring on a surface plate and measure its deflection at the top of spring using a try square.

		Valve spring
Free length		47.32 mm (1.863 in)
Tension/spring height	Set	205 — 235 N (20.9 — 24.0 kgf, 46.1 — 52.8 lb) / 36.0 mm (1.417 in)
	Lift	426 — 490 N (43.4 — 50.0 kgf, 95.8 — 110 lb) / 26.50 mm (1.041 in)
Squareness		2.5°, 2.1 mm (0.083 in) or less



2) Put a small amount of grinding compound on the seat surface, and lap the valve and valve seat. Install a new valve oil seal after lapping.

NOTE:

It is possible to differentiate between the intake valve and the exhaust valve by their overall length.

Valve overall length:

Intake (A)

104.4 mm (4.110 in)

Exhaust (B)

104.65 mm (4.120 in)

Cylinder Head

MECHANICAL

6. INTAKE AND EXHAUST VALVE OIL SEAL

1) For the following, replace the oil seal with a new part.

See the procedure 2) and subsequent for replacement procedures.

- When the lip is damaged.
- When the spring is out of the specified position.
- When readjusting the surfaces of intake valve and valve sheet.
- When replacing the intake valve guide.

2) Place the cylinder head on ST1.

3) Using the ST2, press-fit the oil seal.

ST1 498267600 CYLINDER HEAD TABLE

ST2 498857100 VALVE OIL SEAL GUIDE

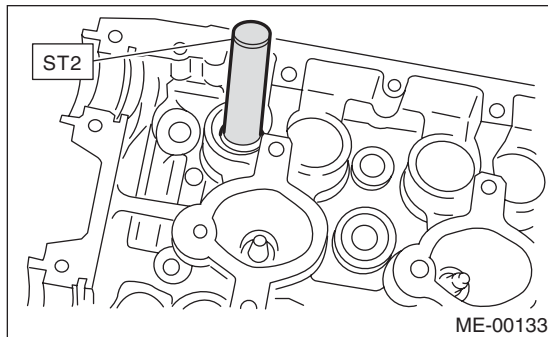
NOTE:

- Apply engine oil to oil seal before press-fitting.
- When press-fitting the oil seal, do not use a hammer or strike in.
- The intake valve oil seal and exhaust valve oil seal can be differentiated by colors.

Color of rubber part:

Intake [Gray]

Exhaust [Green]



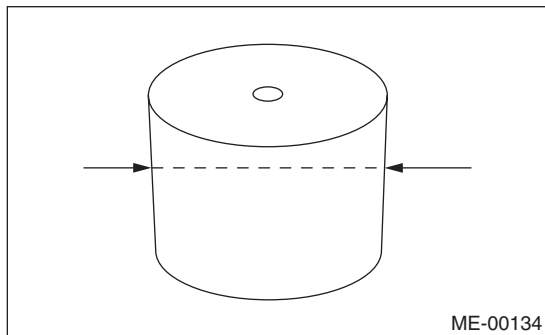
7. VALVE LIFTER

1) Check the valve lifter visually.

2) Measure the outer diameter of valve lifter.

Outer diameter:

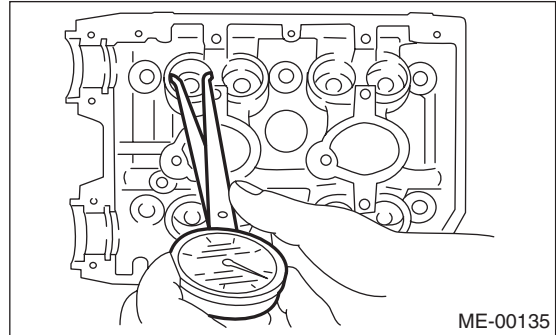
34.959 — 34.975 mm (1.3763 — 1.3770 in)



3) Measure the inner diameter of valve lifter mating surface on cylinder head.

Inner diameter:

34.994 — 35.016 mm (1.3777 — 1.3786 in)



NOTE:

If difference between outer diameter of valve lifter and inner diameter of valve lifter mating part is over the limit, replace the cylinder head.

Standard:

0.019 — 0.057 mm (0.0007 — 0.0022 in)

Service limit:

0.100 mm (0.0039 in)

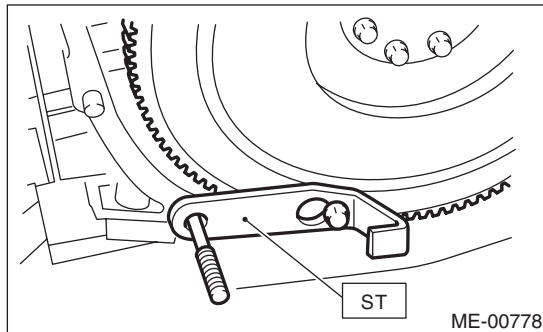
20. Cylinder Block

A: REMOVAL

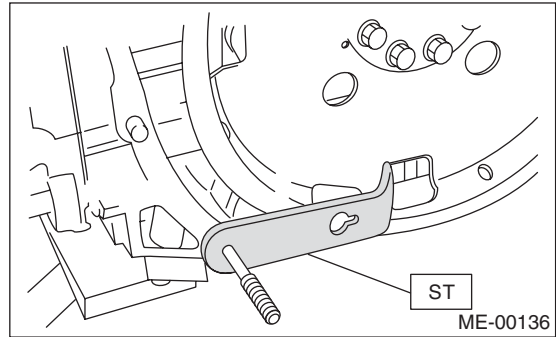
NOTE:

Before conducting this procedure, drain the engine oil completely.

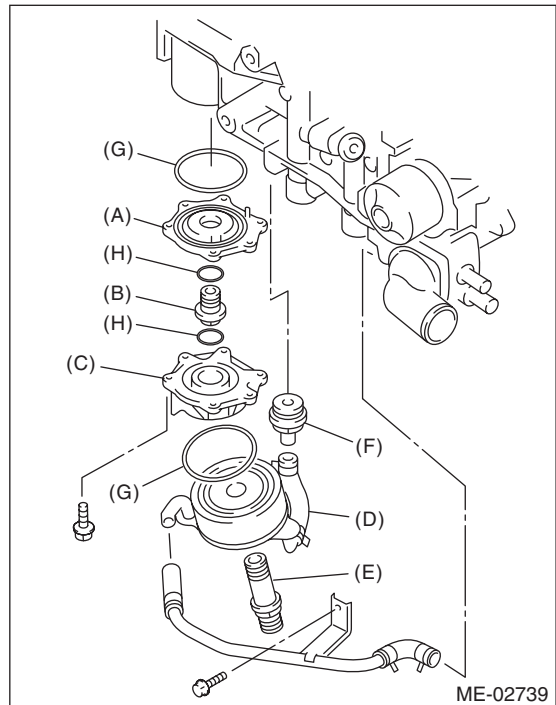
- 1) Remove the intake manifold.
<Ref. to FU(H4DOTC)-14, REMOVAL, Intake Manifold.>
 - 2) Remove the V-belts. <Ref. to ME(H4DOTC)-40, REMOVAL, V-belt.>
 - 3) Remove the crank pulley.
<Ref. to ME(H4DOTC)-42, REMOVAL, Crank Pulley.>
 - 4) Remove the timing belt cover.
<Ref. to ME(H4DOTC)-43, REMOVAL, Timing Belt Cover.>
 - 5) Remove the timing belt.
<Ref. to ME(H4DOTC)-44, REMOVAL, Timing Belt.>
 - 6) Remove the cam sprocket.
<Ref. to ME(H4DOTC)-52, REMOVAL, Cam Sprocket.>
 - 7) Remove the crank sprocket.
<Ref. to ME(H4DOTC)-53, REMOVAL, Crank Sprocket.>
 - 8) Remove the generator and A/C compressor with their brackets.
 - 9) Remove the cylinder head.
<Ref. to ME(H4DOTC)-60, REMOVAL, Cylinder Head.>
 - 10) Remove the clutch disc and cover. <Ref. to CL-12, REMOVAL, Clutch Disc and Cover.>
 - 11) Remove the flywheel. (MT model)
<Ref. to CL-14, REMOVAL, Flywheel.>
- ST 498497100 CRANKSHAFT STOPPER



- 12) Remove the drive plate. (AT model)
Lock the crankshaft using ST.



- 13) Remove the oil separator cover.
- 14) Remove the water by-pass pipe for heater.
- 15) Remove the oil filter. <Ref. to LU (H4SO)-24, REMOVAL, Engine Oil Filter.>
- 16) Remove the oil cooler.



- (A) Adapter (1)
- (B) Adapter connector
- (C) Adapter (2)
- (D) Oil cooler
- (E) Oil cooler connector
- (F) Plug
- (G) Gasket
- (H) O-ring

- 17) Remove the water pump.

Cylinder Block

MECHANICAL

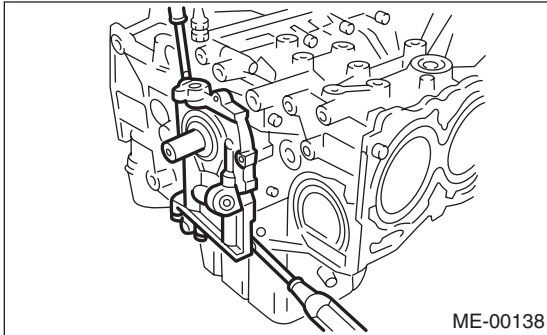
18) Remove the oil pump from cylinder block.

NOTE:

- When disassembling and checking the oil pump, loosen the relief valve plug before removing the oil pump.
- Remove the oil pump from cylinder block using a flat tip screwdriver.

CAUTION:

Be careful not to scratch the mating surface of cylinder block and oil pump.



19) Removal of oil pan:

- (1) Turn the cylinder block with #2 and #4 piston sides facing upward.
- (2) Remove the bolts which secure oil pan to cylinder block.
- (3) Insert an oil pan cutter blade between cylinder block-to-oil pan clearance and remove the oil pan.

CAUTION:

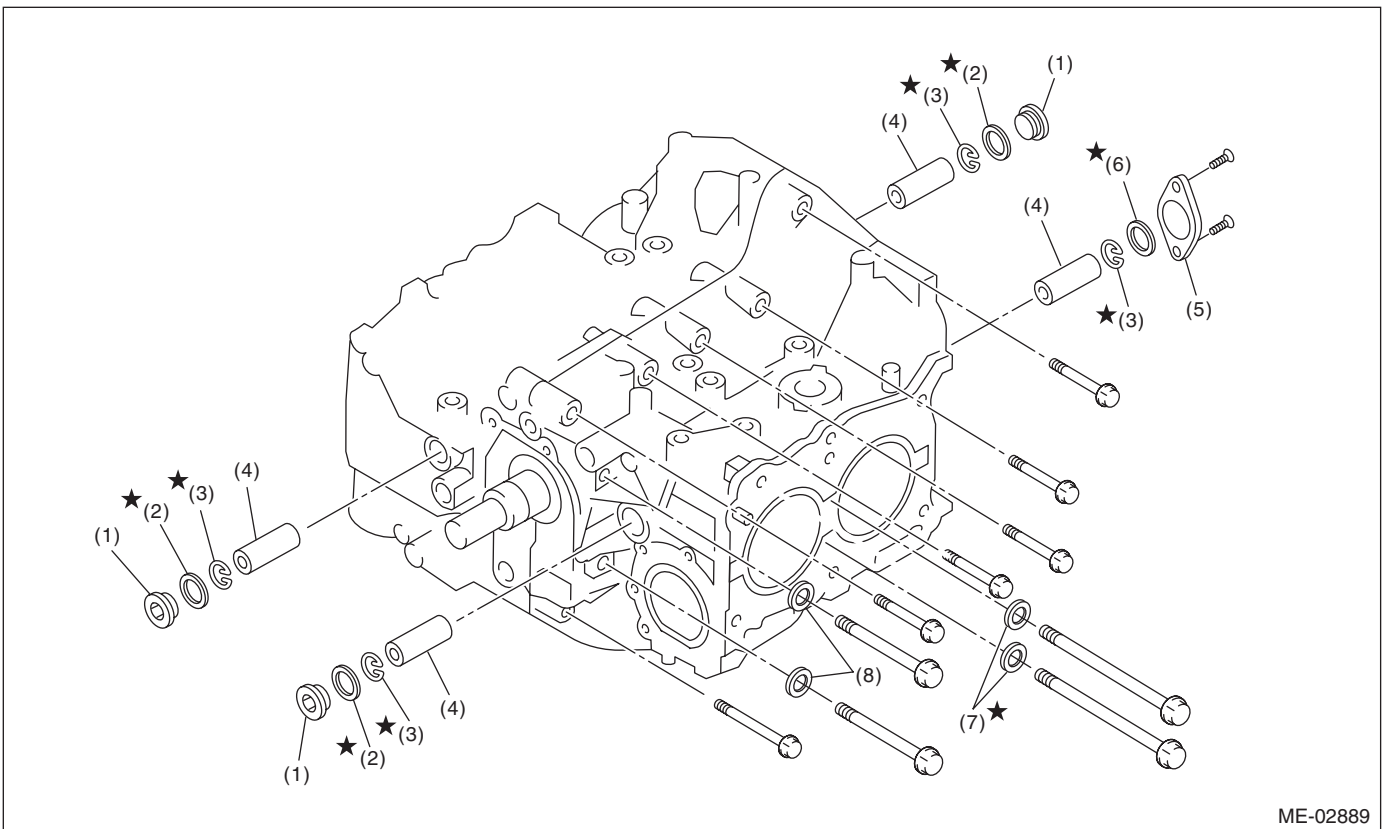
Do not use a screwdriver or similar tool in place of oil pan cutter.

20) Remove the oil strainer stay.

21) Remove the oil strainer.

22) Remove the baffle plate.

23) Remove the water pipe.



(1) Service hole plug

(2) Gasket

(3) Snap ring

(4) Piston pin

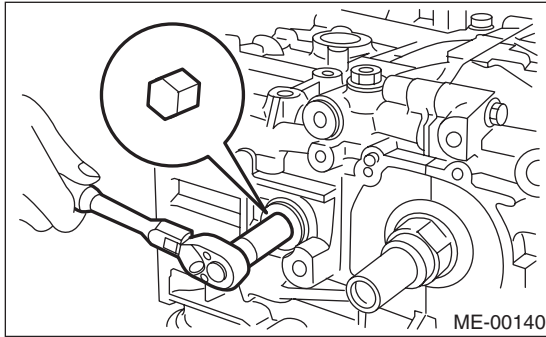
(5) Service hole cover

(6) O-ring

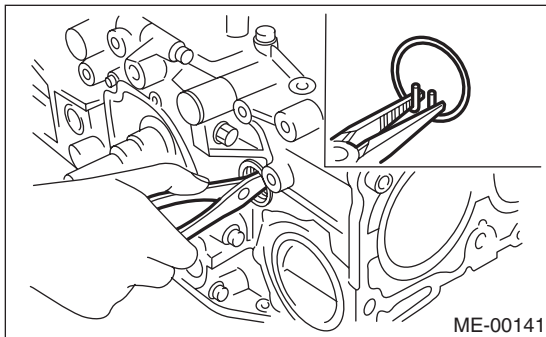
(7) Seal washer

(8) Washer

24) Remove the service hole cover and service hole plugs using a hexagon wrench [14 mm].



25) Rotate the crankshaft to bring #1 and #2 pistons to bottom dead center position, then remove the piston snap ring by inserted the radio pincers into the service hole of #1 and #2 cylinders.

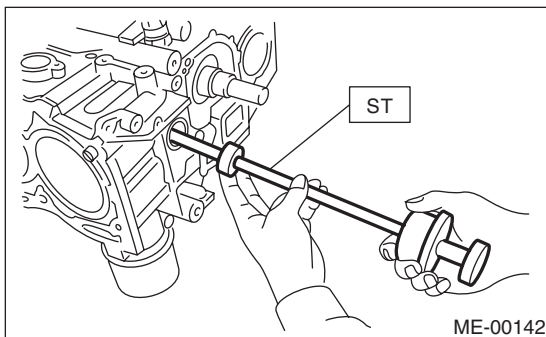


26) Draw out the piston pin from #1 and #2 pistons using ST.

ST 499097700 PISTON PIN REMOVER

NOTE:

Be careful not to confuse the original combination of piston, piston pin and cylinder.



27) Similarly remove the piston pins from #3 and #4 pistons.

28) Remove the bolts which connect cylinder block on the side of #1 and #3 cylinders.

29) Loosen the bolts which connect cylinder block on the side of #2 and #4 cylinders two or three turns.

30) Set up the cylinder block so that #2 and #4 cylinders are on the upper side, then remove bolts connecting the cylinder block.

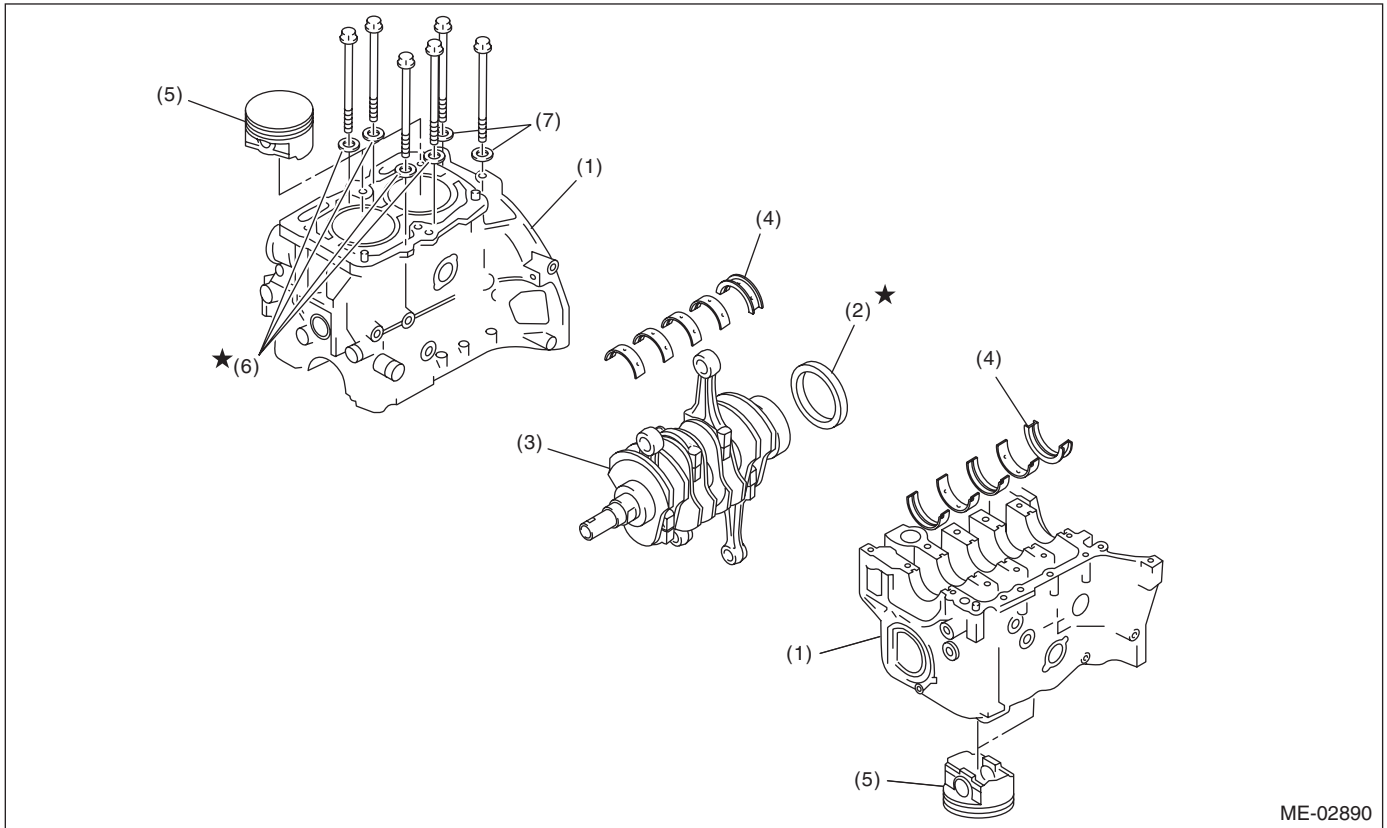
Cylinder Block

MECHANICAL

31) Separate the cylinder block (LH) and (RH).

NOTE:

When separating the cylinder block, do not allow the connecting rod to fall or damage the cylinder block.



ME-02890

- | | | |
|--------------------|------------------------|------------|
| (1) Cylinder block | (4) Crankshaft bearing | (7) Washer |
| (2) Rear oil seal | (5) Piston | |
| (3) Crankshaft | (6) Seal washer | |

32) Remove the rear oil seal.

33) Remove the crankshaft together with connecting rod.

34) Remove the crankshaft bearings from cylinder block using a hammer handle.

NOTE:

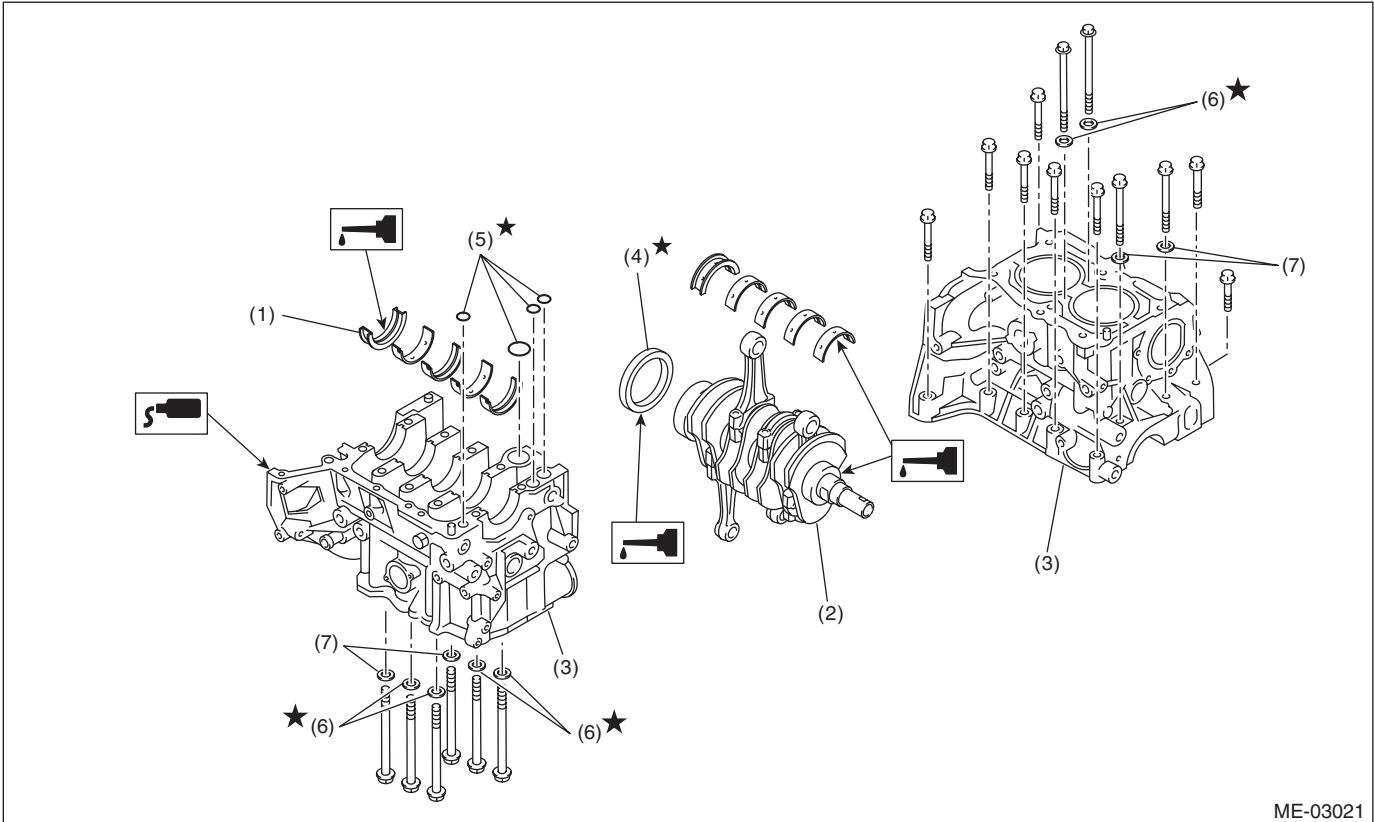
Do not confuse the combination of crankshaft bearings. Press the bearing at the end opposite to locking lip.

35) Remove each piston from cylinder block using wooden bar or hammer handle.

NOTE:

Be careful not to confuse the piston and cylinder combination.

B: INSTALLATION



ME-03021

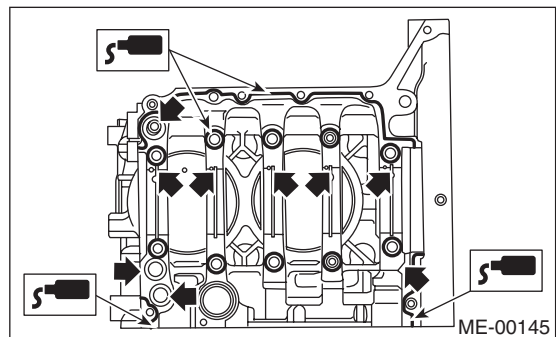
- | | | |
|------------------------|-------------------|------------|
| (1) Crankshaft bearing | (4) Rear oil seal | (7) Washer |
| (2) Crankshaft | (5) O-ring | |
| (3) Cylinder block | (6) Seal washer | |

1) Remove oil on the mating surface of cylinder block before installation. Apply a coat of engine oil to the bearing and crankshaft journal.
 2) Position the crankshaft and the O-ring on the #1 and #3 cylinder block.

3) Apply liquid gasket to the mating surface of #1 and #3 cylinder blocks, and position #2 and #4 cylinder blocks.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent

NOTE:
 Do not allow liquid gasket to jut into O-ring grooves, oil passages, bearing grooves, etc.



ME-00145

4) Apply a coat of engine oil to the washer and bolt thread.

NOTE:
 Use new seal washer.

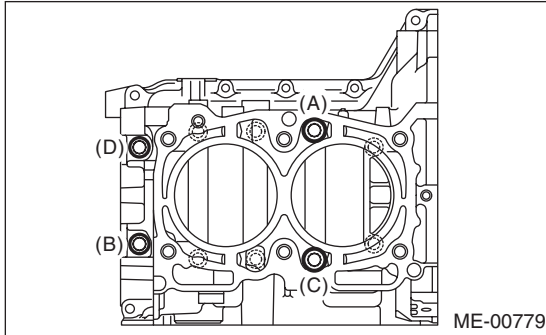
Cylinder Block

MECHANICAL

5) Tighten the 10 mm cylinder block connecting bolts on the LH side (A — D) in alphabetical order.

Tightening torque:

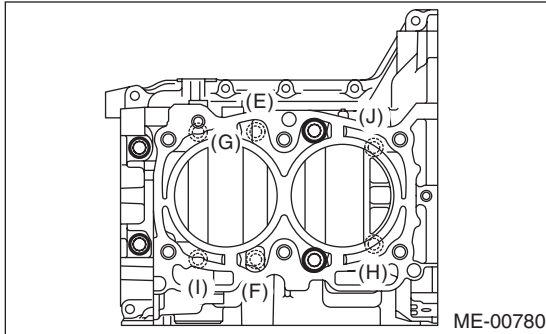
10 N·m (1.0 kgf·m, 7.2 ft·lb)



6) Tighten the 10 mm cylinder block connecting bolts on the RH side (E — J) in alphabetical order.

Tightening torque:

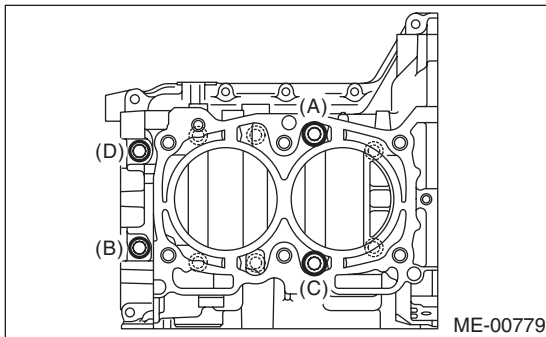
10 N·m (1.0 kgf·m, 7.2 ft·lb)



7) Further tighten the cylinder block connecting bolts on the LH side (A — D) in alphabetical sequence.

Tightening torque:

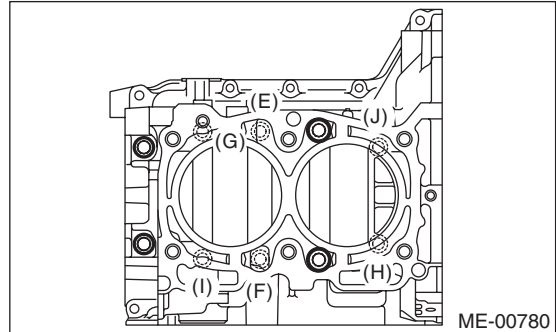
18 N·m (1.8 kgf·m, 13.3 ft·lb)



8) Further tighten the cylinder block connecting bolts on the RH side (E — J) in alphabetical sequence.

Tightening torque:

18 N·m (1.8 kgf·m, 13.3 ft·lb)



9) Further tighten the cylinder block connecting bolts on the LH side (A — D) in alphabetical sequence.

- (A), (C): Angle tightening

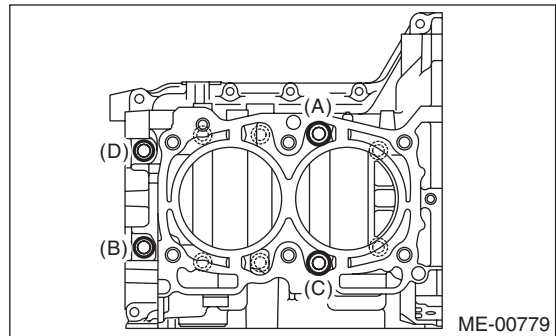
Tightening angle:

90°

- (B), (D): Torque tightening

Tightening torque:

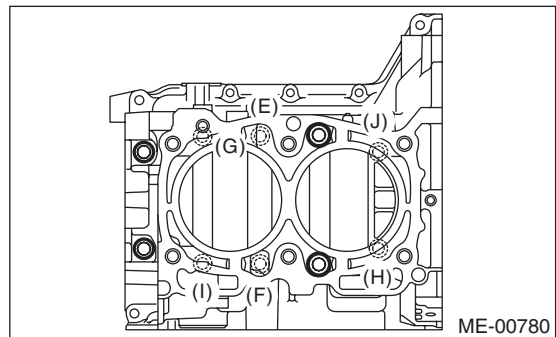
40 N·m (4.1 kgf·m, 29.6 ft·lb)



10) Tighten the cylinder block connecting bolts on the RH side (E — J) in alphabetical sequence.

Tightening angle:

90°

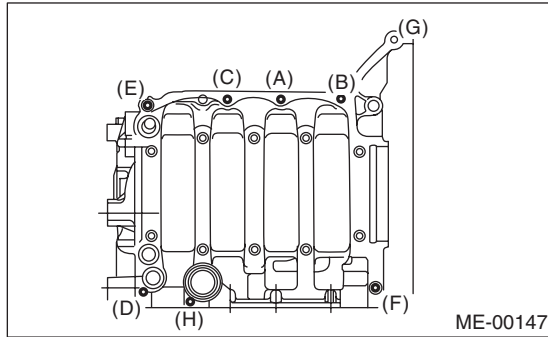


11) Tighten the 8 mm and 6 mm cylinder block connecting bolts on LH side (A — H) in alphabetical sequence.

Tightening torque:

(A) — (G): 25 N·m (2.5 kgf·m, 18.1 ft·lb)

(H): 6.4 N·m (0.65 kgf·m, 4.7 ft·lb)



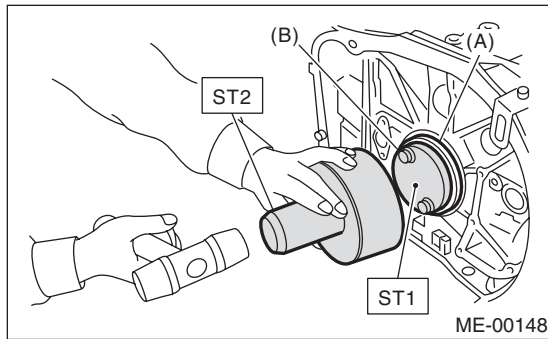
12) Apply a coat of engine oil to the oil seal periphery, then install the rear oil seal using ST1 and ST2.

NOTE:

Use a new rear oil seal.

ST1 499597100 CRANKSHAFT OIL SEAL GUIDE

ST2 499587200 CRANKSHAFT OIL SEAL INSTALLER

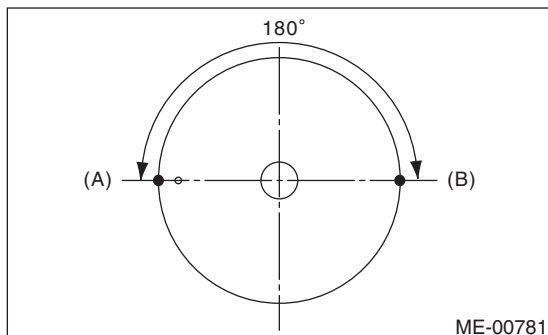


(A) Rear oil seal

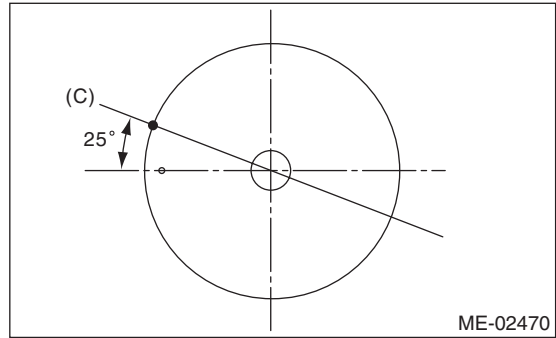
(B) Flywheel attaching bolt

13) Position the top ring gap at (A) or (B) in the figure.

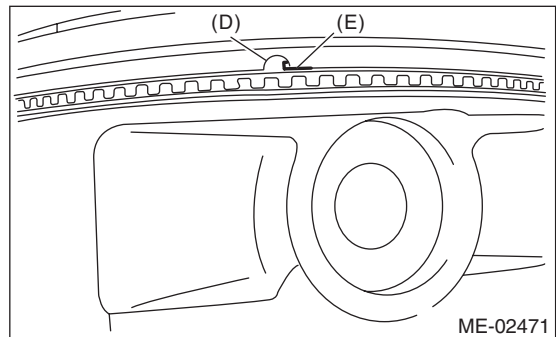
14) Position the second ring gap at 180° on the reverse side the top ring gap.



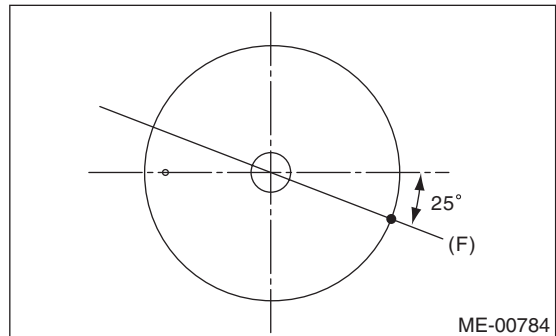
15) Position the upper rail gap at (C) in the figure.



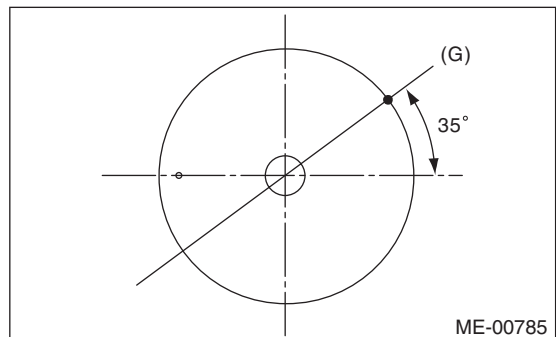
16) Align the upper rail spin stopper (E) to the side hole (D) on the piston.



17) Position the expander gap at (F) in the figure.



18) Position the lower rail gap at (G) in the figure.



NOTE:

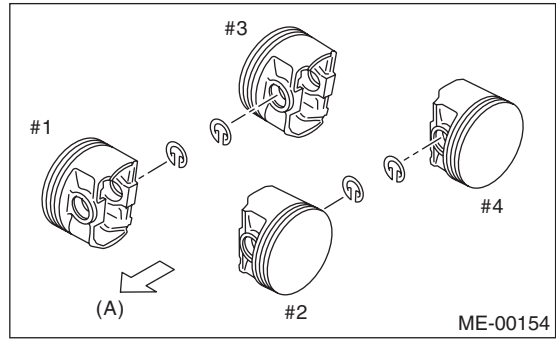
- Make sure the ring gaps do not face the same direction.
- Make sure ring gaps are not within the piston skirt area.

Cylinder Block

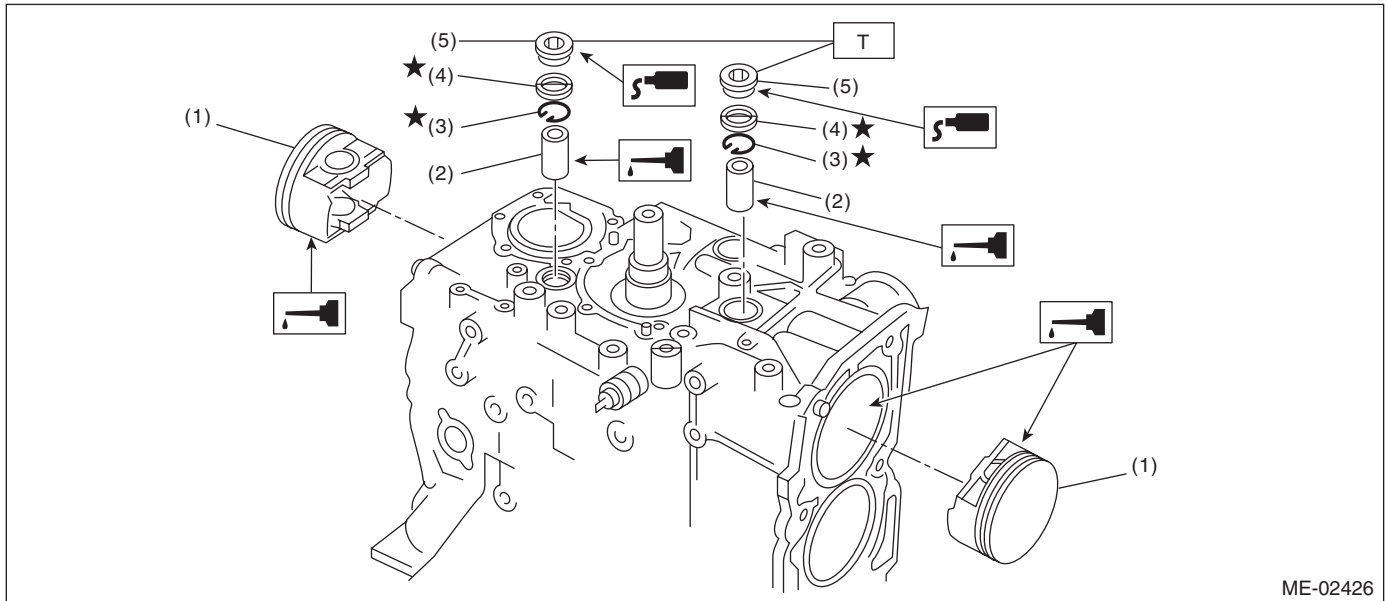
MECHANICAL

19) Install the snap ring.
Install the snap rings in the piston holes located opposite to the service holes in cylinder block before positioning pistons to the cylinder.

NOTE:
Use new snap rings.



(A) Front side



- | | |
|----------------|-----------------------|
| (1) Piston | (4) Gasket |
| (2) Piston pin | (5) Service hole plug |
| (3) Snap ring | |

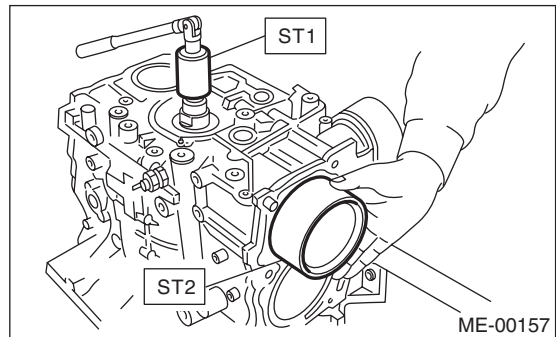
Tightening torque: N·m (kgf·m, ft·lb)
T: 70 (7.1, 51.4)

20) Installing piston:
(1) Place the cylinder block to face the #1 and #2 cylinder side upward.
(2) Using the ST1, turn the crankshaft so that #1 and #2 connecting rods are set at bottom dead center.

ST1 499987500 CRANKSHAFT SOCKET

(3) Apply a coat of engine oil to the pistons and cylinders and insert pistons in their cylinders using ST2.

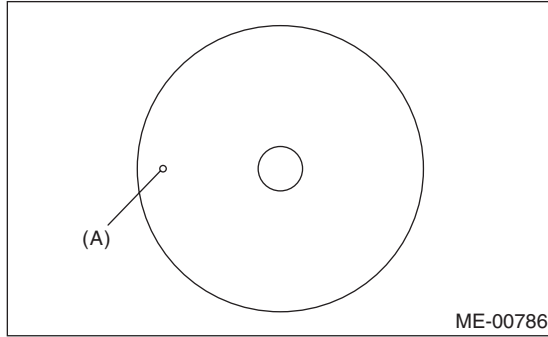
ST2 498747300 PISTON GUIDE



Cylinder Block

MECHANICAL

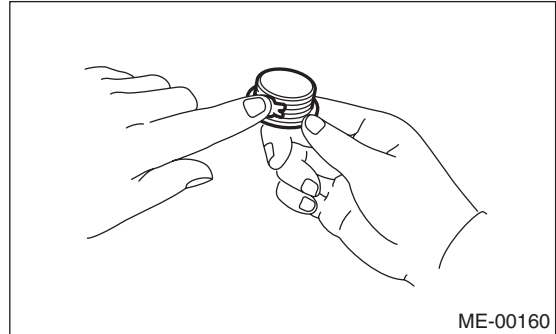
NOTE:
Face the piston front mark towards the front of the engine.



(A) Front mark

(5) Apply liquid gasket around the service hole plug.

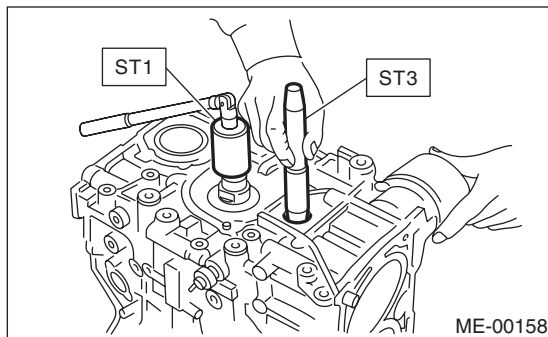
Liquid gasket:
THREE BOND 1105 (Part No. 004403010) or equivalent



21) Installing piston pin:

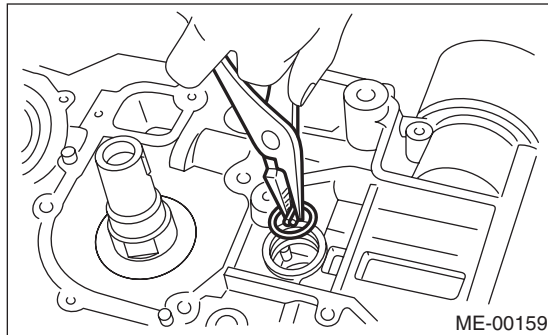
- (1) Apply a coat of engine oil to ST3.
- (2) Insert ST3 into the service hole to align the piston pin hole and the connecting rod small end.

ST3 499017100 PISTON PIN GUIDE



- (3) Apply a coat of engine oil to piston pin, and insert the piston pin into piston and connecting rod through service hole.
- (4) Using radio pincers, install the snap ring.

NOTE:
Use new snap rings.



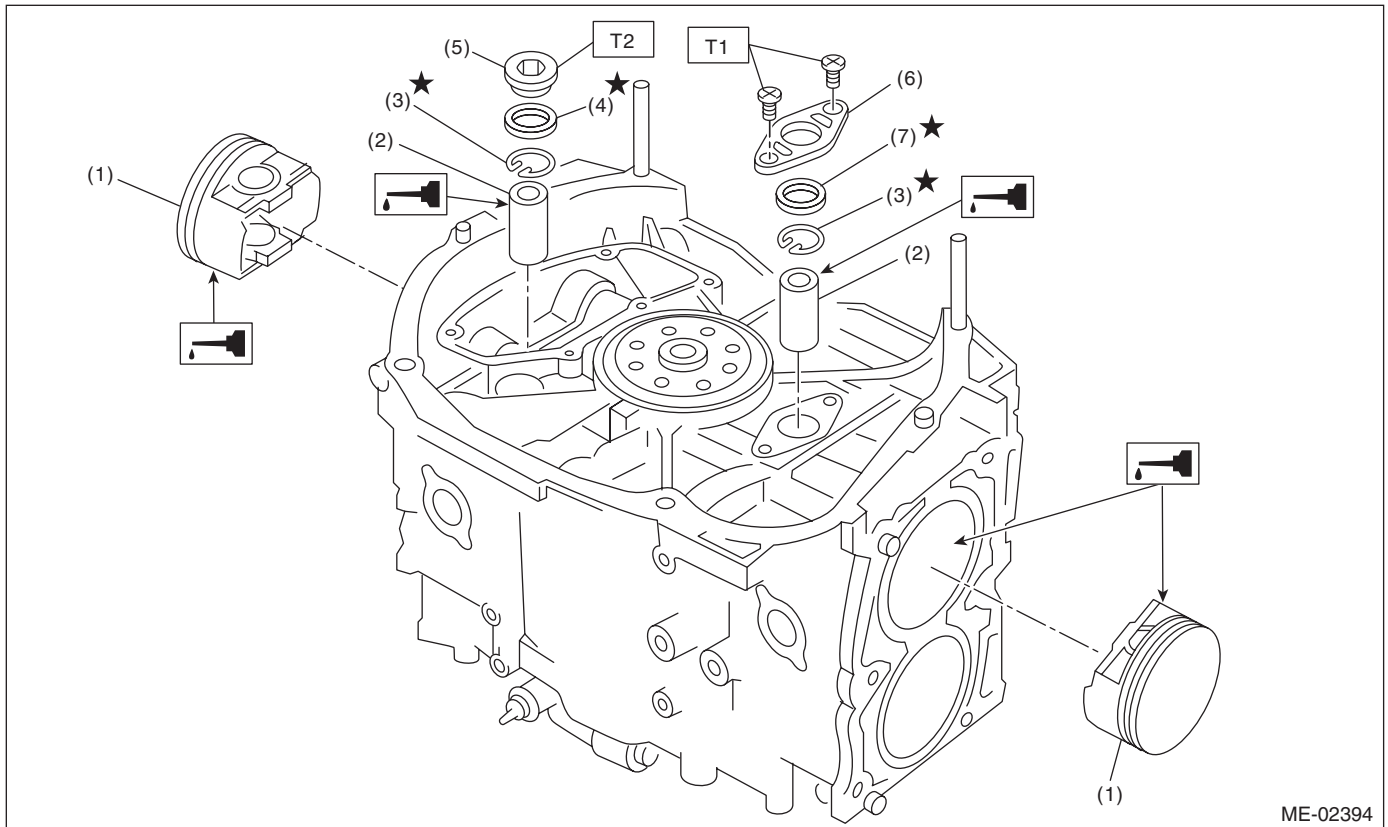
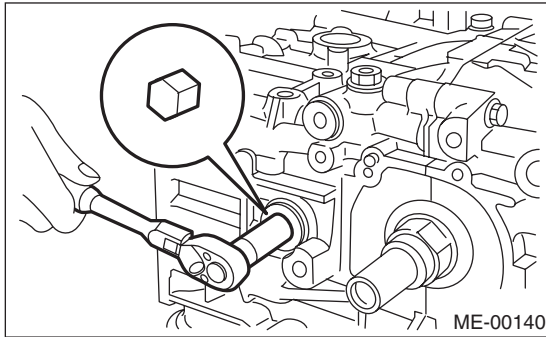
Cylinder Block

MECHANICAL

(6) Install the service hole plug and gasket.

NOTE:

Use a new gasket.



- | | |
|----------------|------------------------|
| (1) Piston | (5) Service hole plug |
| (2) Piston pin | (6) Service hole cover |
| (3) Snap ring | (7) O-ring |
| (4) Gasket | |

Tightening torque: N·m (kgf-m, ft-lb)

T1: 6.4 (0.65, 4.7)

T2: 70 (7.1, 51.4)

(7) Place the cylinder block to face the #3 and #4 cylinder side upward. Following the same procedures as used for #1 and #2 cylinders, install the pistons and piston pins.

22) Install the water pipe.

23) Install the baffle plate.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

24) Install the oil strainer and O-ring.

Tightening torque:

10 N·m (1.0 kgf-m, 7 ft-lb)

25) Install the oil strainer stay.

NOTE:

Tighten the oil strainer stay together with the baffle plate.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

Cylinder Block

MECHANICAL

26) Apply liquid gasket to the mating surfaces, and install the oil pan.

NOTE:

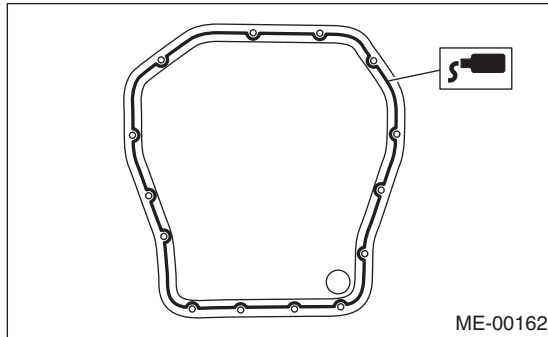
Install within 5 min. after applying liquid gasket.

Liquid gasket:

THREE BOND 1207C (Part No. 004403012) or equivalent

Tightening torque:

5 N·m (0.5 kgf·m, 3.6 ft-lb)



27) Apply liquid gasket to the mating surfaces and the threaded portion of bolt (A) shown in the figure (when reusing the bolt), and then install the oil separator cover.

NOTE:

Install within 5 min. after applying liquid gasket.

Liquid gasket:

Mating surface

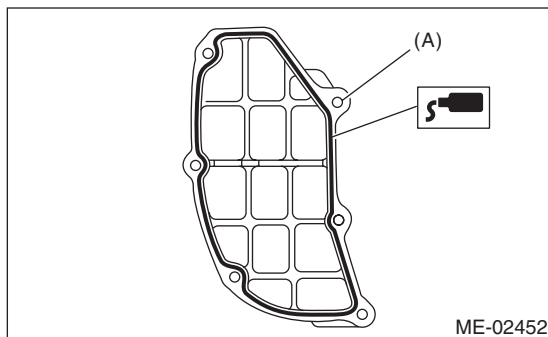
THREE BOND 1217G or equivalent

Bolt (A) thread (when reusing the bolt)

THREE BOND 1324 (Part No. 004403042) or equivalent

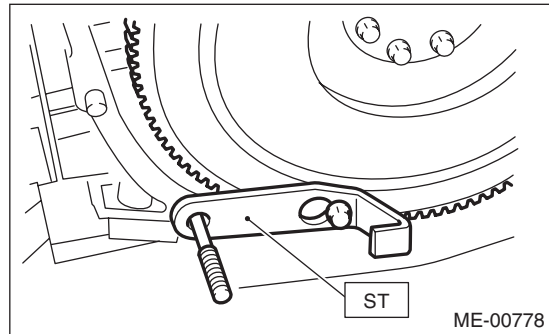
Tightening torque:

6.4 N·m (0.65 kgf·m, 4.7 ft-lb)



28) Install the flywheel. (MT model) <Ref. to CL-14, INSTALLATION, Flywheel.>

ST 498497100 CRANKSHAFT STOPPER



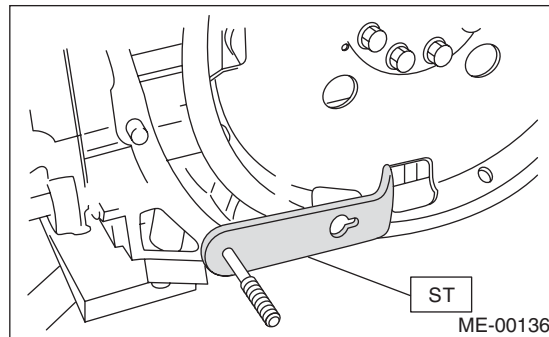
29) Install the drive plate. (AT model)

To lock the crankshaft, use ST.

ST 498497100 CRANKSHAFT STOPPER

Tightening torque:

72 N·m (7.3 kgf·m, 53.1 ft-lb)



30) Install the clutch disc and cover. <Ref. to CL-12, INSTALLATION, Clutch Disc and Cover.>

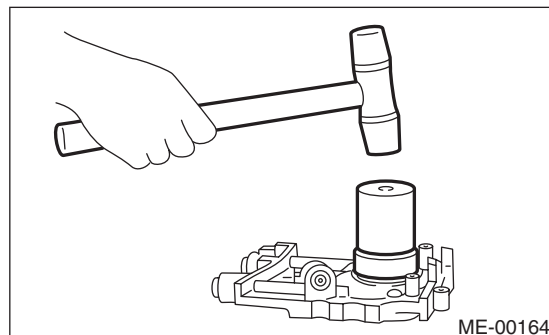
31) Installation of oil pump:

(1) Install a new oil seal using ST.

ST 499587100 OIL SEAL INSTALLER

NOTE:

Use a new front oil seal.

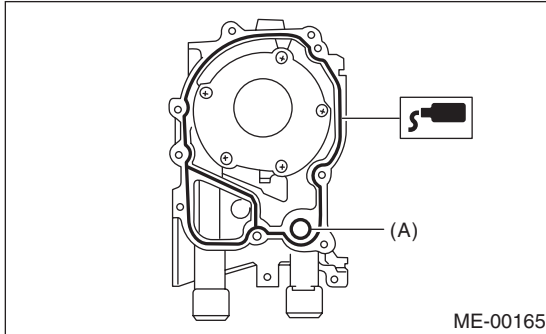


Cylinder Block

MECHANICAL

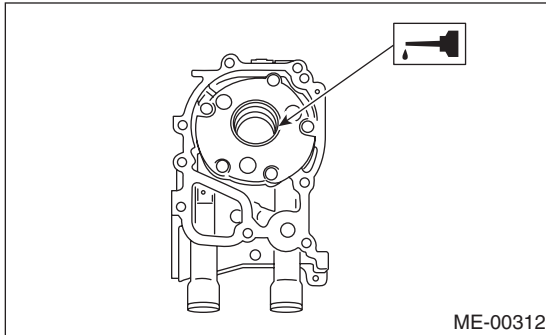
(2) Apply liquid gasket to the matching surface of oil pump.

Liquid gasket:
THREE BOND 1215 (Part No. 004403007) or equivalent



(A) O-ring

(3) Apply a coat of engine oil to the inside of oil seal.



(4) Install the oil pump to cylinder block. Be careful not to damage the oil seal during installation.

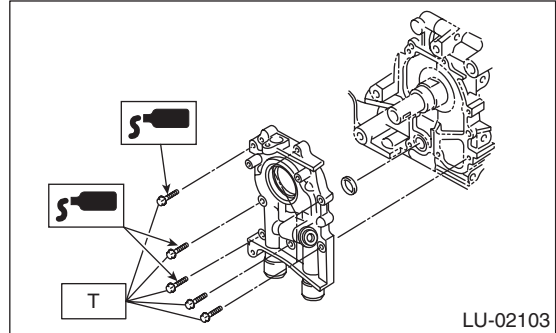
NOTE:

- Make sure the oil seal lip is not folded.
- Align the flat surface of oil pump's inner rotor with crankshaft before installation.
- Use new O-rings and seals when installing the oil pump.

(5) When reusing three bolts shown in the figure, apply liquid gasket to the bolt threads.

Liquid gasket:
THREE BOND 1324 (Part No. 004403042) or equivalent

Tightening torque:
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

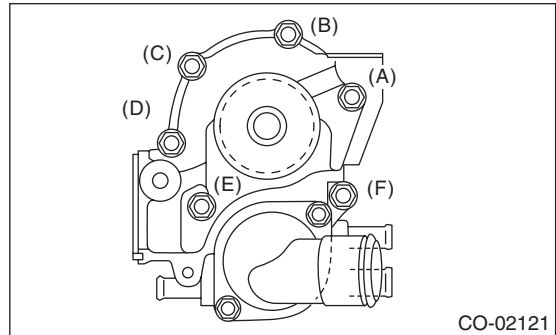


32) Install the service hole plug and gasket.

Tightening torque:
First: 12 N·m (1.2 kgf-m, 8.7 ft-lb)
Second: 12 N·m (1.2 kgf-m, 8.7 ft-lb)

NOTE:

- When installing the water pump, tighten bolts in two stages in alphabetical sequence as shown in the figure.
- Use a new gasket.



33) Install the water by-pass pipe for heater.

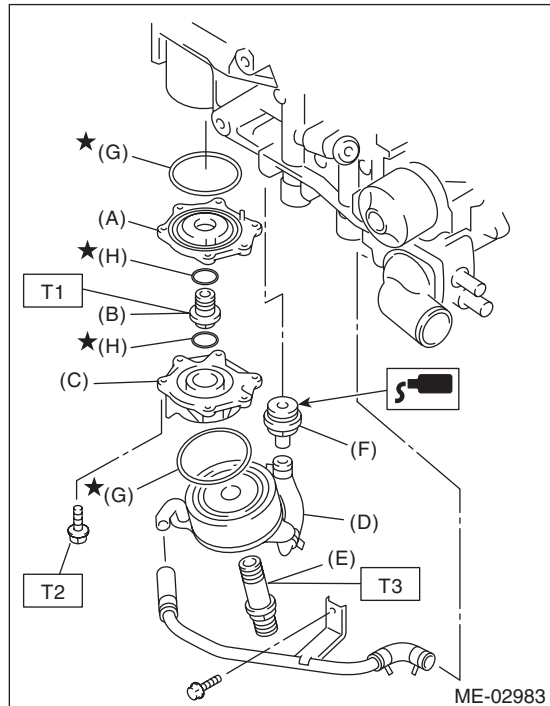
34) Install the oil cooler.

Tightening torque:

T1: 45 N·m (4.6 kgf-m, 33 ft-lb)

T2: 6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

T3: 54 N·m (5.3 kgf-m, 39 ft-lb)



- (A) Adapter (1)
- (B) Adapter connector
- (C) Adapter (2)
- (D) Oil cooler
- (E) Oil cooler connector
- (F) Plug
- (G) Gasket
- (H) O-ring

35) Install the oil filter. <Ref. to LU (H4SO)-24, INSTALLATION, Engine Oil Filter.>

36) Install the water by-pass pipe between oil cooler and water pump.

37) Install the water pipe.

NOTE:

Use new O-rings.

38) Install the cylinder head.

<Ref. to ME(H4DOTC)-60, INSTALLATION, Cylinder Head.>

39) Install the oil level gauge guide and tighten the attaching bolt (left side).

40) Install the rocker cover and rocker cover gasket.

NOTE:

Use a new gasket.

41) Install the crank sprocket.

<Ref. to ME(H4DOTC)-53, INSTALLATION, Crank Sprocket.>

42) Install the cam sprocket.

<Ref. to ME(H4DOTC)-52, INSTALLATION, Cam Sprocket.>

43) Install the timing belt.

<Ref. to ME(H4DOTC)-46, INSTALLATION, Timing Belt.>

44) Install the timing belt cover.

<Ref. to ME(H4DOTC)-43, INSTALLATION, Timing Belt Cover.>

45) Install the crank pulley.

<Ref. to ME(H4DOTC)-42, INSTALLATION, Crank Pulley.>

46) Install the intake manifold.

<Ref. to FU(H4DOTC)-17, INSTALLATION, Intake Manifold.>

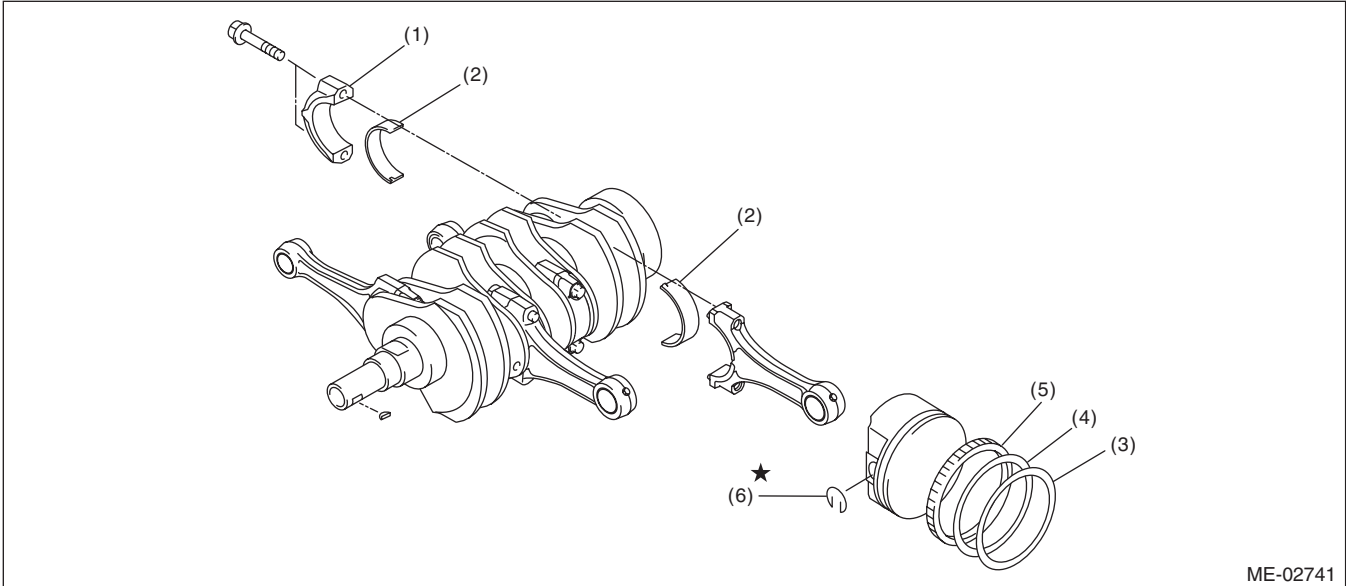
47) Install the generator and A/C compressor brackets on cylinder head.

48) Install the V-belts. <Ref. to ME(H4DOTC)-40, INSTALLATION, V-belt.>

Cylinder Block

MECHANICAL

C: DISASSEMBLY



- | | | |
|----------------------------|-----------------|---------------|
| (1) Connecting rod cap | (3) Top ring | (5) Oil ring |
| (2) Connecting rod bearing | (4) Second ring | (6) Snap ring |

- 1) Remove the connecting rod cap.
- 2) Remove the connecting rod bearing.

NOTE:

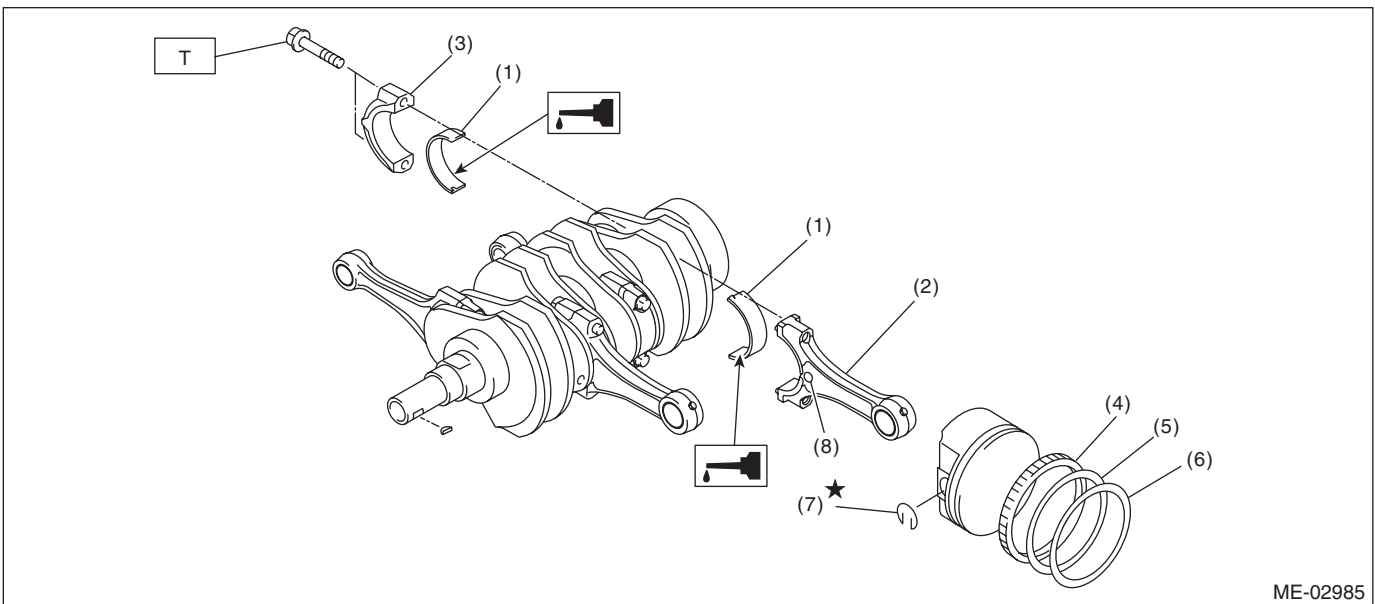
Arrange the removed connecting rod, connecting rod cap and bearing in order to prevent confusion.
 3) Remove the piston rings using piston ring expander.

- 4) Remove the oil ring by hand.

NOTE:

Arrange the removed piston rings in proper order to prevent confusion.
 5) Remove the snap ring.

D: ASSEMBLY



- | | |
|----------------------------|-----------------|
| (1) Connecting rod bearing | (5) Second ring |
| (2) Connecting rod | (6) Top ring |
| (3) Connecting rod cap | (7) Snap ring |
| (4) Oil ring | (8) Side mark |

Tightening torque: N·m (kgf·m, ft·lb)

T: 52 (5.3, 38.4)

- 1) Apply oil to the surface of the connecting rod bearings, and install the connecting rod bearings on connecting rods and connecting rod caps.
- 2) Install the connecting rod on crankshaft.
- 3) Position each connecting rod with the marking side facing forward.
- 4) Tighten the connecting rod cap with the connecting rod bolt. Make sure the arrow on connecting rod cap faces the front during installation.

Tightening torque:

52 N·m (5.3 kgf·m, 38.4 ft·lb)

NOTE:

- Each connecting rod has its own mating cap. Make sure that they are assembled correctly by checking their matching number.
 - When tightening the connecting rod nuts, apply oil on the threads.
- 5) Install the oil ring upper rail, expander and lower rail by hand.
 - 6) Install the second ring and top ring using piston ring expander.

E: INSPECTION

1. CYLINDER BLOCK

- 1) Visually check for cracks and damage. Use liquid penetrant tester on the important sections to check for fissures.
- 2) Check the oil passages for clogging.
- 3) Inspect the crankcase surface that mates with cylinder head for warping by using a straight edge, and correct by grinding if necessary.

Warping limit:

0.025 mm (0.00098 in)

Grinding limit:

0.1 mm (0.004 in)

Standard height of cylinder block:

201.0 mm (7.91 in)

Cylinder Block

MECHANICAL

2. CYLINDER AND PISTON

1) The cylinder bore size is stamped on the cylinder block front upper surface.

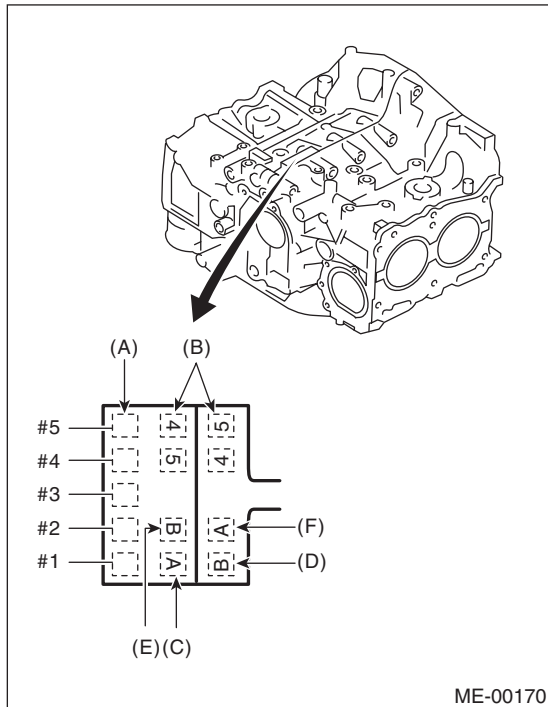
NOTE:

- Measurement should be performed at a temperature of 20°C (68°F).
- Standard sized pistons are classified into two grades, "A" and "B". These grades should be used as guide lines in selecting a standard piston.

Standard diameter:

A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)

B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)



- (A) Main journal size mark
- (B) Cylinder block (RH) — (LH) combination mark
- (C) #1 cylinder bore size mark
- (D) #2 cylinder bore size mark
- (E) #3 cylinder bore size mark
- (F) #4 cylinder bore size mark

2) How to measure the inner diameter of each cylinder:

Measure the inner diameter of each cylinder in both the thrust and piston pin directions at the heights as shown in the figure, using a cylinder bore gauge.

NOTE:

Measurement should be performed at a temperature of 20°C (68°F).

Taper:

Standard:

0.015 mm (0.0006 in)

Service limit:

0.050 mm (0.0020 in)

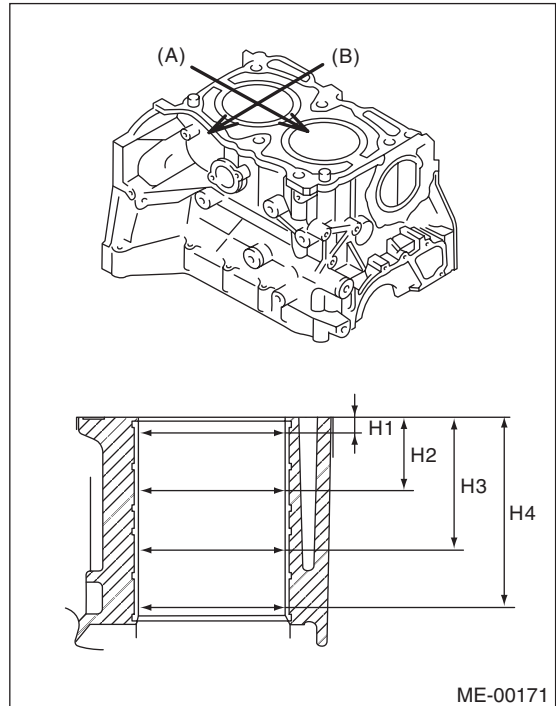
Out-of-roundness:

Standard:

0.010 mm (0.0004 in)

Service limit:

0.050 mm (0.0020 in)



- (A) Piston pin direction
- (B) Thrust direction
- H1: 10 mm (0.39 in)
- H2: 45 mm (1.77 in)
- H3: 80 mm (3.15 in)
- H4: 115 mm (4.53 in)

3) When the piston is to be replaced due to general or cylinder wear, determine a suitable sized piston by measuring the piston clearance.

4) How to measure the outer diameter of each piston:

Measure the outer diameter of each piston at the height as shown in the figure. (Thrust direction)

NOTE:

Measurement should be performed at a temperature of 20°C (68°F).

Piston grade point H:

38.2 mm (1.50 in)

Piston outer diameter:

Standard:

A: 99.505 — 99.515 mm (3.9175 — 3.9179 in)

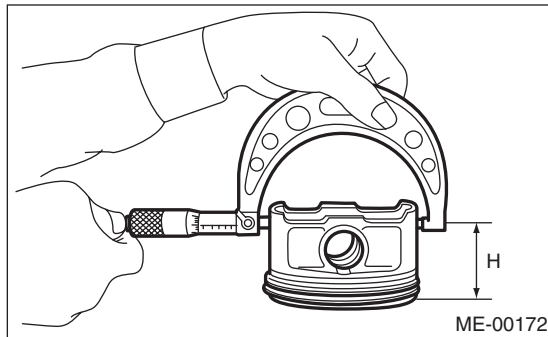
B: 99.495 — 99.505 mm (3.9171 — 3.9175 in)

0.25 mm (0.0098 in) oversize:

99.745 — 99.765 mm (3.9270 — 3.9278 in)

0.50 mm (0.0197 in) oversize:

99.995 — 100.015 mm (3.9368 — 3.9376 in)



5) Calculate the clearance between cylinder and piston.

NOTE:

Measurement should be performed at a temperature of 20°C (68°F).

Cylinder to piston clearance at 20°C (68°F):

Standard:

-0.010 — 0.010 mm (-0.0004 — 0.0004 in)

Service limit:

0.030 mm (0.0012 in)

6) Boring and honing:

(1) If the value of taper, out-of-roundness, or cylinder-to-piston clearance measured exceeds the specified limit or if there is any damage on the cylinder wall, rebore it to use an oversize piston.

CAUTION:

- When any of the cylinders needs reboring, all other cylinders must be bored at the same time, and replace to oversize pistons.
- Do not perform boring on one cylinder only. Nor replace an oversize piston for one cylinder only.

(2) If the cylinder inner diameter exceeds the limit after boring and honing, replace the cylinder block.

NOTE:

Immediately after reboring, the cylinder diameter may differ from its real diameter due to temperature rise. Thus, pay attention to this when measuring the cylinder diameter.

Cylinder inner boring limit (diameter):

100.005 mm (3.9372 in)

3. PISTON AND PISTON PIN

- 1) Check the piston and piston pin for breaks, cracks or wear. Replace if faulty.
- 2) Check the piston ring groove for wear and damage. Replace if faulty.
- 3) Measure the piston-to-cylinder clearance at each cylinder. <Ref. to ME(H4DOTC)-82, CYLINDER AND PISTON, INSPECTION, Cylinder Block.> If any of the clearances exceeds the limit, replace the piston or bore the cylinder to use an oversize piston.
- 4) Make sure that the piston pin can be inserted into the piston pin hole with a thumb at 20°C (68°F). Replace if faulty.

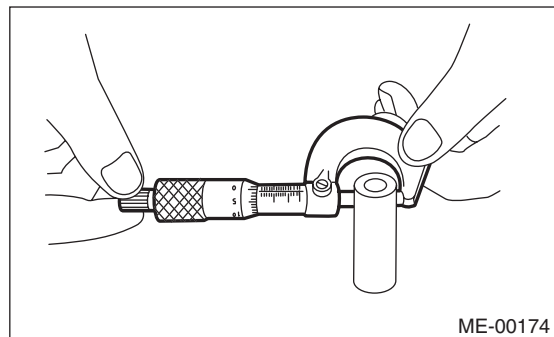
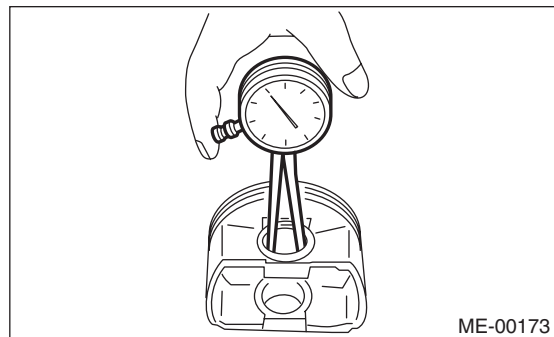
Standard clearance between piston pin and hole in piston:

Standard:

0.004 — 0.008 mm (0.0002 — 0.0003 in)

Service limit:

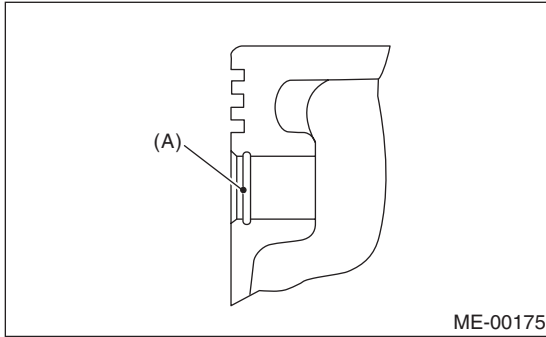
0.020 mm (0.0008 in)



Cylinder Block

MECHANICAL

5) Check the snap ring installation groove (A) on the piston for burr. If necessary, remove burr from the groove so that the piston pin can lightly move.



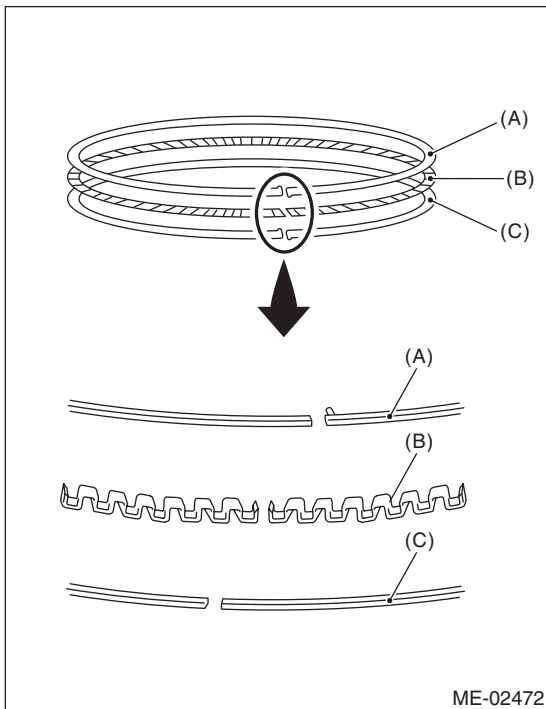
6) Check the piston pin snap ring for distortion, cracks and wear.

4. PISTON RING

1) If the piston ring is broken, damaged or worn, or if its tension is insufficient, or when the piston is replaced, replace the piston ring with a new part of the same size as piston.

NOTE:

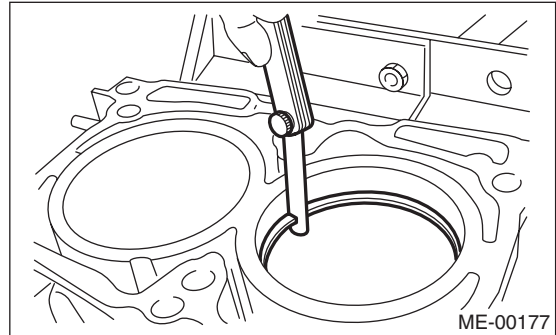
- Marks that shows the installing direction are shown on the end of top and second rings. Face these marks upward when installing the rings to piston.
- Oil ring consists of the upper rail, expander and lower rail. When installing the oil ring on piston, be careful of each rails direction.



- (A) Upper rail
- (B) Expander
- (C) Lower rail

2) Squarely place the piston ring and oil ring in cylinder using the piston, and measure the piston ring gap with a thickness gauge.

		Unit: mm (in)	
		Standard	Limit
Piston ring gap	Top ring	0.20 — 0.25 (0.0079 — 0.0098)	1.0 (0.039)
	Second ring	0.37 — 0.52 (0.015 — 0.020)	1.0 (0.039)
	Oil ring rail	0.20 — 0.50 (0.0079 — 0.0197)	1.5 (0.059)

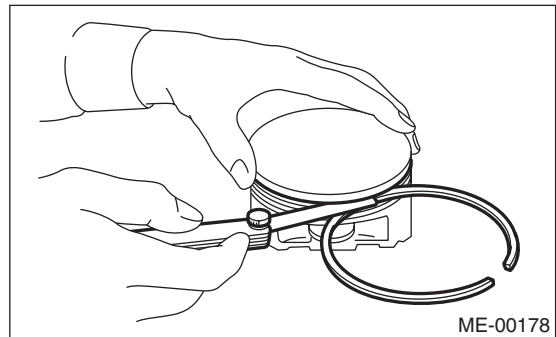


3) Fit the piston ring straight into the piston ring groove, then measure the clearance between piston ring and piston ring groove with a thickness gauge.

NOTE:

Before measuring the clearance, clean the piston ring groove and piston ring.

		Unit: mm (in)	
		Standard	Limit
Clearance between piston ring and piston ring groove	Top ring	0.040 — 0.080 (0.0016 — 0.0031)	0.15 (0.0059)
	Second ring	0.030 — 0.070 (0.0012 — 0.0028)	0.15 (0.0059)

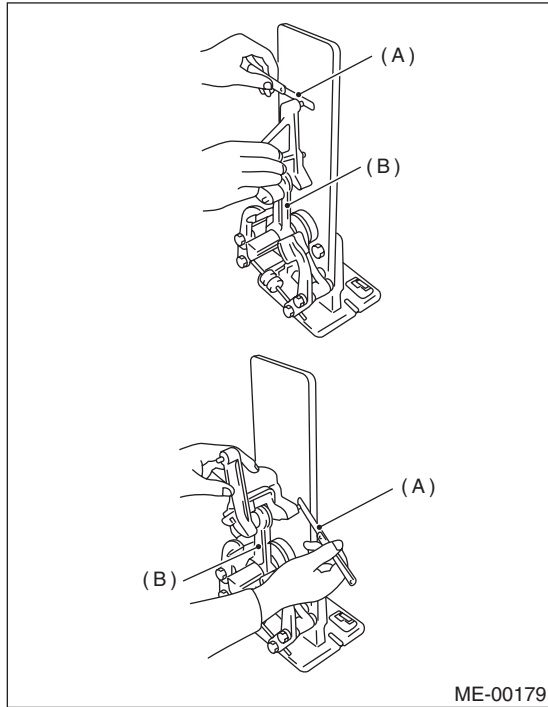


5. CONNECTING ROD

- 1) Replace the connecting rod, if the large or small end thrust surface is damaged.
- 2) Check for bend or twist using a connecting rod aligner. Replace the connecting rod if the bend or twist exceeds the limit.

Limit of bend or twist per 100 mm (3.94 in) in length:

0.10 mm (0.0039 in)



- (A) Thickness gauge
- (B) Connecting rod

- 3) Install the connecting rod fitted with bearing to the crankshaft and measure the side clearance (thrust clearance) using a thickness gauge. Replace the connecting rod if the side clearance exceeds the specified limit.

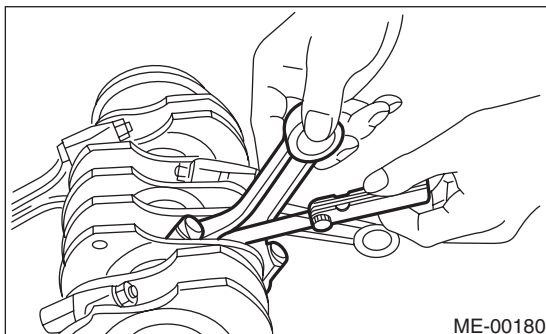
Connecting rod side clearance:

Standard:

0.070 — 0.330 mm (0.0028 — 0.0130 in)

Service limit:

0.4 mm (0.016 in)



- 4) Inspect the connecting rod bearing for scar, peeling, seizure, melting, wear, etc.

- 5) Measure the oil clearance on each connecting rod bearing using plastigauge. If any oil clearance is not within specification, replace the defective bearing with a new part of standard size or under-size as necessary. (See the table below.)

Connecting rod oil clearance:

Standard:

0.017 — 0.045 mm (0.0007 — 0.0018 in)

Service limit:

0.05 mm (0.0020 in)

Unit: mm (in)		
Bearing	Bearing size (Thickness at center)	Outer diameter of crank pin
Standard	1.490 — 1.502 (0.0587 — 0.0591)	51.984 — 52.000 (2.0466 — 2.0472)
0.03 (0.0012) undersize	1.504 — 1.512 (0.0592 — 0.0595)	51.954 — 51.970 (2.0454 — 2.0461)
0.05 (0.0020) undersize	1.514 — 1.522 (0.0596 — 0.0599)	51.934 — 51.950 (2.0447 — 2.0453)
0.25 (0.0098) undersize	1.614 — 1.622 (0.0635 — 0.0639)	51.734 — 51.750 (2.0368 — 2.0374)

Cylinder Block

MECHANICAL

- 6) Inspect the bushing at connecting rod small end, and replace with a new part if worn or damaged.
- 7) Measure the piston pin clearance at connecting rod small end. Replace it with a new part if the limit has been exceeded.

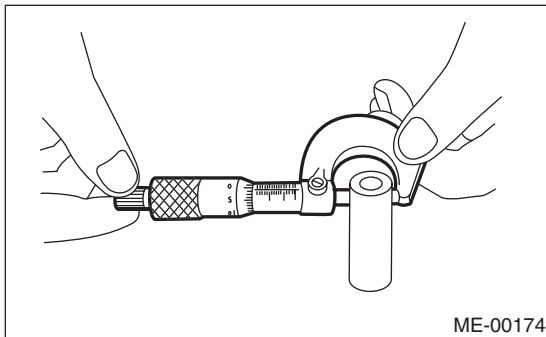
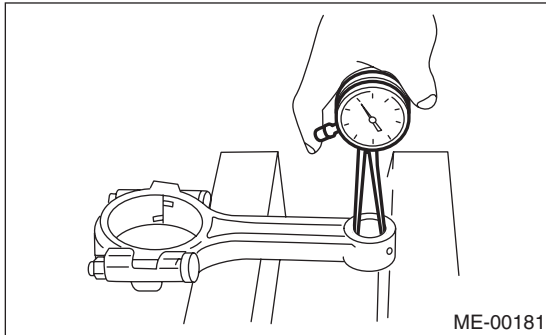
Clearance between piston pin and bushing:

Standard:

0 — 0.022 mm (0 — 0.0009 in)

Service limit:

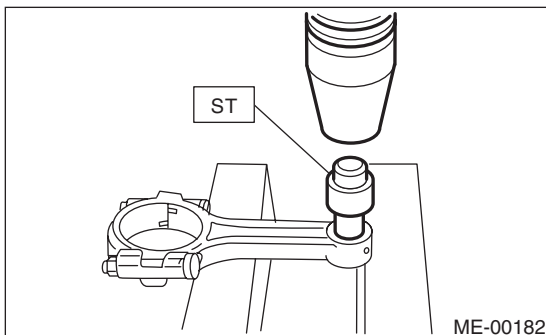
0.030 mm (0.0012 in)



- 8) The replacement procedure for the connecting rod small end bushing is as follows.

- (1) Remove the bushing from connecting rod with ST and press.
- (2) Press the bushing with the ST after applying oil on the periphery of new bushing.

ST 499037100 CONNECTING ROD BUSHING REMOVER AND INSTALLER



- (3) Make two 3 mm (0.12 in) holes in the pressed bushing according to the pre-manufactured holes on the connecting rod to ream the inside of bushing.

- (4) After completion of reaming, clean the bushing to remove chips.

6. CRANKSHAFT AND CRANKSHAFT BEARING

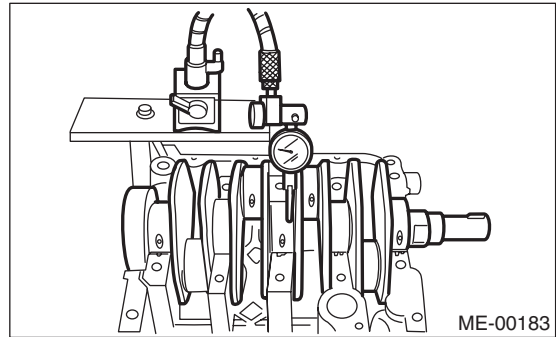
- 1) Clean the crankshaft completely, and check for cracks by means of red lead check etc. If faulty, replace with new a new crankshaft.
- 2) Measure the bend of crankshaft. If it exceeds the limit, correct or replace it.

NOTE:

If a suitable V-block is not available, use only a #1 and #5 crankshaft bearings on cylinder block, and position the crankshaft on cylinder block. Then, measure the crankshaft bend using a dial gauge.

Crankshaft bend limit:

0.035 mm (0.0014 in)



Cylinder Block

MECHANICAL

3) Inspect the crank journal and crank pin for wear. If they are not within the specification, replace the bearing with a suitable (undersize) one, and replace or grind to correct the crankshaft as necessary. When grinding the crank journal or crank pin, finish them to the specified dimensions according to the undersize bearing to be used.

Crank pin:

Out-of-roundness:

0.003 mm (0.0001 in)

Cylindricity:

0.004 mm (0.0002 in)

Grinding limit:

To 51.750 mm (2.0374 in) dia.

Crank journal:

Out-of-roundness:

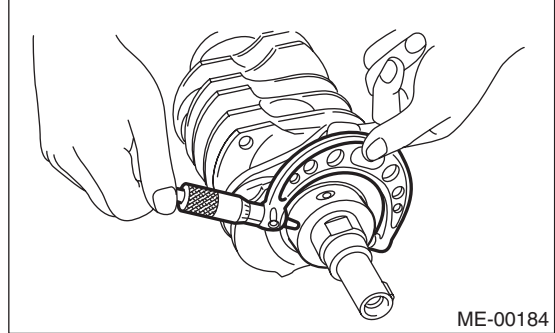
0.005 mm (0.0002 in)

Cylindricity:

0.006 mm (0.0002 in)

Grinding limit:

To 59.758 mm (2.3527 in) dia.



		Unit: mm (in)		
		Crank journal outer diameter		Crank pin outer diameter
		#1, #3	#2, #4, #5	
Standard	Journal O.D.	59.992 — 60.008 (2.3619 — 2.3625)	59.992 — 60.008 (2.3619 — 2.3625)	51.984 — 52.000 (2.0466 — 2.0472)
	Bearing size (Thickness at center)	1.998 — 2.011 (0.0787 — 0.0792)	2.000 — 2.013 (0.0787 — 0.0793)	1.490 — 1.502 (0.0587 — 0.0591)
0.03 (0.0012) undersize	Journal O.D.	59.962 — 59.978 (2.3607 — 2.3613)	59.962 — 59.978 (2.3607 — 2.3613)	51.954 — 51.970 (2.0454 — 2.0461)
	Bearing size (Thickness at center)	2.017 — 2.020 (0.0794 — 0.0795)	2.019 — 2.022 (0.0795 — 0.0796)	1.504 — 1.512 (0.0592 — 0.0595)
0.05 (0.0020) undersize	Journal O.D.	59.942 — 59.958 (2.3599 — 2.3605)	59.942 — 59.958 (2.3599 — 2.3605)	51.934 — 51.950 (2.0447 — 2.0453)
	Bearing size (Thickness at center)	2.027 — 2.030 (0.0798 — 0.0799)	2.029 — 2.032 (0.0799 — 0.0800)	1.514 — 1.522 (0.0596 — 0.0599)
0.25 (0.0098) undersize	Journal O.D.	59.742 — 59.758 (2.3520 — 2.3527)	59.742 — 59.758 (2.3520 — 2.3527)	51.734 — 51.750 (2.0368 — 2.0374)
	Bearing size (Thickness at center)	2.127 — 2.130 (0.0837 — 0.0839)	2.129 — 2.132 (0.0838 — 0.0839)	1.614 — 1.622 (0.0635 — 0.0639)

Cylinder Block

MECHANICAL

4) Use a thickness gauge to measure the thrust clearance of crankshaft at center bearing. If the clearance exceeds the limit, replace the bearing.

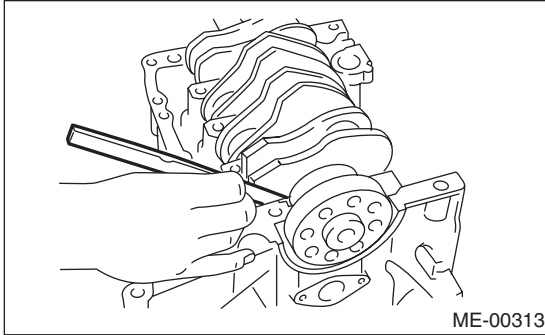
Crankshaft thrust clearance:

Standard:

0.030 — 0.115 mm (0.0012 — 0.0045 in)

Service limit:

0.25 mm (0.0098 in)



5) Inspect individual crankshaft bearings for signs of flaking, seizure, melting and wear.

6) Measure the oil clearance on each crankshaft bearing using plastigauge. If the measured value exceeds the limit, replace the defective bearing with an undersize one, and replace or readjust the crankshaft if necessary.

Crankshaft oil clearance:

Standard:

0.010 — 0.030 mm (0.0004 — 0.0012 in)

Service limit:

0.040 mm (0.0016 in)

21. Intake and Exhaust Valve

A: SPECIFICATION

Refer to "19. Cylinder Head" for work relating to the intake and the exhaust valves.

<Ref. to ME(H4DOTC)-60, REMOVAL, Cylinder Head.> <Ref. to ME(H4DOTC)-60, INSTALLATION, Cylinder Head.>

22.Piston

A: SPECIFICATION

Refer to "20. Cylinder Block" for work relating to the piston.

<Ref. to ME(H4DOTC)-67, REMOVAL, Cylinder Block.> <Ref. to ME(H4DOTC)-71, INSTALLATION, Cylinder Block.>

23.Connecting Rod

A: SPECIFICATION

Refer to "20. Cylinder Block" for work relating to the connecting rods.

<Ref. to ME(H4DOTC)-67, REMOVAL, Cylinder Block.> <Ref. to ME(H4DOTC)-71, INSTALLATION, Cylinder Block.>

24.Crankshaft

A: SPECIFICATION

Refer to "20. Cylinder Block" for work relating to the crankshaft.

<Ref. to ME(H4DOTC)-67, REMOVAL, Cylinder Block.> <Ref. to ME(H4DOTC)-71, INSTALLATION, Cylinder Block.>

25.Engine Trouble in General

A: INSPECTION

NOTE:

“RANK” shown in the chart refers to the possibility of the cause of trouble in order “Very often” to “Rarely”

A — Very often

B — Sometimes

C — Rarely

Symptoms	Problem parts etc.	Possible cause	RANK
1. Engine does not start.			
1) Starter does not turn.	Starter	Defective battery-to-starter harness	B
		Defective starter switch	C
		Defective inhibitor switch or neutral switch	C
		Defective starter	B
	Battery	Improper connection of terminal	A
		Run-down battery	A
		Defective charging system	B
	Excessive friction	Seizure of crankshaft and connecting rod bearing	C
		Seized camshaft	C
Seized or stuck piston and cylinder		C	
2) Initial combustion does not occur.	Starter	Defective starter	C
	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Fuel line	Defective fuel pump and relay	A
		Clogged fuel line	C
		Lack of or insufficient fuel	B
	Timing belt	Degradation, etc.	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective head gasket	C
		Improper valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	B
Worn or stuck piston rings, cylinder and piston		C	
Incorrect valve timing		B	
Improper engine oil (low viscosity)	B		

Engine Trouble in General

MECHANICAL

Symptoms	Problem parts etc.	Possible cause	RANK
3) Initial combustion occurs.	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Defective intake manifold gasket	B
		Defective throttle body gasket	B
	Fuel line	Defective fuel pump and relay	C
		Clogged fuel line	C
		Lack of or insufficient fuel	B
	Timing belt	Degradation, etc.	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective head gasket	C
		Improper valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	B
Worn or stuck piston rings, cylinder and piston		C	
Incorrect valve timing		B	
Improper engine oil (low viscosity)		B	
4) Engine stalls after initial combustion.	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	B
		Loosened or cracked PCV hose	C
		Loosened or cracked vacuum hose	C
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Dirty air cleaner element	C
	Fuel line	Clogged fuel line	C
		Lack of or insufficient fuel	B
	Timing belt	Degradation, etc.	B
		Defective timing	B
	Compression	Incorrect valve clearance	C
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective head gasket	C
		Improper valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
Incorrect valve timing		B	
Improper engine oil (low viscosity)	B		

Engine Trouble in General

MECHANICAL

Symptoms	Problem parts etc.	Possible cause	RANK
2. Rough idle and engine stall	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	A
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	C
		Loosened oil filler cap	B
		Dirty air cleaner element	C
	Fuel line	Defective fuel pump and relay	C
		Clogged fuel line	C
		Lack of or insufficient fuel	B
	Timing belt	Defective timing	C
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	B
		Loosened cylinder head bolt or defective head gasket	B
		Improper valve sealing	B
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	B
		Incorrect valve timing	A
	Lubrication system	Improper engine oil (low viscosity)	B
		Incorrect oil pressure	B
	Cooling system	Defective rocker cover gasket	C
		Overheating	C
	Others	Evaporative emission control system malfunction	A
		Stuck or damaged throttle valve	B
Accelerator cable out of adjustment		C	

Engine Trouble in General

MECHANICAL

Symptoms	Problem parts etc.	Possible cause	RANK
3. Low output, hesitation and poor acceleration	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	B
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	B
		Loosened oil filler cap	B
		Dirty air cleaner element	A
	Fuel line	Defective fuel pump and relay	B
		Clogged fuel line	B
		Lack of or insufficient fuel	C
	Timing belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	B
		Loosened cylinder head bolt or defective head gasket	B
		Improper valve sealing	B
		Defective valve stem	C
		Worn or broken valve spring	B
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
	Improper engine oil (low viscosity)	B	
	Lubrication system	Incorrect oil pressure	B
Cooling system	Overheating	C	
	Over-cooling	C	
Others	Evaporative emission control system malfunction	A	
4. Surging	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	A
		Loosened or cracked PCV hose	A
		Loosened or cracked vacuum hose	A
		Defective intake manifold gasket	B
		Defective throttle body gasket	B
		Defective PCV valve	B
		Loosened oil filler cap	B
		Dirty air cleaner element	B
	Fuel line	Defective fuel pump and relay	B
		Clogged fuel line	B
		Lack of or insufficient fuel	C
	Timing belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective head gasket	C
		Improper valve sealing	C
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
	Improper engine oil (low viscosity)	B	
	Cooling system	Overheating	B
Others	Evaporative emission control system malfunction	C	

Engine Trouble in General

MECHANICAL

Symptoms	Problem parts etc.	Possible cause	RANK
5. Engine does not return to idle.	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked vacuum hose	A
	Others	Stuck or damaged throttle valve	A
		Accelerator cable out of adjustment	B
6. Dieseling (Run-on)	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Cooling system	Overheating	B
	Others	Evaporative emission control system malfunction	B
7. After burning in exhaust system	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened or cracked intake duct	C
		Loosened or cracked PCV hose	C
		Loosened or cracked vacuum hose	B
		Defective PCV valve	B
		Loosened oil filler cap	C
	Timing belt	Defective timing	B
	Compression	Incorrect valve clearance	B
		Loosened spark plug or defective gasket	C
		Loosened cylinder head bolt or defective head gasket	C
		Improper valve sealing	B
		Defective valve stem	C
		Worn or broken valve spring	C
		Worn or stuck piston rings, cylinder and piston	C
		Incorrect valve timing	A
Lubrication system	Incorrect oil pressure	C	
Cooling system	Over-cooling	C	
Others	Evaporative emission control system malfunction	C	
8. Knocking	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A
	Intake system	Loosened oil filler cap	B
	Timing belt	Defective timing	B
	Compression	Incorrect valve clearance	C
		Incorrect valve timing	B
	Cooling system	Overheating	A
9. Excessive engine oil consumption	Intake system	Loosened or cracked PCV hose	A
		Defective PCV valve	B
		Loosened oil filler cap	C
	Compression	Defective valve stem	A
		Worn or stuck piston rings, cylinder and piston	A
	Lubrication system	Loosened oil pump attaching bolts and defective gasket	B
		Defective oil filter o-ring	B
		Defective crankshaft oil seal	B
		Defective rocker cover gasket	B
		Loosened oil drain plug or defective gasket	B
	Loosened oil pan fitting bolts or defective oil pan	B	

Engine Trouble in General

MECHANICAL

Symptoms	Problem parts etc.	Possible cause	RANK	
10. Excessive fuel consumption	Engine control system <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>		A	
	Intake system	Dirty air cleaner element	A	
	Timing belt	Defective timing	B	
	Compression	Incorrect valve clearance		B
		Loosened spark plug or defective gasket		C
		Loosened cylinder head bolt or defective head gasket		C
		Improper valve sealing		B
		Defective valve stem		C
		Worn or broken valve spring		C
		Worn or stuck piston rings, cylinder and piston		B
		Incorrect valve timing		B
	Lubrication system	Incorrect oil pressure	C	
	Cooling system	Over-cooling	C	

26.Engine Noise

A: INSPECTION

Type of sound	Condition	Possible cause
Regular clicking sound	Sound increases as engine speed increases.	<ul style="list-style-type: none"> • Valve mechanism is defective. • Incorrect valve clearance adjustment • Worn camshaft • Broken valve spring
Heavy and dull clank	Oil pressure is low.	<ul style="list-style-type: none"> • Worn camshaft main bearing • Worn connecting rod bearing (large end)
	Oil pressure is normal.	<ul style="list-style-type: none"> • Loosened flywheel mounting bolt • Damaged engine mounting
High-pitched clank	Sound is noticeable when accelerating with an overload condition.	<ul style="list-style-type: none"> • Ignition timing advanced • Accumulation of carbon inside combustion chamber • Wrong heat-durability spark plug • Improper octane value gasoline
Clank when engine speed is 1,000 to 2,000 rpm	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	<ul style="list-style-type: none"> • Worn camshaft main bearing • Worn connecting rod bearing (large end)
Knocking sound when engine is operating under idling speed and engine is warm	Sound is reduced when fuel injector connector of noisy cylinder is disconnected. (NOTE*)	<ul style="list-style-type: none"> • Worn cylinder liner and piston ring • Broken or stuck piston ring • Worn piston pin and hole at piston end of connecting rod
	Sound is not reduced if each fuel injector connector is disconnected in turn. (NOTE*)	<ul style="list-style-type: none"> • Unusually worn valve lifter • Worn cam sprocket • Worn camshaft journal bore in cylinder head assembly
Squeaky sound	—	Insufficient generator lubrication
Rubbing sound	—	Poor contact of generator brush and rotor
Gear scream when starting engine	—	<ul style="list-style-type: none"> • Defective ignition starter switch • Worn gear and starter pinion
Sound like polishing glass with a dry cloth	—	<ul style="list-style-type: none"> • Loose drive belt • Defective water pump shaft
Hissing sound	—	<ul style="list-style-type: none"> • Insufficient compression • Air leakage in air intake system, hose, connection or manifold
Timing belt noise	—	<ul style="list-style-type: none"> • Loose timing belt • Belt contacting with case/adjacent part
Valve noise	—	Incorrect valve clearance

NOTE*)

When disconnecting the fuel injector connector, the malfunction indicator light illuminates and DTC is stored in ECM memory. Therefore, perform the Clear Memory Mode and Inspection Mode after connecting the fuel injector connector. <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>

Engine Noise

MECHANICAL

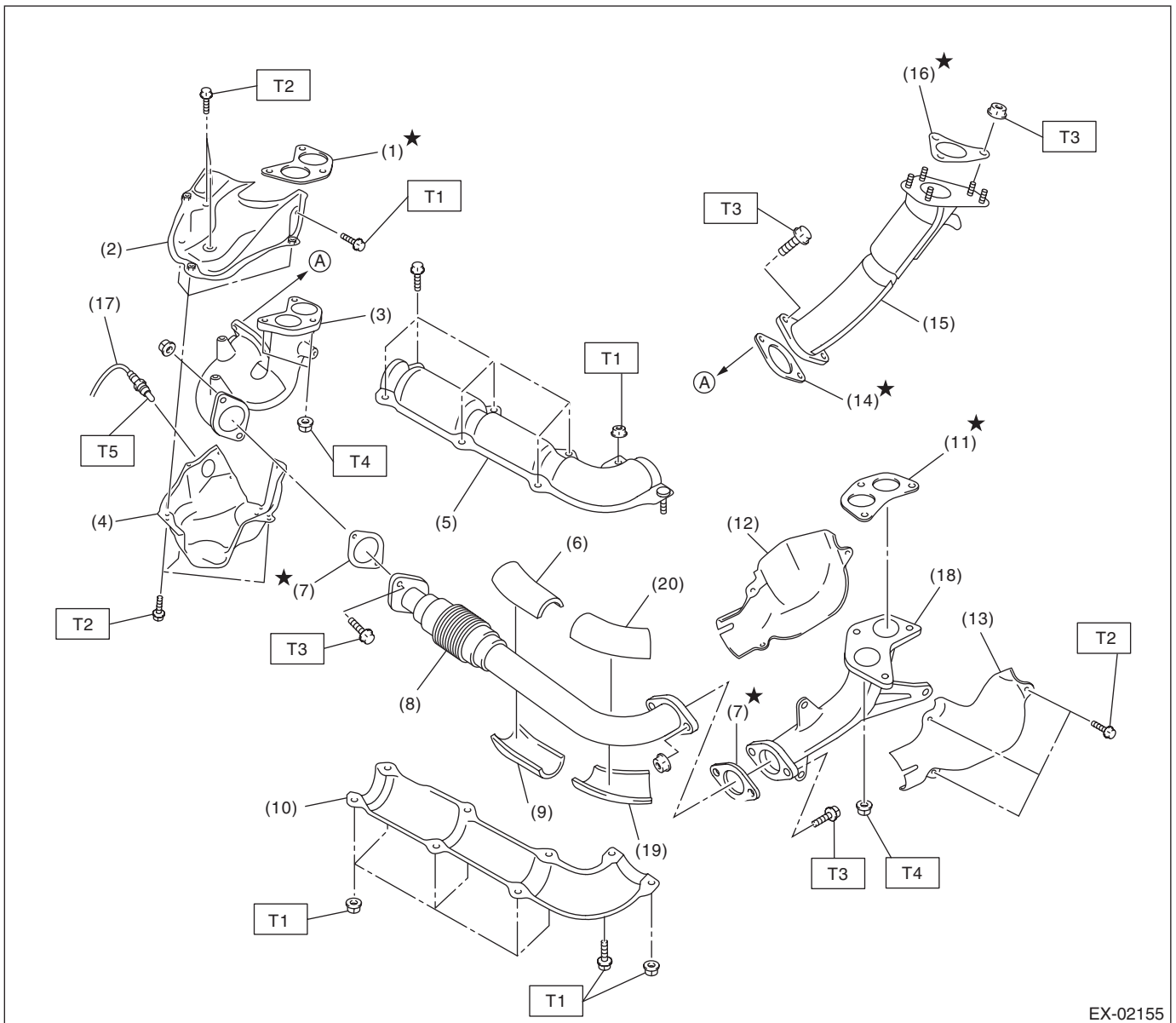
General Description

EXHAUST

1. General Description

A: COMPONENT

1. FRONT EXHAUST PIPE



EX-02155

General Description

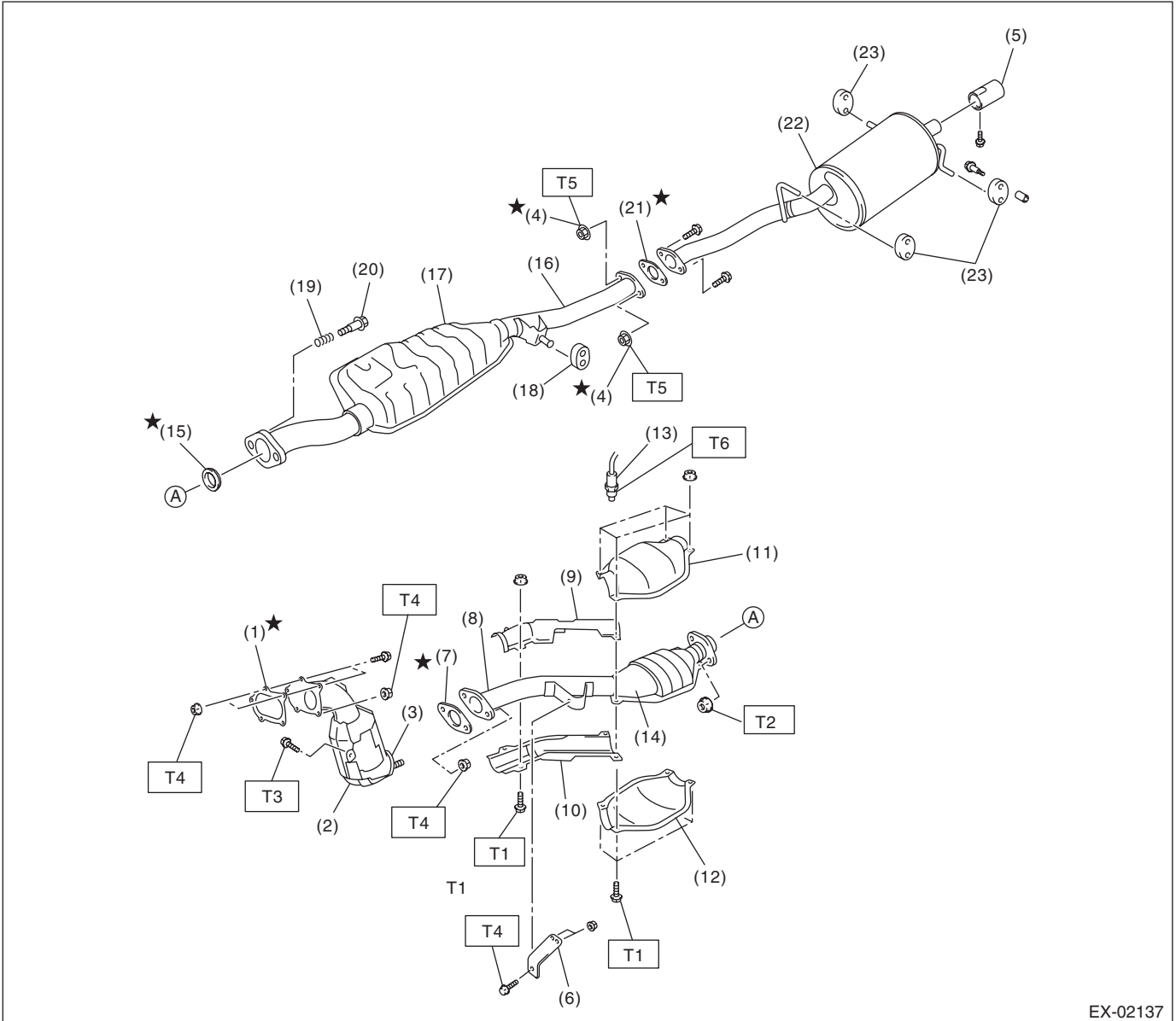
EXHAUST

(1) Gasket	(10) Front exhaust pipe lower cover	(20) Front exhaust pipe upper insulator (LH)
(2) Exhaust manifold upper cover (RH)	(11) Gasket	
(3) Exhaust manifold (RH)	(12) Exhaust manifold inner cover (LH)	
(4) Exhaust manifold lower cover (RH)	(13) Exhaust manifold outer cover (LH)	Tightening torque: N·m (kgf·m, ft·lb)
(5) Front exhaust pipe upper cover	(14) Gasket	T1: 7.5 (0.8, 5.5)
(6) Front exhaust pipe upper insulator (RH)	(15) Turbocharger joint pipe	T2: 19 (1.9, 14.0)
(7) Gasket	(16) Gasket	T3: 35 (3.6, 26.0)
(8) Front exhaust pipe	(17) Front oxygen (A/F) sensor	T4: 40 (4.0, 28.9)
(9) Front exhaust pipe lower insulator (RH)	(18) Exhaust manifold (LH)	T5: <Ref. to FU(H4DOTC)-40, INSTALLATION, Front Oxygen (A/F) Sensor.>
	(19) Front exhaust pipe lower insulator (LH)	

General Description

EXHAUST

2. CENTER AND REAR EXHAUST PIPE, AND MUFFLER



EX-02137

- | | | |
|---|---|--------------|
| (1) Gasket | (12) Lower rear catalytic converter cover | (22) Muffler |
| (2) Front catalytic converter | (13) Rear oxygen sensor | (23) Cushion |
| (3) Center exhaust pipe (Front) | (14) Rear catalytic converter | |
| (4) Self-locking nut | (15) Gasket | |
| (5) Muffler cutter | (16) Rear exhaust pipe | |
| (6) Bracket | (17) Chamber | |
| (7) Gasket | (18) Cushion | |
| (8) Center exhaust pipe (Rear) | (19) Spring | |
| (9) Center pipe upper cover (Rear) | (20) Bolt | |
| (10) Center pipe lower cover (Rear) | (21) Gasket | |
| (11) Upper rear catalytic converter cover | | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 13 (1.3, 9.6)

T2: 18 (1.8, 13.0)

T3: 30 (3.1, 22.4)

T4: 35 (3.6, 26.0)

T5: 48 (4.9, 35.4)

T6: <Ref. to FU(H4DOTC)-43, INSTALLATION, Rear Oxygen Sensor.>

B: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from battery.

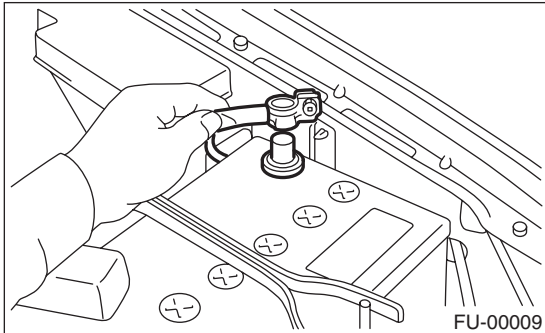
Front Exhaust Pipe

EXHAUST

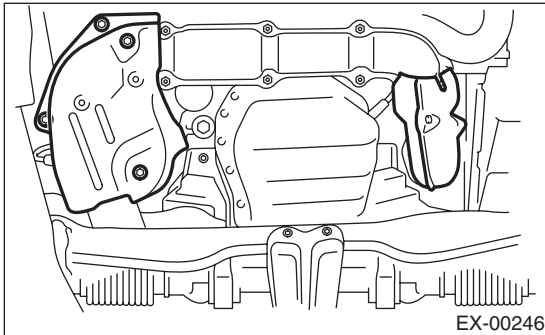
2. Front Exhaust Pipe

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.

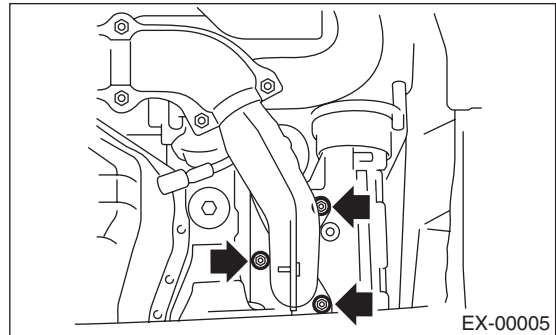
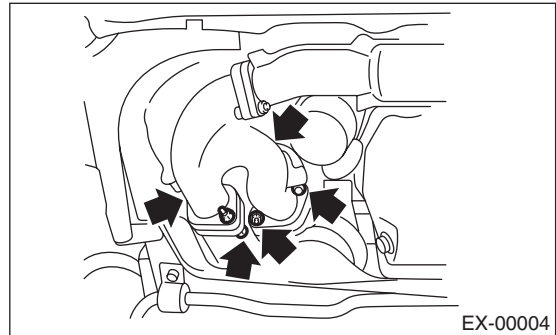


- 3) Remove the collector cover.
- 4) Remove the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-40, REMOVAL, Front Oxygen (A/F) Sensor.>
- 5) Remove the under cover.
- 6) Remove the exhaust manifold lower cover (RH) and the exhaust manifold cover (LH).

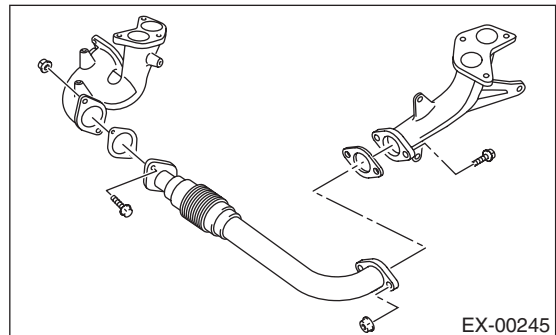


- 7) Remove the nuts which hold front exhaust pipe assembly onto turbocharger joint pipe.

- 8) While holding the front exhaust pipe assembly with one hand, remove the nuts which hold the front exhaust pipe assembly to cylinder head exhaust port.



- 9) Remove the front exhaust pipe assembly.
- 10) Remove the covers from exhaust manifold and front exhaust pipe.
- 11) Separate the front exhaust pipe from exhaust manifolds.



B: INSTALLATION

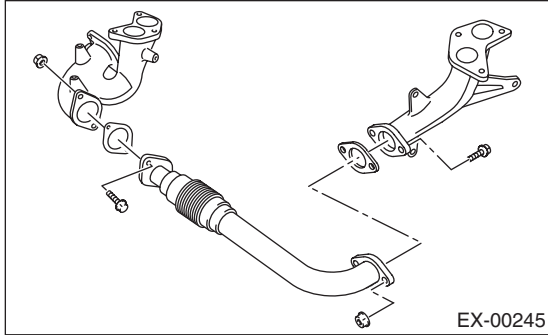
NOTE:

Use a new gasket.

1) Install the front exhaust pipe and the exhaust manifold.

Tightening torque:

35 N·m (3.6 kgf-m, 26.0 ft-lb)



2) Install the front exhaust pipe cover.

Tightening torque:

7.5 N·m (0.8 kgf-m, 5.5 ft-lb)

3) Install the exhaust manifold upper cover (RH).

Tightening torque:

19 N·m (1.9 kgf-m, 14.0 ft-lb)

4) Install the front exhaust pipe assembly.

Tightening torque:

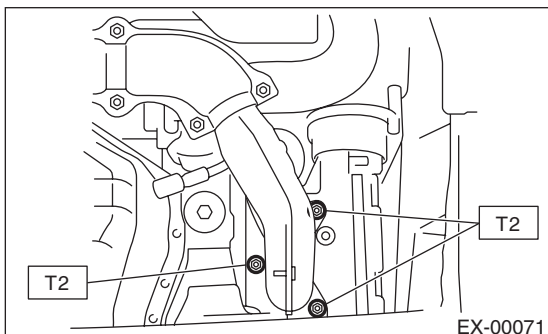
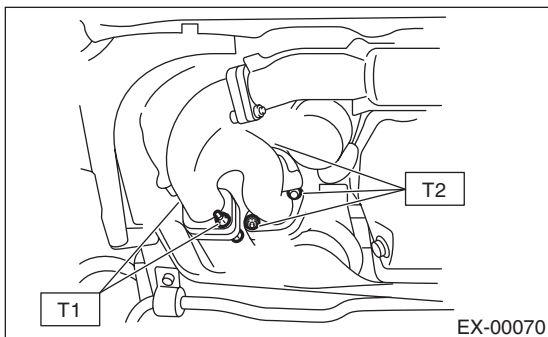
35 N·m (3.6 kgf-m, 26.0 ft-lb)

5) Connect the exhaust manifold (RH) to turbo-charger joint pipe.

Tightening torque:

T1: 35 N·m (3.6 kgf-m, 26.0 ft-lb)

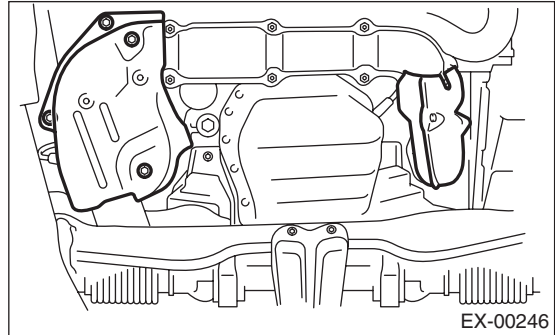
T2: 40 N·m (4.0 kgf-m, 28.9 ft-lb)



6) Install the exhaust manifold lower cover (RH) and the exhaust manifold cover (LH).

Tightening torque:

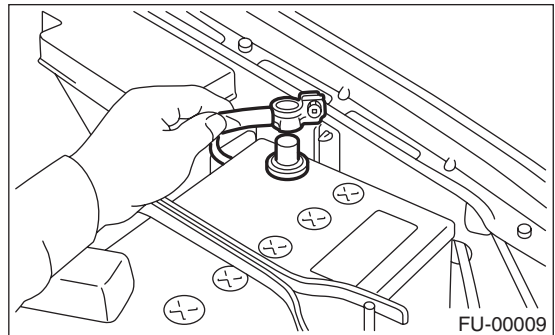
19 N·m (1.9 kgf-m, 14.0 ft-lb)



7) Install the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-40, INSTALLATION, Front Oxygen (A/F) Sensor.>

8) Install the under cover.

9) Connect the ground cable to battery.



10) Install the collector cover.

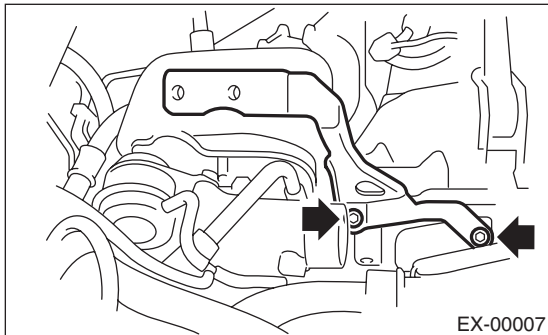
Center Exhaust Pipe

EXHAUST

3. Center Exhaust Pipe

A: REMOVAL

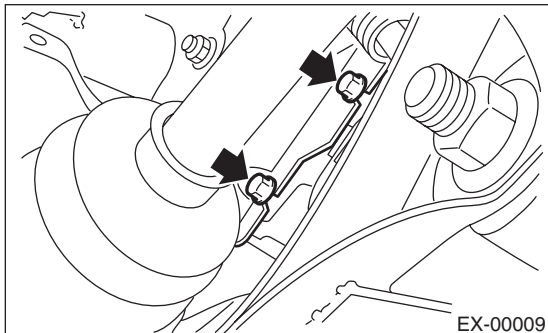
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Remove the collector cover.
- 4) Remove the intercooler. <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 5) Remove the intercooler bracket.



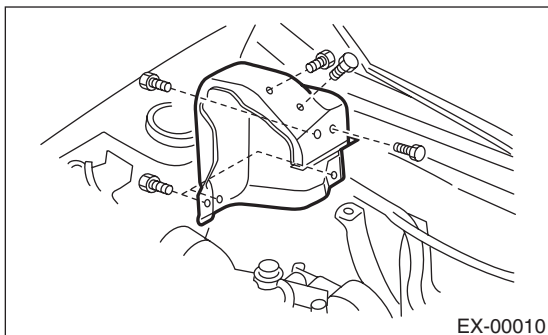
- 6) Lift-up the vehicle.
- 7) Remove the under cover.
- 8) Remove the bolts which install the lower side of turbocharger upper cover.

CAUTION:

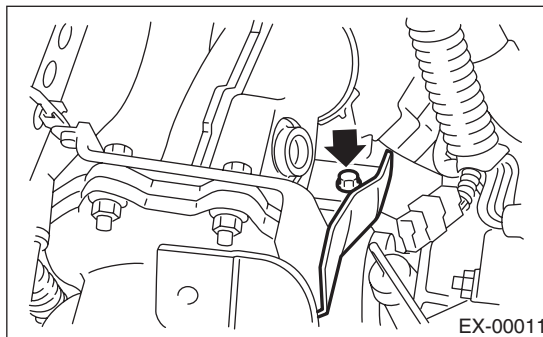
Be careful, the turbocharger and exhaust pipe are hot.



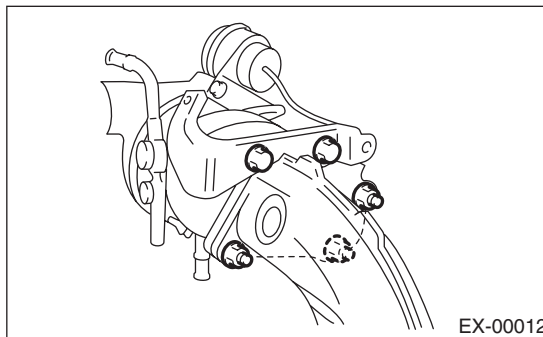
- 9) Lower the vehicle.
- 10) Remove the turbocharger upper cover.



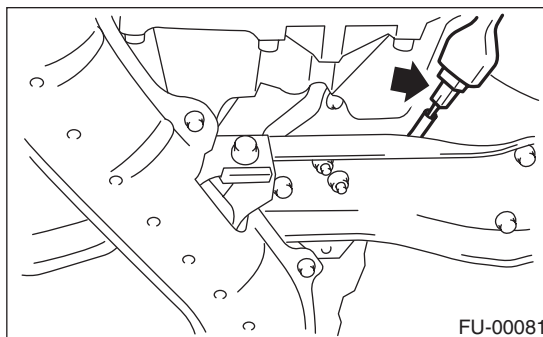
- 11) Remove the bolts which install the upper side of turbocharger upper cover, and remove it.



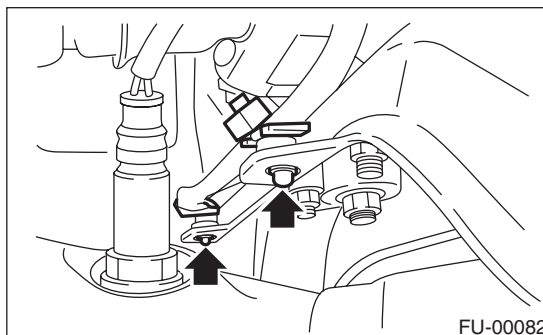
- 12) Separate the center exhaust pipe from turbocharger.



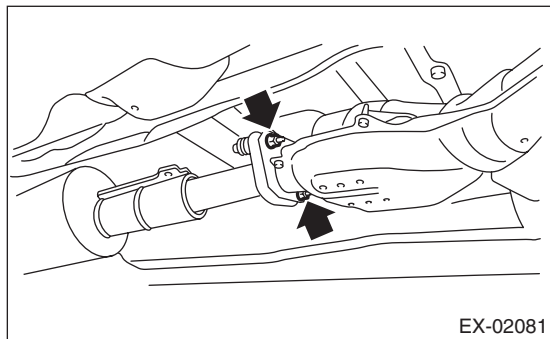
- 13) Lift-up the vehicle.
- 14) Disconnect the connector from rear oxygen sensor.



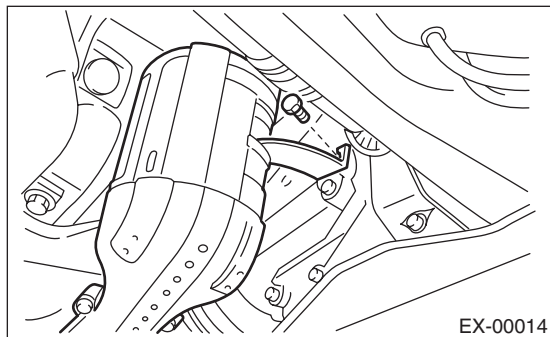
- 15) Vertically draw out clip from crossmember.



16) Separate the center exhaust pipe from rear exhaust pipe.



17) Remove the bolt which holds center exhaust pipe bracket to transmission.

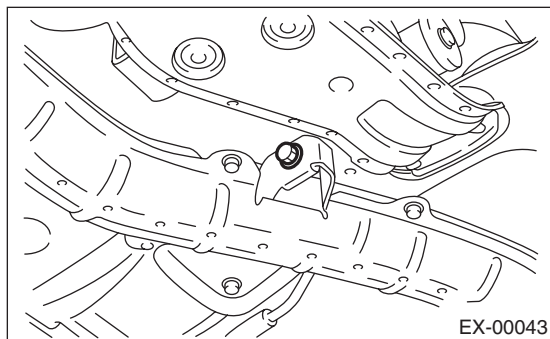


18) Remove the intercooler bracket.

19) Remove the bolt which holds center exhaust pipe to hanger bracket.

CAUTION:

Be careful not to pull down the center exhaust pipe.



20) Remove the center exhaust pipe.



B: INSTALLATION

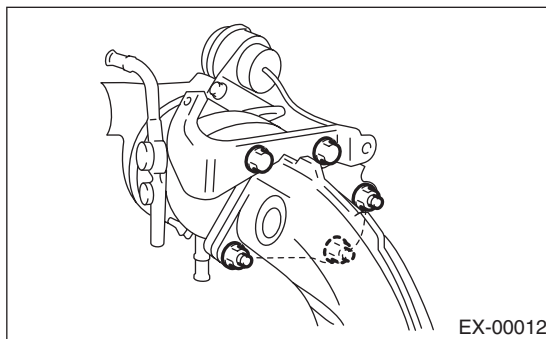
NOTE:

Use a new gasket.

- 1) Install the center exhaust pipe and temporarily tighten the bolt which holds center exhaust pipe to hanger bracket.
- 2) Temporarily tighten the bolt which holds the center pipe to transmission.
- 3) Connect the center exhaust pipe to turbocharger.

Tightening torque:

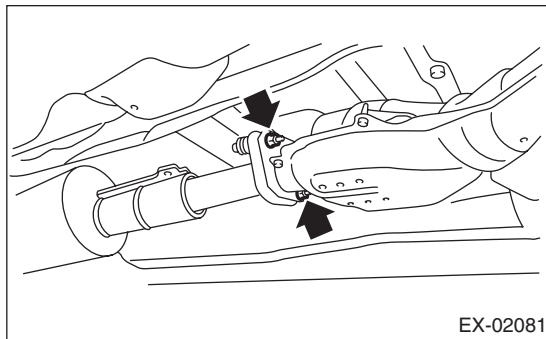
35 N·m (3.6 kgf·m, 26.0 ft·lb)



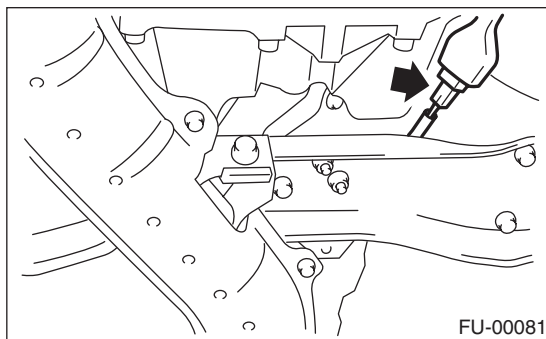
4) Install the center exhaust pipe to rear exhaust pipe.

Tightening torque:

18 N·m (1.8 kgf·m, 13.0 ft·lb)



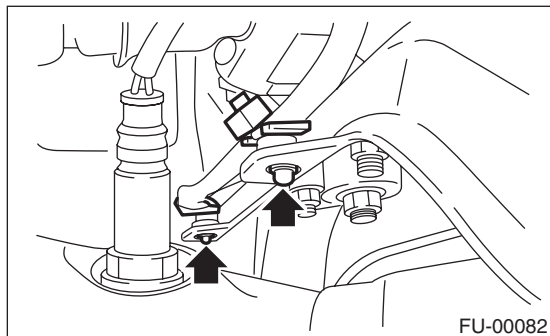
5) Connect the connector to rear oxygen sensor.



Center Exhaust Pipe

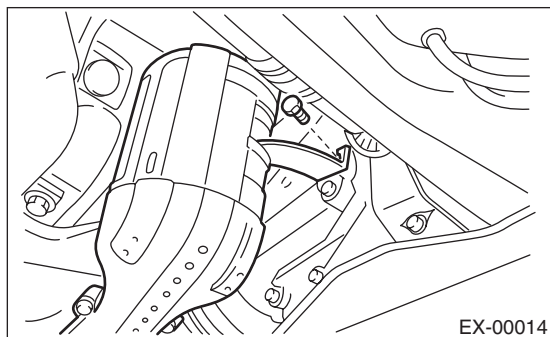
EXHAUST

6) Secure clip on the crossmember.



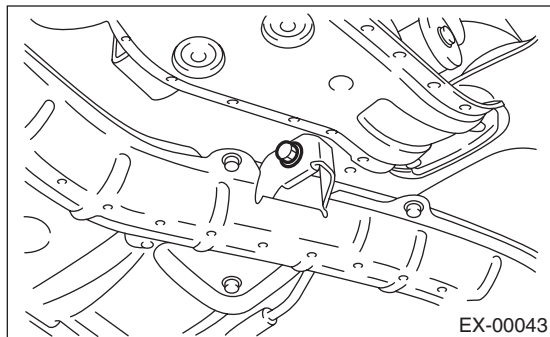
7) Tighten the bolt which holds center exhaust pipe bracket to transmission.

Tightening torque:
30 N·m (3.1 kgf·m, 22.4 ft·lb)



8) Tighten the bolt which holds center exhaust pipe to hanger bracket.

Tightening torque:
35 N·m (3.6 kgf·m, 26.0 ft·lb)



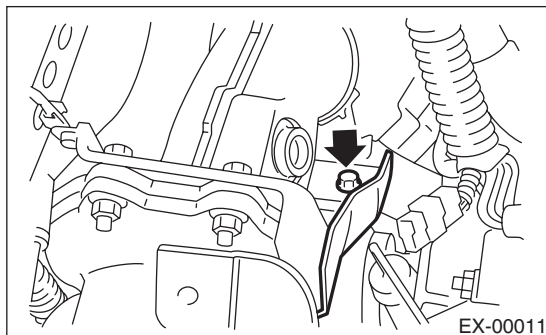
9) Tighten the bolts which hold the intercooler bracket.

Tightening torque:
35 N·m (3.6 kgf·m, 26.0 ft·lb)

10) Lower the vehicle.

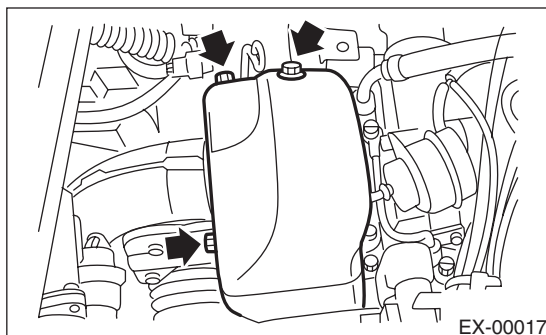
11) Position the turbocharger lower cover, and tighten the bolts which install the upper side of lower cover.

Tightening torque:
7.5 N·m (0.8 kgf·m, 5.5 ft·lb)



12) Position the turbocharger upper cover, and tighten the bolts which install the upper side of upper cover.

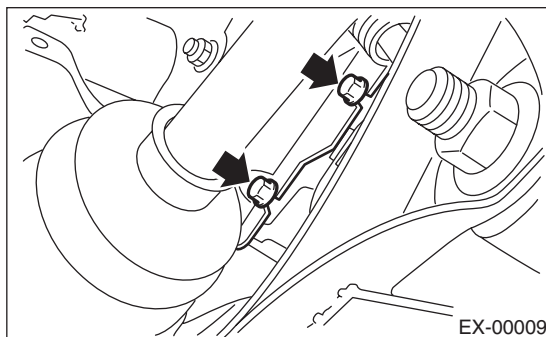
Tightening torque:
7.5 N·m (0.8 kgf·m, 5.5 ft·lb)



13) Lift-up the vehicle.

14) Tighten the bolts which install the under side of turbocharger upper cover.

Tightening torque:
7.5 N·m (0.8 kgf·m, 5.5 ft·lb)



15) Install the universal joint.

(1) Align the bolt hole on the long yoke side of universal joint with the cutout at the serrated section of shaft end, and then insert the universal joint.

(2) Align the bolt hole on the short yoke side of universal joint with the cutout on the serrated section of gearbox assembly. Lower the universal joint completely.

(3) Temporarily tighten the bolt of short yoke side. Raise the universal joint to make sure the bolt is properly passing through the cutout at the serrated section.

(4) Tighten the long yoke side bolt, and also tighten the short yoke side bolt.

Tightening torque:

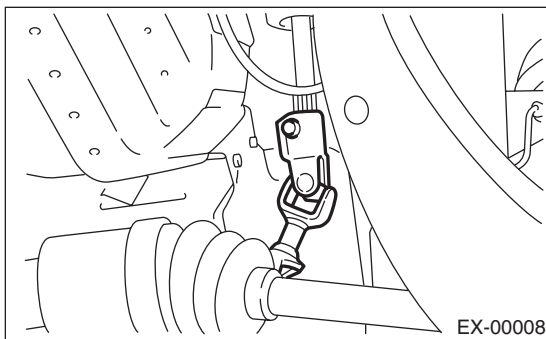
24 N·m (2.4 kgf·m, 17.4 ft·lb)

CAUTION:

- Make sure the universal joint bolts are tightened through the shaft serration notches.
- Excessively large tightening torque of universal joint bolts may lead to heavy steering wheel operation.

Standard clearance between gearbox and DOJ:

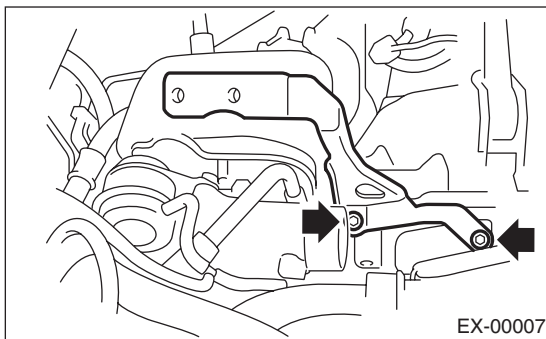
15 mm (0.59 in) or more



16) Install the under cover.

17) Lower the vehicle.

18) Install the intercooler bracket.



19) Install the intercooler. <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

20) Align the center of the roll connector. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>

21) Install the collector cover.

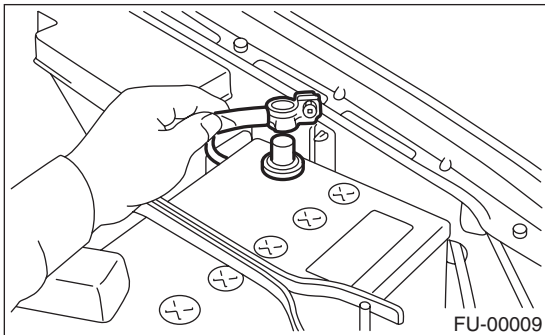
Joint Pipe

EXHAUST

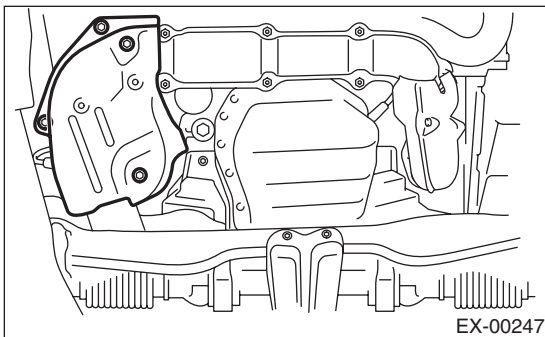
4. Joint Pipe

A: REMOVAL

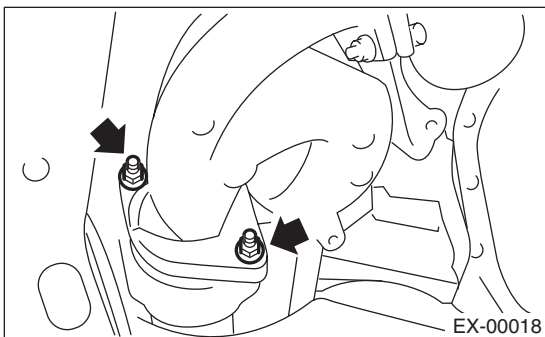
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.



- 3) Remove the collector cover.
- 4) Remove the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-40, REMOVAL, Front Oxygen (A/F) Sensor.>
- 5) Remove the under cover.
- 6) Remove the exhaust manifold lower cover (RH).



- 7) Remove the nuts which hold the front exhaust manifold to joint pipe.



- 8) Remove the center exhaust pipe. <Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
- 9) Remove the turbocharger. <Ref. to IN(H4DOTC)-13, REMOVAL, Turbocharger.>
- 10) Take off the joint pipe in the upward direction.

B: INSTALLATION

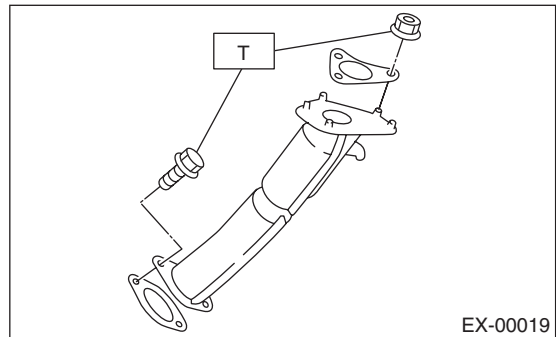
Install in the reverse order of removal.

NOTE:

Use a new gasket.

Tightening torque:

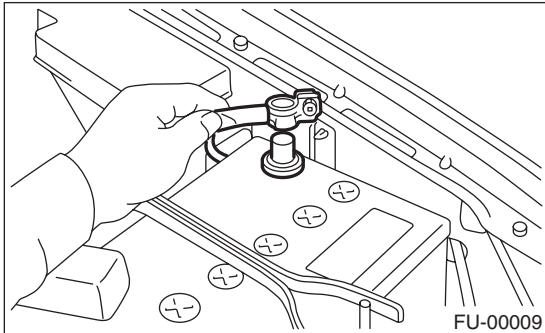
T: 35 N·m (3.6 kgf-m, 26.0 ft-lb)



5. Rear Exhaust Pipe

A: REMOVAL

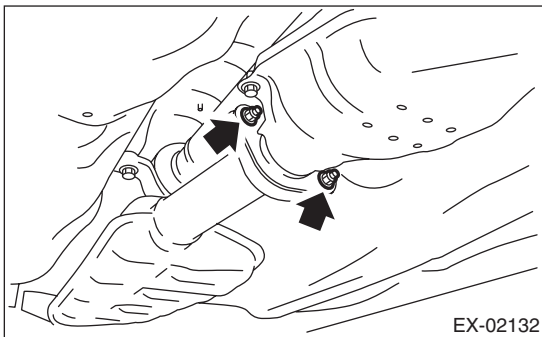
- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.



- 3) Lift-up the vehicle.
- 4) Separate the rear exhaust pipe from center exhaust pipe.

CAUTION:

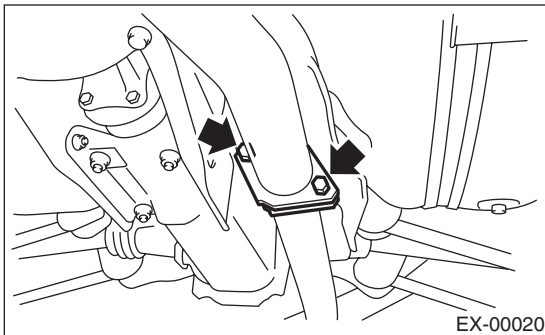
Be careful, exhaust pipe is hot.



- 5) Separate the rear exhaust pipe from muffler.

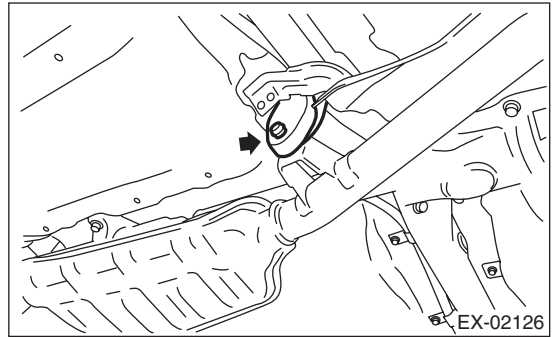
CAUTION:

Be careful not to pull down the rear exhaust pipe.



- 6) Apply a coat of spray type lubricant to the mating area of cushion rubber.

- 7) Remove the rear exhaust pipe from cushion rubber.



Rear Exhaust Pipe

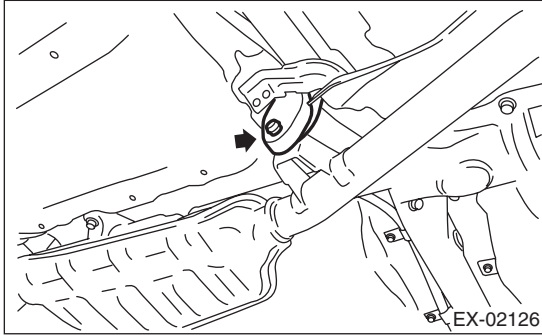
EXHAUST

B: INSTALLATION

NOTE:

- Use a new gasket and self-locking nut.
- When the lubricant was applied to the cushion rubber during the removal/installation, degrease it after reassembling.

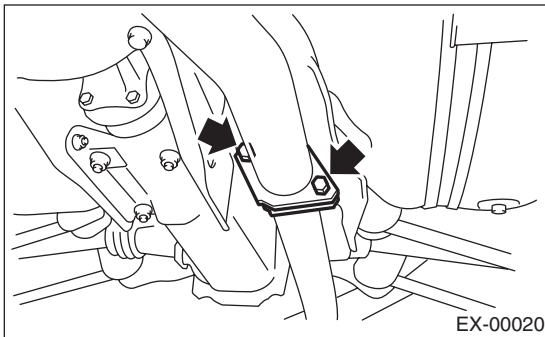
1) Install the rear exhaust pipe to cushion rubber.



2) Install the rear exhaust pipe to muffler.

Tightening torque:

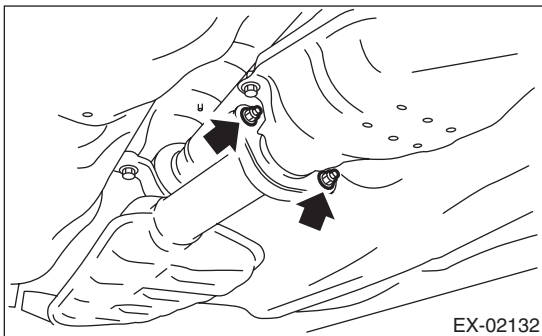
48 N·m (4.9 kgf·m, 35.4 ft·lb)



3) Install the rear exhaust pipe to center exhaust pipe.

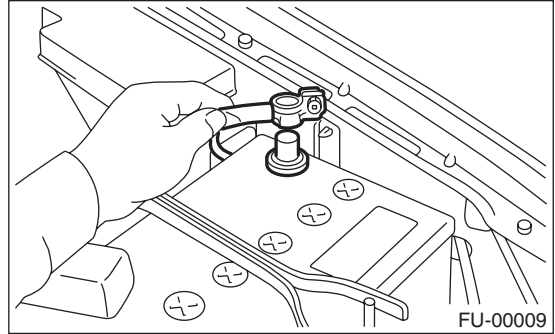
Tightening torque:

18 N·m (1.8 kgf·m, 13.0 ft·lb)



4) Lower the vehicle.

5) Connect the ground cable to battery.



C: INSPECTION

- 1) Check the connections and welds for exhaust leaks.
- 2) Make sure there are no holes or rusting.
- 3) Check the cushion rubber for wear or crack.

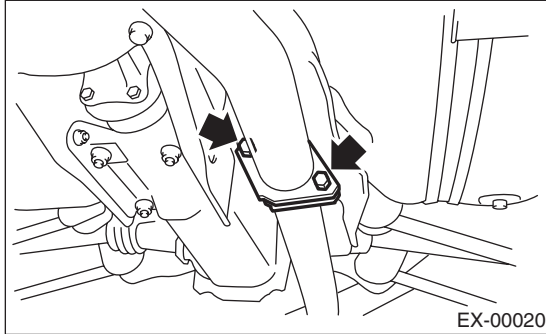
6. Muffler

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Lift-up the vehicle.
- 3) Separate the muffler from rear exhaust pipe.

CAUTION:

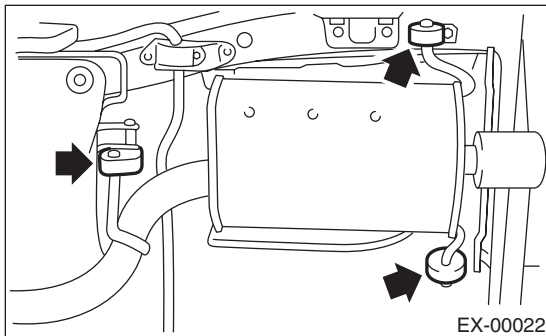
Be careful, exhaust pipe is hot.



- 4) Apply a coat of spray type lubricant to the mating area of cushion rubber.
- 5) Remove the cushion rubber, and detach the muffler.

CAUTION:

Be careful not to drop the muffler during removal.



B: INSTALLATION

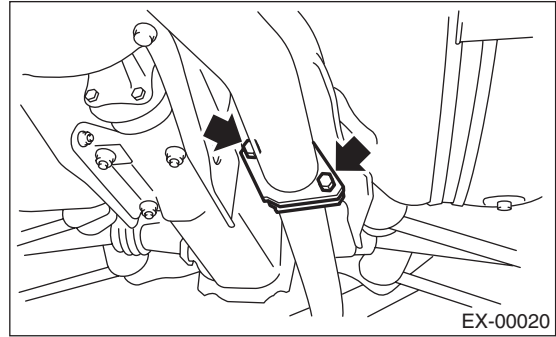
Install in the reverse order of removal.

NOTE:

- Use a new gasket and self-locking nut.
- When the lubricant was applied to the cushion rubber during the removal/installation, degrease it after reassembling.

Tightening torque:

48 N·m (4.9 kgf·m, 35.4 ft·lb)



C: INSPECTION

- 1) Check the connections and welds for exhaust leaks.
- 2) Make sure there are no holes or rusting.
- 3) Check the cushion rubber for wear or crack.

Muffler

EXHAUST

1. General Description

A: SPECIFICATION

Specifications for the turbo model are included in the CO (H4SO) section. <Ref. to CO(H4SO)-2, General Description.>

1. General Description

A: SPECIFICATION

Specifications for the turbo model are included in the LU (H4SO) section. <Ref. to LU (H4SO)-2, General Description.>

1. General Description

A: SPECIFICATION

Specifications for the turbo model are the same as in the SP (H4SO) section. <Ref. to SP (H4SO)-2, General Description.>

General Description

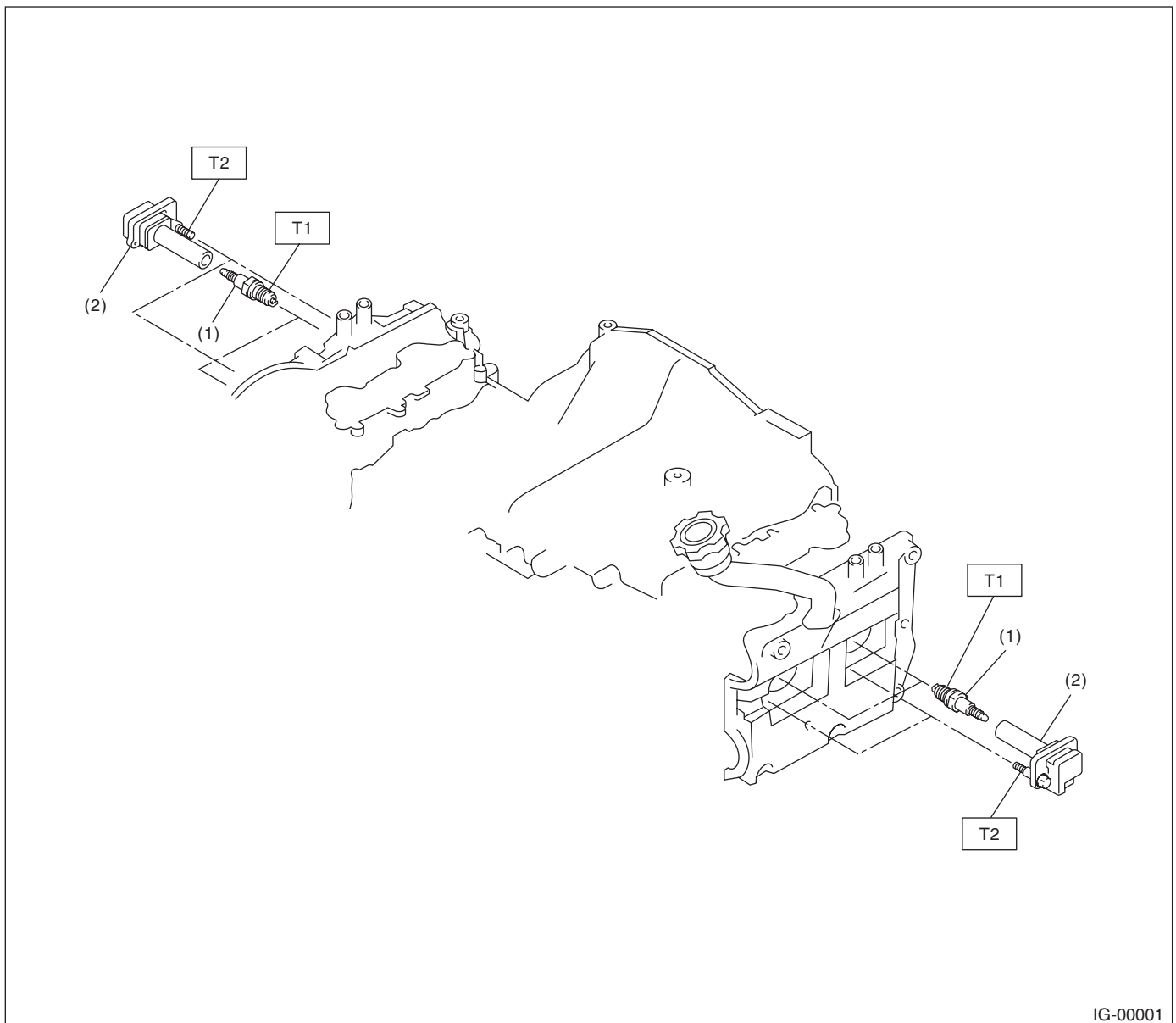
IGNITION

1. General Description

A: SPECIFICATION

Item		Specification
Ignition coil	Type	FK0186
	Ignition system	Independent ignition coil
	Manufacturer	Diamond Electric
Spark plug	Manufacturer and type	NGK: ILFR6B
	Thread diameter, pitch, length	mm 14, 1.25, 26.5
	Spark plug gap	mm (in) 0.7 — 0.8 (0.028 — 0.031)
	Electrode	Iridium

B: COMPONENT



IG-00001

(1) Spark plug

(2) Ignition coil

Tightening torque: N·m (kgf·m, ft·lb)

T1: 21 (2.1, 15.2)

T2: 16 (1.6, 11.7)

C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from the battery.

Spark Plug

IGNITION

2. Spark Plug

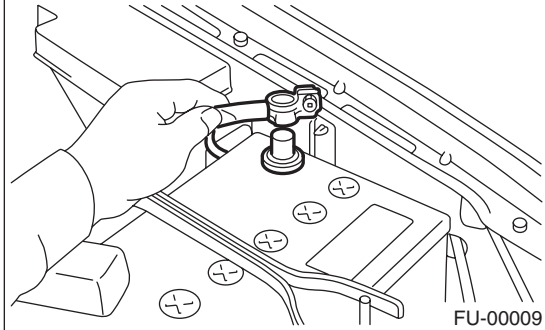
A: REMOVAL

Spark plug:

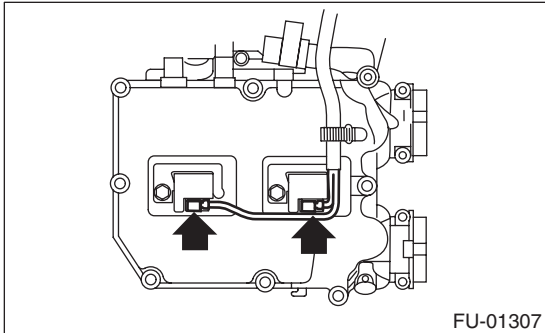
<Ref. to IG(H4DOTC)-2, SPECIFICATION, General Description.>

1. RH SIDE

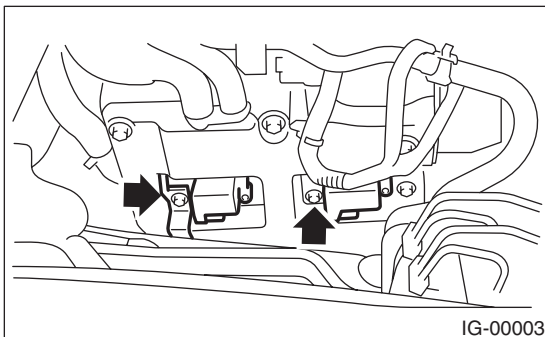
- 1) Disconnect the ground cable from the battery.



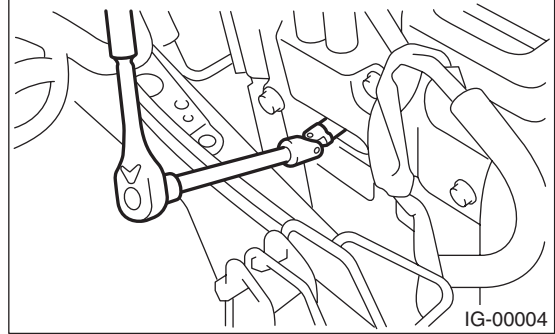
- 2) Remove the collector cover.
- 3) Remove the air cleaner lower case.
<Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
- 4) Disconnect the connector from ignition coil.



- 5) Remove the ignition coil.

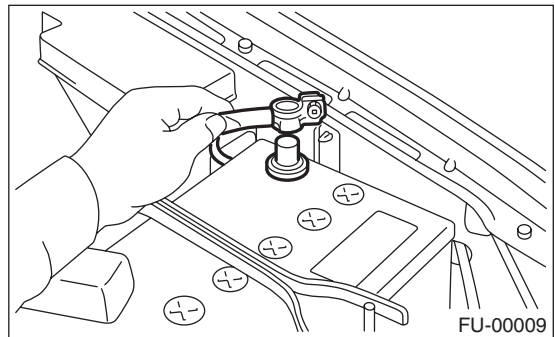


- 6) Remove the spark plug with a spark plug socket.

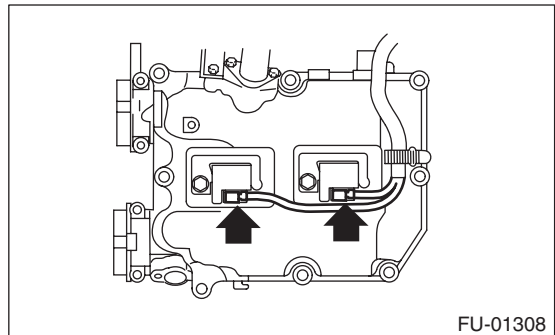


2. LH SIDE

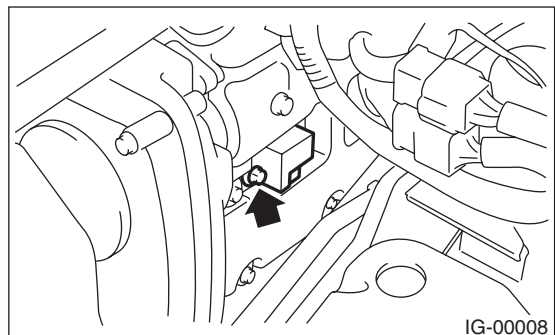
- 1) Disconnect the ground cable from battery and remove the battery and battery carrier.



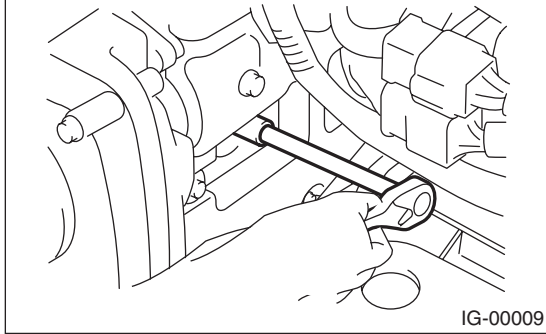
- 2) Remove the collector cover.
- 3) Remove the secondary air pump.
<Ref. to EC (H4DOTC)-9, REMOVAL, Secondary Air Pump.>
- 4) Disconnect the connector from ignition coil.



- 5) Remove the ignition coil.



6) Remove the spark plug with a spark plug socket.



B: INSTALLATION

1. RH SIDE

Install in the reverse order of removal.

Tightening torque:

Spark plug

21 N·m (2.1 kgf-m, 15.2 ft-lb)

Ignition coil

16 N·m (1.6 kgf-m, 11.7 ft-lb)

NOTE:

The tightening torque described above should be applied to only new spark plugs without oil on their threads.

In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

2. LH SIDE

Install in the reverse order of removal.

Tightening torque:

Spark plug

21 N·m (2.1 kgf-m, 15.2 ft-lb)

Ignition coil

16 N·m (1.6 kgf-m, 11.7 ft-lb)

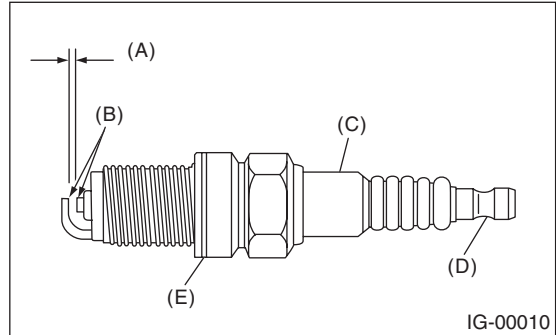
NOTE:

The tightening torque described above should be applied to only new spark plugs without oil on their threads.

In case their threads are lubricated, the torque should be reduced by approx. 1/3 of the specified torque in order to avoid over-stressing.

C: INSPECTION

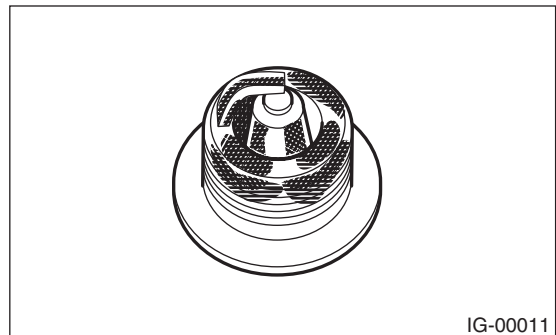
Check the electrodes and inner and outer ceramic insulator of plugs, noting the type of deposits and the degree of electrode erosion.



- (A) Spark plug gap
- (B) Carbon accumulation or wear
- (C) Crack
- (D) Damage
- (E) Damaged gasket

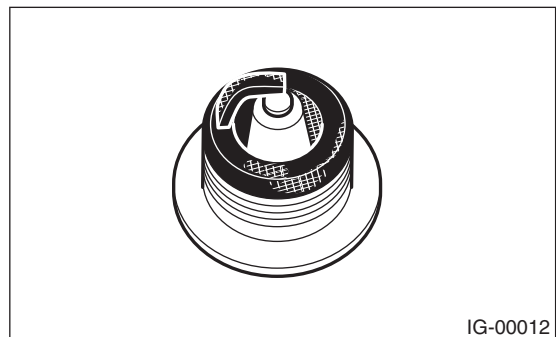
1) Normal:

Brown to grayish-tan deposits and slight electrode wear indicate correct spark plug heat range.



2) Carbon fouled:

Dry fluffy carbon deposits on insulator and electrode are mostly caused by slow speed driving in the city, weak ignition, too rich fuel mixture, dirty air cleaner, etc.

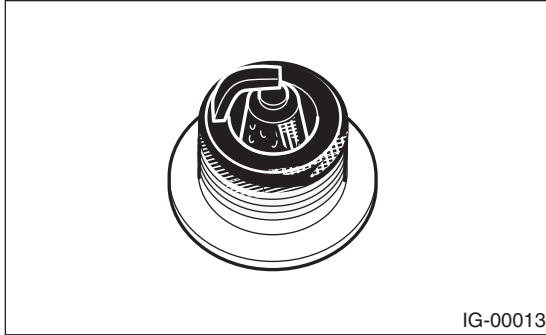


Spark Plug

IGNITION

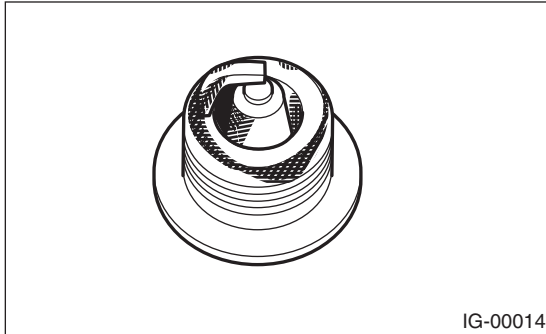
3) Oil fouled:

Wet black deposits show oil entrance into combustion chamber through worn rings or increased clearance between valve guides and stems.



4) Overheating:

White or light gray insulator with black or brown spots and bluish burnt electrodes indicate engine overheating, incorrect ignition timing, improper fuel, or loose spark plugs.



D: ADJUSTMENT

Clean the spark plugs using a wire brush. Clean and remove the carbon or oxide deposits. But do not wear away ceramic insulator at this time. If deposits are too stubborn, replace the spark plugs.

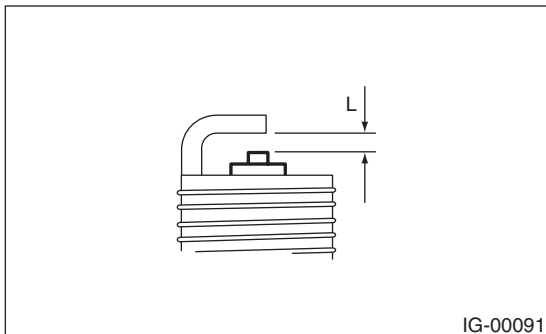
After cleaning the spark plugs, measure the spark plug gap using a gap gauge.

NOTE:

Do not use a plug cleaner because the spark plugs are applied with iridium tip.

Spark plug gap: L

0.7 — 0.8 mm (0.028 — 0.031 in)



3. Ignition Coil

A: REMOVAL

Direct ignition type has been adopted. Refer to "Spark Plug", "REMOVAL" for removal procedures. <Ref. to IG(H4DOTC)-4, REMOVAL, Spark Plug.>

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

16 N·m (1.6 kgf-m, 11.7 ft-lb)

C: INSPECTION

For inspection procedures, refer to "Diagnostics for Engine Start Failure". <Ref. to EN(H4DOTC)(diag)-64, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>

Ignition Coil

IGNITION

General Description

STARTING/CHARGING SYSTEMS

1. General Description

A: SPECIFICATION

Specifications for the turbo model are included in the SC (H4SO) section. <Ref. to SC (H4SO)-2, General Description.>

Basic Diagnostic Procedure

ENGINE (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

NOTE:

If the malfunction indicator light illuminates when Subaru Select Monitor or general scan tool is connected, perform the following procedures.

1. Disconnect Subaru Select Monitor or general scan tool from the vehicle.
2. Repeat the ignition switch ON-OFF cycle three times.
3. Turn the ignition switch to ON.

If the malfunction indicator light turns off, the Subaru Select Monitor or general scan tool may be faulty. Connect a different Subaru Select Monitor or general scan tool, and if malfunction indicator light remains off, delete the DTC. <Ref. to EN(H4DOTC)(diag)-50, Clear Memory Mode.>

	Step	Check	Yes	No
1	CHECK ENGINE START FAILURE. 1) Ask the customer when and how the trouble occurred using the interview check list. <Ref. to EN(H4DOTC)(diag)-3, CHECK, Check List for Interview.> 2) Start the engine.	Does the engine start?	Go to step 2.	Inspection using "Diagnostics for Engine Start Failure". <Ref. to EN(H4DOTC)(diag)-58, Diagnostics for Engine Starting Failure.>
2	CHECK ILLUMINATION OF MALFUNCTION INDICATOR LIGHT.	Does the malfunction indicator light illuminate?	Go to step 3.	Inspection using "General Diagnostic Table". <Ref. to EN(H4DOTC)(diag)-400, General Diagnostic Table.>
3	CHECK INDICATION OF DTC ON THE DISPLAY. 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or general scan tool to data link connector. 3) Turn the ignition switch to ON, and run the Subaru Select Monitor or general scan tool. 4) Read the DTC on Subaru Select Monitor or general scan tool.	Is DTC displayed on the Subaru Select Monitor or general scan tool?	Repair the trouble cause. <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).> Go to step 4.	Perform the diagnosis of the malfunction indicator light circuit or the combination meter. <Ref. to EN(H4DOTC)(diag)-54, Malfunction Indicator Light.>
4	PERFORM DIAGNOSIS. 1) Perform the Clear Memory Mode. <Ref. to EN(H4DOTC)(diag)-50, Clear Memory Mode.> 2) Perform the Inspection Mode. <Ref. to EN(H4DOTC)(diag)-38, Inspection Mode.>	Is DTC displayed on the Subaru Select Monitor or general scan tool?	Repair the trouble cause. <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Check List for Interview

ENGINE (DIAGNOSTICS)

2. Check List for Interview

A: CHECK

1. CHECK LIST NO. 1

Check the following item when problem has occurred.

NOTE:

Use copies of this page for interviewing customers.

Customer's name		Engine No.	
Date of purchase		Fuel brand	
Date of repair		Odometer reading	km
V.I.N.			miles
Weather	<input type="checkbox"/> Fine <input type="checkbox"/> Cloudy <input type="checkbox"/> Rainy <input type="checkbox"/> Snowy <input type="checkbox"/> Various/Others:		
Ambient air temperature	°C (°F)		
	<input type="checkbox"/> Hot <input type="checkbox"/> Warm <input type="checkbox"/> Cool <input type="checkbox"/> Cold		
Place	<input type="checkbox"/> Highway <input type="checkbox"/> Suburbs <input type="checkbox"/> Inner city <input type="checkbox"/> Uphill <input type="checkbox"/> Downhill <input type="checkbox"/> Rough road <input type="checkbox"/> Others :		
Engine temperature	<input type="checkbox"/> Cold <input type="checkbox"/> Warming-up <input type="checkbox"/> After warming-up <input type="checkbox"/> Any temperature <input type="checkbox"/> Others :		
Engine speed	rpm		
Vehicle speed	MPH		
Driving conditions	<input type="checkbox"/> Not affected <input type="checkbox"/> At starting <input type="checkbox"/> While idling <input type="checkbox"/> At racing <input type="checkbox"/> While accelerating <input type="checkbox"/> While cruising <input type="checkbox"/> While decelerating <input type="checkbox"/> While turning (RH/LH)		
Headlight	<input type="checkbox"/> ON / <input type="checkbox"/> OFF	Rear defogger	<input type="checkbox"/> ON / <input type="checkbox"/> OFF
Blower	<input type="checkbox"/> ON / <input type="checkbox"/> OFF	Radio	<input type="checkbox"/> ON / <input type="checkbox"/> OFF
A/C compressor	<input type="checkbox"/> ON / <input type="checkbox"/> OFF	CD/Cassette	<input type="checkbox"/> ON / <input type="checkbox"/> OFF
Radiator fan	<input type="checkbox"/> ON / <input type="checkbox"/> OFF	Car phone	<input type="checkbox"/> ON / <input type="checkbox"/> OFF
Front wiper	<input type="checkbox"/> ON / <input type="checkbox"/> OFF	Wireless device	<input type="checkbox"/> ON / <input type="checkbox"/> OFF
Rear wiper	<input type="checkbox"/> ON / <input type="checkbox"/> OFF		

Check List for Interview

ENGINE (DIAGNOSTICS)

2. CHECK LIST NO. 2

Check the following item about the vehicle's state when malfunction indicator light turns on.

NOTE:

Use copies of this page for interviewing customers.

a) Other warning lights or indicators turn on. <input type="checkbox"/> Yes / <input type="checkbox"/> No
<input type="checkbox"/> Low fuel warning light <input type="checkbox"/> Charge indicator light <input type="checkbox"/> AT diagnostic indicator light <input type="checkbox"/> ABS warning light <input type="checkbox"/> Oil pressure warning light
b) Fuel level
• Lack of gasoline: <input type="checkbox"/> Yes / <input type="checkbox"/> No • Indicator position of fuel gauge: • Experienced running out of fuel: <input type="checkbox"/> Yes / <input type="checkbox"/> No
c) Intentional connecting or disconnecting of harness connectors or spark plug cords: <input type="checkbox"/> Yes / <input type="checkbox"/> No
• What:
d) Intentional connecting or disconnecting of hoses: <input type="checkbox"/> Yes / <input type="checkbox"/> No
• What:
e) Installing of other parts except genuine parts: <input type="checkbox"/> Yes / <input type="checkbox"/> No
• What: • Where:
f) Occurrence of noise: <input type="checkbox"/> Yes / <input type="checkbox"/> No
• From where: • What kind:
g) Occurrence of smell: <input type="checkbox"/> Yes / <input type="checkbox"/> No
• From where: • What kind:
h) Intrusion of water into engine compartment or passenger compartment: <input type="checkbox"/> Yes / <input type="checkbox"/> No
i) Troubles occurred
<input type="checkbox"/> Engine does not start. <input type="checkbox"/> Engine stalls during idling. <input type="checkbox"/> Engine stalls while driving. <input type="checkbox"/> Engine speed decreases. <input type="checkbox"/> Engine speed does not decrease. <input type="checkbox"/> Rough idling <input type="checkbox"/> Poor acceleration <input type="checkbox"/> Back fire <input type="checkbox"/> After fire <input type="checkbox"/> Does not shift. <input type="checkbox"/> Excessive shift shock

3. General Description

A: CAUTION

1) Airbag system wiring harness is routed near the ECM, main relay and fuel pump relay.

CAUTION:

- All airbag system wiring harness and connectors are all colored yellow. Do not use the electrical test equipment on these circuits.
- Be careful not to damage the airbag system wiring harness when servicing the ECM, TCM, main relay and fuel pump relay.

2) Never connect the battery in reverse polarity.

- The ECM will be destroyed instantly.
- The fuel injector and other parts will be damaged.

3) Do not disconnect the battery terminals while the engine is running.

- A large counter electromotive force will be generated in the generator, and this voltage may damage electronic parts such as ECM etc.

4) Before disconnecting the connectors of each sensor and ECM, be sure to turn the ignition switch to OFF.

5) Poor contact has been identified as a primary cause of this problem. Measure the voltage or resistance of individual sensor or all electrical control modules using a tapered pin with a diameter of less than 0.64 mm (0.025 in). Do not insert the pin more than 5 mm (0.20 in) into the part.

6) Remove the ECM from the located position after disconnecting two cables on battery.

- Otherwise, the ECM may be damaged.

CAUTION:

When replacing the ECM, be careful not to use the wrong spec. ECM to avoid damaging the fuel injection system.

7) Connectors of each sensor in the engine compartment and the harness connectors on the engine side and body side are all designed to be waterproof. Even if the connectors are waterproof, take care not to allow water to get into them when washing the vehicle, or when servicing the vehicle in rainy weather.

8) Use ECM mounting stud bolts as the body head grounding point when measuring voltage and resistance in the passenger compartment.

9) Use the engine ground terminal or engine assembly as the grounding point to chassis when measuring the voltage and resistance in engine compartment.

10) Every MFI-related part is a precision part. Do not drop them.

11) Observe the following cautions when installing a radio in MFI equipped models.

CAUTION:

- The antenna must be kept as far apart as possible from control unit. (The ECM is located under the steering column, inside of instrument panel lower trim panel.)

- The antenna feeder must be placed as far apart as possible from the ECM and MFI harness.

- Carefully adjust the antenna for correct matching.

- When mounting a large power type radio, pay special attention to the three items mentioned above.

- **Incorrect installation of the radio may affect the operation of ECM.**

12) Release fuel pressure before disconnecting the fuel hose. <Ref. to FU(H4DOTC)-49, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.>

13) For the model with ABS, the ABS warning light may illuminate when performing driving test with jacked-up or lifted-up condition, but this is not a system malfunction. The reason for this is the speed difference between the front and rear wheels. After diagnosis of engine control system, perform the ABS memory clear procedure of self-diagnosis function.

B: INSPECTION

Before performing diagnostics, check the following item which might affect engine problems.

1. BATTERY

1) Measure the battery voltage and specific gravity of electrolyte.

Standard voltage:

12 V

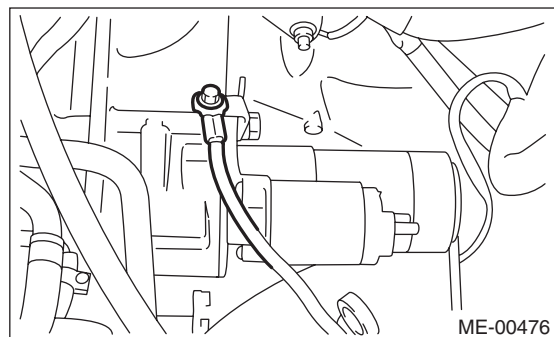
Specific gravity:

1.260 or more

2) Check the condition of the main and other fuses, and harnesses and connectors. Also check for proper grounding.

2. ENGINE GROUND

Make sure the engine ground terminal is properly connected to the engine.



General Description

ENGINE (DIAGNOSTICS)

C: NOTE

1. GENERAL DESCRIPTION

- The on-board diagnosis (OBD) system detects and indicates a fault in various inputs and outputs of the complex electronic control. Malfunction indicator light in the combination meter indicates occurrence of a fault or trouble.
- Further, against such a failure or sensors as may disable the drive, the fail-safe function is provided to ensure the minimal drive ability.
- The OBD system incorporated with the vehicles within this type of engine complies with OBD-II regulations. The OBD system monitors the components and the system malfunction listed in “Engine Section” which affects on emissions.
- When the system decides that a malfunction occurs, malfunction indicator light illuminates. At the same time of the malfunction indicator light illumination or blinking, a DTC and a freeze frame engine conditions are stored into on-board computer.
- The OBD system stores freeze frame engine condition data (engine load, engine coolant temperature, fuel trim, engine speed and vehicle speed, etc.) into on-board computer first when it detects a malfunction.
- If the OBD system detects the various malfunctions including the fault of fuel trim or misfire, the OBD system first stores freeze frame engine conditions about the fuel trim or misfire.
- When the malfunction does not occur again for three consecutive driving cycles, malfunction indicator light is turned off, but DTC remains at on-board computer.
- When troubleshooting the vehicle which complies with OBD-II regulations, connect the Subaru Select Monitor or general scan tool to the vehicle.

2. ENGINE AND EMISSION CONTROL SYSTEM

- The Multipoint Fuel Injection (MFI) system is a system that supplies the optimum air-fuel mixture to the engine for all the various operating conditions through the use of the latest electronic technology.

With this system fuel, which is pressurized at a constant pressure, is injected into the intake air passage of the cylinder head. The injection quantity of fuel is controlled by an intermittent injection system where the electro-magnetic injection valve (fuel injector) opens only for a short period of time, depending on the quantity of air required for one cycle of operation. In actual operation, the injection quantity is determined by the duration of an electric pulse applied to the fuel injector and this permits simple, yet highly precise metering of the fuel.

- Furthermore, all operating conditions of the engine are converted into electronic signals, and this enables additional system features with greatly improved adaptability, making it easier to add compensation features.

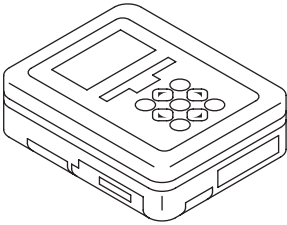
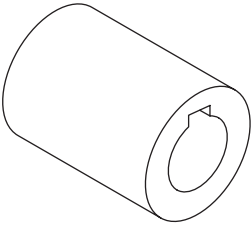
The MFI system also has the following features:

- Reduced emission of harmful exhaust gases.
- Reduction in fuel consumption.
- Increased engine output.
- Superior acceleration and deceleration.
- Superior start ability and warm-up performance in cold weather since compensation is made for coolant and intake air temperature.

General Description

ENGINE (DIAGNOSTICS)

D: PREPARATION TOOL

ILLUSTRATION	TOOL NUMBER	TOOL NAME	REMARKS
 ST1B020XU0	1B020XU0	SUBARU SELECT MONITOR KIT	Used for troubleshooting the electrical system.
 ST-499987500	499987500	CRANKSHAFT SOCKET	Used for rotating the crankshaft.

Electrical Component Location

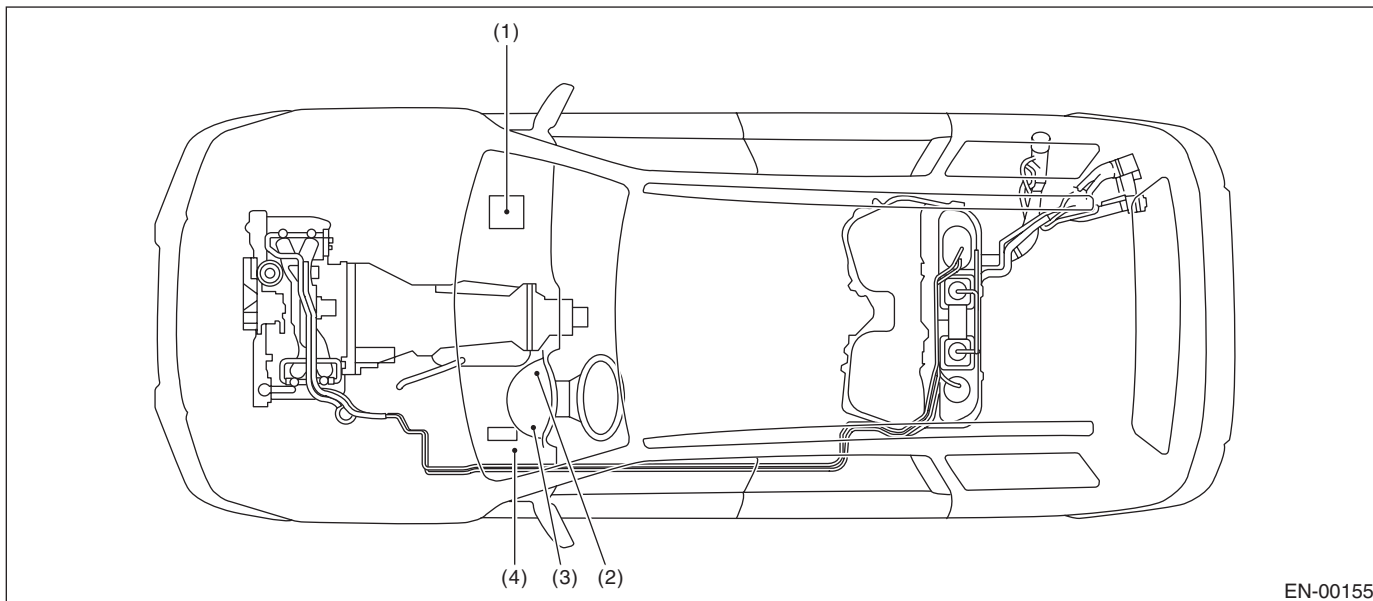
ENGINE (DIAGNOSTICS)

4. Electrical Component Location

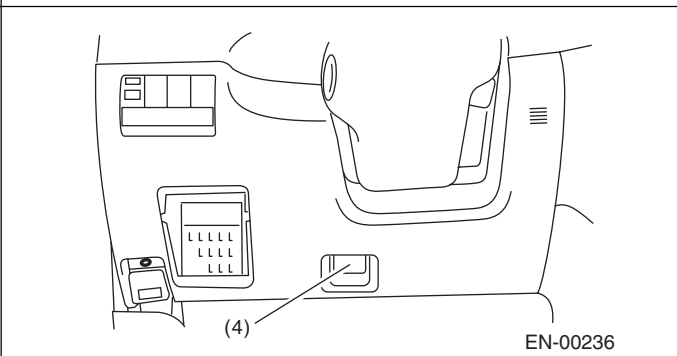
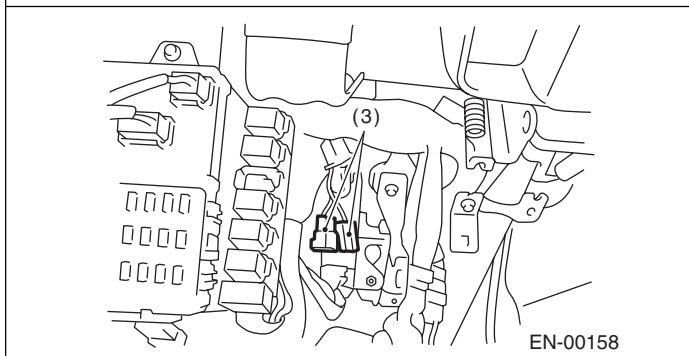
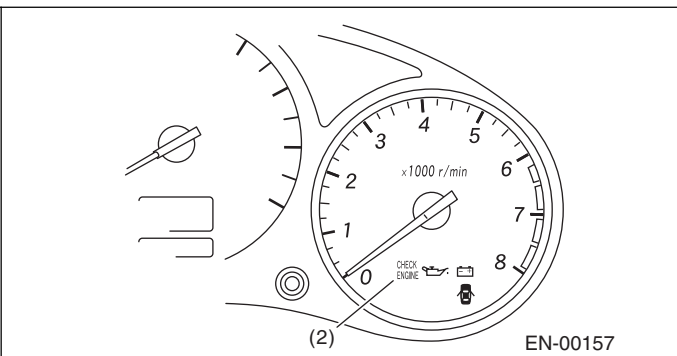
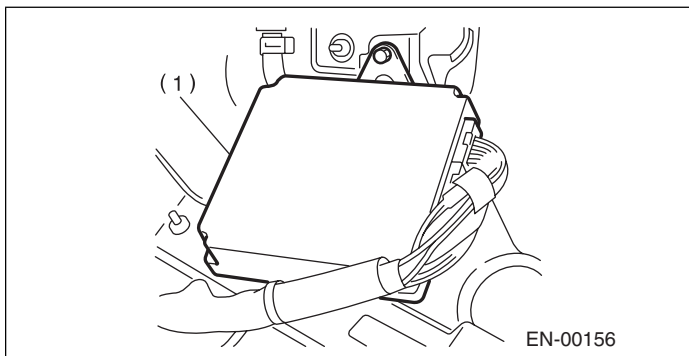
A: LOCATION

1. ENGINE

- Control module



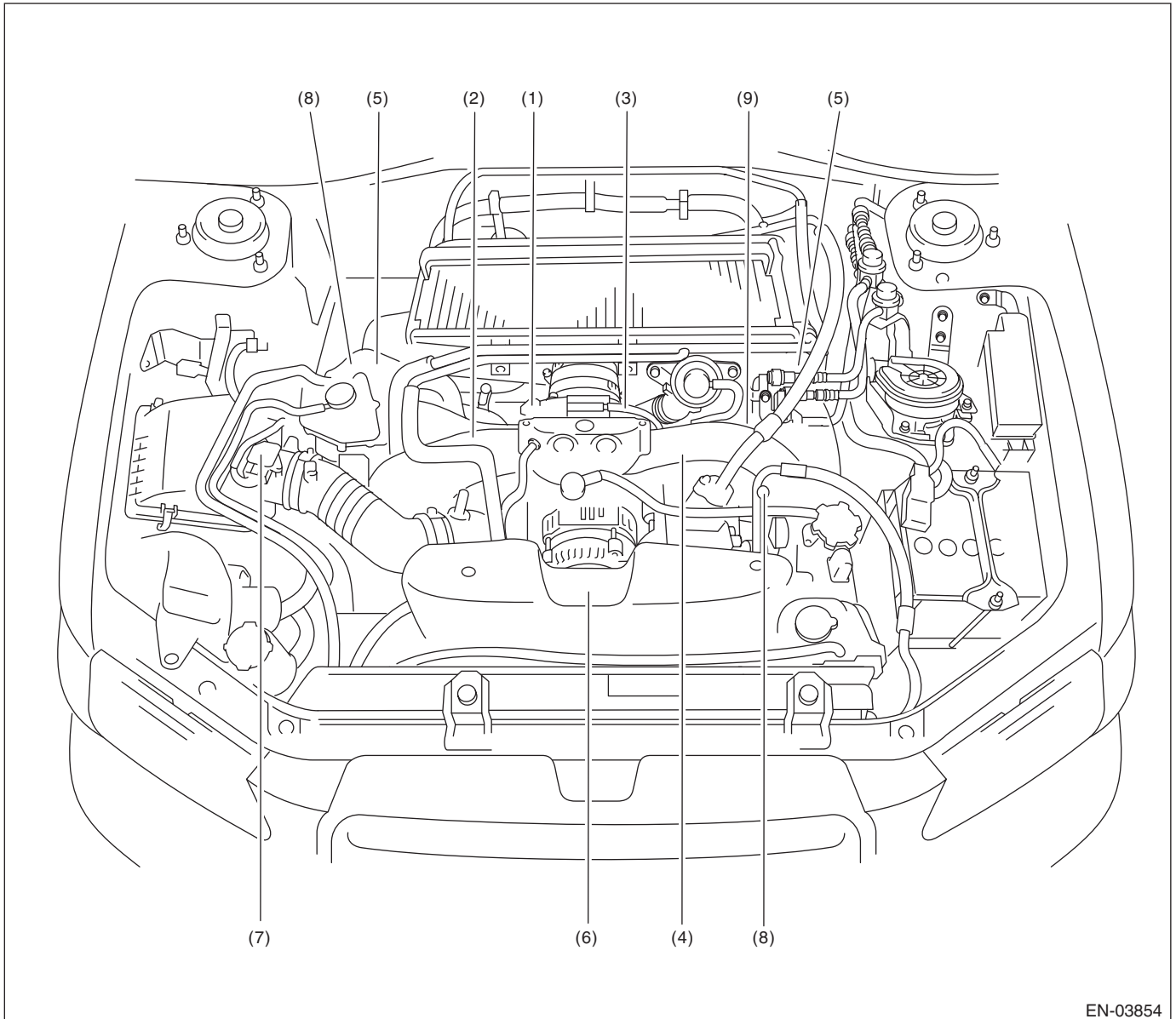
- (1) Engine control module (ECM) (3) Test mode connector (4) Data link connector
(2) Malfunction indicator light



Electrical Component Location

ENGINE (DIAGNOSTICS)

- Sensor

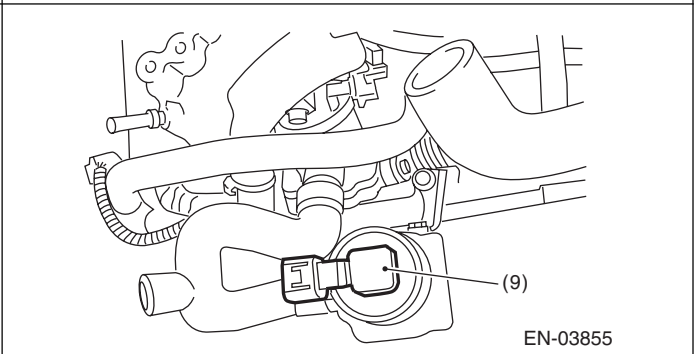
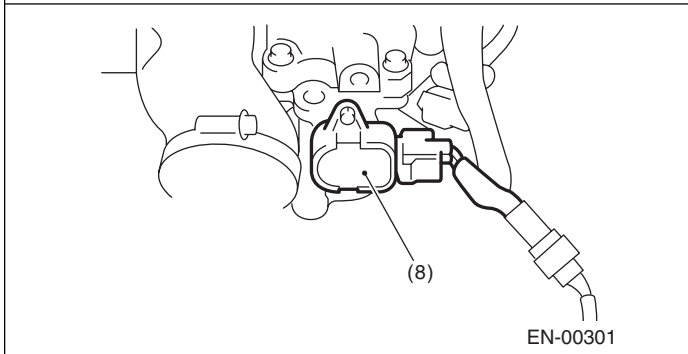
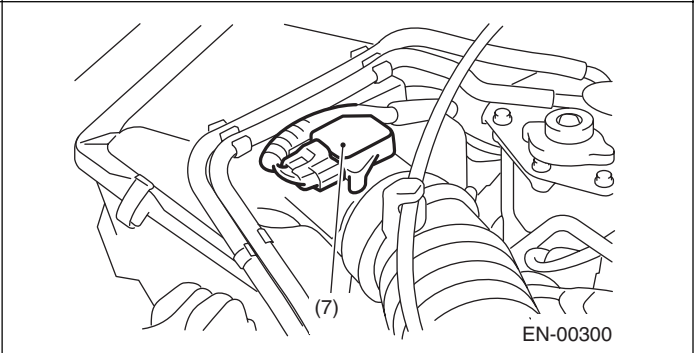
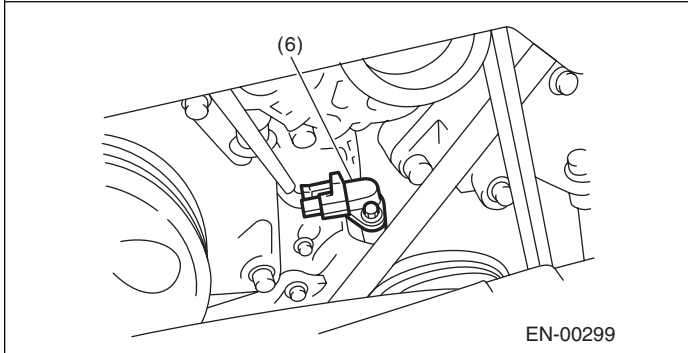
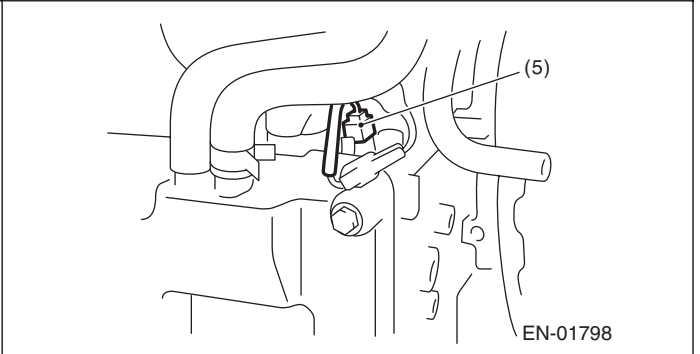
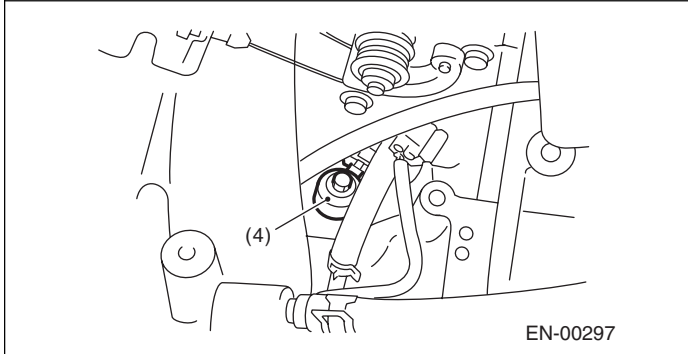
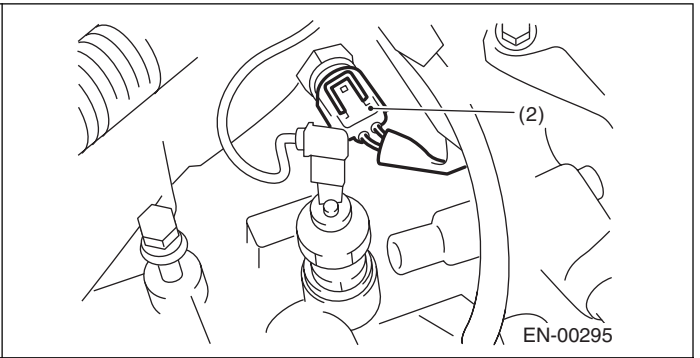
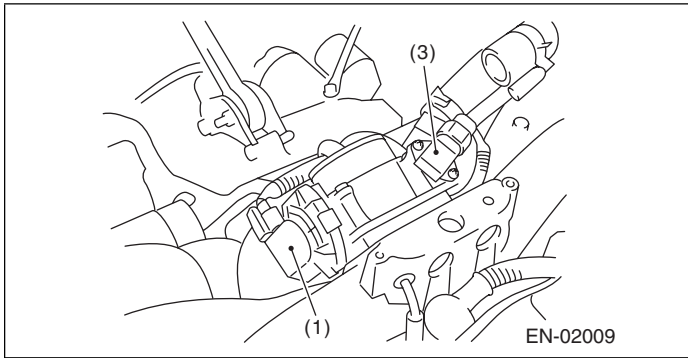


EN-03854

- | | | |
|---------------------------------------|---|--|
| (1) Throttle position sensor | (4) Knock sensor | (8) Tumble generator valve position sensor |
| (2) Engine coolant temperature sensor | (5) Camshaft position sensor | (9) Secondary air pressure sensor |
| (3) Manifold absolute pressure sensor | (6) Crankshaft position sensor | |
| | (7) Mass air flow and intake air temperature sensor | |

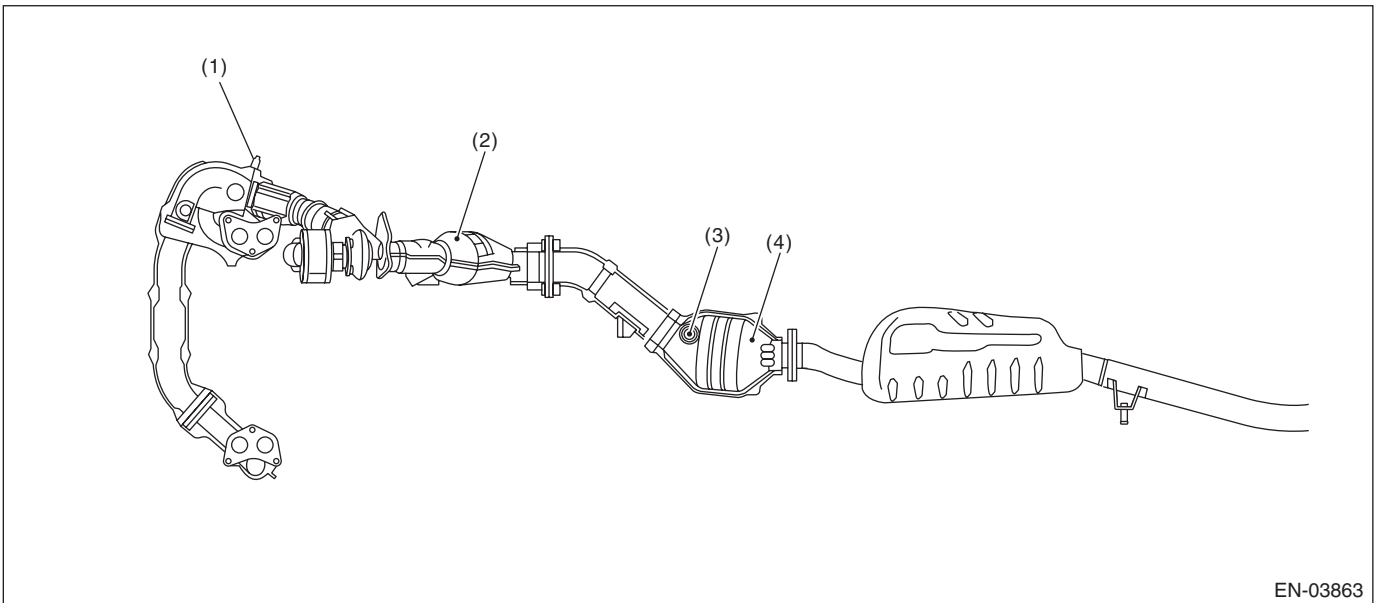
Electrical Component Location

ENGINE (DIAGNOSTICS)



Electrical Component Location

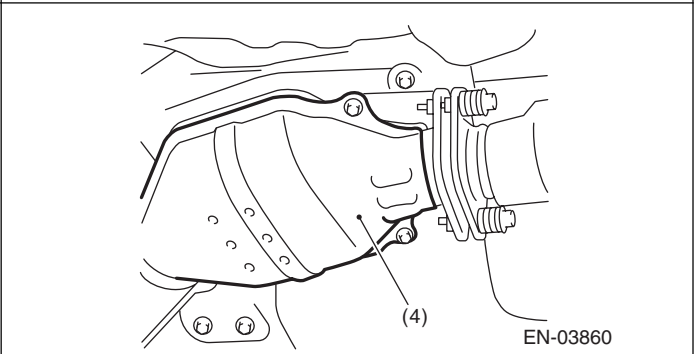
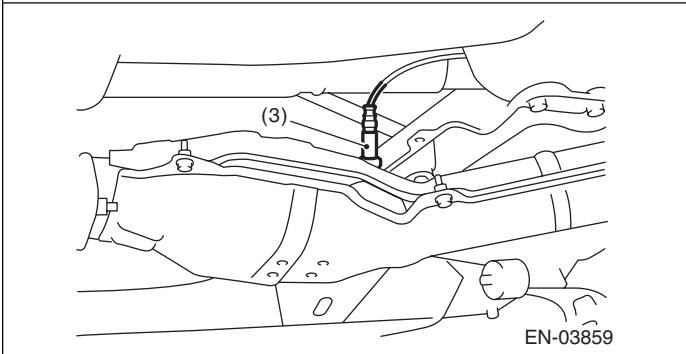
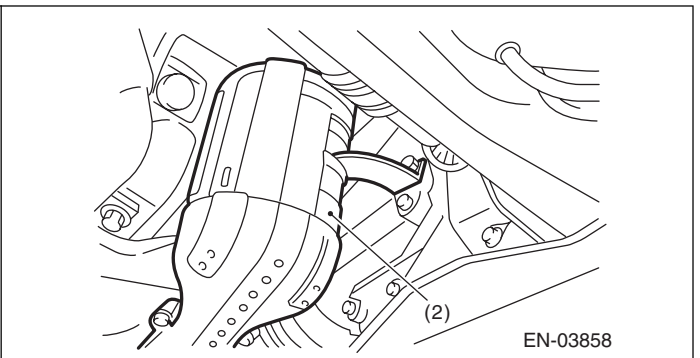
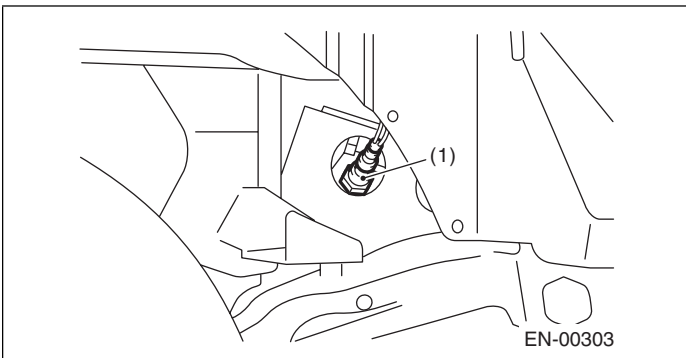
ENGINE (DIAGNOSTICS)



(1) Front oxygen (A/F) sensor
(2) Front catalytic converter

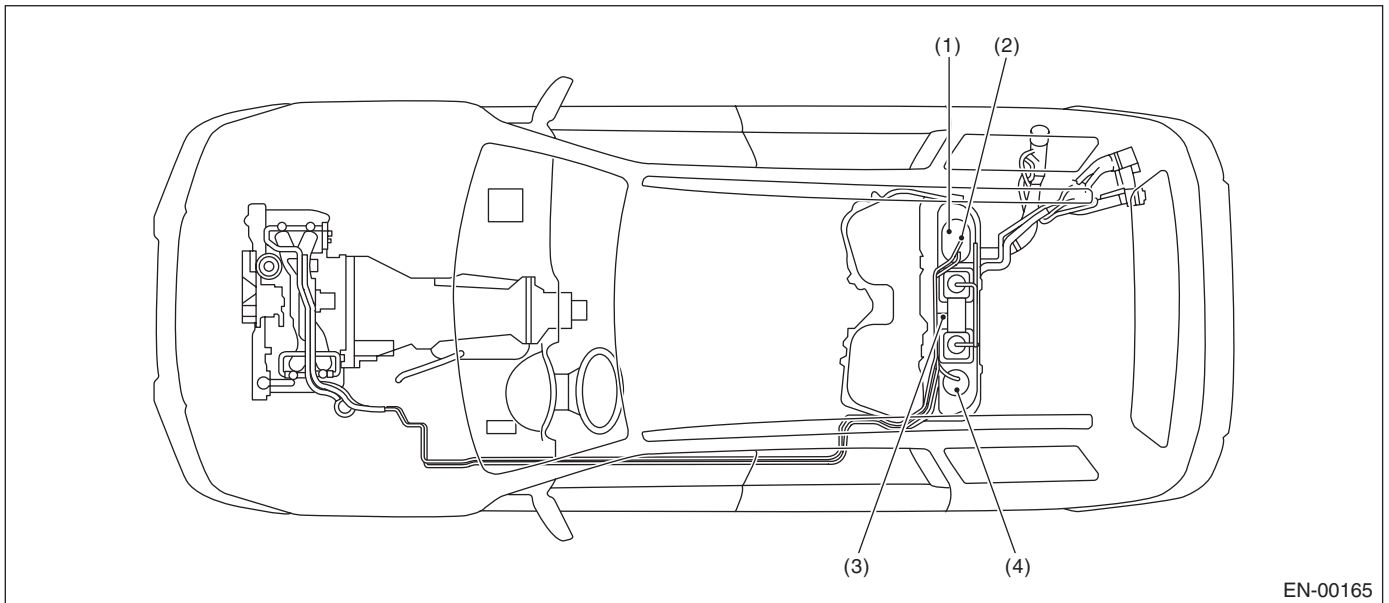
(3) Rear oxygen sensor

(4) Rear catalytic converter



Electrical Component Location

ENGINE (DIAGNOSTICS)

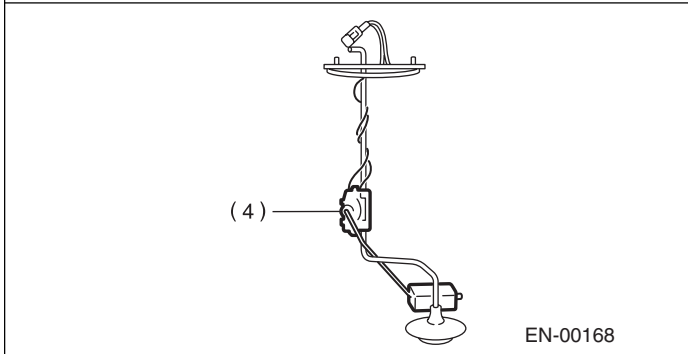
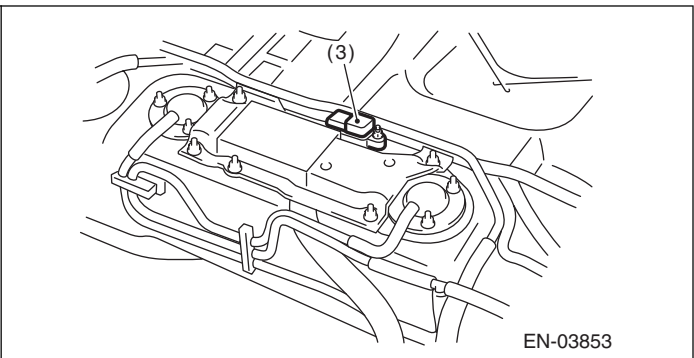
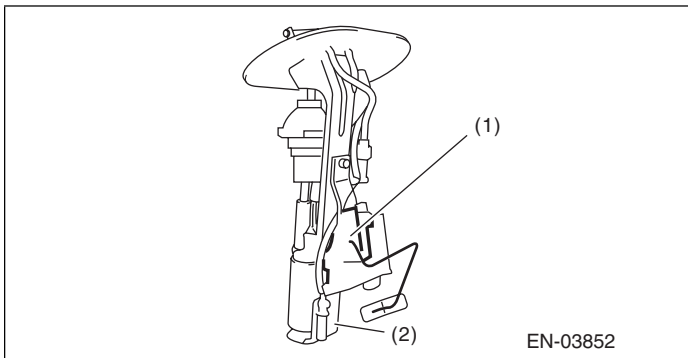


(1) Fuel level sensor

(3) Fuel tank pressure sensor

(4) Fuel sub level sensor

(2) Fuel temperature sensor

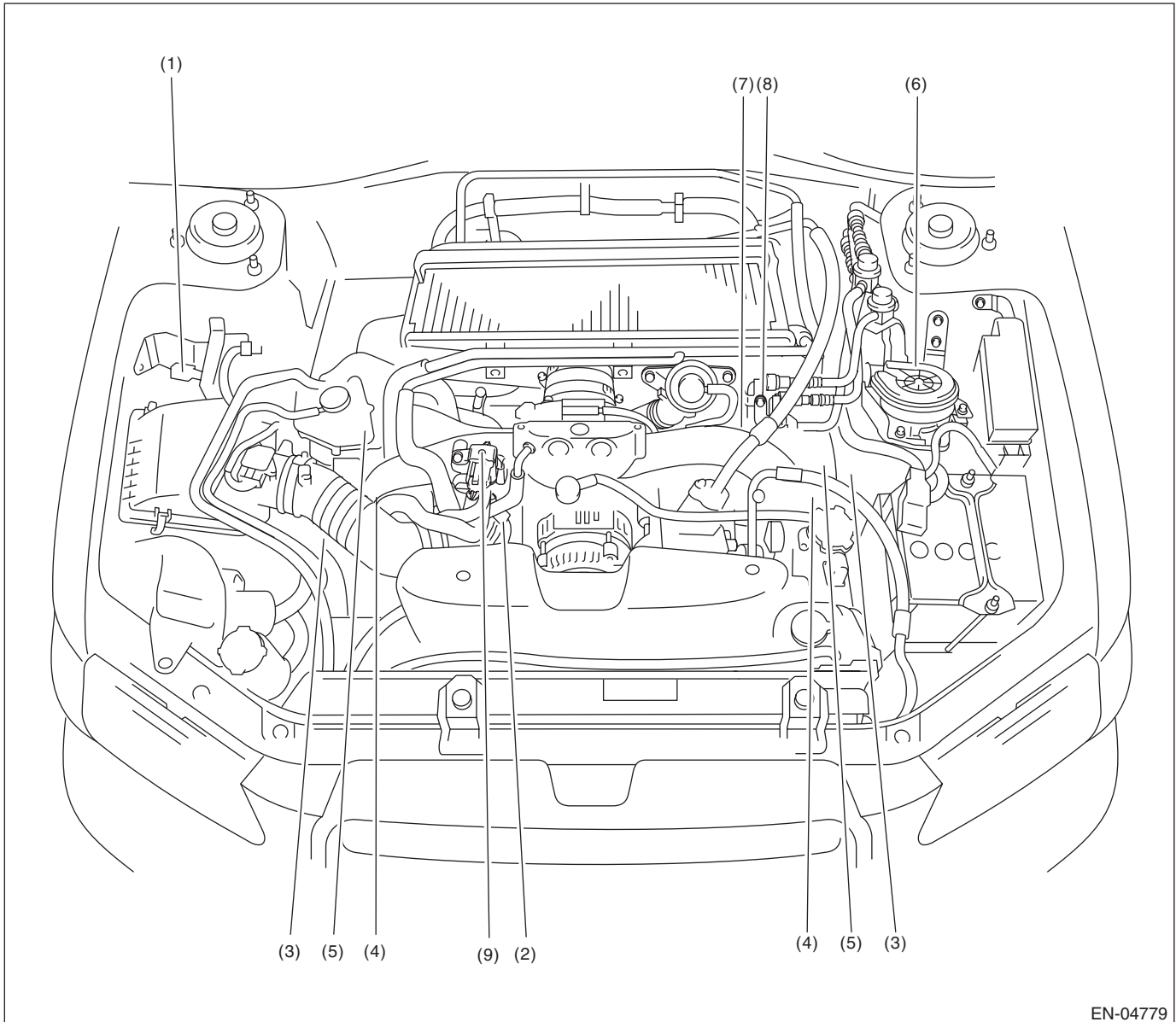


SUBARU

Electrical Component Location

ENGINE (DIAGNOSTICS)

- Solenoid valve, actuator, emission control system parts and ignition system parts

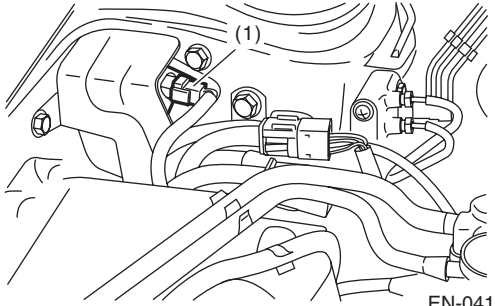


EN-04779

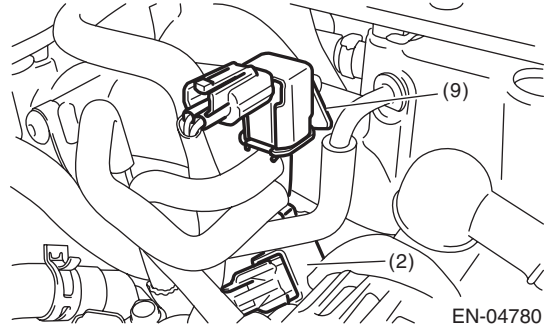
- | | | |
|--------------------------------------|---|---|
| (1) Wastegate control solenoid valve | (5) Oil flow control solenoid valve | (8) Secondary air injection system switching valve (LH) |
| (2) Purge control solenoid valve 1 | (6) Secondary air pump | (9) Purge control solenoid valve 2 |
| (3) Ignition coil | (7) Secondary air injection system switching valve (RH) | |
| (4) Tumble generator valve actuator | | |

Electrical Component Location

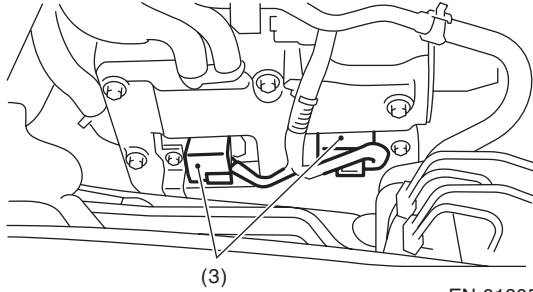
ENGINE (DIAGNOSTICS)



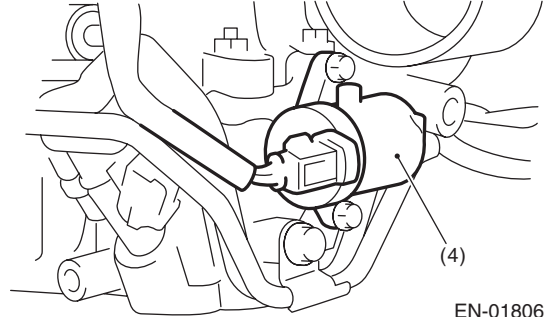
EN-04111



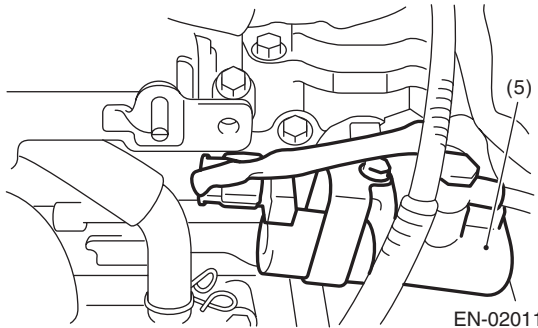
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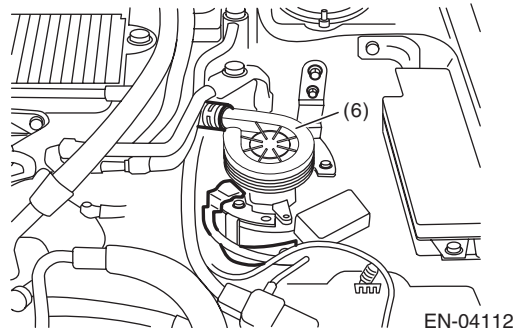
EN-01805



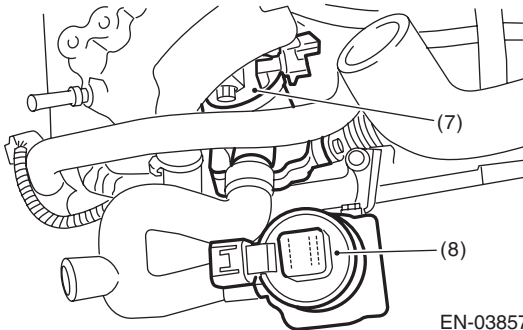
EN-01806



EN-02011



EN-04112

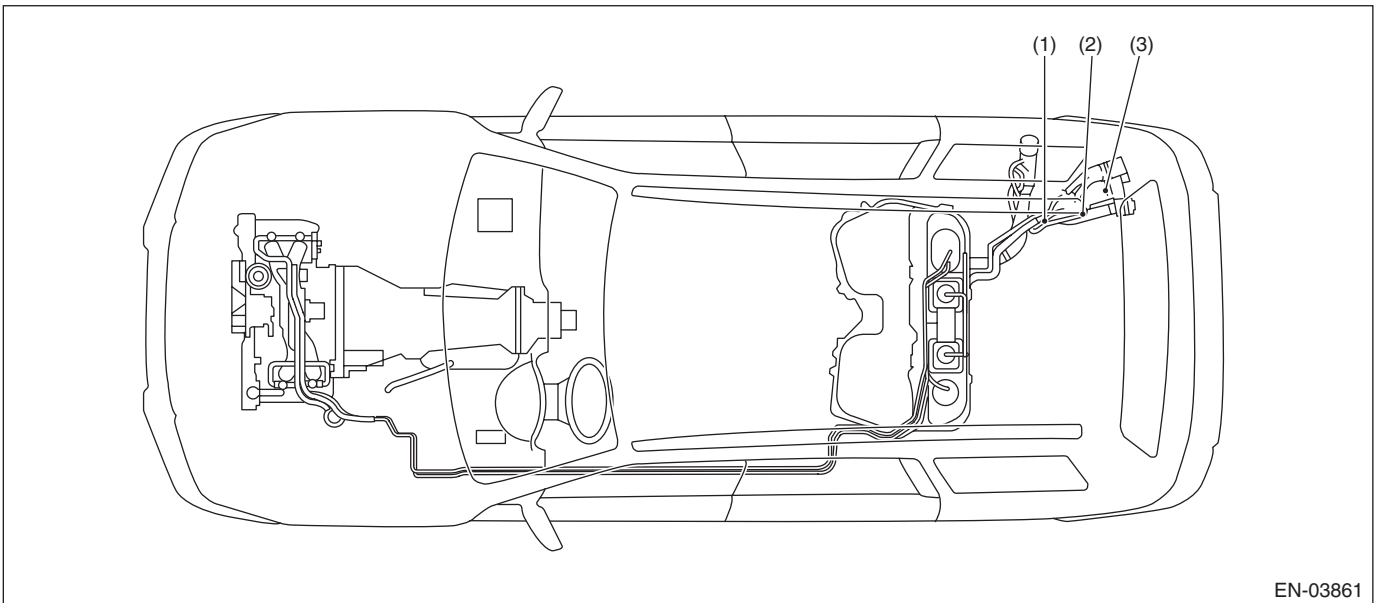


EN-03857

SUBARU.

Electrical Component Location

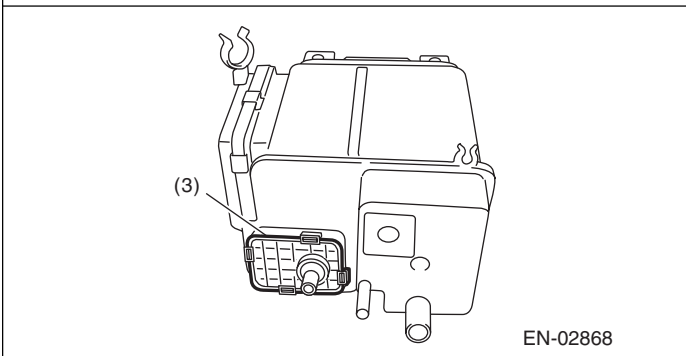
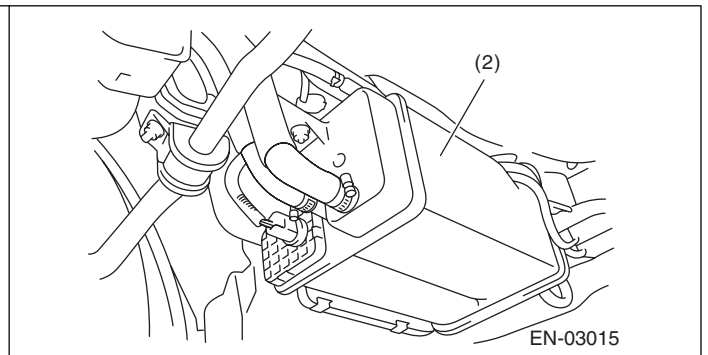
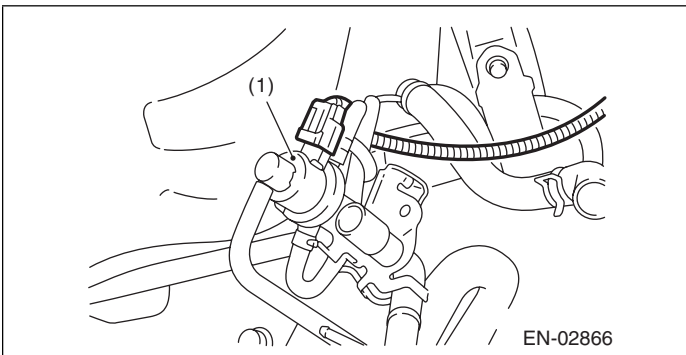
ENGINE (DIAGNOSTICS)



(1) Pressure control solenoid valve

(2) Canister

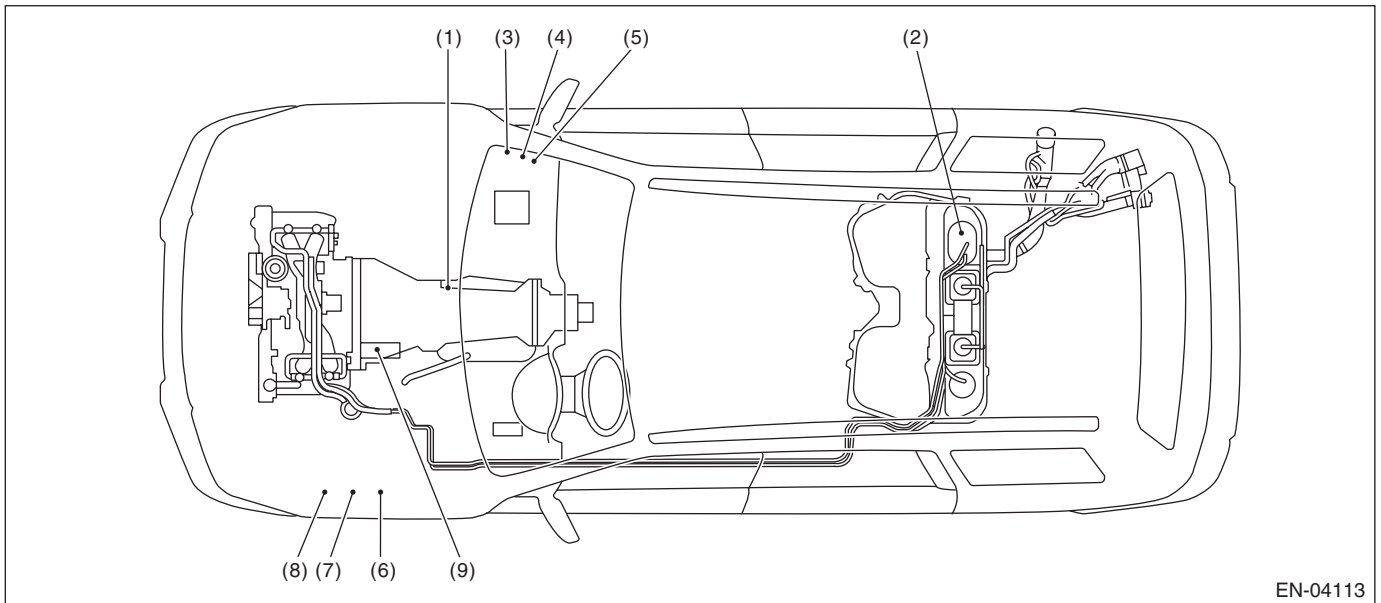
(3) Drain valve



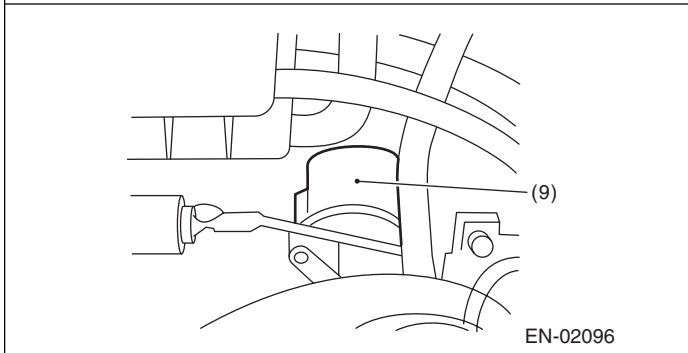
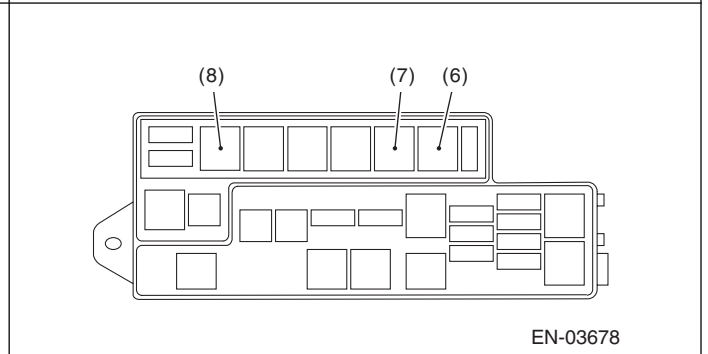
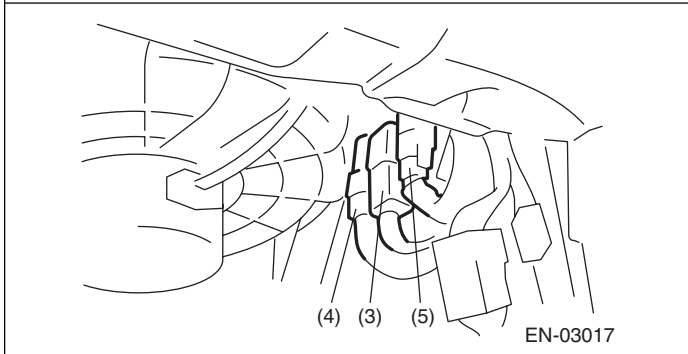
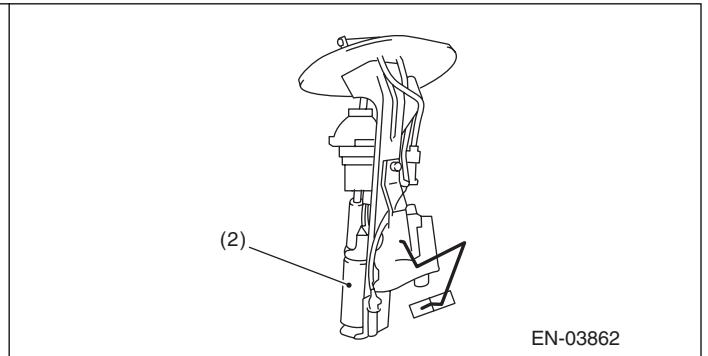
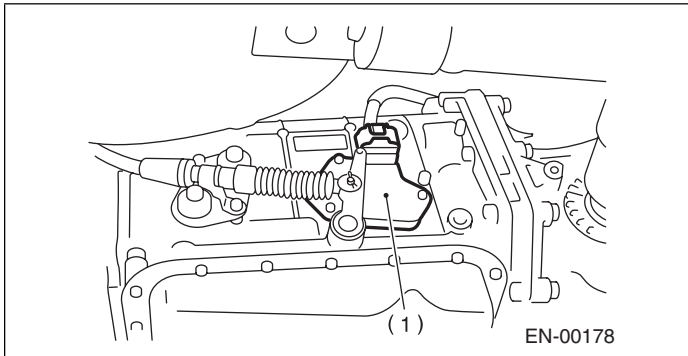
SUBARU.

Electrical Component Location

ENGINE (DIAGNOSTICS)



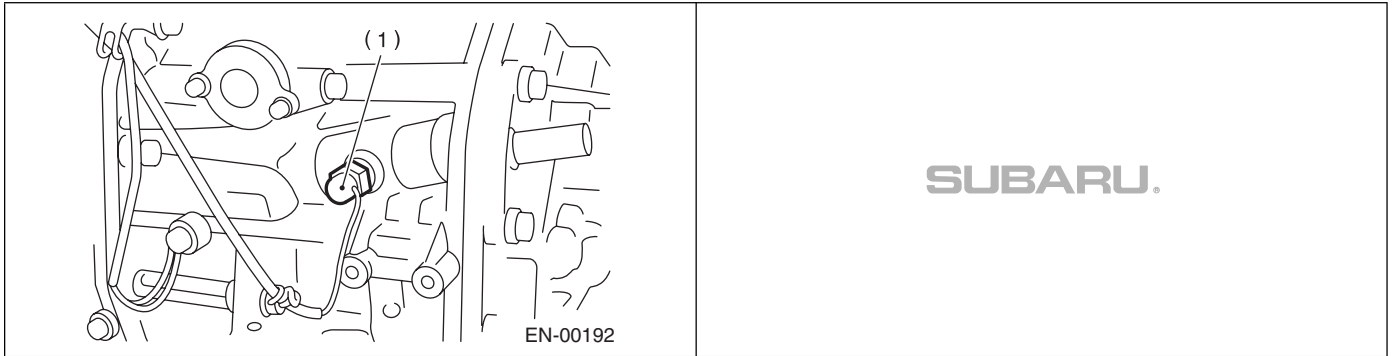
- | | | |
|----------------------|---------------------------------------|----------------------------|
| (1) Inhibitor switch | (4) Fuel pump relay | (7) Radiator sub fan relay |
| (2) Fuel pump | (5) Electronic throttle control relay | (8) Fan mode relay |
| (3) Main relay | (6) Radiator main fan relay | (9) Starter |



SUBARU.

2. TRANSMISSION

- Solenoid valve and switch (MT vehicles)



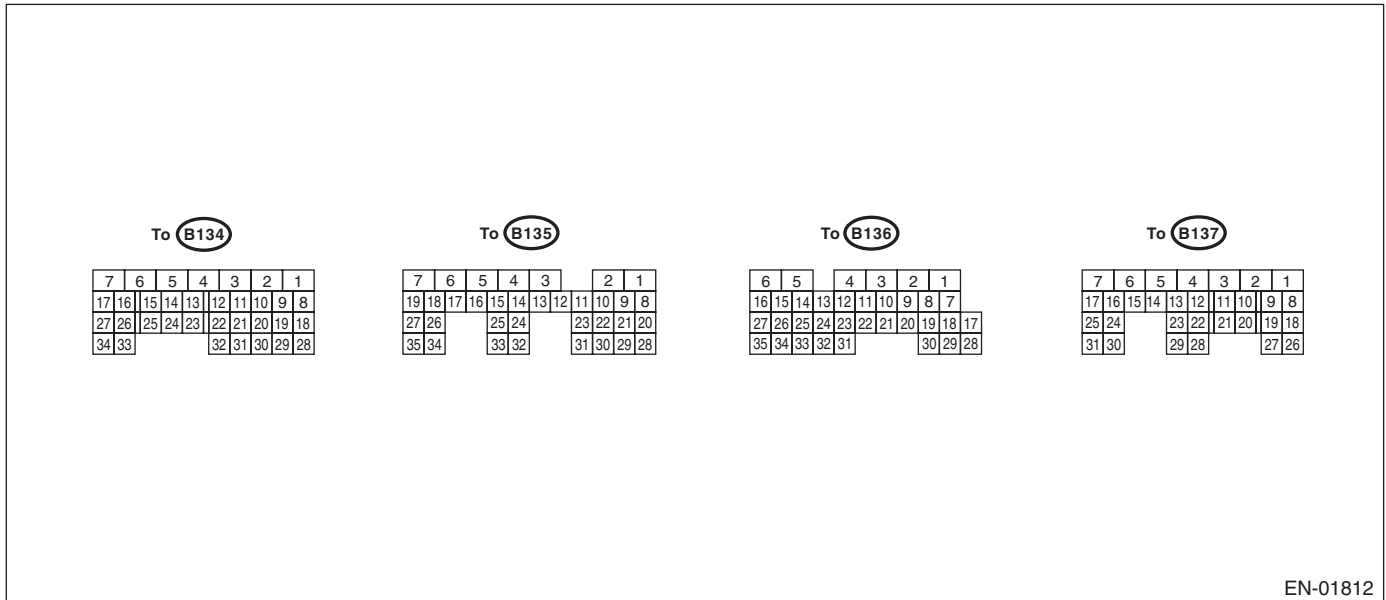
- (1) Neutral position switch

Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)

5. Engine Control Module (ECM) I/O Signal

A: ELECTRICAL SPECIFICATION



EN-01812

Contents		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Crankshaft position sensor	Signal (+)	B134	13	0	-7 — +7	Sensor output waveform
	Signal (-)	B134	14	0	0	—
	Shield	B134	24	0	0	—
Rear oxygen sensor	Signal	B135	4	0	0 — 0.9	—
	Shield	B135	1	0	0	—
	GND (sensor)	B135	30	0	0	—
Front oxygen (A/F) sensor heater	Signal 1	B136	3	0 — 1.0	—	Sensor output waveform
	Signal 2	B136	2	0 — 1.0	—	Sensor output waveform
Rear oxygen sensor heater signal		B136	4	0 — 1.0	—	Sensor output waveform
Engine coolant temperature sensor	Signal	B134	34	1.0 — 1.4	1.0 — 1.4	After engine is warmed-up.
	GND (sensor)	B134	29	0	0	After engine is warmed-up.
Vehicle speed signal		B136	13	0 or 5	0 or 5	"5" and "0" are repeatedly displayed when vehicle is driven.
Air flow sensor	Signal	B135	26	—	0.3 — 4.5	—
	Shield	B135	35	0	0	—
	GND	B135	34	0	0	—
Intake air temperature sensor signal		B135	18	0.3 — 4.6	0.3 — 4.6	—
Tumble generator valve position sensor RH	Signal	B134	26	Fully closed: 3.8 — 4.9 Fully open: 0.2 — 0.9		—
	Power supply	B134	19	5	5	—
	GND (sensor)	B134	29	0	0	—

Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)

Contents		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Tumble generator valve position sensor LH	Signal	B134	16	Fully closed: 3.8 — 4.9 Fully open: 0.2 — 0.9		—
	Power supply	B134	19	5	5	—
	GND (sensor)	B134	29	0	0	—
Tumble generator valve RH (open)		B137	22	0 or 10 — 13	0 or 12 — 14	Sensor output waveform
Tumble generator valve RH (close)		B137	23	0 or 10 — 13	0 or 12 — 14	Sensor output waveform
Tumble generator valve LH (open)		B137	12	0 or 10 — 13	0 or 12 — 14	Sensor output waveform
Tumble generator valve LH (close)		B137	13	0 or 10 — 13	0 or 12 — 14	Sensor output waveform
Wastegate control solenoid valve		B137	27	0 or 10 — 13	0 or 12 — 14	Sensor output waveform
Starter switch		B136	32	0	0	Cranking: 8 — 14
A/C switch		B136	24	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
Ignition switch		B135	19	10 — 13	12 — 14	—
Neutral position switch		B136	31	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
Test mode connector		B135	27	10 — 13	13 — 14	When connected: 0
Knock sensor	Signal	B134	15	2.8	2.8	—
	Shield	B134	25	0	0	—
Back-up power supply		B135	5	10 — 13	12 — 14	Ignition switch "OFF": 10 — 13
Control module power supply		B134	7	10 — 13	12 — 14	—
		B135	2	10 — 13	12 — 14	—
Sensor power supply		B134	19	5	5	—
Ignition control	#1	B137	18	0	12 — 14	Waveform
	#2	B137	19	0	12 — 14	Waveform
	#3	B137	20	0	12 — 14	Waveform
	#4	B137	21	0	12 — 14	Waveform
Fuel injector	#1	B137	8	10 — 13	1 — 14	Waveform
	#2	B137	9	10 — 13	1 — 14	Waveform
	#3	B137	10	10 — 13	1 — 14	Waveform
	#4	B137	11	10 — 13	1 — 14	Waveform
Fuel pump control unit	Signal 1	B136	12	0 or 5	0 or 5	Sensor output waveform
	Signal 2	B135	33	10 — 13	12 — 14	—
A/C relay control		B136	9	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—
Radiator fan relay 1 control		B136	18	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	—
Radiator fan relay 2 control		B136	29	ON: 0.5 or less OFF: 10 — 13	ON: 0.5 or less OFF: 12 — 14	Model with A/C only
Malfunction indicator light		B136	11	—	—	Light "ON": 1 or less Light "OFF": 10 — 14
Engine speed output		B136	22	—	0 — 13 or more	Waveform
Purge control solenoid valve 1		B137	29	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	Sensor output waveform

Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)

Contents		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Purge control solenoid valve 2		B136	7	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	Sensor output waveform
Manifold absolute pressure sensor	Signal	B134	6	1.7 — 2.4	1.1 — 1.6	—
	Power supply	B134	19	5	5	
	GND (sensor)	B134	29	0	0	
Fuel tank pressure sensor	Signal	B135	32	2.3 — 2.7	2.3 — 2.7	The valve operates when fuel filler cap is removed and reinstalled.
	Power supply	B135	22	5	5	
	GND (sensor)	B135	30	0	0	—
Pressure control solenoid valve		B136	28	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	—
Drain valve		B136	17	ON: 1 or less OFF: 10 — 13	ON: 1 or less OFF: 12 — 14	—
Fuel level sensor		B135	10	0.12 — 4.75	0.12 — 4.75	—
Fuel temperature sensor signal		B135	17	2.5 — 3.8	2.5 — 3.8	Ambient temperature: 25°C (77°F)
Blow-by leak diagnosis signal		B134	30	0	0	At the time of open circuit (fault): 5
Small light switch		B135	15	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Blower fan switch		B135	16	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Rear defogger switch		B135	14	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Power steering oil pressure switch		B134	33	10 — 13	ON: 0 OFF: 12 — 14	—
Front oxygen (A/F) sensor signal (+)		B135	9	2.8 — 3.2	2.8 — 3.2	—
Front oxygen (A/F) sensor signal (-)		B135	8	2.4 — 2.7	2.4 — 2.7	—
Front oxygen (A/F) sensor shield		B135	1	0	0	—
SSM/GST communication line		B136	16	1 ↔ 4	1 ↔ 4	—
Ground (engine 4)		B137	1	0	0	—
Ground (ignition system 1)		B137	26	0	0	—
Ground (ignition system 2)		B137	6	0	0	—
Ground (engine 3)		B137	2	0	0	—
Ground (engine 1)		B134	5	0	0	—
Ground (engine 5)		B137	3	0	0	—
Ground (engine 2)		B137	7	0	0	—
Camshaft position sensor (LH)		B134	21	0 — 0.9	ON: 0 OFF: 4.7 — 5.3	Sensor output waveform
Camshaft position sensor (RH)		B134	11	0 — 0.9	ON: 0 OFF: 4.7 — 5.3	Sensor output waveform

Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)

Contents		Connector No.	Terminal No.	Signal (V)		Note
				Ignition SW ON (engine OFF)	Engine ON (idling)	
Electronic throttle control	Main	B134	18	0.64 — 0.72 Fully opened: 3.96	0.64 — 0.72 (After engine is warmed-up.)	Fully closed: 0.6 Fully opened: 3.96
	Sub	B134	28	1.51 — 1.58 Fully opened: 4.17	1.51 — 1.58 (After engine is warmed-up.)	Fully closed: 1.48 Fully opened: 4.17
	Power supply	B134	19	5	5	—
	Ground (sensor)	B134	29	0	0	—
Electronic throttle control motor (+)		B137	5	Duty waveform	Duty waveform	Drive frequency: 500 Hz
Electronic throttle control motor (-)		B137	4	Duty waveform	Duty waveform	Drive frequency: 500 Hz
Electronic throttle control motor power supply		B136	1	10 — 13	12 — 14	—
Electronic throttle control motor relay		B136	21	0	0	—
Oil flow control solenoid (LH)	Signal (+)	B137	15	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
	Signal (-)	B137	14	0	0	—
Oil flow control solenoid (RH)	Signal (+)	B137	17	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
	Signal (-)	B137	16	0	0	—
Accelerator pedal position sensor	Main sensor signal	B135	23	Fully closed: 1 Fully opened: 3.5	Fully closed: 1 Fully opened: 3.5	—
	Main power supply	B135	21	5	5	—
	GND (main sensor)	B135	29	0	0	—
	Sub sensor signal	B135	31	Fully closed: 1 Fully opened: 3.5	Fully closed: 1 Fully opened: 3.5	—
	Sub power supply	B135	22	5	5	—
	Ground (Sub sensor)	B135	30	0	0	—
Main light		B135	6	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Cruise control set light		B135	3	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—
Clutch switch		B136	25	When clutch pedal is depressed: 0 When clutch pedal is released: 10 — 13	When clutch pedal is depressed: 0 When clutch pedal is released: 12 — 14	—
SET/COAST switch		B135	24	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—
Brake switch 1		B135	20	When brake pedal is depressed: 0 When brake pedal is released: 10 — 13	When brake pedal is depressed: 0 When brake pedal is released: 12 — 14	—

Engine Control Module (ECM) I/O Signal

ENGINE (DIAGNOSTICS)

Contents	Connector No.	Terminal No.	Signal (V)		Note	
			Ignition SW ON (engine OFF)	Engine ON (idling)		
Brake switch 2	B135	28	When brake pedal is depressed: 10 — 13 When brake pedal is released: 0	When brake pedal is depressed: 12 — 14 When brake pedal is released: 0	—	
Main switch	B135	12	ON: 10 — 13 OFF: 0	ON: 12 — 14 OFF: 0	—	
CAN communication	Signal (+)	B136	27	Pulse signal		—
	Signal (-)	B136	35	Pulse signal		—
Secondary air piping pressure sensor	Signal	B134	27	1.7 — 2.4	1.1 — 1.6	—
	Power supply	B134	19	5	5	
	GND (sensor)	B134	29	0	0	
Secondary air combination valve relay 1	B136	30	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—	
Secondary air combination valve relay 2	B136	19	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—	
Secondary air pump relay	B136	8	ON: 0 OFF: 10 — 13	ON: 0 OFF: 12 — 14	—	

6. Engine Condition Data

A: ELECTRICAL SPECIFICATION

Content	Specification
Engine load	17.6 — 35.64 (%): Idling
	13.2 — 26.73 (%): 2,500 rpm racing

Measuring condition:

- After engine is warmed-up.
- Gear position is in neutral.
- Turn the A/C off.
- Turn all the accessory switches to OFF.

Data Link Connector

ENGINE (DIAGNOSTICS)

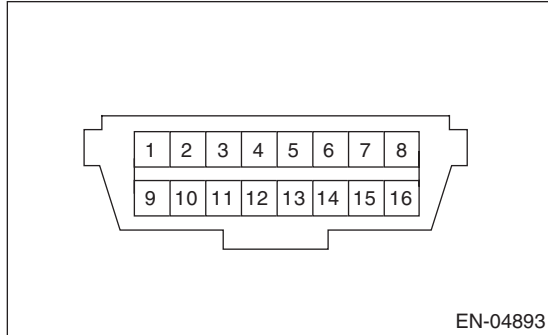
7. Data Link Connector

A: NOTE

This connector is used for the general scan tool and the Subaru Select Monitor.

CAUTION:

Do not connect any scan tools other than general scan tools and the Subaru Select Monitor, because the circuit for the Subaru Select Monitor may be damaged.



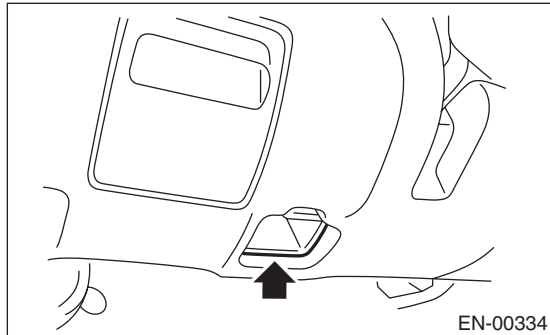
Terminal No.	Content	Terminal No.	Content
1	Empty	9	Empty
2	Empty	10	Empty
3	Empty	11	Empty
4	Ground	12	Empty
5	Ground	13	Empty
6	CAN (+)	14	CAN (-)
7	Subaru select monitor/General scan tool signal	15	Empty
8	Empty	16	Power supply

8. General Scan Tool

A: OPERATION

1. HOW TO USE GENERAL SCAN TOOL

- 1) Prepare a scan tool (general scan tool) required by SAE J1978.
- 2) Open the cover and connect the general scan tool to the data link connector located in the lower portion of instrument panel (on the driver's side).



- 3) Using the general scan tool, call up DTC and freeze frame data.

General scan tool functions consist of:

- (1) MODE \$01: Current power train diagnostic data
- (2) MODE \$02: Powertrain freeze frame data
- (3) MODE \$03: Emission-related powertrain DTC
- (4) MODE \$04: Clear/Reset emission-related diagnostic information
- (5) MODE \$06: Request on-board monitoring test results for intermittently monitored systems
- (6) MODE \$07: Request on-board monitoring test results for continuously monitored systems
- (7) MODE \$09: Request vehicle information

Read data according to repair procedures. (For detailed operation procedure, refer to the general scan tool instruction manual.)

NOTE:

For details concerning DTC, refer to "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).>

General Scan Tool

ENGINE (DIAGNOSTICS)

2. MODE \$01 (CURRENT POWERTRAIN DIAGNOSTIC DATA)

Refer to data denoting the current operating condition of analog input/output, digital input/output or the powertrain system.

A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
01	Number of emission-related powertrain DTC and malfunction indicator light status and diagnosis support information	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	mmHg
0C	Engine speed	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
0F	Intake air temperature	°C
10	Air flow rate from mass air flow sensor	g/sec
11	Throttle valve absolute opening angle	%
12	Secondary air control status	—
13	Check whether oxygen sensor is installed.	—
15	Oxygen sensor output voltage and short term fuel trim associated with oxygen sensor	V and %
1C	Supporting OBD system	—
1F	Elapsed time after starting engine	sec
21	Travel distance after malfunction indicator light illuminating	km
24	A/F value and A/F sensor output voltage	— and V
2E	Evaporative purge	%
2F	Fuel level	%
30	Number of warm ups after DTC clear	—
31	Travel distance after DTC clear	km
32	Fuel tank pressure	mmHg
33	Atmospheric pressure	mmHg
34	A/F value and A/F sensor current	— and mA
3C	Catalytic temperature#1	°C
41	Diagnostic monitor of each drive cycle	—
42	ECM power voltage	V
43	Absolute load	%
44	A/F target lambda	—
45	Relative throttle opening angle	%
46	Ambient temperature	°C
47	Absolute throttle opening angle 2	%
49	Absolute accelerator opening angle 1	%
4A	Absolute accelerator opening angle 2	%
4C	Target throttle opening angle	%
4D	Engine operating time during malfunction indicator illuminates	min
4E	Elapsed time after DTC clear	min
51	Fuel used	—
5A	Relative accelerator opening angle	%

NOTE:

Refer to general scan tool manufacturer's instruction manual to access generic OBD-II PIDs (MODE \$01).

3. MODE \$02 (POWERTRAIN FREEZE FRAME DATA)

Refer to data denoting the operating condition when trouble is detected by on-board diagnosis system. A list of the support data and PID (Parameter Identification) codes are shown in the following table.

PID	Data	Unit of measure
02	DTC that caused CARB required freeze frame data storage	—
03	Fuel system control status	—
04	Calculated engine load value	%
05	Engine coolant temperature	°C
06	Short term fuel trim	%
07	Long term fuel trim	%
0B	Intake manifold absolute pressure	mmHg
0C	Engine speed	rpm
0D	Vehicle speed	km/h
0E	Ignition timing advance	°
0F	Intake air temperature	°C
10	Air flow rate from mass air flow sensor	g/sec
11	Throttle valve absolute opening angle	%
12	Secondary air control status	—
13	Air fuel ratio sensor	—
15	Oxygen sensor output voltage and oxygen sensor short term fuel trim	V and %
1C	Supporting OBD system	—
1F	Elapsed time after starting engine	sec
2E	Evaporative purge	%
2F	Fuel level	%
32	Fuel tank pressure	mmHg
33	Atmospheric pressure	mmHg
42	ECM power voltage	V
43	Absolute load	%
44	A/F target lambda	—
45	Relative throttle opening angle	%
46	Ambient temperature	°C
47	Absolute throttle opening angle 2	%
49	Absolute accelerator opening angle 1	%
4A	Absolute accelerator opening angle 2	%
4C	Target throttle opening angle	%

NOTE:

Refer to general scan tool manufacturer's instruction manual to access freeze frame data (MODE \$02).

4. MODE \$03 (EMISSION-RELATED POWERTRAIN DTC)

Refer to "Read Diagnostic Trouble Code (DTC)" for information about data denoting emission-related powertrain DTC. <Ref. to EN(H4DOTC)(diag)-37, Read Diagnostic Trouble Code (DTC).>

5. MODE \$04 (CLEAR/RESET EMISSION-RELATED DIAGNOSTIC INFORMATION)

Refer to the mode used to clear or reset emission-related diagnostic information (OBD-II trouble diagnostic information).

NOTE:

Refer to general scan tool manufacturer's instruction manual to clear the emission-related diagnostic information (MODE \$04).

General Scan Tool

ENGINE (DIAGNOSTICS)

6. MODE \$06

Refer to the test value of troubleshooting and data of test specification on the support data bit sequence table. A list of the support data is shown in the following table.

OBDMID	TID	SID	Diagnostic item
\$01	\$81	\$0A	A/F Sensor Conduction Abnormal (Bank 1 Sensor 1)
	\$82	\$8D	
	\$83	\$14	
	\$84	\$1E	A/F Sensor Range Abnormal (Bank 1 Sensor 1)
	\$85	\$1E	
	\$86	\$20	A/F Sensor Response Abnormal (Bank 1 Sensor 1)
\$02	\$87	\$0B	Oxygen Sensor Circuit Abnormal (Bank 1 Sensor 2)
	\$88	\$0B	
	\$07	\$0B	Oxygen Sensor Drop Abnormal (Bank 1 Sensor 2)
	\$08	\$0B	
	\$A5	\$0B	
	\$05	\$10	Oxygen Sensor Response Abnormal (Bank 1 Sensor 2)
	\$06	\$10	
\$21	\$89	\$20	Catalyst Degradation Diagnosis (Bank 1)
\$39	\$93	\$FE	Evaporative Emission Control System Leak Detected (Cap off)
\$3B	\$94	\$FE	Evaporative Emission Control System (0.04 inch leak)
	\$95	\$FE	
\$3C	\$96	\$FE	Evaporative Emission Control System (0.02 inch leak)
	\$97	\$FE	
\$3D	\$98	\$FE	Evaporative Emission Control System Leak Detected (purge flow)
\$41	\$99	\$24	A/F Sensor Heater Abnormal (Bank 1 Sensor 1)
	\$9A	\$24	
	\$9B	\$14	A/F Sensor Heater Characteristics Abnormal (Bank 1 Sensor 1)
\$42	\$9C	\$24	Oxygen Sensor Heater Abnormal (Bank 1 Sensor 1)
	\$9D	\$24	
\$A1	\$0B	\$24	Misfire Monitoring (All cylinders)
	\$0C	\$24	
\$A2	\$0B	\$24	Misfire Monitoring (#1 cylinder)
	\$0C	\$24	
\$A3	\$0B	\$24	Misfire Monitoring (#2 cylinder)
	\$0C	\$24	
\$A4	\$0B	\$24	Misfire Monitoring (#3 cylinder)
	\$0C	\$24	
\$A5	\$0B	\$24	Misfire Monitoring (#4 cylinder)
	\$0C	\$24	
\$E1	\$A6	\$FE	Purge Control Solenoid Valve 2 Stock Closed

7. MODE \$07

Refer to the data of DTC (pending code) for troubleshooting result about emission in the first time.

8. MODE \$09

Refer to the data of vehicle specification (V.I.N., calibration ID, etc.).

9. Subaru Select Monitor

A: OPERATION

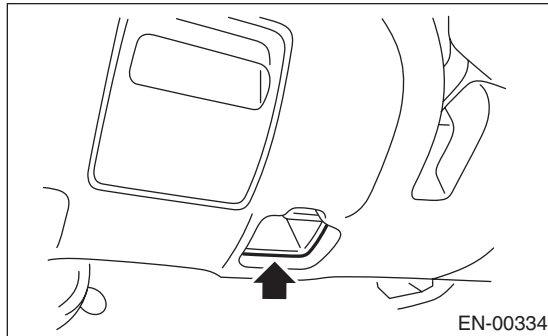
1. HOW TO USE SUBARU SELECT MONITOR

1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>

2) Connect the diagnosis cable to the Subaru Select Monitor.

3) Connect the Subaru Select Monitor to the data link connector.

(1) Data link connector is located in the lower portion of instrument panel (on the driver's side).



(2) Connect the diagnosis cable to the data link connector.

CAUTION:

Do not connect any scan tools except the Subaru Select Monitor or the general scan tool.

4) Turn the ignition switch to ON (engine OFF) and run the Subaru Select Monitor.

5) Using the Subaru Select Monitor, call up DTC and data, then record them.

2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE (NORMAL MODE)

Refer to "Read Diagnostic Trouble Code (DTC)" for information about how to display a DTC. <Ref. to EN(H4DOTC)(diag)-37, Read Diagnostic Trouble Code (DTC).>

3. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR ENGINE (OBD MODE)

Refer to "Read Diagnostic Trouble Code (DTC)" for information about how to display a DTC. <Ref. to EN(H4DOTC)(diag)-37, Read Diagnostic Trouble Code (DTC).>

Subaru Select Monitor

ENGINE (DIAGNOSTICS)

4. READ CURRENT DATA FOR ENGINE (NORMAL MODE)

- 1) On the «Main Menu» display screen, select {Each System Check}.
 - 2) On the «System Selection Menu» display screen, select {Engine Control System}.
 - 3) Select the [OK] after the information of engine type has been displayed.
 - 4) On the «Engine Diagnosis» display screen, select {Current Data Display/Save}.
 - 5) On the «Data Display Menu» screen, select {Data Display}.
 - 6) Using the scroll key, scroll the display screen up or down until the desired data is shown.
- A list of the support data is shown in the following table.

Content	Display	Unit of measure	Note (at idling)
Engine load	Engine Load	%	21.0%
Engine coolant temperature signal	Coolant Temp.	°C or °F	80 — 100°C or 176 — 212°F
A/F correction #1	A/F Correction #1	%	-10 — +10%
A/F learning #1	A/F Learning #1	%	-15 — +15%
Intake manifold absolute pressure	Mani. Absolute Pressure	mmHg, kPa, inHg or psig	220 — 275 mmHg, 29.5 — 37 kPa, 8.7 — 10 inHg or 4.2 — 5.3 psig
Engine speed signal	Engine Speed	rpm	700 rpm (Agree with the tachometer indication)
Meter vehicle speed signal	Meter Vehicle Speed	km/h or MPH	0 km/h or 0 MPH (at parking)
Ignition timing signal	Ignition Timing	deg	+17.0 deg
Intake air temperature signal	Intake Air Temp.	°C or °F	20 — 50°C or 68 — 122°F
Amount of intake air	Mass Air Flow	g/s or lb/m	3.6 g/s or 0.48 lb/m
Throttle opening angle signal	Throttle Opening Angle	%	3.0 — 3.2%
Rear oxygen sensor voltage	Rear O2 Sensor	V	0 — 1.0 V
Battery voltage	Battery Voltage	V	12 — 15 V
Mass air flow voltage	Air Flow Sensor Voltage	V	1.0 — 1.7 V
Injection 1 pulse width	Fuel Injection #1 Pulse	ms	1.2 — 2.2 ms
Atmospheric pressure	Atmospheric Pressure	mmHg, kPa, inHg or psig	(Atmosphere pressure)
Intake manifold relative pressure	Mani. Relative Pressure	mmHg, kPa, inHg or psig	(Air intake absolute pressure — atmosphere pressure)
Ignition timing learning value	Learned Ignition Timing	deg	0 deg
Acceleration opening angle signal	Accel. Opening Angle	%	0.0%
Fuel temperature signal	Fuel Temp.	°C or °F	+21°C or 70°F
Fuel level signal	Fuel Level	V	0 — 5 V
Primary supercharged pressure control signal	Primary Control	%	0.0%
Purge control solenoid duty ratio	CPC Valve Duty Ratio	%	0 — 25%
Tumble generator valve RH opening signal	TGV Position Sensor R	V	0.44 V
Tumble generator valve LH opening signal	TGV Position Sensor L	V	0.48 V
Fuel pump duty ratio	Fuel Pump Duty	%	33%
AVCS advance angle amount RH	VVT Adv. Ang. Amount R	deg	0 deg
AVCS advance angle amount LH	VVT Adv. Ang. Amount L	deg	0 deg
Oil flow control solenoid valve duty RH (AVCS)	OCV Duty R	%	9.4%
Oil flow control solenoid valve duty LH (AVCS)	OCV Duty L	%	9.4%
Oil flow control solenoid valve current RH	OCV Current R	mA	40 — 100 mA
Oil flow control solenoid valve current LH	OCV Current L	mA	40 — 100 mA
A/F sensor current value 1	A/F Sensor #1 Current	mA	-20 — 20 mA
A/F sensor resistance value 1	A/F Sensor #1 Resistance	Ω	27 — 35 Ω
A/F sensor output lambda 1	A/F Sensor #1	—	1.00
A/F correction 3	A/F Correction #3	%	0.00%
A/F learning 3	A/F Learning #3	%	0.00%

Subaru Select Monitor

ENGINE (DIAGNOSTICS)

Content	Display	Unit of measure	Note (at idling)
Throttle motor duty	Throttle Motor Duty	%	-10%
Throttle motor voltage	Throttle Motor Voltage	V	12 — 15 V
Sub throttle sensor voltage	Sub-throttle Sensor	V	1.52 V
Main throttle sensor voltage	Main-throttle Sensor	V	0.66 V
Sub accelerator sensor voltage	Sub-accelerator Sensor	V	0.68 V
Main accelerator sensor voltage	Main-accelerator Sensor	V	0.66 V
Secondary air supply piping pressure signal	Secondary air supply piping pressure	mmHg, kPa, inHg or psig	765 mmHg, 102 kPa, 30.1 inHg or 14.8 psig
Secondary airflow signal	Secondary airflow amount	g/s or lb/m	0.00 g/s or 0.00 lb/m
Memory vehicle speed	Memory Vehicle Speed	km/h or MPH	0 km/h or 0 MPH
Odd Meter	Estimated Cumulative Driving Distance	km	—
#1 cylinder roughness monitor	Roughness Monitor #1	—	0
#2 cylinder roughness monitor	Roughness Monitor #2	—	0
#3 cylinder roughness monitor	Roughness Monitor #3	—	0
#4 cylinder roughness monitor	Roughness Monitor #4	—	0
Knock sensor correction	Knock Correction	deg	0.0 deg
Fuel tank pressure signal	Fuel Tank Pressure	mmHg, kPa, inHg or psig	+8.8 mmHg, +1.2 kPa, +0.4 inHg or 0.2 psig
AT/MT identification terminal	AT Vehicle ID Signal	—	ON/OFF
Test mode terminal	Test Mode Signal	—	U-check
D check request flag	D check request flag	—	OFF
Delivery mode connector	Delivery mode connector	—	OFF
Neutral position switch signal	Neutral position switch	—	Neutral
Soft idle switch signal	Soft Idle Switch Signal	—	Idling
Ignition switch signal	Ignition Switch	—	ON input
Power steering switch signal	P/S Switch	—	OFF input (At OFF)
Air conditioning switch signal	A/C Switch	—	OFF input (At OFF)
Starter switch signal	Starter Switch	—	OFF input
Rear oxygen monitor	Rear O2 Rich Signal	—	Rich/Lean
Knocking signal	Knock Signal	—	None
Crankshaft position sensor signal	Crankshaft Position Sig.	—	Provided
Camshaft position sensor signal	Camshaft Position Sig.	—	Provided
Rear defogger switch signal	Rear Defogger SW	—	OFF input (At OFF)
Blower fan switch signal	Blower Fan SW	—	OFF input (At OFF)
Light switch signal	Light Switch	—	OFF input (At OFF)
A/C middle pressure switch signal	A/C Mid Pressure Switch	—	OFF input (At OFF)
Air conditioner compressor relay output signal	A/C Compressor Signal	—	OFF output (At OFF)
Radiator fan relay 1 signal	Radiator Fan Relay #1	—	OFF output (At OFF)
Radiator fan relay 2 signal	Radiator Fan Relay #2	—	OFF output (At OFF)
PCV hose assembly diagnosis signal	Blow-by Leak Connector	—	Connected
Pressure control solenoid valve signal	PCV Solenoid	—	OFF output (At OFF)
Tumble generator valve output signal	TGV Output	—	None
Tumble generator valve drive signal	TGV Drive	—	Opening direction
Drain valve signal	Vent Control Solenoid	—	OFF output (At OFF)
Purge control solenoid valve 2 signal	CPC Solenoid 2	—	OFF (At OFF)
AT coordinate retard angle demand signal	Retard Signal from AT	—	None
AT coordinate fuel cut demand signal	Fuel Cut Signal from AT	—	None

Subaru Select Monitor

ENGINE (DIAGNOSTICS)

Content	Display	Unit of measure	Note (at idling)
Vehicle dynamics control (VDC) torque down prohibition output	Ban of Torque Down	—	Allow
Vehicle dynamics control (VDC) torque down demand	VDC torque down demand	—	None
Torque control permission signal	AT Cooperative Control Request Signal	—	Allow
ETC motor relay signal	ETC Motor Relay	—	ON
Clutch switch signal	Clutch Switch	—	OFF (At OFF)
Stop light switch signal	Stop Light Switch	—	OFF (At OFF)
SET/COAST switch signal	SET/COAST Switch	—	OFF (At OFF)
RES/ACC switch signal	RESUME/ACCEL Switch	—	OFF (At OFF)
Brake switch signal	Brake Switch	—	OFF (At OFF)
Main switch signal	Main Switch	—	OFF (At OFF)
Secondary air combination valve relay 2 signal	Secondary Air Combination Valve Relay 2	—	OFF (At OFF)
Secondary air pump relay signal	Secondary Air Pump Relay	—	OFF (At OFF)
Secondary air combination valve relay 1 signal	Secondary Air Combination Valve Relay 1	—	OFF (At OFF)
Cruise control cancel switch signal	CC Cancel SW	—	OFF (At OFF)
Malfunction indicator light signal	MIL Lit Flag	—	OFF (when light is OFF)

NOTE:

For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

5. READ CURRENT DATA FOR ENGINE (OBD MODE)

- 1) On the «Main Menu» display screen, select {Each System Check}.
 - 2) On the «System Selection Menu» display screen, select {Engine Control System}.
 - 3) Select the [OK] after the information of engine type has been displayed.
 - 4) On the «Engine Diagnosis» display screen, select {OBD System}.
 - 5) On the «OBD Menu» screen, select {Current Data Display/Save}.
 - 6) On the «Data Display Menu» screen, select {Data Display}.
 - 7) Using the scroll key, scroll the display screen up or down until the desired data is shown.
- A list of the support data is shown in the following table.

Content	Display	Unit of measure	Note (at idling)
Number of diagnosis code	Number of Diag. Code:	—	—
Condition of malfunction indicator light	MI (MIL)	—	ON or OFF
Monitoring test of misfire	Misfire Monitoring	—	Finish or incomplete
Monitoring test of fuel system	Fuel system monitoring	—	Finish or incomplete
Monitoring test of comprehensive component	Component monitoring	—	Finish or incomplete
Test of catalyst	Catalyst Diagnosis	—	Finish or incomplete
Test of heating-type catalyst	Heated catalyst	—	no support
Test of evaporative emission purge control system	Evaporative purge system	—	Finish or incomplete
Test of Secondary air system	Secondary air system	—	Finish or incomplete
Test of air conditioning system refrigerant	A/C system refrigerant	—	no support
Oxygen sensor test	Oxygen sensor	—	Finish or incomplete
Oxygen sensor heater test	O2 Heater Diagnosis	—	Finish or incomplete
Test of EGR system	EGR system	—	no support
Air fuel ratio control system for bank 1	Fuel System for Bank 1	—	CLOSE NORMAL
Engine load data	Calculated load valve	%	21.0%
Engine coolant temperature signal	Coolant Temp.	°C or °F	+91°C or 196°F
Short term fuel trim by front oxygen (A/F) sensor	Short term fuel trim B1	%	+0.8%
Long term fuel trim by front oxygen (A/F) sensor	Long term fuel trim B1	%	+3.9%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg, kPa, inHg or psig	233 mmHg, 31 kPa, 9.2 inHg or 4.5 psig
Engine speed signal	Engine Speed	rpm	700 rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH	0 km/h or 0 MPH
#1 Cylinder ignition timing	Ignition timing adv.#1	°	+16.5°
Intake air temperature signal	Intake Air Temp.	°C or °F	54°C or 129°F
Intake air amount	Mass Air Flow	g/s or lb/m	2.8 g/s or 0.37 lb/m
Throttle position signal	Throttle Opening Angle	%	13%
Secondary air system	Secondary air system	—	Stop
Oxygen sensor #12	Oxygen Sensor #12	V	0.1 — 0.7 V
Air fuel ratio correction by rear oxygen sensor	Short term fuel trim #12	%	+0.0%
On-board diagnostic system	OBD System	—	CARB-OBD2
Oxygen sensor #11	Oxygen Sensor #11	—	Support
Rear oxygen sensor output signal	Oxygen Sensor #12	—	Support
A/F lambda signal	A/F sensor #11	—	1.001
A/F sensor output signal	A/F sensor #11	V	2.805 V
A/F lambda signal #11	A/F sensor #11	—	0.999
A/F sensor current #11	A/F sensor #11	mA	0.02 mA
Elapsed time after starting engine	Elapsed Time After Starting Engine	sec	—

Subaru Select Monitor

ENGINE (DIAGNOSTICS)

Content	Display	Unit of measure	Note (at idling)
Travel distance after malfunction indicator light illuminating	Elapsed Time After MIL Illuminates	km or miles	—
Evaporative purge	Evaporative purge	%	0%
Fuel level signal	Fuel level	%	—
Number of warm ups after DTC clear	Number Of Warm Ups After DTC Clear	—	—
Travel distance after DTC clear	Travel distance after DTC clear	km or miles	—
Fuel tank pressure signal	Fuel Tank Pressure	mmHg, kPa, inHg or psig	+8.8 mmHg, +1.2 kPa, +0.4 inHg or 0.2 psig
Atmospheric absolute pressure signal	Atmospheric Pressure	mmHg, kPa, inHg or psig	Atmospheric pressure
Catalyzer temperature #1	Catalyzer temperature #1	°C or °F	—
Diagnostic monitor of each drive cycle	Diagnostic monitor of each DC	—	—
ECM power voltage	ECM power voltage	V	13.789 V
Absolute load	Absolute load	%	22%
Air fuel ratio target lambda	A/F target lambda	—	0.976
Relative throttle position	Relative throttle position	%	2%
Ambient temperature	Ambient temperature	°C or °F	(Ambient air temperature)
Absolute throttle opening angle 2	Absolute throttle opening angle 2	%	32%
Absolute accelerator opening angle 1	Absolute accelerator opening angle 1	%	13%
Absolute accelerator opening angle 2	Absolute accelerator opening angle 2	%	13%
Target throttle opening angle	Target throttle opening angle	%	0%
Engine operating time during malfunction indicator illuminates	Engine operating time during MIL illuminates	min	—
Elapsed time after DTC clear	Elapsed time after DTC clear	min	—
Fuel used	Fuel used	—	GAS
Relative accelerator opening angle	Relative accelerator opening angle	%	0%

NOTE:

For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

6. READ FREEZE FRAME DATA FOR ENGINE (OBD MODE)

- 1) On the «Main Menu» display screen, select {Each System Check}.
 - 2) On the «System Selection Menu» display screen, select {Engine Control System}.
 - 3) Select the [OK] after the information of engine type has been displayed.
 - 4) On the «Engine Diagnosis» display screen, select {OBD System}.
 - 5) On the «Menu» screen, select {Freeze Frame Data}.
- A list of the support data is shown in the following table.

Content	Display	Unit of measure
DTC of freeze frame data	Freeze frame data	DTC
Air fuel ratio control system for bank 1	Fuel system for Bank 1	Close normal or open initial
Oxygen sensor #12	Oxygen sensor #12	V
Short term fuel trim by oxygen (A/F) sensor (Bank 1)	Short term fuel trim B1	%
Engine load data	Engine load	%
Engine coolant temperature signal	Coolant Temp.	°C or °F
Short term fuel trim by front oxygen (A/F) sensor (Bank 1)	Short term fuel trim B1	%
Long term fuel trim by front oxygen (A/F) sensor (Bank 1)	Long term fuel trim B1	%
Intake manifold absolute pressure signal	Mani. Absolute Pressure	mmHg, kPa, inHg or psig
Engine speed signal	Engine Speed	rpm
Vehicle speed signal	Vehicle Speed	km/h or MPH
Ignition timing #1	Ignition timing adv. #1	°
Intake air temperature	Intake Air Temp.	°C or °F
Amount of intake air	Mass Air Flow	g/s
Throttle position signal	Throttle Opening Angle	%
Secondary air system	Secondary air system	—
Oxygen sensor #11	Oxygen sensor #11	Support
Oxygen sensor #12	Oxygen sensor #12	Support
On-board diagnostic system	OBD System	—
Elapsed time after starting engine	Elapsed Time After Starting Engine	sec
Evaporative purge	Evaporative purge	%
Fuel level signal	Fuel level	%
Fuel tank pressure signal	Tank pressure	mmHg, kPa, inHg or psig
Atmospheric pressure	Atmospheric Pressure	mmHg, kPa, inHg or psig
ECM power voltage	ECM power voltage	V
Absolute load	Absolute load	%
Air fuel ratio target lambda	A/F target lambda	—
Relative throttle position	Relative throttle position	%
Ambient temperature	Ambient temperature	°C or °F
Absolute throttle opening angle 2	Absolute throttle opening angle 2	%
Absolute accelerator opening angle 1	Absolute accelerator opening angle 1	%
Absolute accelerator opening angle 2	Absolute accelerator opening angle 2	%
Target throttle opening angle	Target throttle opening angle	%

NOTE:

For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

Subaru Select Monitor

ENGINE (DIAGNOSTICS)

7. V.I.N. REGISTRATION

- 1) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
- 2) On the «System Selection Menu» display screen, select the {Engine Control System} and press the [YES] key.
- 3) Press the [YES] key after the information of engine type has been displayed.
- 4) On the «Engine Diagnosis» display screen, select the {V.I.N. Registration} and press the [YES] key.
- 5) Perform the procedures shown on the display screen.

NOTE:

For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

10. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

- 1) On the «Main Menu» display screen, select {Each System Check}.
- 2) On the «System Selection Menu» display screen, select {Engine Control System}.
- 3) Select the [OK] after the information of engine type has been displayed.
- 4) On the «Engine Diagnosis» screen, select {DTC Display}.
- 5) On the «Diagnostic Code(s) Display» screen, select {Current Diagnostic Code(s)} or {History Diagnostic Code(s)}.

NOTE:

- For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.
- For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).>

2. SUBARU SELECT MONITOR (OBD MODE)

- 1) On the «Main Menu» display screen, select {Each System Check}.
- 2) On the «System Selection Menu» display screen, select {Engine Control System}.
- 3) Select the [OK] after the information of engine type has been displayed.
- 4) On the «Engine Diagnosis» display screen, select {OBD System}.
- 5) On the «OBD Menu» display screen, select {Diagnostic Code(s) Display}.
- 6) Make sure DTC is shown on the screen.

NOTE:

- For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.
- For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).>

3. GENERAL SCAN TOOL

Refer to the data denoting emission-related powertrain DTC.

For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).>

NOTE:

Refer to the general scan tool manufacturer’s operation manual to access powertrain DTC (MODE \$03).

Inspection Mode

ENGINE (DIAGNOSTICS)

11. Inspection Mode

A: PROCEDURE

Perform the diagnosis shown in the following DTC table.

When performing the diagnosis not listed in “List of Diagnostic Trouble Code (DTC)”, refer the item on the drive cycle. <Ref. to EN(H4DOTC)(diag)-44, Drive Cycle.>

DTC	Item	Condition
P0011	Intake Camshaft Position-Timing Over- Advanced or System Performance (Bank 1)	—
P0016	Crankshaft Position - Camshaft Position Correlation (Bank 1)	—
P0018	Crankshaft Position - Camshaft Position Correlation (Bank 2)	—
P0021	A Camshaft Position-Timing Over- Advanced or System Performance (Bank 2)	—
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	—
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	—
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	—
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	—
P0102	Mass or Volume Air Flow Circuit Low Input	—
P0103	Mass or Volume Air Flow Circuit High Input	—
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	—
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	—
P0112	Intake Air Temperature Sensor 1 Circuit Low	—
P0113	Intake Air Temperature Sensor 1 Circuit High	—
P0117	Engine Coolant Temperature Circuit Low	—
P0118	Engine Coolant Temperature Circuit High	—
P0122	Throttle/Pedal Position Sensor / Switch “A” Circuit Low Input	—
P0123	Throttle/Pedal Position Sensor/ Switch “A” Circuit High	—
P0131	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	—
P0132	O2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	—
P0137	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	—
P0138	O2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	—
P0140	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 2)	—
P0182	Fuel Temperature Sensor “A” Circuit Low Input	—
P0183	Fuel Temperature Sensor “A” Circuit High Input	—
P0222	Throttle/Pedal Position Sensor/Switch “B” Circuit Low	—
P0223	Throttle/Pedal Position Sensor/Switch “B” Circuit High	—
P0230	Fuel Pump Primary Circuit	—
P0245	Turbo/Super Charger Wastegate Solenoid “A” Low	—
P0327	Knock Sensor 1 Circuit Low Input (Bank 1 or Single Sensor)	—
P0328	Knock Sensor 1 Circuit High (Bank 1 or Single Sensor)	—
P0335	Crankshaft Position Sensor “A” Circuit	—
P0336	Crankshaft Position Sensor “A” Circuit Range/Performance	—
P0340	Camshaft Position Sensor “A” Circuit (Bank 1 or Single Sensor)	—
P0345	Camshaft Position Sensor “A” Circuit (Bank 2)	—
P0413	Secondary Air Injection System Switching Valve “A” Circuit Open	—
P0416	Secondary Air Injection System Switching Valve “B” Circuit Open	—
P0418	Secondary Air Injection System Control “A” Circuit Open	—
P0447	Evaporative Emission Control System Vent Control Circuit Open	—
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	—
P0452	Evaporative Emission Control System Pressure Sensor Low Input	—
P0453	Evaporative Emission Control System Pressure Sensor High Input	—
P0458	Evaporative Emission System Purge Control Valve Circuit Low	—
P0462	Fuel Level Sensor “A” Circuit Low	—

Inspection Mode

ENGINE (DIAGNOSTICS)

DTC	Item	Condition
P0463	Fuel Level Sensor "A" Circuit High	—
P0502	Vehicle Speed Sensor "A" Circuit Low Input	—
P0503	Vehicle Speed Sensor "A" Intermittent/Erratic/High	—
P0512	Starter Request Circuit	—
P0513	Incorrect Immobilizer Key	—
P0519	Idle Air Control System Performance	—
P0600	Serial Communication Link	—
P0604	Internal Control Module Random Access Memory (RAM) Error	—
P0605	Internal Control Module Read Only Memory (ROM) Error	—
P0607	Control Module Performance	—
P0638	Throttle Actuator Control Range/Performance (Bank 1)	—
P0691	Fan 1 Control Circuit Low	—
P0700	Transmission Control System (MIL Request)	—
P0851	Neutral Switch Input Circuit Low	—
P0852	Neutral Switch Input Circuit High	—
P1152	O2 Sensor Circuit Range/Performance (Low) (Bank 1 Sensor 1)	—
P1153	O2 Sensor Circuit Range/Performance (High) (Bank 1 Sensor 1)	—
P1160	Return Spring Failure	—
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	—
P1410	Secondary Air Injection System Switching Valve Stuck Open	—
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	—
P1491	Positive Crankcase Ventilation (Blowby) Function Problem	—
P1518	Starter Switch Circuit Low Input	—
P1560	Back-Up Voltage Circuit Malfunction	—
P1570	Antenna	—
P1571	Reference Code Incompatibility	—
P1572	Egi-Immobilizer Communications (Except Antenna Circuit)	—
P1574	Key Communication Failure	—
P1576	EGI Control Module EEPROM	—
P1577	IMM Control Module EEPROM	—
P2006	Intake Manifold Runner Control Stuck Closed (Bank 1)	—
P2007	Intake Manifold Runner Control Stuck Closed (Bank 2)	—
P2008	Tumble Generator Valve Signal 1 Circuit Malfunction (Open)	—
P2009	Tumble Generator Valve Signal 1 Circuit Malfunction (Short)	—
P2011	Tumble Generator Valve Signal 2 Circuit Malfunction (Open)	—
P2012	Tumble Generator Valve Signal 2 Circuit Malfunction (Short)	—
P2016	Tumble Generator Valve Position Sensor 1 Circuit Low	—
P2017	Tumble Generator Valve Position Sensor 1 Circuit High	—
P2021	Tumble Generator Valve Position Sensor 2 Circuit Low	—
P2022	Tumble Generator Valve Position Sensor 2 Circuit High	—
P2088	OCV Solenoid Valve Signal A Circuit Open (Bank 1)	—
P2089	OCV Solenoid Valve Signal A Circuit Short (Bank 1)	—
P2092	OCV Solenoid Valve Signal A Circuit Open (Bank 2)	—
P2093	OCV Solenoid Valve Signal A Circuit Short (Bank 2)	—
P2101	Throttle Actuator Control Motor Circuit Range/Performance	—
P2102	Throttle Actuator Control Motor Circuit Low	—
P2109	Throttle/Pedal Position Sensor "A" Minimum Stop Performance	—
P2122	Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input	—
P2123	Throttle/Pedal Position Sensor/Switch "D" Circuit High Input	—
P2127	Throttle/Pedal Position Sensor/Switch "E" Circuit Low Input	—

Inspection Mode

ENGINE (DIAGNOSTICS)

DTC	Item	Condition
P2128	Throttle/Pedal Position Sensor/Switch "E" Circuit High Input	—
P2135	Throttle/Pedal Position Sensor/Switch "A"/"B" Voltage Correlation	—
P2138	Throttle/Pedal Position Sensor/Switch "D"/"E" Voltage Correlation	—
P2419	Evaporative Emissions System Purge Control Valve Circuit Low	—
P2420	Evaporative Emission Control System Purge Control Valve Circuit High	—
P2431	Secondary Air Injection System Air Flow /Pressure Sensor Circuit Range/Performance	—
P2432	Secondary Air Injection System Air Flow /Pressure Sensor Circuit Low	—
P2433	Secondary Air Injection System Air Flow /Pressure Sensor Circuit High	—
P2444	Secondary Air Injection System Pump Stuck On	—

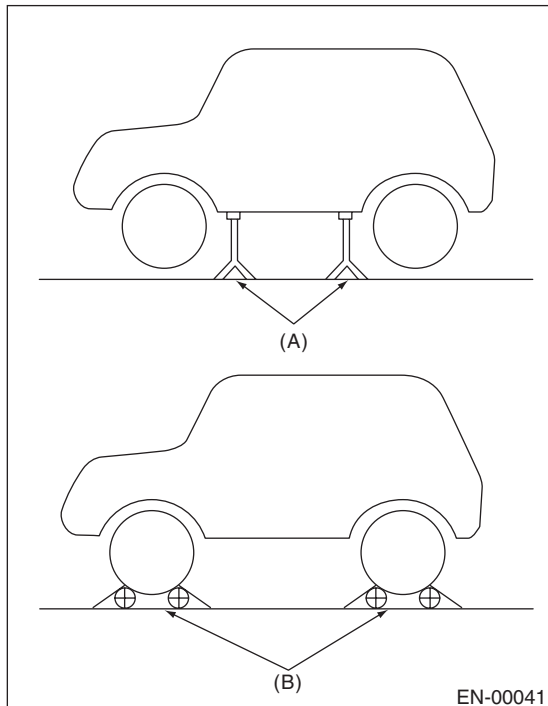
1. PREPARATION FOR THE INSPECTION MODE

1) Check battery voltage is more than 12 V and fuel remains half [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)].

2) Lift-up the vehicle using a garage jack and place it on rigid racks, or drive the vehicle onto free rollers.

WARNING:

- Before raising the vehicle, ensure parking brakes are applied.
- Do not use a pantograph jack in place of a rigid rack.
- Secure a rope or wire to the front or rear towing hooks to prevent the lateral runout of front wheels.
- Do not abruptly depress/release clutch pedal or accelerator pedal during works even when the engine is operating at low speeds since this may cause vehicle to jump off free rollers.
- In order to prevent the vehicle from slipping due to vibration, do not place any wooden blocks or similar items between the rigid racks and vehicle.
- Since the rear wheels will also rotate, do not place anything near them. Also, make sure that nobody goes in front of the vehicle.

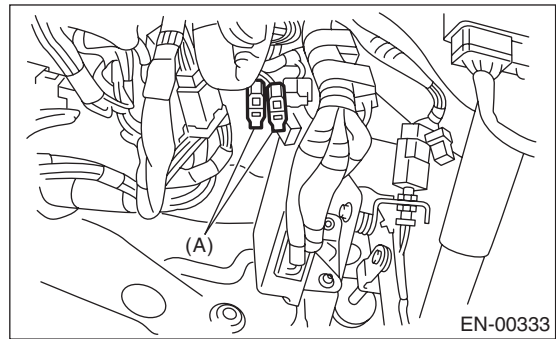


- (A) Rigid rack
(B) Free rollers

EN-00041

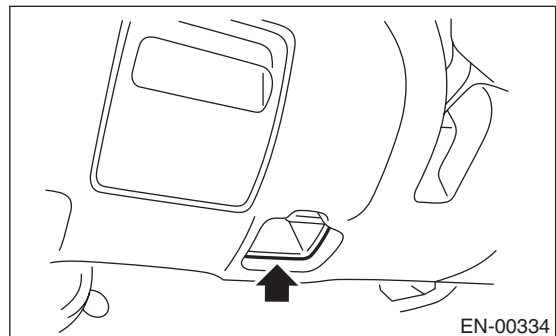
2. SUBARU SELECT MONITOR

- 1) Warm up the engine.
- 2) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>
- 3) Connect the diagnosis cable to the Subaru Select Monitor.
- 4) Connect the test mode connector (A) located at the lower portion of instrument panel (on the driver's side).



(A) Test mode connector

- 5) Connect the Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).



CAUTION:

Do not connect any scan tools except the Subaru Select Monitor or the general scan tool.

- 6) Turn the ignition switch to ON (engine OFF) and run the Subaru Select Monitor.
- 7) On the «Main Menu» display screen, select {Each System Check}.
- 8) On the «System Selection Menu» display screen, select {Engine Control System}.
- 9) Select the [OK] after the information of engine type has been displayed.
- 10) On the «Engine Diagnosis» display screen, select {D Check}.
- 11) When the “Perform D Check?” is shown on the screen, select the [OK].

Inspection Mode

ENGINE (DIAGNOSTICS)

12) Perform subsequent procedures as instructed on the display screen.

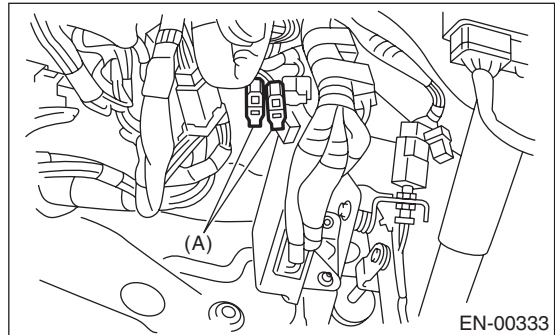
- If trouble still remains in the memory, the corresponding DTC appears on the display screen.

NOTE:

- For detailed operation procedure, refer to the "SUBARU SELECT MONITOR OPERATION MANUAL".
- For details concerning DTC, refer to "List of Diagnostic Trouble Code (DTC)".
<Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).>
- Release the parking brake.
- The speed difference between front and rear wheels may light the ABS warning light, but this does not indicate a malfunction. When engine control diagnosis is finished, perform the ABS memory clearance procedure of the self-diagnosis system. <Ref. to ABS(diag)-26, Clear Memory Mode.>

3. GENERAL SCAN TOOL

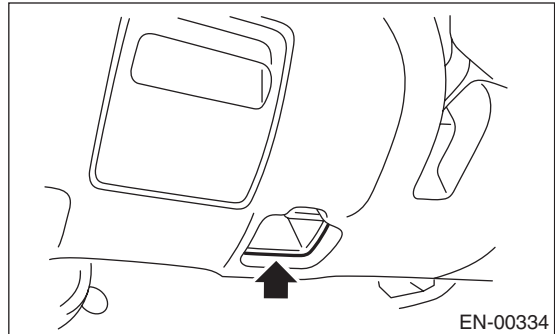
- 1) Warm up the engine.
- 2) Connect the test mode connector (A) located at the lower portion of instrument panel (on the driver's side).



- 3) Connect the general scan tool to data link connector located in the lower portion of the instrument panel (on the driver's side).

CAUTION:

Do not connect any scan tools except the Subaru Select Monitor or the general scan tool.



- 4) Start the engine.

NOTE:

- Make sure the select lever is placed in the "P" position before starting. (AT model)
 - Depress the clutch pedal when starting engine. (MT model)
- 5) Using the select lever or shift lever, turn the "P" position switch and "N" position switch on.
 - 6) Depress the brake pedal to turn the brake switch ON. (AT model)
 - 7) Keep the engine speed in 2,500 — 3,000 rpm range for 40 seconds.

8) Place the selector lever or shift lever in “D” range (AT model) or “1st” gear (MT model) and drive the vehicle at 5 to 10 km/h (3 to 6 MPH).

NOTE:

- For AWD model, release the parking brake.
- The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunctions. When engine control diagnosis is finished, perform the ABS memory clearance procedure of the self-diagnosis system. <Ref. to ABS(diag)-26, Clear Memory Mode.>

9) Using the general scan tool, check DTC and record the result(s).

NOTE:

- For detailed operation procedures, refer to the “General Scan Tool Instruction Manual”.
 - For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”.
- <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).>

12. Drive Cycle

A: PROCEDURE

For the troubleshooting, there are seven driving patterns of drive cycles A to G. Driving in the specified pattern allows to diagnose malfunctioning items listed below. After the repair of the following trouble items, be sure to drive the vehicle with the specified drive patterns to check whether the function is resumed correctly.

1. PREPARATION FOR DRIVE CYCLE

- 1) Check battery voltage is more than 12 V and fuel remains half [20 — 40 ℓ (5.3 — 10.6 US gal, 4.4 — 8.8 Imp gal)].
- 2) Disconnect the test mode connector.

NOTE:

- Except for the water temperature specified items at starting, be sure to carry out the diagnosis after the engine is warmed up.
- Perform the diagnosis twice if the DTC marked with *. After completing the first diagnosis, stop the engine and perform second diagnosis in same condition.

Drive Cycle

ENGINE (DIAGNOSTICS)

2. DRIVE CYCLE A — DRIVE THE VEHICLE WITH 80 KM/H (50 MPH) FOR 20 MINUTES, AND THEN IDLE THE ENGINE FOR A MINUTE.

DTC	Item	Condition
*P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	Engine coolant temperature at engine start is 20°C (68°F) or less.
*P0128	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)	Engine coolant temperature at engine start is 55°C (131°F) or less.
*P0133	O2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	—
*P0171	System Too Lean (Bank 1)	Diagnosis completes in drive cycle B or C as well.
*P0172	System Too Rich (Bank 1)	Diagnosis completes in drive cycle B or C as well.
P0301	Cylinder 1 Misfire Detected	Diagnosis completes in drive cycle B or C as well.
P0302	Cylinder 2 Misfire Detected	Diagnosis completes in drive cycle B or C as well.
P0303	Cylinder 3 Misfire Detected	Diagnosis completes in drive cycle B or C as well.
P0304	Cylinder 4 Misfire Detected	Diagnosis completes in drive cycle B or C as well.
*P0420	Catalyst System Efficiency Below Threshold (Bank 1)	—
P0441	CPC 2 Solenoid Characteristic (Closed)	Coolant temperature at start is less than 25°C (77°F).
*P0442	Evaporative Emission Control System Leak Detected (Small Leak)	Coolant temperature at start is less than 25°C (77°F).
*P0451	Evaporative Emission Control System Pressure Sensor	—
*P0456	Evaporative emission control system (0.02 inch leak)	Coolant temperature at start is less than 25°C (77°F).
*P0457	Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)	Coolant temperature at start is less than 25°C (77°F).
P0459	Evaporative Emission System Purge Control Valve Circuit High	—
P0692	Fan 1 Control Circuit High	—
P1443	Vent Control Solenoid Valve Function Problem	—
*P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	Diagnosis completes in drive cycle B or C as well.
*P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	Diagnosis completes in drive cycle B or C as well.
P2103	Throttle Actuator Control Motor Circuit High	Diagnosis completes in drive cycle B or C as well.

Drive Cycle

ENGINE (DIAGNOSTICS)

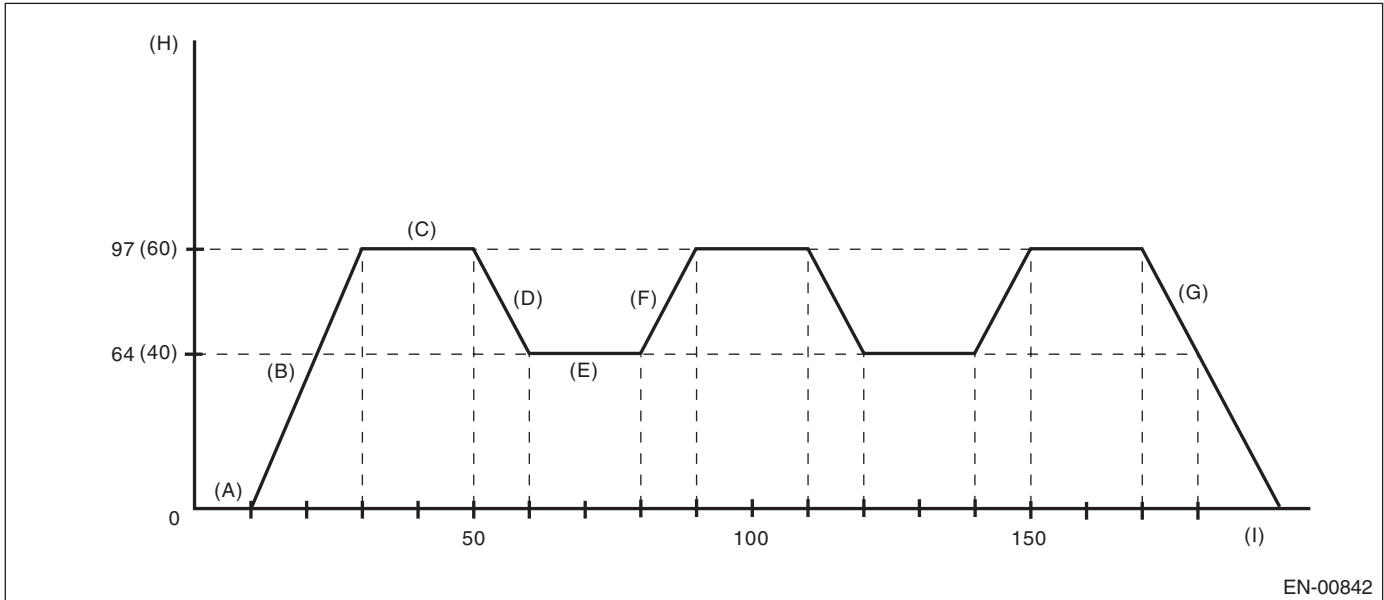
3. DRIVE CYCLE B (10 MINUTES IDLING)

NOTE:

Drive the vehicle in more than 10 km/h (6 MPH) before diagnosis.

DTC	Item	Condition
*P0126	Insufficient Coolant Temperature for Stable Operation	—
*P0171	System Too Lean (Bank 1)	Diagnosis completes in drive cycle A or C as well.
*P0172	System Too Rich (Bank 1)	Diagnosis completes in drive cycle A or C as well.
P0301	Cylinder 1 Misfire Detected	Diagnosis completes in drive cycle A or C as well.
P0302	Cylinder 2 Misfire Detected	Diagnosis completes in drive cycle A or C as well.
P0303	Cylinder 3 Misfire Detected	Diagnosis completes in drive cycle A or C as well.
P0304	Cylinder 4 Misfire Detected	Diagnosis completes in drive cycle A or C as well.
*P0464	Fuel Level Sensor Circuit Intermittent	—
*P0483	Fan Rationality Check	—
*P0506	Idle Air Control System RPM Lower Than Expected	—
*P0507	Idle Air Control System RPM Higher Than Expected	—
*P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	Diagnosis completes in drive cycle A or C as well.
*P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	Diagnosis completes in drive cycle A or C as well.
P2103	Throttle Actuator Control Motor Circuit High	Diagnosis completes in drive cycle A or C as well.

4. DRIVE CYCLE C (DRIVE ACCORDING TO THE FOLLOWING DRIVE PATTERN)



EN-00842

- | | | |
|---|--|--|
| (A) Idle the engine for more than 10 seconds. | (D) Decelerate the vehicle to 64 km/h (40 MPH) with throttle fully closed. | (G) Stop the vehicle with throttle fully closed. |
| (B) Accelerate the vehicle to 97 km/h (60 MPH) within 20 seconds. | (E) Drive the vehicle at 64 km/h (40 MPH) for 20 seconds. | (H) Vehicle speed km/h (MPH) |
| (C) Drive the vehicle at 97 km/h (60 MPH) for 20 seconds. | (F) Accelerate the vehicle to 97 km/h (60 MPH) within 10 seconds. | (I) (sec.) |

DTC	Item	Condition
*P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	—
P0068	MAP/MAF - Throttle Position Correlation	—
*P0101	Mass or Volume Air Flow Circuit Range/Performance	—
P0134	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	—
*P0139	O2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	—
*P0171	System Too Lean (Bank 1)	Diagnosis completes in drive cycle A or B as well.
*P0172	System Too Rich (Bank 1)	Diagnosis completes in drive cycle A or B as well.
*P0244	Turbo/Supercharger Wastegate Solenoid A Range/Performance	—
P0246	Turbo/Super Charger Wastegate Solenoid "A" High	—
*P0301	Cylinder 1 Misfire Detected	Diagnosis completes in drive cycle A or B as well.
*P0302	Cylinder 2 Misfire Detected	Diagnosis completes in drive cycle A or B as well.
*P0303	Cylinder 3 Misfire Detected	Diagnosis completes in drive cycle A or B as well.
*P0304	Cylinder 4 Misfire Detected	Diagnosis completes in drive cycle A or B as well.
P2004	Intake Manifold Runner Control Stuck Open (Bank 1)	—
P2005	Intake Manifold Runner Control Stuck Open (Bank 2)	—
*P2096	Post Catalyst Fuel Trim System Too Lean (Bank 1)	Diagnosis completes in drive cycle A or B as well.
*P2097	Post Catalyst Fuel Trim System Too Rich (Bank 1)	Diagnosis completes in drive cycle A or B as well.
P2103	Throttle Actuator Control Motor Circuit High	Diagnosis completes in drive cycle A or B as well.

Drive Cycle

ENGINE (DIAGNOSTICS)

5. DRIVE CYCLE D

Drift Diagnosis

- 1) Make sure that the engine coolant temperature at engine starting is less than 30°C (86°F).
- 2) Make sure that fuel remains more than 10 ℓ (2.6 US gal, 2.2 Imp gal) and the battery voltage is more than 10.9 V.
- 3) Make sure that the engine coolant temperature rises for more than 10°C (18°F) from the level of engine starting and is also above 75°C (167°F).
- 4) Idle the engine for more than 120 seconds in the condition of step 3.

Stuck Diagnosis

- 1) Make sure that the battery voltage is more than 10.9 V.
- 2) Perform the Clear Memory Mode. <Ref. to EN(H4DOTC)(diag)-50, Clear Memory Mode.>
- 3) Drive for approximately 50 ℓ (13.2 US gal, 11 Imp gal) of fuel.

NOTE:

- It is acceptable to drive the vehicle intermittently.
- Do not disconnect the terminal of battery during diagnosis. (Data will be cleared when disconnecting the battery terminals.)

DTC	Item	Condition
P0181	Fuel Temperature Sensor "A" Circuit Range/Performance	—

6. DRIVE CYCLE E

- 1) Make sure that the battery voltage is 10.9 V or more.
- 2) Perform the Clear Memory Mode. <Ref. to EN(H4DOTC)(diag)-50, Clear Memory Mode.>
- 3) Drive for approximately 30 ℓ (7.9 US gal, 6.6 Imp gal) of fuel.

NOTE:

- It is acceptable to drive the vehicle intermittently.
- Do not disconnect the terminal of battery during diagnosis. (Data will be cleared when disconnecting the battery terminals.)

DTC	Item	Condition
P0461	Fuel Level Sensor Circuit Range/Performance	—

7. DRIVE CYCLE F

- 1) Make sure that the engine coolant temperature at engine starting is less than 30°C (86°F).
- 2) Warm-up the engine until engine coolant temperature rises above 95°C (203°F) after starting the engine.
- 3) Idle the engine for more than 10 minutes in the condition of step 2.

NOTE:

Do not disconnect the terminal of battery during diagnosis. (Data will be cleared when disconnecting the battery terminals.)

DTC	Item	Condition
P0111	Intake Air Temperature Circuit Range/Performance	—

8. DRIVE CYCLE G

- 1) Remove the battery negative terminal, and reconnect after 10 seconds have passed.
- 2) Start the engine and warm-up engine until coolant temperature is 80°C (176°F).
- 3) Start the engine and warm-up engine until coolant temperature is 40°C (104°F).

NOTE:

Do not let engine coolant temperature drop below 5°C (41°F).

- 4) Start the engine and warm-up engine until coolant temperature is 80°C (176°F).
- 5) Start the engine and warm-up engine until coolant temperature is 40°C (104°F).

NOTE:

Do not let engine coolant temperature drop below 5°C (41°F).

- 6) Start and idle the engine.

DTC	Item	Condition
*P0410	Secondary Air Injection System	—
*P0411	Secondary Air Injection System Incorrect Flow Detected	—
P0414	Secondary Air Injection System Switching Valve "A" Circuit Shorted	—
P0417	Secondary Air Injection System Switching Valve B Circuit Shorted	—
P1418	Secondary Air Injection System Control "A" Circuit Shorted	—
*P2440	Secondary Air Injection System Switching Valve Stuck Open (Bank 1)	—
*P2441	Secondary Air Injection System Switching Valve Stuck Closed (Bank 1)	—
*P2442	Secondary Air Injection System Switching Valve Stuck Open (Bank 2)	—
*P2443	Secondary Air Injection System Switching Valve Stuck Closed (Bank 2)	—

9. DRIVE CYCLE H

- 1) Perform the Clear Memory Mode. <Ref. to EN(H4DOTC)(diag)-50, Clear Memory Mode.>
- 2) Read the engine coolant temperature, intake air temperature and fuel temperature with ignition switch ON. <Ref. to EN(H4DOTC)(diag)-30, READ CURRENT DATA FOR ENGINE (NORMAL MODE), OPERATION, Subaru Select Monitor.>
- 3) Start the engine if the value in step 2) meets the following two conditions.

Condition:

|engine coolant temperature — intake air temperature| ≤ 5°C (41°F)

|engine coolant temperature — fuel temperature| ≤ 2°C (36°F)

NOTE:

- If the value does not meet the conditions, turn the ignition switch to OFF and wait until it meets.
 - Start the engine in P range (AT model) or in N position (MT model).
- 4) Idle the engine for one minute in the condition of step 3.

DTC	Item	Condition
*P1602	ECM error (cold start)	—

Clear Memory Mode

ENGINE (DIAGNOSTICS)

13. Clear Memory Mode

A: OPERATION

1. SUBARU SELECT MONITOR (NORMAL MODE)

- 1) On the «Main Menu» display screen, select {Each System Check}.
- 2) On the «System Selection Menu» display screen, select {Engine Control System}.
- 3) Select the [OK] after the information of engine type has been displayed.
- 4) On the «Engine Diagnosis» display screen, select {Clear Memory}.
- 5) When the «Done» is shown on the display screen, turn the ignition switch to OFF and then close the Subaru Select Monitor.

NOTE:

- Initial diagnosis of the electronic throttle control is performed after the memory is erased. Therefore, start the engine after 10 seconds or more have passed since turning the ignition switch to ON.
- For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

2. SUBARU SELECT MONITOR (OBD MODE)

- 1) On the «Main Menu» display screen, select {Each System Check}.
- 2) On the «System Selection Menu» display screen, select {Engine Control System}.
- 3) Select the [OK] after the information of engine type has been displayed.
- 4) On the «Engine Diagnosis» display screen, select {OBD System}.
- 5) On the «OBD Menu» display screen, select {DTC Clear}.
- 6) When the “Perform Diagnostic Code(s) Clear?” is shown on the screen, select the [OK].
- 7) Turn the ignition switch to OFF and then close the Subaru Select Monitor.

NOTE:

- Initial diagnosis of the electronic throttle control is performed after the memory is erased. Therefore, start the engine after 10 seconds or more have passed since turning the ignition switch to ON.
- For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

3. GENERAL SCAN TOOL

For procedures clearing memory using the general scan tool, refer to the general scan tool operation manual.

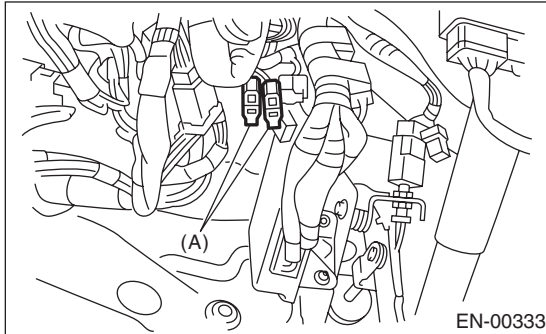
NOTE:

Initial diagnosis of the electronic throttle control is performed after the memory is erased. Therefore, start the engine after 10 seconds or more have passed since turning the ignition switch to ON.

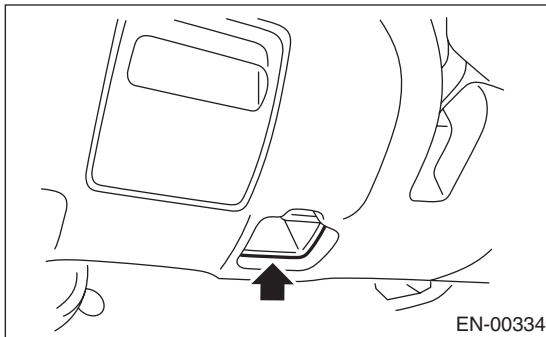
14. Compulsory Valve Operation Check Mode

A: PROCEDURE

- 1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>
- 2) Connect the diagnosis cable to the Subaru Select Monitor.
- 3) Connect the test mode connector (A) located at the lower portion of instrument panel (on the driver's side).



- 4) Connect the Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).



CAUTION:

Do not connect any scan tools except the Subaru Select Monitor or the general scan tool.

- 5) Turn the ignition switch to ON (engine OFF) and run the Subaru Select Monitor.
- 6) On the «Main Menu» display screen, select {Each System Check}.
- 7) On the «System Selection Menu» display screen, select {Engine Control System}.
- 8) Select the [OK] after the information of engine type has been displayed.
- 9) On the «Engine Diagnosis» display screen, select {System Operation Check Mode}.
- 10) On the «System Operation Check Mode» display screen, select {Actuator ON/OFF Operation}.
- 11) Select the desired compulsory actuator on the «Actuator ON/OFF Operation» display screen and select the [OK].

12) Selecting the [NO] completes the compulsory operation check mode. The display will then return to the «Actuator ON/OFF Operation» screen.

- A list of the support data is shown in the following table.

Contents	Display
Compulsory fuel pump relay operation check	Fuel Pump
Compulsory radiator fan relay operation check	Radiator Fan Relay
Compulsory air conditioning relay operation check	A/C Compressor Relay
Compulsory purge control solenoid 1 valve operation check	CPC Solenoid
Compulsory purge control solenoid 2 valve operation check	CPC Solenoid 2
Compulsory pressure control solenoid valve operation check	PCV Solenoid
Compulsory drain valve operation check	Vent. Control Solenoid
Compulsory wastegate control solenoid valve operation check	Wastegate control solenoid
Secondary air combination valve 1 compulsory operation check	Secondary Air Combination Valve 1
Secondary air combination valve 2 compulsory operation check	Secondary Air Combination Valve 2
Secondary air pump relay compulsory operation check	Secondary air pump relay

NOTE:

- The following parts will be displayed but not functional because they are not installed on the vehicle.

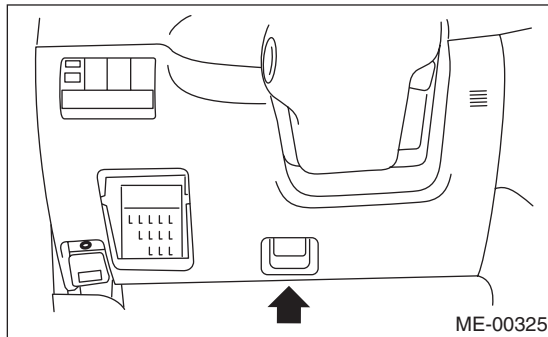
Display
EGR Solenoid
ASV Solenoid
FICD Solenoid
Pressure Switching Sol.1
Pressure Switching Sol.2
AAI Solenoid
Exhaust Bypass Valve Control Permit Flag

- For detailed operation procedure, refer to the "SUBARU SELECT MONITOR OPERATION MANUAL".

15. System Operation Check Mode

A: OPERATION

- 1) Prepare the Subaru Select Monitor kit. <Ref. to EN(H4DOTC)(diag)-7, PREPARATION TOOL, General Description.>
- 2) Connect the diagnosis cable to the Subaru Select Monitor.
- 3) Connect the Subaru Select Monitor to data link connector located in the lower portion of the instrument panel (on the driver's side).



CAUTION:

Do not connect scan tools except for Subaru Select Monitor and general scan tool.

- 4) Turn the ignition switch to ON (engine OFF) and run the Subaru Select Monitor.
- 5) On the «Main Menu» display screen, select the {Each System Check}.
- 6) On the «System Selection Menu» display screen, select the {Engine Control System}.
- 7) Select the [OK] after the information of engine type has been displayed.
- 8) On the «Engine Diagnosis» display screen, select the {System Operation Check Mode}.
- 9) The following items are displayed on the monitor.

Display
Fuel Pump Control
Idling Ignition Timing Fixed
Idle Speed Control
Injector Control

1. FUEL PUMP CONTROL (OFF OPERATION)

CAUTION:

After carrying out the Operation Check Mode, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>

- 1) On the «System Operation Check Mode» display screen, select the {Fuel Pump Control}.
- 2) On the «Fuel Pump Control» display screen, select the {OFF Operation}.
- 3) On the «Start the Engine» display screen, start the engine and select the [OK].
- 4) Select the [NO] completes the OFF Operation. The display will then return to the «Fuel Pump Control» screen.

2. FUEL PUMP CONTROL (ON/OFF OPERATION)

CAUTION:

After carrying out the Operation Check Mode, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>

- 1) On the «System Operation Check Mode» display screen, select the {Fuel Pump Control}.
- 2) On the «Fuel Pump Control» display screen, select the {ON/OFF Operation}.
- 3) On the «Turn Ignition Switch ON with Engine Stalled» display screen, select the [OK].
- 4) Selecting the [NO] completes the ON/OFF Operation. The display will then return to the «Fuel Pump Control» screen.

3. IDLING IGNITION TIMING FIXED

CAUTION:

After carrying out the Operation Check Mode, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>

- 1) On the «System Operation Check Mode» display screen, select the {Idling Ignition Timing Fixed}.
- 2) On the «Start the Engine» display screen, start the engine and select the [OK].
- 3) Selecting the [NO] completes the Idling Ignition Timing Fixed. The display will then return to the «System Operation Check Mode» screen.

4. IDLE SPEED CONTROL

CAUTION:

After carrying out the Operation Check Mode, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

- 1) On the «System Operation Check Mode» display screen, select the {Idle Speed Control}.
- 2) On the «Start the Engine» display screen, start the engine and select the [OK].
- 3) On the «Idle Speed Control» display screen, select [△] or [▽] to change the setting value. It is possible to set by 50 rpm, ranging from 500 rpm to 2,000 rpm. However, the actual idle speed that can be controlled is varied by vehicle type.
- 4) Select the [NO] completes the Idling Speed Control. The display will then return to the «System Operation Check Mode» screen.

5. INJECTOR CONTROL (INJECTION STOP MODE)

CAUTION:

After carrying out the Operation Check Mode, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

- 1) On the «System Operation Check Mode» display screen, select the {Injector Control}.
- 2) On the «Injector Control» display screen, select the {Injection Stop Mode}.
- 3) Select the desired injector number on the «Injection Stop Mode».
- 4) On the «Start the Engine» display screen, start the engine and select the [OK].
- 5) Select the [NO] completes the Injection Stop Mode. The display will then return to the «Injector Control» screen.

6. INJECTOR CONTROL (INJECTION QUANTITY CONTROL)

CAUTION:

After carrying out the Operation Check Mode, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

- 1) On the «System Operation Check Mode» display screen, select the {Injector Control}.
- 2) On the «Injector Control» display screen, select the {Injection Quantity Control}.
- 3) On the «Start the Engine» display screen, start the engine and select the [YES] key.
- 4) On the «Injection Quantity Control» display screen, select [△] or [▽] to change the setting value, and select the [OK]. It is possible to set by 1%, ranging from 0 to 20%.
- 5) Select the [NO] completes the Injection Quantity Control. The display will then return to the «Injector Control» screen.

NOTE:

For detailed operation procedure, refer to the "SUBARU SELECT MONITOR OPERATION MANUAL".

Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

16. Malfunction Indicator Light

A: PROCEDURE

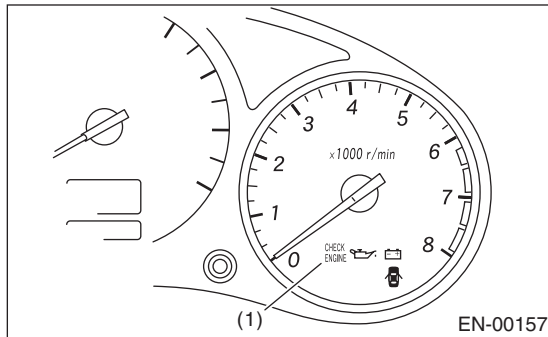
1. Activation of malfunction indicator light. <Ref. to EN(H4DOTC)(diag)-54, ACTIVATION OF MALFUNCTION INDICATOR LIGHT, Malfunction Indicator Light.>
↓
2. Check that the malfunction indicator light does not come on. <Ref. to EN(H4DOTC)(diag)-55, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>
↓
3. Check that the malfunction indicator light does not go off. <Ref. to EN(H4DOTC)(diag)-57, MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF, Malfunction Indicator Light.>

B: ACTIVATION OF MALFUNCTION INDICATOR LIGHT

1) When the ignition switch is turned to ON (engine off), the malfunction indicator light in the combination meter come on.

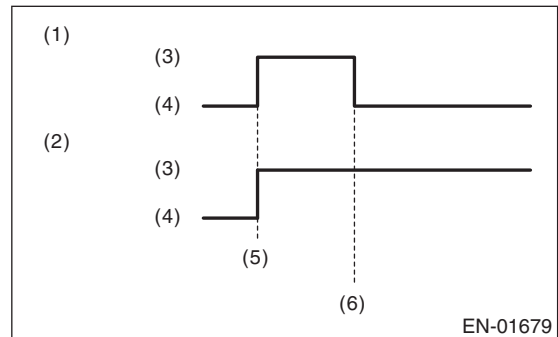
NOTE:

If the malfunction indicator light does not illuminate, perform diagnostics of the malfunction indicator light circuit or the combination meter circuit. <Ref. to EN(H4DOTC)(diag)-55, MALFUNCTION INDICATOR LIGHT DOES NOT COME ON, Malfunction Indicator Light.>



(1) Malfunction indicator light

2) After starting the engine, the malfunction indicator light goes out. If it does not, either the engine or the emission control system has a problem.



- (1) No faulty
- (2) Trouble occurs
- (3) ON
- (4) OFF
- (5) Ignition switch ON
- (6) Engine start

Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

C: MALFUNCTION INDICATOR LIGHT DOES NOT COME ON

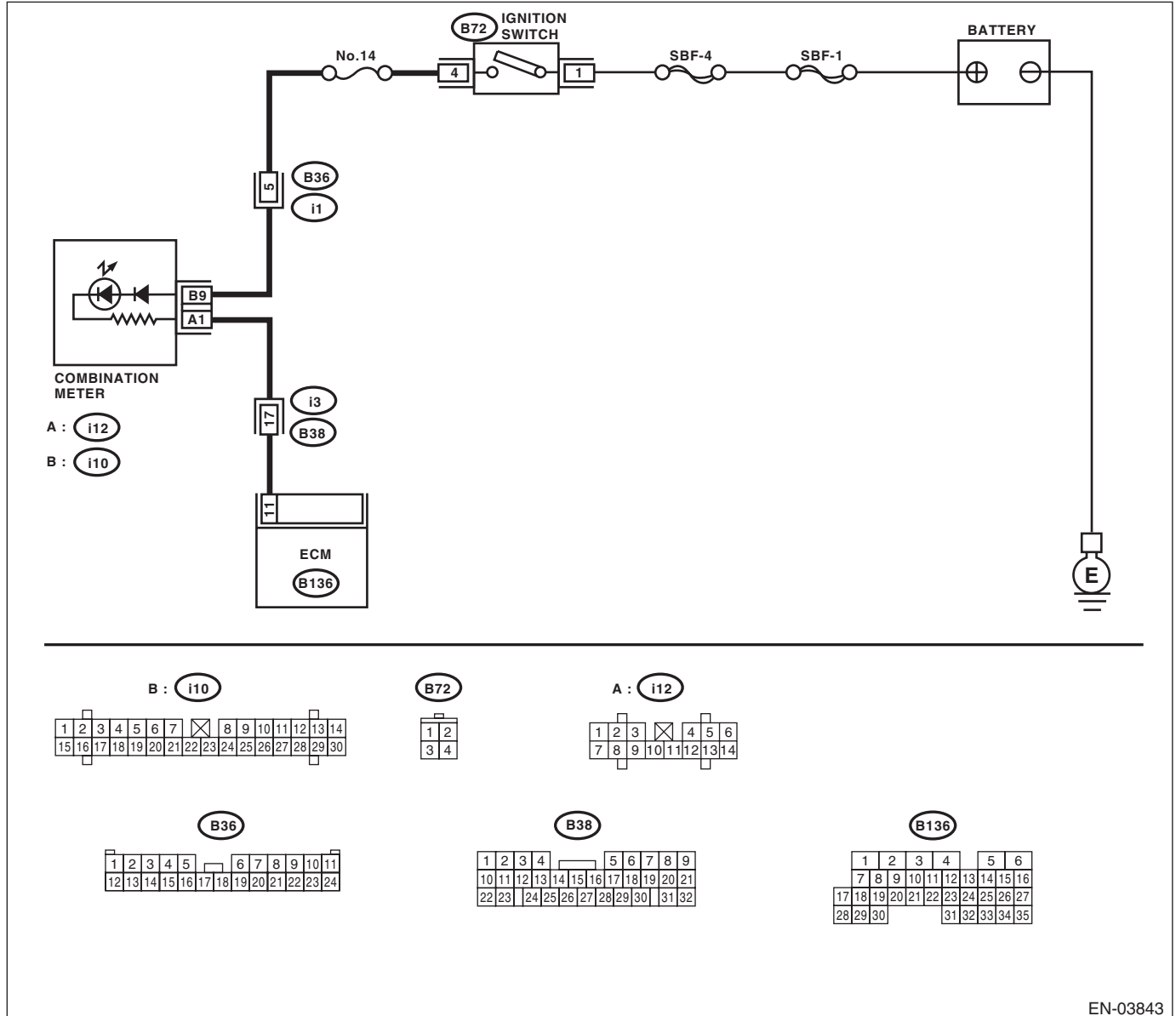
DIAGNOSIS:

The malfunction indicator light circuit is open or shorted.

TROUBLE SYMPTOM:

When the ignition switch is turned to ON (engine OFF), the malfunction indicator light does not come on.

WIRING DIAGRAM:



EN-03843

Malfunction Indicator Light

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B136) No. 11 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 4.	Go to step 2.
2 CHECK POOR CONTACT.	Does the malfunction indicator light come on when shaking or pulling the ECM connector and harness?	Repair poor contact in ECM connector.	Go to step 3.
3 CHECK ECM CONNECTOR.	Is the ECM connector correctly connected?	Replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	Repair the connection of ECM connector.
4 CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Remove the combination meter. <Ref. to IDI-10, Combination Meter.> 3) Disconnect the connector from ECM and combination meter. 4) Measure the resistance of harness between ECM and combination meter connector. <i>Connector & terminal</i> <i>(B136) No. 11 — (i12) No. 1:</i>	Is the resistance less than 1 Ω?	Go to step 5.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and combination meter connector • Poor contact in coupling connector
5 CHECK POOR CONTACT. Check poor contact of combination meter connector.	Is there poor contact in combination meter connector?	Repair the poor contact of combination meter connector.	Go to step 6.
6 CHECK HARNESS BETWEEN COMBINATION METER AND IGNITION SWITCH CONNECTOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between combination meter connector and chassis ground. <i>Connector & terminal</i> <i>(i10) No. 9 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Replace the combination meter circuit board. <Ref. to IDI-10, Combination Meter.>	Check the following item and repair if necessary. NOTE: • Blown out of fuse (No. 14) • Open or short circuit of harness between fuse (No. 14) and battery terminal • Poor contact in ignition switch connector

D: MALFUNCTION INDICATOR LIGHT DOES NOT GO OFF

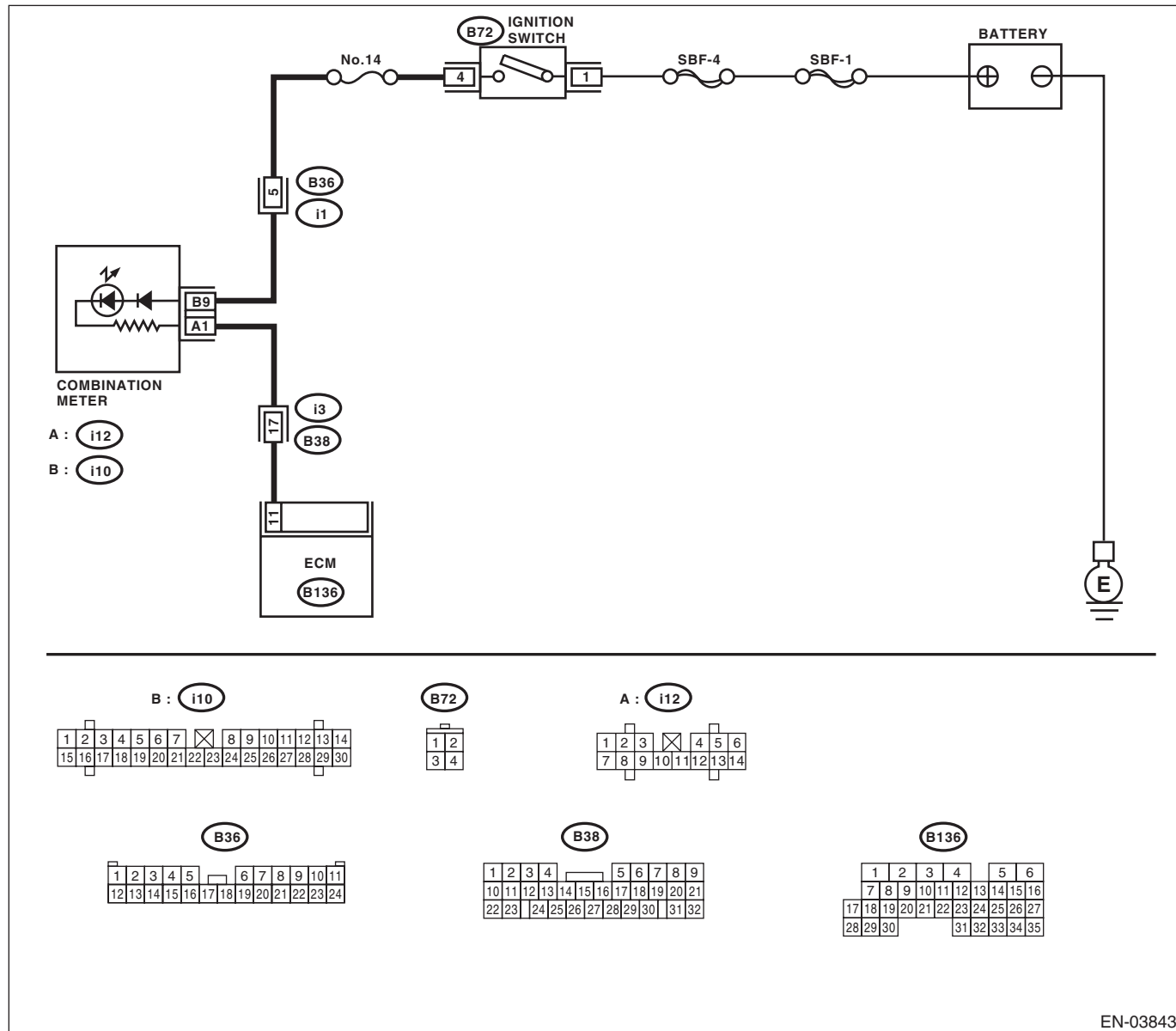
DIAGNOSIS:

The malfunction indicator light circuit is shorted.

TROUBLE SYMPTOM:

Although malfunction indicator light comes on when the engine runs, DTC is not shown on the Subaru Select Monitor or general scan tool display.

WIRING DIAGRAM:



Step	Check	Yes	No
1 CHECK HARNESS BETWEEN COMBINATION METER AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Turn the ignition switch to ON.	Does the malfunction indicator light illuminate?	Repair the short circuit of harness between combination meter and ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>

Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

17. Diagnostics for Engine Starting Failure

A: PROCEDURE

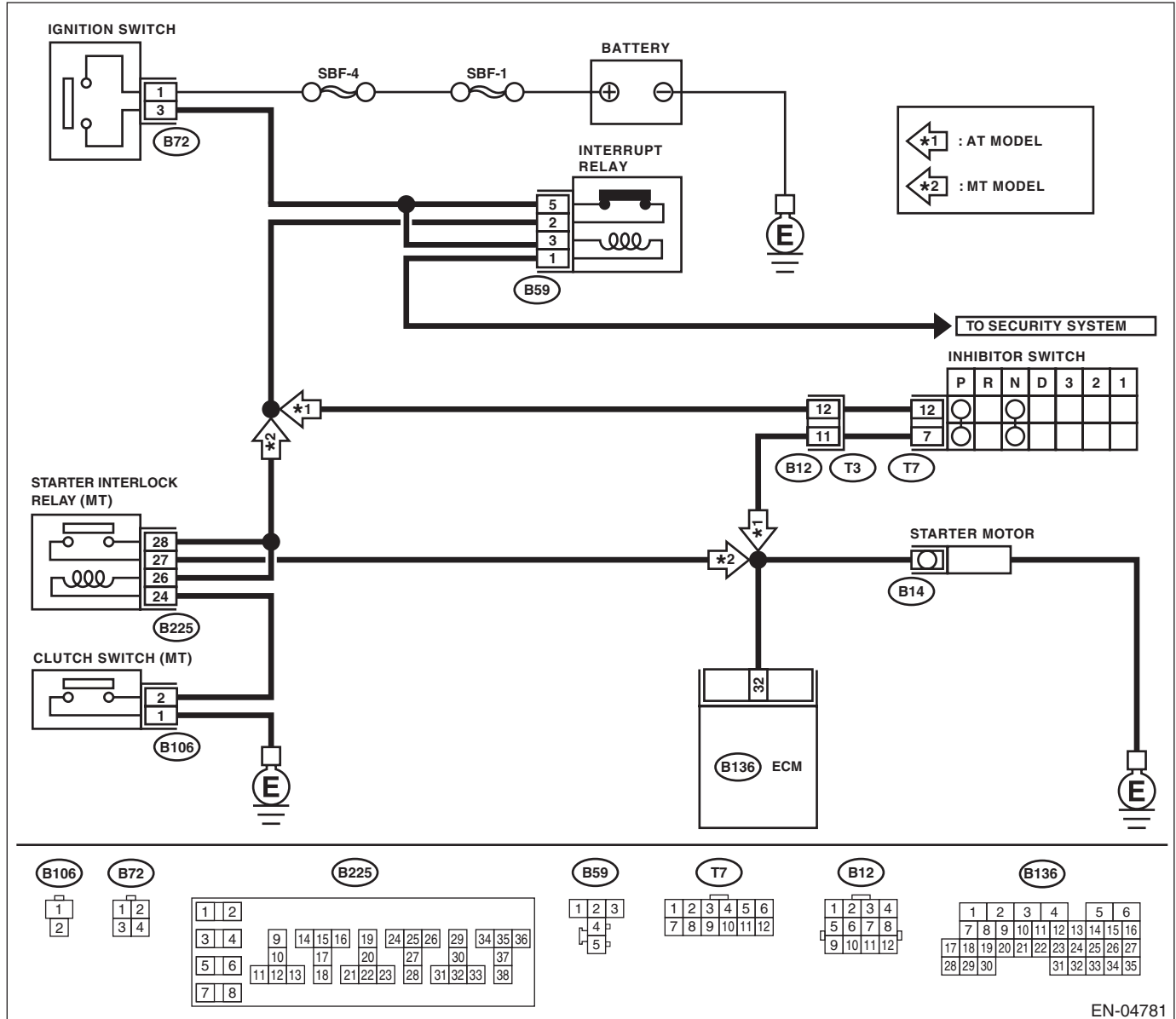
1. Check for fuel amount.
↓
2. Inspection of starter motor circuit. <Ref. to EN(H4DOTC)(diag)-59, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
3. Inspection of ECM power supply and ground line. <Ref. to EN(H4DOTC)(diag)-62, CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM), Diagnostics for Engine Starting Failure.>
↓
4. Inspection of ignition control system. <Ref. to EN(H4DOTC)(diag)-64, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>
↓
5. Inspection of fuel pump circuit. <Ref. to EN(H4DOTC)(diag)-67, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>
↓
6. Inspection of fuel injector circuit. <Ref. to EN(H4DOTC)(diag)-68, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

B: STARTER MOTOR CIRCUIT

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>

WIRING DIAGRAM:



EN-04781

Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK BATTERY. Check the battery voltage.	Is the voltage 12 V or more?	Go to step 2.	Charge or replace the battery.
2 CHECK OPERATION OF STARTER MOTOR.	Does the starter motor operate?	Go to step 3.	Go to step 4.
3 CHECK DTC.	Is DTC displayed? <Ref. to EN(H4DOTC)(diag)-37, OPERATION, Read Diagnostic Trouble Code (DTC).>	Check the appropriate DTC using the List of Diagnostic Trouble Code (DTC). <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).>	Repair poor contact in ECM connector.
4 CHECK INPUT SIGNAL FOR STARTER MOTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter motor. 3) Turn the ignition switch to ST. 4) Measure the power supply voltage between starter motor connector terminal and engine ground. Connector & terminal (B14) No. 1 (+) — Engine ground (-): NOTE: • For AT model, place the select lever in “P” or “N” range. • For MT model, depress the clutch pedal.	Is the voltage 10 V or more?	Check the starter motor. <Ref. to SC (H4SO)-6, Starter.>	Go to step 5.
5 CHECK HARNESS BETWEEN BATTERY AND IGNITION SWITCH CONNECTOR. 1) Disconnect the connector from ignition switch. 2) Measure the power supply voltage between ignition switch connector and chassis ground. Connector & terminal (B72) No. 1 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 6.	Repair the open circuit of harness between ignition switch and battery, and check fuse SBF No. 4 and SBF No. 1.
6 CHECK IGNITION SWITCH. 1) Disconnect the connector from ignition switch. 2) Measure the resistance between ignition switch terminals after turning the ignition switch to ST. Terminals No. 1 — No. 3:	Is the resistance less than 5 Ω?	Go to step 7.	Replace the ignition switch.
7 CHECK TRANSMISSION TYPE. Check the type of the transmission.	Is the transmission type AT?	Go to step 8.	Go to step 12.
8 CHECK INHIBITOR SWITCH INPUT VOLTAGE. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from inhibitor switch. 3) Connect the connector to the ignition switch. 4) Measure the input voltage between inhibitor switch connector terminal and engine ground while turning the ignition switch to ST. Connector & terminal (B12) No. 12 (+) — Engine ground (-):	Is the voltage 10 V or more?	Go to step 9.	Repair open or ground short circuit of harness between inhibitor switch and ignition switch. NOTE: Check security system (if equipped). <Ref. to SL-21, Security System.>

Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK INHIBITOR SWITCH. 1) Place the select lever in "P" or "N" range. 2) Measure the resistance between inhibitor switch terminals. <i>Connector & terminal (T3) No. 11 — No. 12:</i>	Is the resistance less than 1 Ω ?	Go to step 10.	Replace the inhibitor switch. <Ref. to 4AT-47, Inhibitor Switch.>
10 CHECK INPUT VOLTAGE OF STARTER INTERLOCK RELAY. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from starter interlock relay. 3) Connect the connector to ignition switch. 4) Measure the input voltage between starter interlock relay connector and chassis ground after turning the ignition switch to ST. <i>Connector & terminal (B225) No. 26 (+) — Chassis ground (-): (B225) No. 28 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Go to step 11.	Repair open or short circuit to ground in harness between starter interlock relay and ignition switch. NOTE: Check security system (if equipped). <Ref. to SL-21, Security System.>
11 CHECK STARTER INTERLOCK RELAY. 1) Connect the battery to starter interlock relay terminals No. 26 and No. 24. 2) Measure the resistance between starter interlock relay terminals. <i>Terminals No. 27 — No. 28:</i>	Is the resistance less than 1 Ω ?	Go to step 12.	Replace the starter interlock relay.
12 CHECK GROUND CIRCUIT OF CLUTCH SWITCH. 1) Disconnect the connector from clutch switch. 2) Measure the resistance between the clutch switch connector and chassis ground. <i>Connector & terminal (B106) No. 1 — Chassis ground:</i>	Is the resistance less than 1 Ω ?	Go to step 13.	Repair the open circuit of ground cable.
13 CHECK CLUTCH SWITCH. Measure the resistance between clutch switch terminals while depressing the clutch pedal. <i>Terminals No. 1 — No. 2:</i>	Is the resistance less than 1 Ω ?	Go to step 14.	Replace the clutch switch. <Ref. to CL-28, Clutch Switch.>
14 CHECK CLUTCH SWITCH CIRCUIT. 1) Connect the connector to the clutch switch. 2) Measure the resistance between starter interlock relay connector and chassis ground while depressing the clutch pedal. <i>Connector & terminal (B225) No. 24 — Chassis ground:</i>	Is the resistance less than 1 Ω ?	Repair the ground short of the harness between starter interlock relay and starter motor.	Repair the open circuit in harness between starter interlock relay and clutch switch.

Diagnostics for Engine Starting Failure

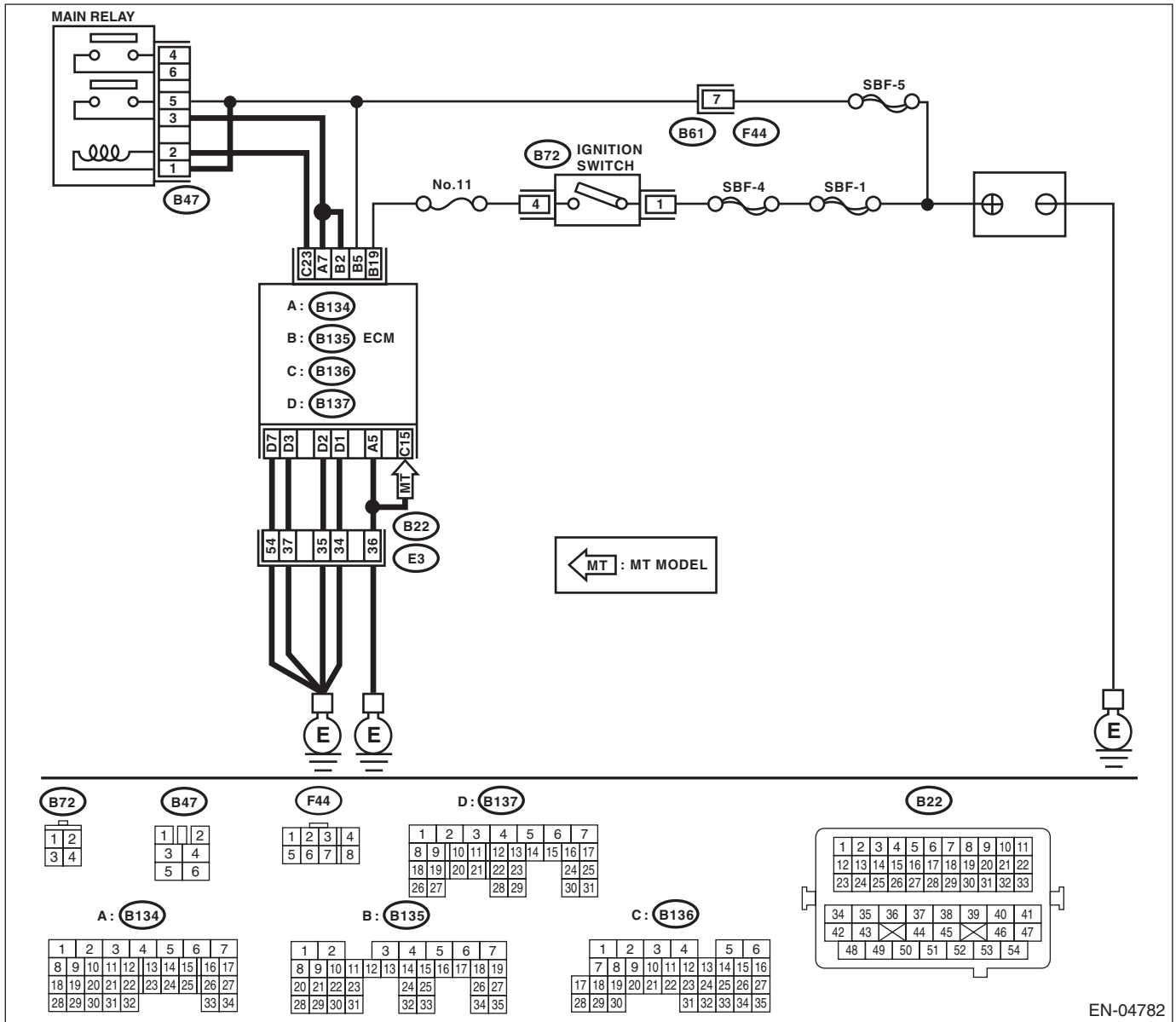
ENGINE (DIAGNOSTICS)

C: CHECK POWER SUPPLY AND GROUND LINE OF ENGINE CONTROL MODULE (ECM)

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>

WIRING DIAGRAM:



EN-04782

Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK MAIN RELAY. 1) Turn the ignition switch to OFF. 2) Remove the main relay. 3) Connect the battery to main relay terminals No. 1 and No. 2. 4) Measure the resistance between main relay terminals. <i>Terminals</i> No. 3 — No. 5: No. 4 — No. 6:	Is the resistance less than 10 Ω ?	Go to step 2.	Replace the main relay.
2 CHECK GROUND CIRCUIT FOR ECM. 1) Disconnect the connectors from ECM. 2) Measure the resistance of harness between ECM and chassis ground. <i>Connector & terminal</i> (B134) No. 5 — Chassis ground: (B136) No. 15 — Chassis ground: (B137) No. 1 — Chassis ground: (B137) No. 2 — Chassis ground: (B137) No. 3 — Chassis ground: (B137) No. 7 — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 3.	Repair the open circuit of harness between ECM connector and engine grounding terminal.
3 CHECK INPUT VOLTAGE OF ECM. Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> (B135) No. 5 (+) — Chassis ground (-): (B135) No. 19 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 4.	Repair the open or ground short circuit of power supply circuit.
4 CHECK INPUT VOLTAGE OF MAIN RELAY. Measure the voltage between main relay connector and chassis ground. <i>Connector & terminal</i> (B47) No. 1 (+) — Chassis ground (-): (B47) No. 5 (+) — Chassis ground (-): (B47) No. 6 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 5.	Repair the open or ground short circuit of harness of power supply circuit.
5 CHECK INPUT VOLTAGE OF ECM. 1) Connect the main relay connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> (B134) No. 7 (+) — Chassis ground (-): (B135) No. 2 (+) — Chassis ground (-): (B136) No. 23 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Check ignition control system. <Ref. to EN(H4DOTC)(diag)-64, IGNITION CONTROL SYSTEM, Diagnostics for Engine Starting Failure.>	Repair the open or ground short circuit of harness between ECM connector and main relay connector.

Diagnostics for Engine Starting Failure

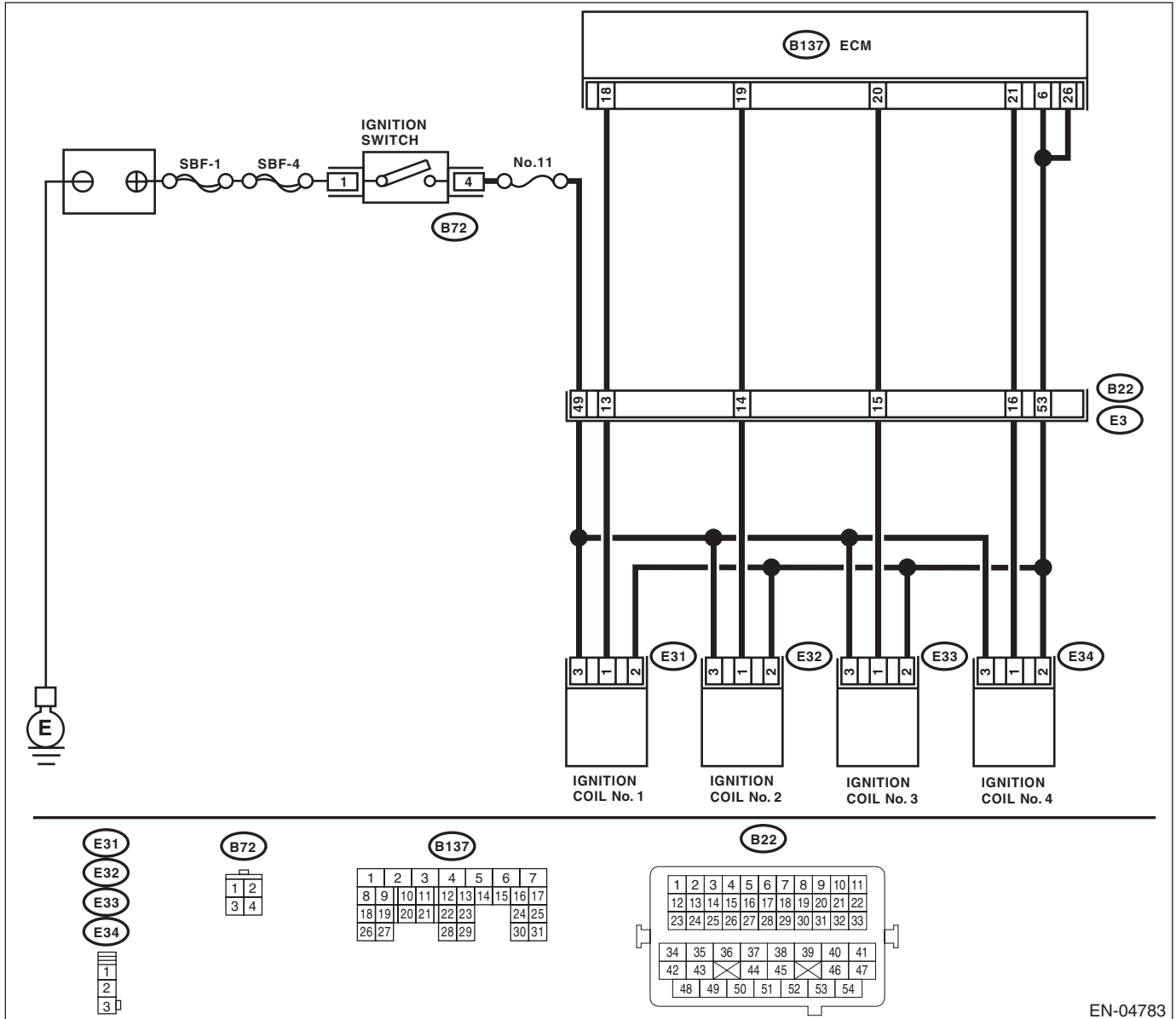
ENGINE (DIAGNOSTICS)

D: IGNITION CONTROL SYSTEM

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04783

Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SPARK PLUG CONDITION. 1) Remove the spark plug. <Ref. to IG(H4DOTC)-4, REMOVAL, Spark Plug.> 2) Check the spark plug condition. <Ref. to IG(H4DOTC)-5, INSPECTION, Spark Plug.>	Is the spark plug condition status OK?	Go to step 2.	Replace the spark plug.
2 CHECK IGNITION SYSTEM FOR SPARKS. 1) Connect the spark plug to ignition coil. 2) Release the fuel pressure. <Ref. to FU(H4DOTC)-49, RELEASING OF FUEL PRESSURE, PROCEDURE, Fuel.> 3) Contact the spark plug's thread portion to the engine. 4) While opening the throttle valve fully, crank the engine to check that spark occurs at each cylinder.	Does spark occur at each cylinder?	Check fuel pump system. <Ref. to EN(H4DOTC)(diag)-67, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>	Go to step 3.
3 CHECK POWER SUPPLY CIRCUIT FOR IGNITION COIL AND IGNITOR ASSEMBLY. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ignition coil and ignitor assembly. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between ignition coil and ignitor assembly connector and engine ground. <i>Connector & terminal</i> (E31) No. 3 (+) — Engine ground (-): (E32) No. 3 (+) — Engine ground (-): (E33) No. 3 (+) — Engine ground (-): (E34) No. 3 (+) — Engine ground (-):	Is the voltage 10 V or more?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between the ignition coil and ignitor assembly and ignition switch connector • Poor contact in coupling connector
4 CHECK HARNESS OF IGNITION COIL AND IGNITOR ASSEMBLY GROUND CIRCUIT. 1) Turn the ignition switch to OFF. 2) Measure the resistance between the ignition coil and ignitor assembly connector and the ECM. <i>Connector & terminal</i> (E31) No. 2 — (B137) No. 6, 26: (E32) No. 2 — (B137) No. 6, 26: (E33) No. 2 — (B137) No. 6, 26: (E34) No. 2 — (B137) No. 6, 26:	Is the resistance less than 5 Ω?	Go to step 5.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and ignition coil and ignitor assembly connector
5 CHECK HARNESS BETWEEN ECM AND IGNITION COIL AND IGNITOR ASSEMBLY CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connector from ignition coil and ignitor assembly. 4) Measure the resistance of harness between ECM and ignition coil and ignitor assembly connector. <i>Connector & terminal</i> (B137) No. 21 — (E34) No. 1: (B137) No. 20 — (E33) No. 1: (B137) No. 19 — (E32) No. 1: (B137) No. 18 — (E31) No. 1:	Is the resistance less than 1 Ω?	Go to step 6.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and ignition coil and ignitor assembly connector • Poor contact in coupling connector

Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

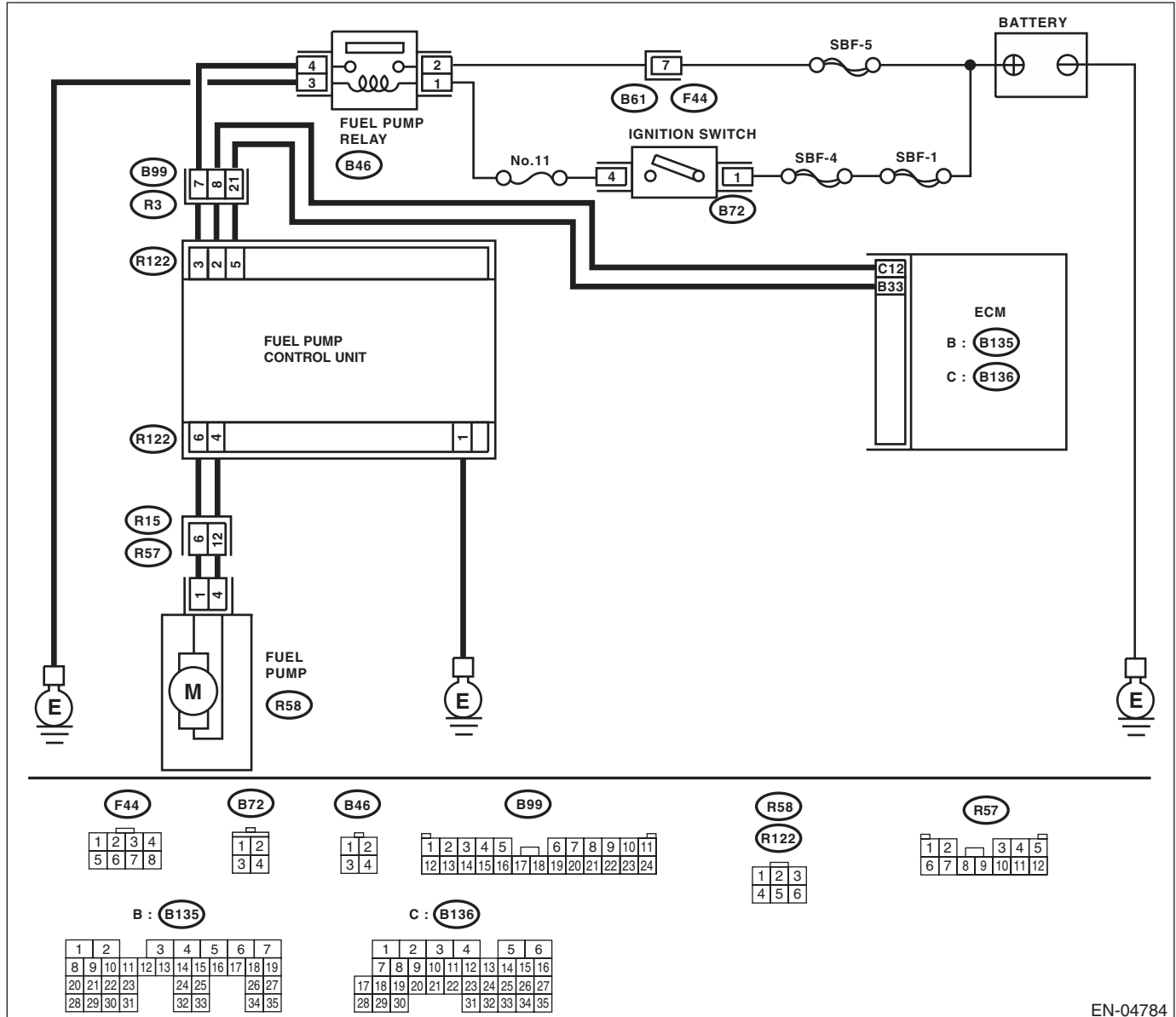
Step	Check	Yes	No
6 CHECK HARNESS BETWEEN ECM AND IGNITION COIL AND IGNITOR ASSEMBLY CONNECTOR. Measure the resistance of harness between ECM and engine ground. <i>Connector & terminal</i> <i>(B137) No. 21 — Engine ground:</i> <i>(B137) No. 20 — Engine ground:</i> <i>(B137) No. 19 — Engine ground:</i> <i>(B137) No. 18 — Engine ground:</i>	Is the resistance 1 MΩ or more?	Go to step 7.	Repair the ground short circuit of harness between ECM and ignition coil and ignitor assembly connector.
7 CHECK POOR CONTACT. Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Check fuel pump circuit. <Ref. to EN(H4DOTC)(diag)-67, FUEL PUMP CIRCUIT, Diagnostics for Engine Starting Failure.>

E: FUEL PUMP CIRCUIT

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Step	Check	Yes	No
<p>1</p> <p>CHECK OPERATING SOUND OF FUEL PUMP.</p> <p>Make sure that the fuel pump operates for 2 seconds when turning the ignition switch to ON.</p> <p>NOTE: Fuel pump operation check can also be executed using Subaru Select Monitor.</p> <p>For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.></p>	<p>Does the fuel pump emit operating sound?</p>	<p>Check the fuel injector circuit.</p> <p><Ref. to EN(H4DOTC)(diag)-68, FUEL INJECTOR CIRCUIT, Diagnostics for Engine Starting Failure.></p>	<p>Display the DTC.</p> <p><Ref. to EN(H4DOTC)(diag)-37, OPERATION, Read Diagnostic Trouble Code (DTC).></p>

Diagnostics for Engine Starting Failure

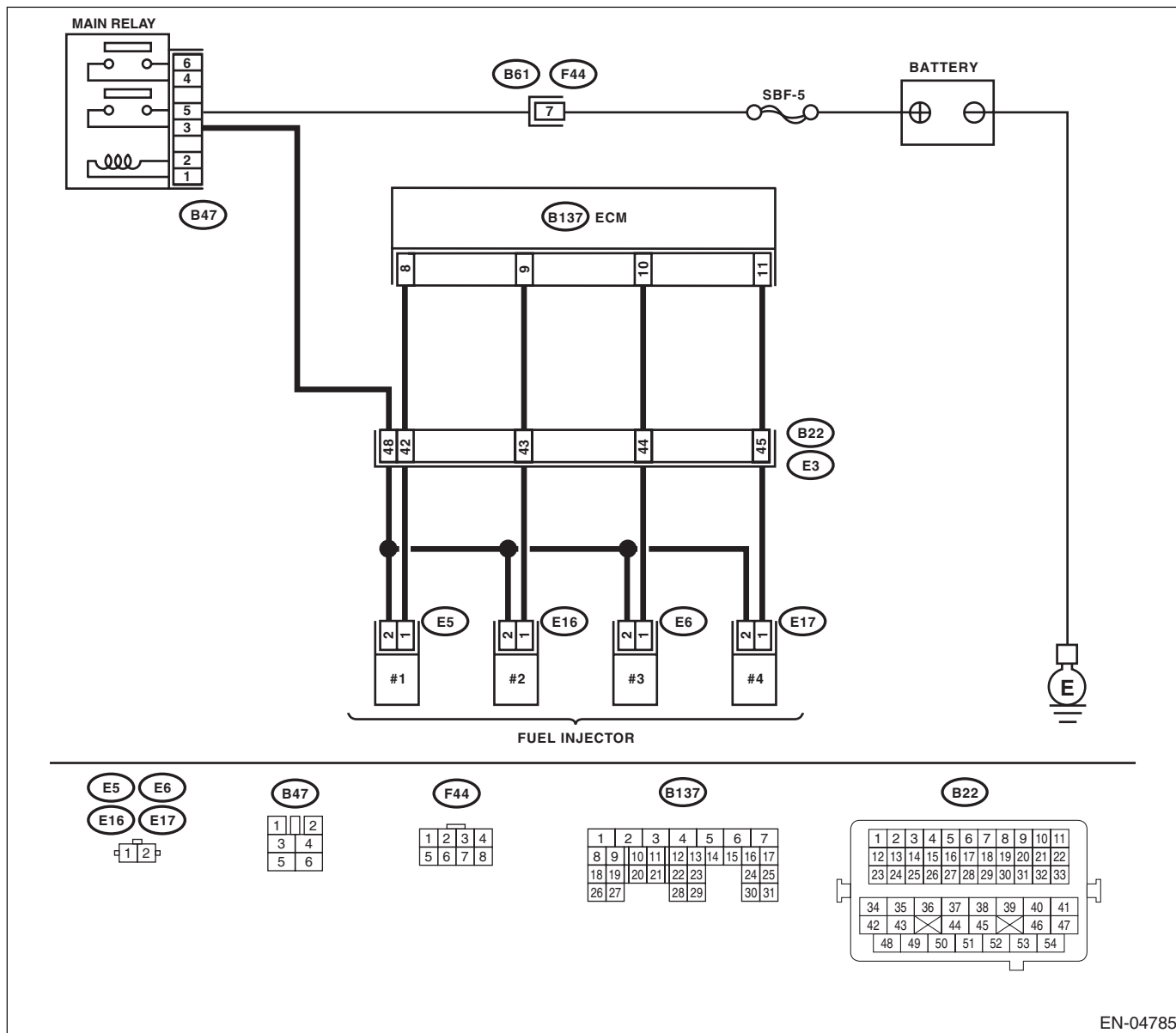
ENGINE (DIAGNOSTICS)

F: FUEL INJECTOR CIRCUIT

CAUTION:

- Check or repair only faulty parts.
- After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04785

Diagnostics for Engine Starting Failure

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1 CHECK OPERATION OF EACH FUEL INJECTOR. While cranking the engine, check each fuel injector emits operating sound. Use a sound scope or attach a screwdriver to the injector for this check.</p>	Does the fuel injector emit operating sound?	Check the fuel pressure. <Ref. to ME(H4DOTC)-27, INSPECTION, Fuel Pressure.>	Go to step 2.
<p>2 CHECK POWER SUPPLY TO EACH FUEL INJECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector. 3) Turn the ignition switch to ON. 4) Measure the power supply voltage between fuel injector terminal and engine ground. Connector & terminal #1 (E5) No. 2 (+) — Engine ground (-): #2 (E16) No. 2 (+) — Engine ground (-): #3 (E6) No. 2 (+) — Engine ground (-): #4 (E17) No. 2 (+) — Engine ground (-):</p>	Is the voltage 10 V or more?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between main relay and fuel injector connector • Poor contact in main relay connector • Poor contact in coupling connector • Poor contact in fuel injector connector
<p>3 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. 1) Disconnect the connectors from ECM. 2) Measure the resistance of harness between ECM and fuel injector connector. Connector & terminal (B137) No. 8 — (E5) No. 1: (B137) No. 9 — (E16) No. 1: (B137) No. 10 — (E6) No. 1: (B137) No. 11 — (E17) No. 1:</p>	Is the resistance less than 1 Ω?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
<p>4 CHECK HARNESS BETWEEN ECM AND FUEL INJECTOR CONNECTOR. Measure the resistance of harness between ECM and fuel injector connector. Connector & terminal (B137) No. 8 — Chassis ground: (B137) No. 9 — Chassis ground: (B137) No. 10 — Chassis ground: (B137) No. 11 — Chassis ground:</p>	Is the resistance less than 1 Ω?	Repair the ground short circuit of harness between ECM and fuel injector connector.	Go to step 5.
<p>5 CHECK EACH FUEL INJECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between each fuel injector terminals. Terminals No. 1 — No. 2:</p>	Is the resistance between 5 — 20 Ω?	Go to step 6.	Replace the faulty fuel injector.
<p>6 CHECK POOR CONTACT. Check poor contact of ECM connector.</p>	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Inspection using “General Diagnostic Table” <Ref. to EN(H4DOTC)(diag)-400, INSPECTION, General Diagnostic Table.>

List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

18. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Note
P0011	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 1)	<Ref. to EN(H4DOTC)(diag)-78, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0016	Crankshaft Position - Camshaft Position Correlation (Bank 1)	<Ref. to EN(H4DOTC)(diag)-79, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0018	Crankshaft Position - Camshaft Position Correlation (Bank 2)	<Ref. to EN(H4DOTC)(diag)-80, DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0021	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)	<Ref. to EN(H4DOTC)(diag)-81, DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-82, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-84, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-87, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC)(diag)-89, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC)(diag)-92, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0068	MAP/MAF - Throttle Position Correlation	<Ref. to EN(H4DOTC)(diag)-94, DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0101	Mass or Volume Air Flow Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-96, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0102	Mass or Volume Air Flow Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-98, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0103	Mass or Volume Air Flow Circuit High Input	<Ref. to EN(H4DOTC)(diag)-101, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-103, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to EN(H4DOTC)(diag)-105, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0111	Intake Air Temperature Sensor 1 Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-107, DTC P0111 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0112	Intake Air Temperature Sensor 1 Circuit Low	<Ref. to EN(H4DOTC)(diag)-109, DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DTC	Item	Note
P0113	Intake Air Temperature Sensor 1 Circuit High	<Ref. to EN(H4DOTC)(diag)-111, DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0117	Engine Coolant Temperature Circuit Low	<Ref. to EN(H4DOTC)(diag)-114, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0118	Engine Coolant Temperature Circuit High	<Ref. to EN(H4DOTC)(diag)-116, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0122	Throttle/Pedal Position Sensor/Switch "A" Circuit Low	<Ref. to EN(H4DOTC)(diag)-119, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0123	Throttle/Pedal Position Sensor/Switch "A" Circuit High	<Ref. to EN(H4DOTC)(diag)-121, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	<Ref. to EN(H4DOTC)(diag)-123, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0126	Insufficient Engine Coolant Temperature for Stable Operation	<Ref. to EN(H4DOTC)(diag)-125, DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0128	Coolant Thermostat (Engine Coolant Temperature Below Thermostat Regulating Temperature)	<Ref. to EN(H4DOTC)(diag)-127, DTC P0128 COOLANT THERMOSTAT (ENGINE COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0131	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-128, DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0132	O2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-130, DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0133	O2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-132, DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0134	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-134, DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0137	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC)(diag)-136, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0138	O2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC)(diag)-139, DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0139	O2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC)(diag)-142, DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0140	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 2)	<Ref. to EN(H4DOTC)(diag)-144, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0171	System Too Lean (Bank 1)	<Ref. to EN(H4DOTC)(diag)-146, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0172	System Too Rich (Bank 1)	<Ref. to EN(H4DOTC)(diag)-147, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0181	Fuel Temperature Sensor "A" Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-149, DTC P0181 FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DTC	Item	Note
P0182	Fuel Temperature Sensor "A" Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-151, DTC P0182 FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0183	Fuel Temperature Sensor "A" Circuit High Input	<Ref. to EN(H4DOTC)(diag)-153, DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0222	Throttle/Pedal Position Sensor/Switch "B" Circuit Low	<Ref. to EN(H4DOTC)(diag)-156, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0223	Throttle/Pedal Position Sensor/Switch "B" Circuit High	<Ref. to EN(H4DOTC)(diag)-158, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0230	Fuel Pump Primary Circuit	<Ref. to EN(H4DOTC)(diag)-161, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0244	Turbo/Super Charger Wastegate Solenoid "A" Range/Performance	<Ref. to EN(H4DOTC)(diag)-164, DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0245	Turbo/Super Charger Wastegate Solenoid "A" Low	<Ref. to EN(H4DOTC)(diag)-166, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0246	Turbo/Super Charger Wastegate Solenoid "A" High	<Ref. to EN(H4DOTC)(diag)-168, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0301	Cylinder 1 Misfire Detected	<Ref. to EN(H4DOTC)(diag)-169, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0302	Cylinder 2 Misfire Detected	<Ref. to EN(H4DOTC)(diag)-169, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0303	Cylinder 3 Misfire Detected	<Ref. to EN(H4DOTC)(diag)-169, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0304	Cylinder 4 Misfire Detected	<Ref. to EN(H4DOTC)(diag)-170, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0327	Knock Sensor 1 Circuit Low (Bank 1 or Single Sensor)	<Ref. to EN(H4DOTC)(diag)-174, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0328	Knock Sensor 1 Circuit High (Bank 1 or Single Sensor)	<Ref. to EN(H4DOTC)(diag)-176, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0335	Crankshaft Position Sensor "A" Circuit	<Ref. to EN(H4DOTC)(diag)-178, DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0336	Crankshaft Position Sensor "A" Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-180, DTC P0336 CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0340	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	<Ref. to EN(H4DOTC)(diag)-182, DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0345	Camshaft Position Sensor "A" Circuit (Bank 2)	<Ref. to EN(H4DOTC)(diag)-184, DTC P0345 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0410	Secondary Air Injection System	<Ref. to EN(H4DOTC)(diag)-186, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0411	Secondary Air Injection System Incorrect Flow Detected	<Ref. to EN(H4DOTC)(diag)-190, DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DTC	Item	Note
P0413	Secondary Air Injection System Switching Valve "A" Circuit Open	<Ref. to EN(H4DOTC)(diag)-193, DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "A" CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0414	Secondary Air Injection System Switching Valve "A" Circuit Shorted	<Ref. to EN(H4DOTC)(diag)-196, DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "A" CIRCUIT SHORTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0416	Secondary Air Injection System Switching Valve "B" Circuit Open	<Ref. to EN(H4DOTC)(diag)-199, DTC P0416 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "B" CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0417	Secondary Air Injection System Switching Valve "B" Circuit Shorted	<Ref. to EN(H4DOTC)(diag)-202, DTC P0417 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "B" CIRCUIT SHORTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0418	Secondary Air Injection System Control "A" Circuit Open	<Ref. to EN(H4DOTC)(diag)-205, DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL "A" CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to EN(H4DOTC)(diag)-208, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0441	Evaporative Emission System Incorrect Purge Flow	<Ref. to EN(H4DOTC)(diag)-212, DTC P0441 EVAPORATIVE EMISSION SYSTEM INCORRECT PURGE FLOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0442	Evaporative Emission Control System Leak Detected (Small Leak)	<Ref. to EN(H4DOTC)(diag)-213, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0447	Evaporative Emission Control System Vent Control Circuit Open	<Ref. to EN(H4DOTC)(diag)-216, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	<Ref. to EN(H4DOTC)(diag)-219, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0451	Evaporative Emission Control System Pressure Sensor	<Ref. to EN(H4DOTC)(diag)-221, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0452	Evaporative Emission Control System Pressure Sensor Low Input	<Ref. to EN(H4DOTC)(diag)-223, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0453	Evaporative Emission Control System Pressure Sensor High Input	<Ref. to EN(H4DOTC)(diag)-226, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)	<Ref. to EN(H4DOTC)(diag)-229, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0457	Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)	<Ref. to EN(H4DOTC)(diag)-232, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0458	Evaporative Emission System Purge Control Valve Circuit Low	<Ref. to EN(H4DOTC)(diag)-235, DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0459	Evaporative Emission System Purge Control Valve Circuit High	<Ref. to EN(H4DOTC)(diag)-237, DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0461	Fuel Level Sensor "A" Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-239, DTC P0461 FUEL LEVEL SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0462	Fuel Level Sensor "A" Circuit Low	<Ref. to EN(H4DOTC)(diag)-241, DTC P0462 FUEL LEVEL SENSOR "A" CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DTC	Item	Note
P0463	Fuel Level Sensor "A" Circuit High	<Ref. to EN(H4DOTC)(diag)-244, DTC P0463 FUEL LEVEL SENSOR "A" CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to EN(H4DOTC)(diag)-247, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0483	Fan Rationality Check	<Ref. to EN(H4DOTC)(diag)-249, DTC P0483 FAN RATIONALITY CHECK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0502	Vehicle Speed Sensor "A" Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-250, DTC P0502 VEHICLE SPEED SENSOR "A" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0503	Vehicle Speed Sensor "A" Intermittent/Erratic/High	<Ref. to EN(H4DOTC)(diag)-252, DTC P0503 VEHICLE SPEED SENSOR "A" INTERMITTENT/ERRATIC/HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0506	Idle Air Control System RPM Lower Than Expected	<Ref. to EN(H4DOTC)(diag)-254, DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0507	Idle Air Control System RPM Higher Than Expected	<Ref. to EN(H4DOTC)(diag)-256, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0512	Starter Request Circuit	<Ref. to EN(H4DOTC)(diag)-258, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0513	Incorrect Immobilizer Key	<Ref. to IM(diag)-17, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0519	Idle Air Control System Performance	<Ref. to EN(H4DOTC)(diag)-260, DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0600	Serial Communication Link	<Ref. to EN(H4DOTC)(diag)-262, DTC P0600 SERIAL COMMUNICATION LINK, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to EN(H4DOTC)(diag)-264, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0605	Internal Control Module Read Only Memory (ROM) Error	<Ref. to EN(H4DOTC)(diag)-265, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0607	Control Module Performance	<Ref. to EN(H4DOTC)(diag)-266, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<Ref. to EN(H4DOTC)(diag)-268, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0691	Fan 1 Control Circuit Low	<Ref. to EN(H4DOTC)(diag)-268, DTC P0691 FAN 1 CONTROL CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0692	Fan 1 Control Circuit High	<Ref. to EN(H4DOTC)(diag)-268, DTC P0692 FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0700	Transmission Control System (MIL Request)	<Ref. to EN(H4DOTC)(diag)-268, DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0851	Park/Neutral Switch Input Circuit Low (AT Model)	<Ref. to EN(H4DOTC)(diag)-269, DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0851	Neutral Switch Input Circuit Low (MT Model)	<Ref. to EN(H4DOTC)(diag)-271, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0852	Park/Neutral Switch Input Circuit High (AT Model)	<Ref. to EN(H4DOTC)(diag)-273, DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DTC	Item	Note
P0852	Neutral Switch Input Circuit High (MT Model)	<Ref. to EN(H4DOTC)(diag)-276, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1152	O2 Sensor Circuit Range/Performance (Low) (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-278, DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1153	O2 Sensor Circuit Range/Performance (High) (Bank 1 Sensor 1)	<Ref. to EN(H4DOTC)(diag)-280, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1160	Return Spring Failure	<Ref. to EN(H4DOTC)(diag)-281, DTC P1160 RETURN SPRING FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to EN(H4DOTC)(diag)-282, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1410	Secondary Air Injection System Switching Valve Stuck Open	<Ref. to EN(H4DOTC)(diag)-284, DTC P1410 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1418	Secondary Air Injection System Control "A" Circuit Shorted	<Ref. to EN(H4DOTC)(diag)-287, DTC P1418 SECONDARY AIR INJECTION SYSTEM CONTROL "A" CIRCUIT SHORTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	<Ref. to EN(H4DOTC)(diag)-290, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1443	Vent Control Solenoid Valve Function Problem	<Ref. to EN(H4DOTC)(diag)-292, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1491	Positive Crankcase Ventilation (Blow-by) Function Problem	<Ref. to EN(H4DOTC)(diag)-294, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1518	Starter Switch Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-296, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1560	Back-up Voltage Circuit Malfunction	<Ref. to EN(H4DOTC)(diag)-298, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1570	Antenna	<Ref. to IM(diag)-19, DTC P1570 ANTENNA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1571	Reference Code Incompatibility	<Ref. to IM(diag)-13, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1572	IMM Circuit Failure (Except Antenna Circuit)	<Ref. to IM(diag)-14, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1574	Key Communication Failure	<Ref. to IM(diag)-16, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1576	EGI Control Module EEPROM	<Ref. to IM(diag)-17, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1577	IMM Control Module EEPROM	<Ref. to IM(diag)-18, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1602	Control Module Programming Error	<Ref. to EN(H4DOTC)(diag)-300, DTC P1602 CONTROL MODULE PROGRAMMING ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2004	Intake Manifold Runner Control Stuck Open (Bank 1)	<Ref. to EN(H4DOTC)(diag)-310, DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DTC	Item	Note
P2005	Intake Manifold Runner Control Stuck Open (Bank 2)	<Ref. to EN(H4DOTC)(diag)-311, DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2006	Intake Manifold Runner Control Stuck Closed (Bank 1)	<Ref. to EN(H4DOTC)(diag)-311, DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2007	Intake Manifold Runner Control Stuck Closed (Bank 2)	<Ref. to EN(H4DOTC)(diag)-312, DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2008	Intake Manifold Runner Control Circuit / Open (Bank 1)	<Ref. to EN(H4DOTC)(diag)-313, DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2009	Intake Manifold Runner Control Circuit Low (Bank 1)	<Ref. to EN(H4DOTC)(diag)-315, DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2011	Intake Manifold Runner Control Circuit / Open (Bank 2)	<Ref. to EN(H4DOTC)(diag)-317, DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2012	Intake Manifold Runner Control Circuit Low (Bank 2)	<Ref. to EN(H4DOTC)(diag)-319, DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2016	Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 1)	<Ref. to EN(H4DOTC)(diag)-321, DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2017	Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 1)	<Ref. to EN(H4DOTC)(diag)-324, DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2021	Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 2)	<Ref. to EN(H4DOTC)(diag)-326, DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2022	Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 2)	<Ref. to EN(H4DOTC)(diag)-329, DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2088	OCV Solenoid Valve Signal A Circuit Open (Bank 1)	<Ref. to EN(H4DOTC)(diag)-331, DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2089	OCV Solenoid Valve Signal A Circuit Short (Bank 1)	<Ref. to EN(H4DOTC)(diag)-333, DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2092	OCV Solenoid Valve Signal A Circuit Open (Bank 2)	<Ref. to EN(H4DOTC)(diag)-335, DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2093	Intake Camshaft Position Actuator Control Circuit High (Bank 2)	<Ref. to EN(H4DOTC)(diag)-337, DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	<Ref. to EN(H4DOTC)(diag)-339, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	<Ref. to EN(H4DOTC)(diag)-345, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2101	Throttle Actuator Control Motor Circuit Range/Performance	<Ref. to EN(H4DOTC)(diag)-351, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2102	Throttle Actuator Control Motor Circuit Low	<Ref. to EN(H4DOTC)(diag)-357, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DTC	Item	Note
P2103	Throttle Actuator Control Motor Circuit High	<Ref. to EN(H4DOTC)(diag)-359, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2109	Throttle/Pedal Position Sensor "A" Minimum Stop Performance	<Ref. to EN(H4DOTC)(diag)-360, DTC P2109 THROTTLE/PEDAL POSITION SENSOR "A" MINIMUM STOP PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2122	Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-361, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2123	Throttle/Pedal Position Sensor/Switch "D" Circuit High Input	<Ref. to EN(H4DOTC)(diag)-363, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2127	Throttle/Pedal Position Sensor/Switch "E" Circuit Low Input	<Ref. to EN(H4DOTC)(diag)-365, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2128	Throttle/Pedal Position Sensor/Switch "E" Circuit High Input	<Ref. to EN(H4DOTC)(diag)-367, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2135	Throttle/Pedal Position Sensor/Switch "A"/"B" Voltage Correlation	<Ref. to EN(H4DOTC)(diag)-369, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A"/"B" VOLTAGE CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2138	Throttle/Pedal Position Sensor/Switch "D"/"E" Voltage Correlation	<Ref. to EN(H4DOTC)(diag)-373, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D"/"E" VOLTAGE CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2419	Evaporative Emission System Switching Valve Control Circuit Low	<Ref. to EN(H4DOTC)(diag)-376, DTC P2419 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2420	Evaporative Emission System Switching Valve Control Circuit High	<Ref. to EN(H4DOTC)(diag)-378, DTC P2420 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2431	Secondary Air Injection System Air Flow /Pressure Sensor Circuit Range/ Performance	<Ref. to EN(H4DOTC)(diag)-380, DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW/PRESSURE SENSOR CIRCUIT RANGE/ PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2432	Secondary Air Injection System Air Flow /Pressure Sensor Circuit Low	<Ref. to EN(H4DOTC)(diag)-383, DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW/PRESSURE SENSOR CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2433	Secondary Air Injection System Air Flow /Pressure Sensor Circuit High	<Ref. to EN(H4DOTC)(diag)-386, DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2440	Secondary Air Injection System Switching Valve Stuck Open (Bank 1)	<Ref. to EN(H4DOTC)(diag)-389, DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2441	Secondary Air Injection System Switching Valve Stuck Closed (Bank 1)	<Ref. to EN(H4DOTC)(diag)-392, DTC P2441 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2442	Secondary Air Injection System Switching Valve Stuck Open (Bank 2)	<Ref. to EN(H4DOTC)(diag)-393, DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2443	Secondary Air Injection System Switching Valve Stuck Closed (Bank 2)	<Ref. to EN(H4DOTC)(diag)-396, DTC P2443 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P2444	Secondary Air Injection System Pump Stuck On	<Ref. to EN(H4DOTC)(diag)-397, DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

19. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-9, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK CURRENT DATA. 1) Start the engine and let it idle. 2) Using the Subaru Select Monitor or general scan tool, inspect the AVCS advance angle amount and oil flow control solenoid valve duty output. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is AVCS advance approximately 0 degrees, and the oil flow control solenoid valve duty output approx. 10%?	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clogged or dirty oil passages, spring settings) • Intake camshaft (dirt, damage of camshaft) • Timing belt (matching of timing mark)	A temporary malfunction. Perform the following, and clean the oil routing. Replace the engine oil and idle the engine for 5 minutes, and then replace the oil filter and engine oil.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

B: DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-12, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK CURRENT DATA. 1) Start the engine and let it idle. 2) Using the Subaru Select Monitor or general scan tool, inspect the AVCS advance angle amount and oil flow control solenoid valve duty output. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is AVCS advance approximately 0 degrees, and the oil flow control solenoid valve duty output approx. 10%?	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clogged or dirty oil passages, spring settings) • Intake camshaft (dirt, damage of camshaft) • Timing belt (matching of timing mark)	A temporary malfunction. Perform the following, and clean the oil routing. Replace the engine oil and idle the engine for 5 minutes, and then replace the oil filter and engine oil.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

C: DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-12, DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK CURRENT DATA. 1) Start the engine and let it idle. 2) Using the Subaru Select Monitor or general scan tool, inspect the AVCS advance angle amount and oil flow control solenoid valve duty output. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is AVCS advance approximately 0 degrees, and the oil flow control solenoid valve duty output approx. 10%?	Check the following item and repair or replace if necessary. • Oil pipe (clog) • Oil flow control solenoid valve (clogged or dirty oil passages, spring settings) • Intake camshaft (dirt, damage of camshaft) • Timing belt (matching of timing mark)	A temporary malfunction. Perform the following, and clean the oil routing. Replace the engine oil and idle the engine for 5 minutes, and then replace the oil filter and engine oil.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

D: DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-12, DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine stalls.
- Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK CURRENT DATA. 1) Start the engine and let it idle. 2) Using the Subaru Select Monitor or general scan tool, inspect the AVCS advance angle amount and oil flow control solenoid valve duty output. NOTE: <ul style="list-style-type: none">• Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.>• General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is AVCS advance approximately 0 degrees, and the oil flow control solenoid valve duty output approx. 10%?	Check the following item and repair or replace if necessary. <ul style="list-style-type: none">• Oil pipe (clog)• Oil flow control solenoid valve (clogged or dirty oil passages, spring settings)• Intake camshaft (dirt, damage of camshaft)• Timing belt (matching of timing mark)	A temporary malfunction. Perform the following, and clean the oil routing. Replace the engine oil and idle the engine for 5 minutes, and then replace the oil filter and engine oil.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

E: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

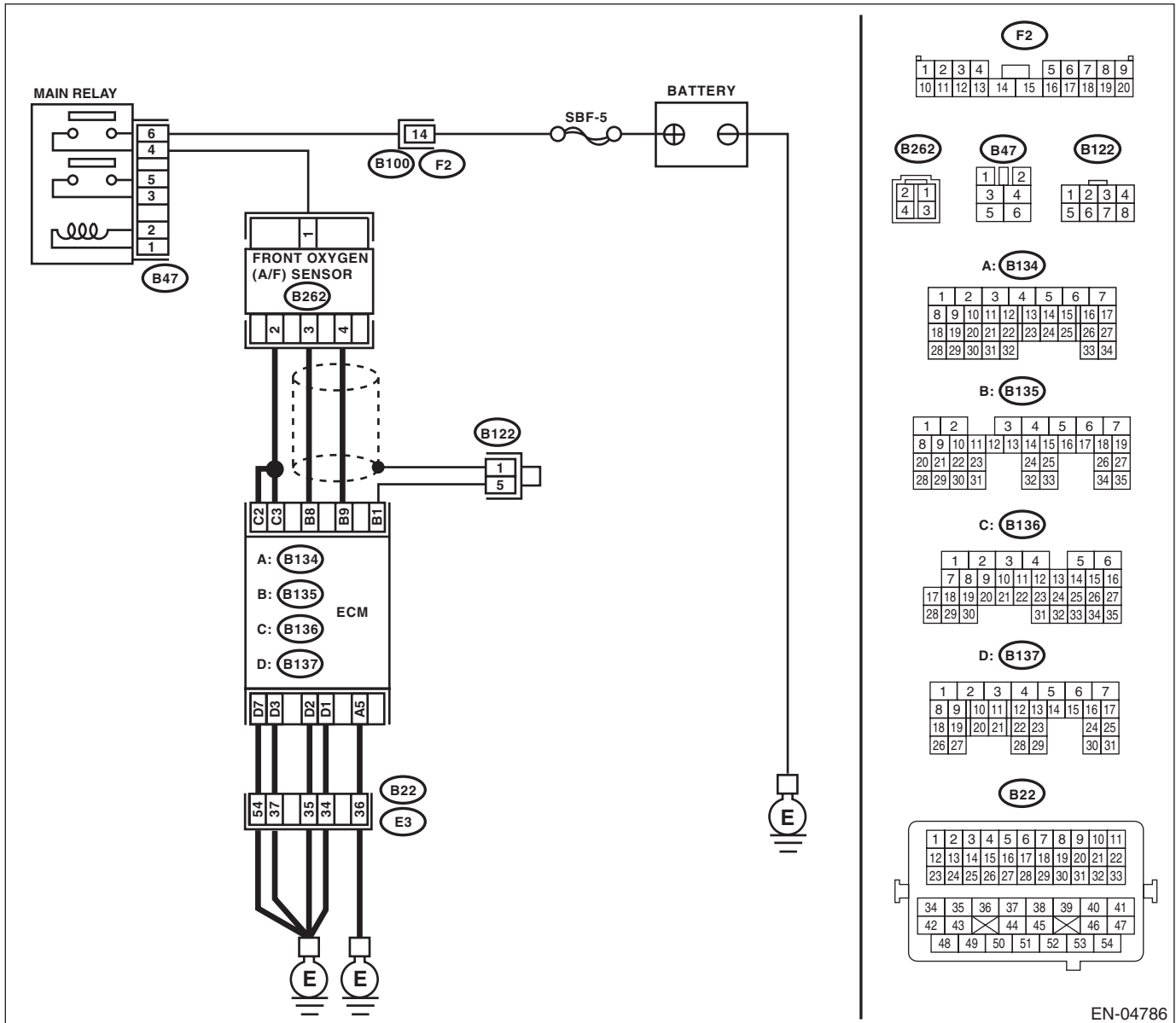
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-13, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04786

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. 1) Start and warm-up the engine. 2) Turn the ignition switch to OFF. 3) Disconnect the connectors from ECM and front oxygen (A/F) sensor. 4) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. <i>Connector & terminal</i> <i>(B136) No. 2 — (B262) No. 2:</i> <i>(B136) No. 3 — (B262) No. 2:</i>	Is the resistance less than 1 Ω?	Go to step 2.	Repair the open circuit of harness between ECM and front oxygen (A/F) sensor connector.
2 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. <i>Connector & terminal</i> <i>(B135) No. 8 — (B262) No. 3:</i> <i>(B135) No. 9 — (B262) No. 4:</i>	Is the resistance less than 1 Ω?	Go to step 3.	Repair the open circuit of harness between ECM and front oxygen (A/F) sensor connector.
3 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. Measure the resistance of harness between main relay and front oxygen (A/F) sensor connector. <i>Connector & terminal</i> <i>(B47) No. 4 — (B262) No. 1:</i>	Is the resistance less than 1 Ω?	Go to step 4.	Repair the open circuit of harness between ECM and front oxygen (A/F) sensor connector.
4 CHECK FRONT OXYGEN (A/F) SENSOR. Measure the resistance between front oxygen (A/F) sensor connector terminals. <i>Terminals</i> <i>No. 1 — No. 2:</i>	Is the resistance less than 5 Ω?	Go to step 5.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-36, Front Oxygen (A/F) Sensor.>
5 CHECK POOR CONTACT. Check the poor contact of ECM and front oxygen (A/F) sensor connector.	Is there poor contact in the ECM or front oxygen (A/F) sensor connector?	Repair poor contact of the ECM or front oxygen (A/F) sensor.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-36, Front Oxygen (A/F) Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

F: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

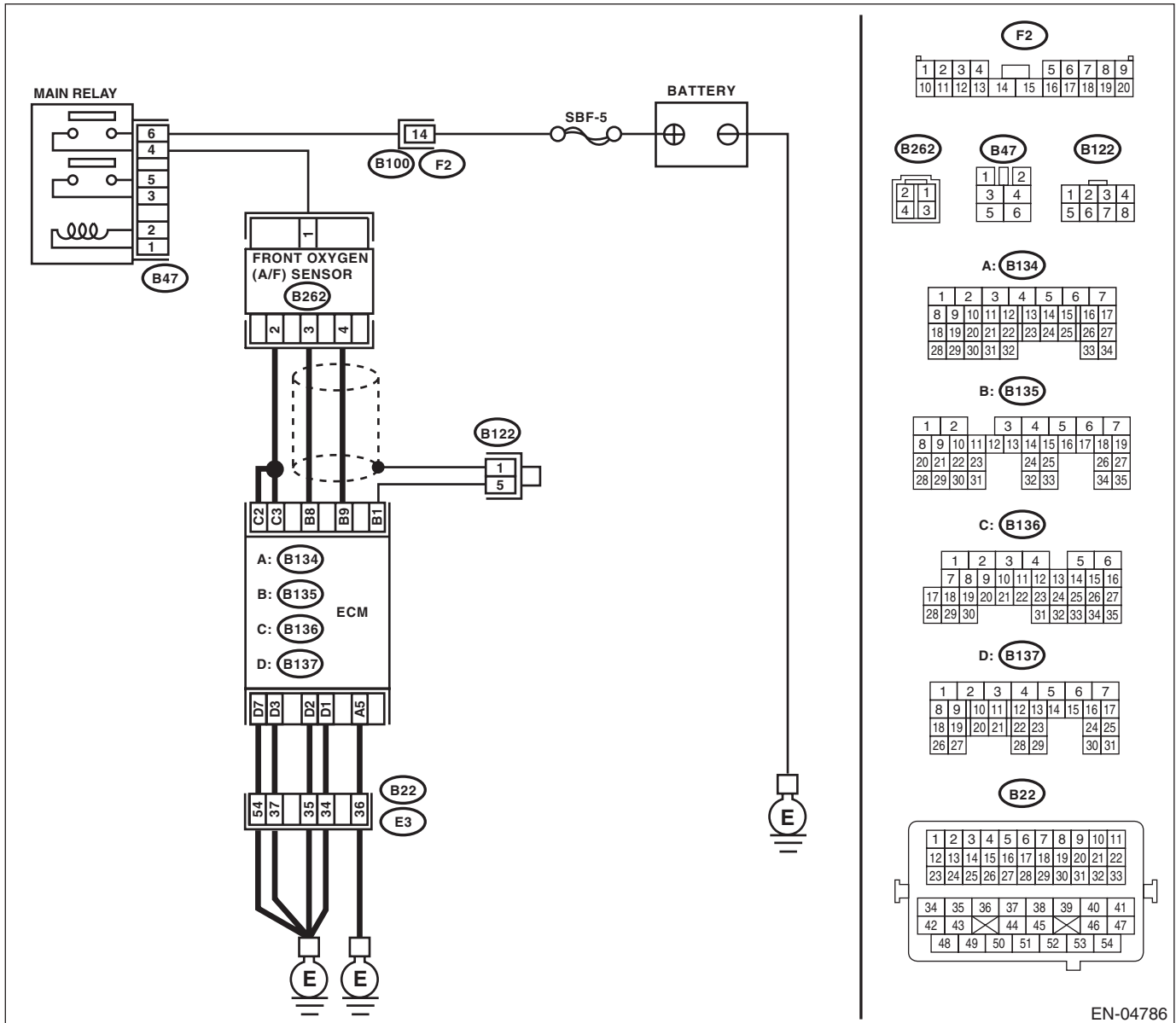
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-15, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04786

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK POWER SUPPLY TO FRONT OXYGEN (A/F) SENSOR.</p> <ol style="list-style-type: none"> Turn the ignition switch to OFF. Disconnect the connector from front oxygen (A/F) sensor. Turn the ignition switch to ON. Measure the voltage between front oxygen (A/F) sensor connector and engine ground. <p>Connector & terminal (B262) No. 1 (+) — Engine ground (-):</p>	Is the voltage 10 V or more?	Go to step 2.	<p>Repair the power supply line.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> Open circuit of harness between main relay and front oxygen (A/F) sensor connector Poor contact in front oxygen (A/F) sensor connector Poor contact in main relay connector
2	<p>CHECK GROUND CIRCUIT FOR ECM.</p> <p>Measure the resistance of harness between ECM connector and chassis ground.</p> <p>Connector & terminal (B134) No. 5 — Chassis ground: (B137) No. 1 — Chassis ground: (B137) No. 2 — Chassis ground: (B137) No. 3 — Chassis ground: (B137) No. 7 — Chassis ground:</p>	Is the resistance less than 5 Ω?	Go to step 3.	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> Open circuit of harness between ECM and engine ground cable Poor contact in ECM connector Poor contact in coupling connector
3	<p>CHECK CURRENT DATA.</p> <ol style="list-style-type: none"> Start the engine. Read the data of front oxygen (A/F) sensor heater current using the Subaru Select Monitor or general scan tool. <p>NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	Is the current 0.2 A or more?	<p>Repair the poor contact of connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> Poor contact in front oxygen (A/F) sensor connector Poor contact in ECM connector 	Go to step 4.
4	<p>CHECK OUTPUT SIGNAL OF ECM.</p> <ol style="list-style-type: none"> Start and idle the engine. Measure the voltage between ECM connector and chassis ground. <p>Connector & terminal (B136) No. 2 (+) — Chassis ground (-): (B136) No. 3 (+) — Chassis ground (-):</p>	Is the voltage less than 1 V?	Go to step 6.	Go to step 5.
5	<p>CHECK OUTPUT SIGNAL OF ECM.</p> <p>Measure the voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B136) No. 2 (+) — Chassis ground (-): (B136) No. 3 (+) — Chassis ground (-):</p>	Does the voltage change when shaking the harness and connector of the ECM while monitoring the value with a voltage meter?	Repair poor contact in ECM connector.	Go to step 6.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
6	CHECK FRONT OXYGEN (A/F) SENSOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between front oxygen (A/F) sensor connector terminals. Terminals No. 1 — No. 2:	Is the resistance less than 10 Ω ?	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none">• Open or ground short circuit of harness between front oxygen (A/F) sensor and ECM connector• Poor contact in front oxygen (A/F) sensor connector• Poor contact in ECM connector	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-36, Front Oxygen (A/F) Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

G: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

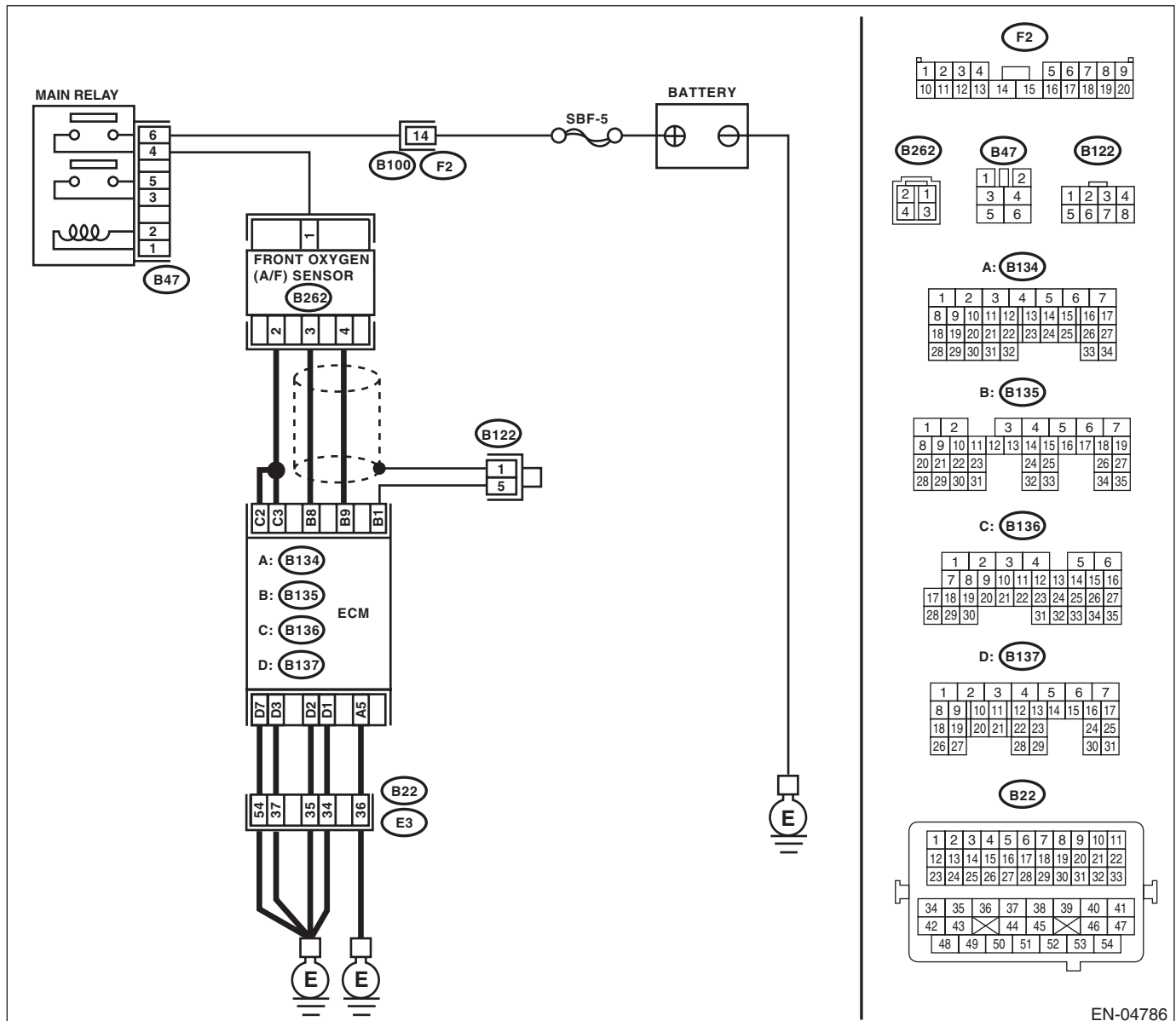
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-17, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04786

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal <i>(B136) No. 2 (+) — Chassis ground (-):</i> <i>(B136) No. 3 (+) — Chassis ground (-):</i>	Is the voltage 8 V or more?	Go to step 3.	Go to step 2.
2 CHECK FRONT OXYGEN (A/F) SENSOR HEATER CURRENT. 1) Turn the ignition switch to OFF. 2) Repair the short to power supply in the harness between ECM and front oxygen (A/F) sensor connector. 3) Turn the ignition switch to ON. 4) Read the data of front oxygen (A/F) sensor heater current using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is the current 2.3 A or more?	Replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	END.
3 CHECK OUTPUT SIGNAL OF ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal <i>(B136) No. 2 (+) — Chassis ground (-):</i> <i>(B136) No. 3 (+) — Chassis ground (-):</i>	Does the voltage change when shaking the harness and connector of the ECM while monitoring the value with a voltage meter?	Repair the short to power supply in the harness between ECM and front oxygen (A/F) sensor connector.	END.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

H: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

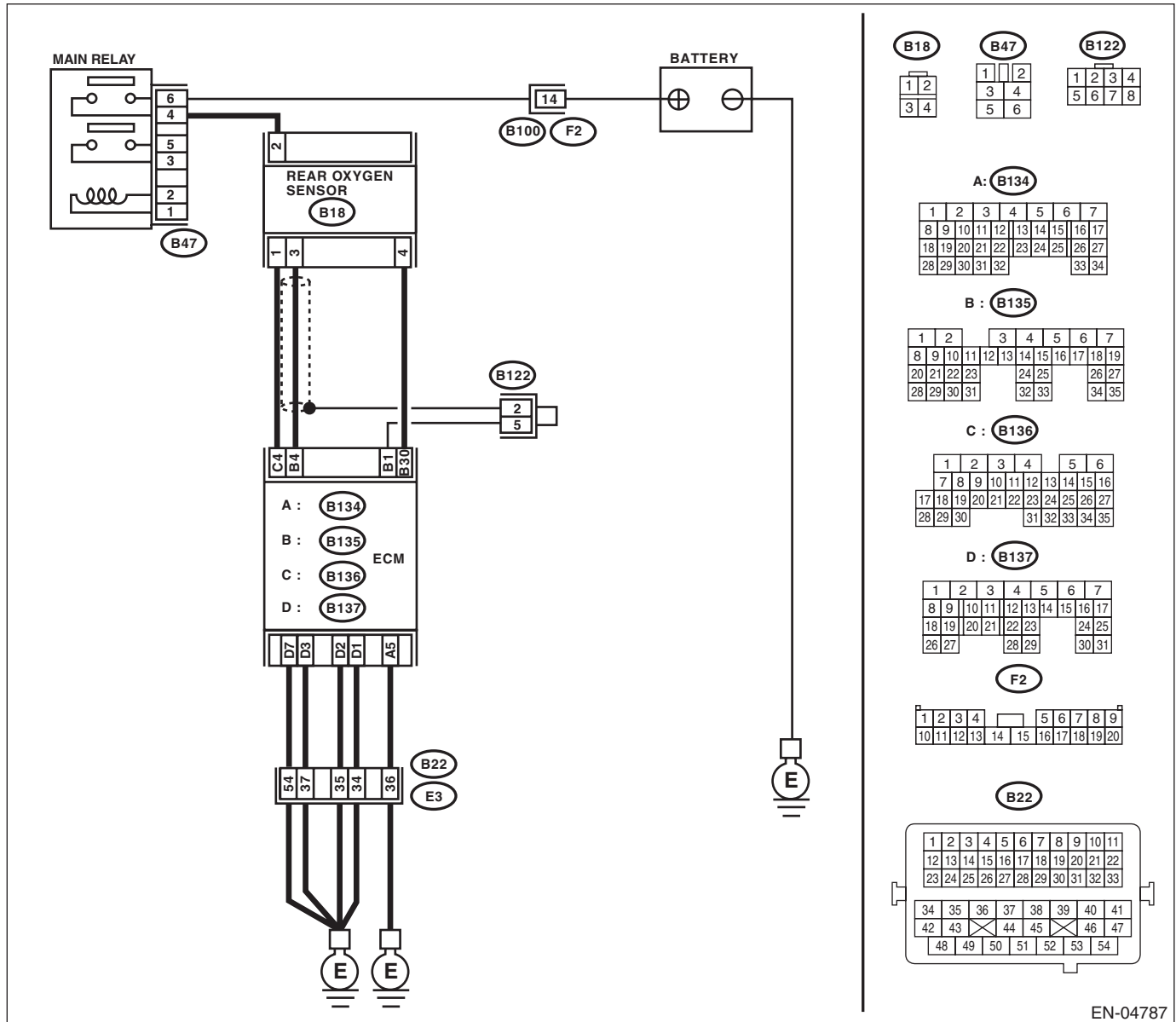
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-19, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04787

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK GROUND CIRCUIT FOR ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal <i>(B134) No. 5 — Chassis ground:</i> <i>(B137) No. 1 — Chassis ground:</i> <i>(B137) No. 2 — Chassis ground:</i> <i>(B137) No. 3 — Chassis ground:</i> <i>(B137) No. 7 — Chassis ground:</i>	Is the resistance less than 5 Ω?	Go to step 2.	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open circuit of harness between ECM and engine ground cable • Poor contact in ECM connector • Poor contact in coupling connector
2 CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of rear oxygen sensor heater current using the Subaru Select Monitor or general scan tool. NOTE: <ul style="list-style-type: none"> • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.> <ul style="list-style-type: none"> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is the current 0.2 A or more?	Repair the connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Poor contact in rear oxygen sensor connector • Poor contact in rear oxygen sensor connecting harness connector • Poor contact in ECM connector 	Go to step 3.
3 CHECK OUTPUT SIGNAL OF ECM. 1) Start and idle the engine. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal <i>(B136) No. 4 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 6.	Go to step 4.
4 CHECK OUTPUT SIGNAL OF ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal <i>(B136) No. 4 (+) — Chassis ground (-):</i>	Does the voltage change when shaking the harness and connector of the ECM while monitoring the value with a voltage meter?	Repair poor contact in ECM connector.	Go to step 5.
5 CHECK OUTPUT SIGNAL OF ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the rear oxygen sensor. 3) Measure the voltage between ECM connector and chassis ground. Connector & terminal <i>(B136) No. 4 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	Repair the short to power supply in the harness between ECM and rear oxygen sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>6</p> <p>CHECK POWER SUPPLY TO REAR OXYGEN SENSOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from the rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor connector and engine ground or chassis ground.</p> <p>Connector & terminal (B18) No. 2 (+) — Chassis ground (-):</p>	<p>Is the voltage 10 V or more?</p>	<p>Go to step 7.</p>	<p>Repair the power supply line.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit of harness between main relay and rear oxygen sensor connector • Poor contact in rear oxygen sensor connector • Poor contact in coupling connector
<p>7</p> <p>CHECK REAR OXYGEN SENSOR.</p> <p>1) Turn the ignition switch to OFF. 2) Measure the resistance between the rear oxygen sensor connector terminals.</p> <p>Terminals No. 1 — No. 2:</p>	<p>Is the resistance less than 30 Ω?</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit of harness between the rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector • Poor contact in coupling connector 	<p>Replace the rear oxygen sensor.</p> <p><Ref. to FU(H4DOTC)-42, Rear Oxygen Sensor.></p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

I: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

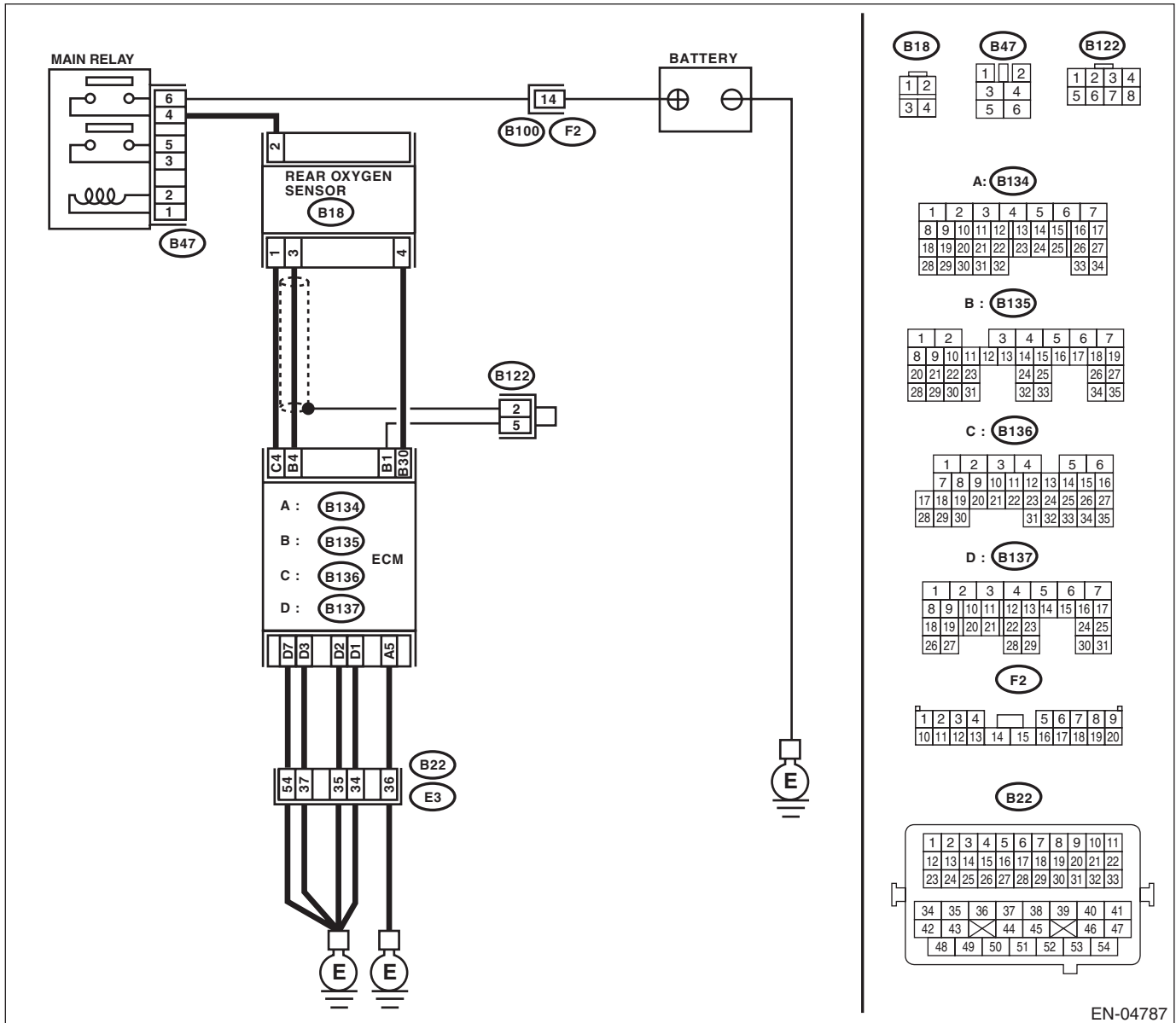
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-21, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04787

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT SIGNAL OF ECM. 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B136) No. 4 (+) — Chassis ground (-):	Is the voltage 8 V or more?	Go to step 2.	Go to step 3.
2 CHECK CURRENT DATA. 1) Repair the short to power supply in the harness between ECM and rear oxygen sensor connector. 2) Turn the ignition switch to ON. 3) Read the data of rear oxygen sensor heater current using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is the current 7 A or more?	Replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	END.
3 CHECK POOR CONTACT. Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	END.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

J: DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-23, DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

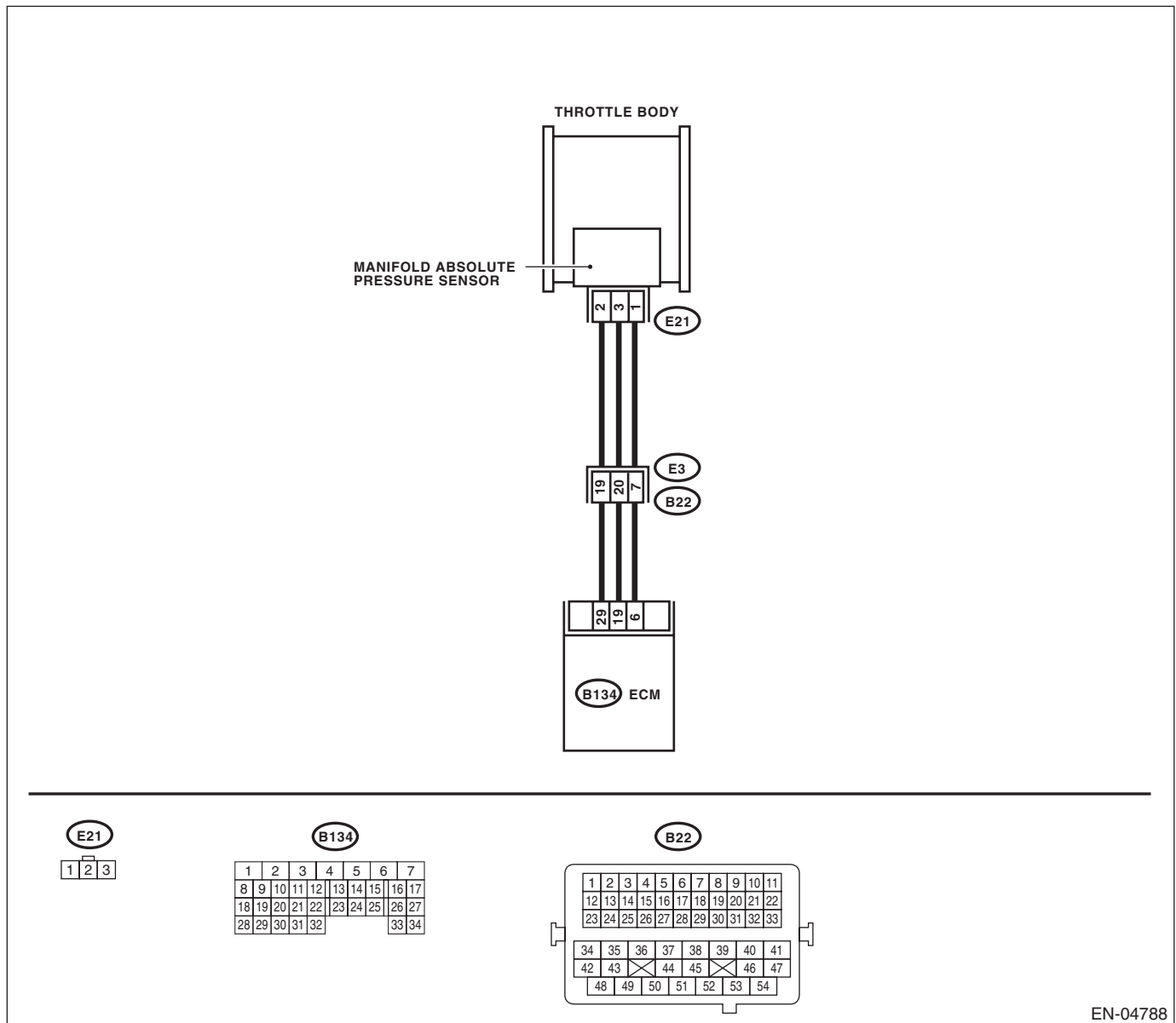
TROUBLE SYMPTOM:

Failure of engine to start

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04788

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK IDLE SWITCH SIGNAL.</p> <p>1) Turn the ignition switch to ON. 2) Operate the LED operation mode for engine using Subaru Select Monitor.</p> <p>NOTE: For detailed operation procedures, refer to the "LED OPERATION MODE FOR ENGINE." <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.></p>	Does the LED of {Idle Switch Signal} come on?	Go to step 2.	<p>Check the throttle position sensor circuit. <Ref. to EN(H4DOTC)(diag)-369, DTC P2135 THROTTLE/ PEDAL POSITION SENSOR/ SWITCH "A"/"B" VOLTAGE CORRELATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).></p> <p>NOTE: In this case, it is not necessary to inspect DTC P0106.</p>
2	<p>CHECK ANY OTHER DTC ON DISPLAY.</p>	Is any other DTC displayed?	<p>Check the relative DTC. "List of Diagnostic Trouble Code (DTC)" <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).></p> <p>NOTE: In this case, it is not necessary to inspect DTC P0106.</p>	Go to step 3.
3	<p>CHECK CONDITION OF MANIFOLD ABSOLUTE PRESSURE SENSOR.</p>	Is the manifold absolute pressure sensor installation bolt tightened securely?	Go to step 4.	Securely tighten the manifold absolute pressure sensor installation bolt.
4	<p>CHECK CONDITION OF THROTTLE BODY.</p>	Is the throttle body installation bolt tightened securely?	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-31, Manifold Absolute Pressure Sensor.>	Tighten the throttle body installation bolt securely.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

K: DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/ PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-25, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

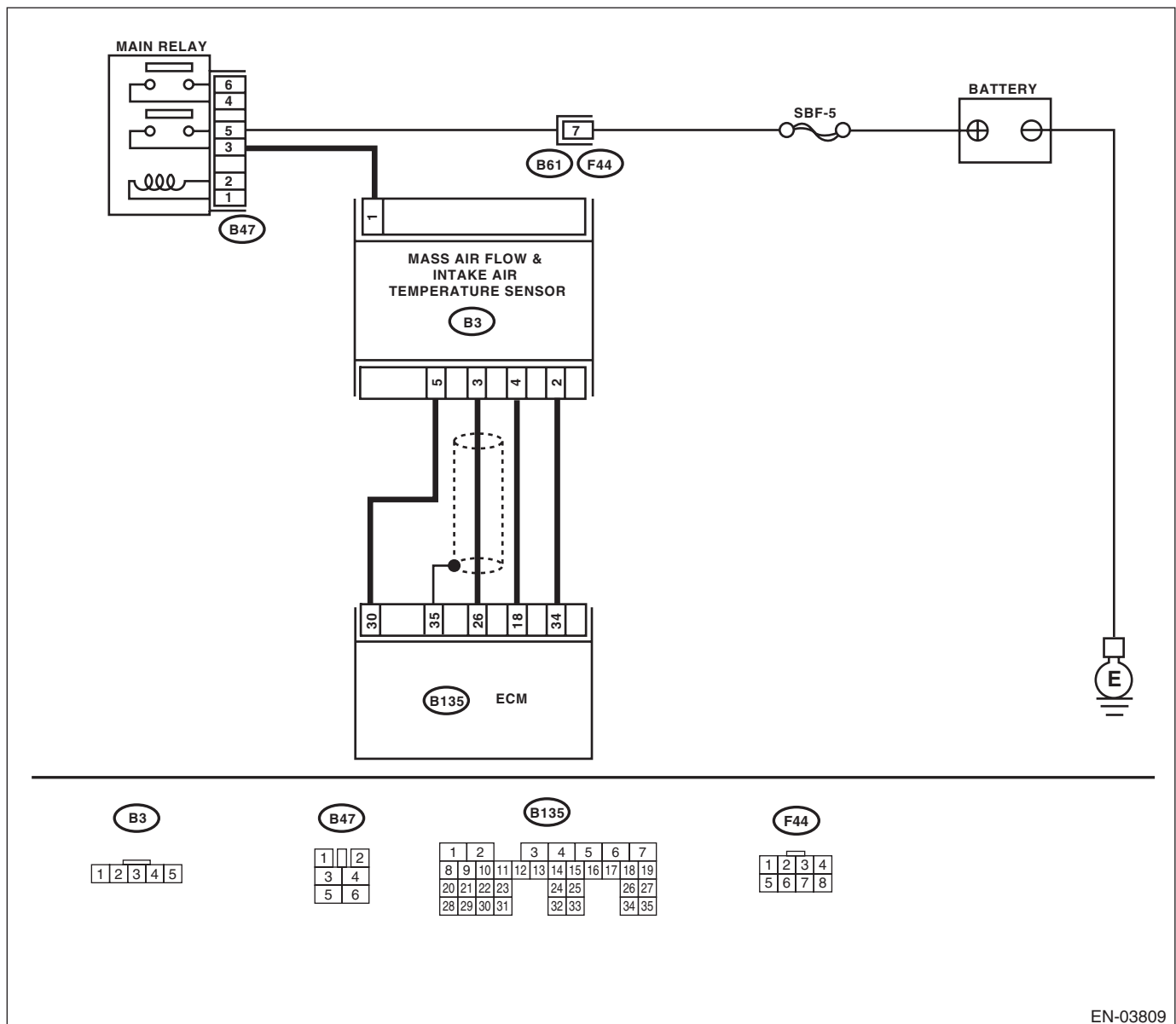
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03809

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0101.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-30, Mass Air Flow and Intake Air Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

L: DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-28, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

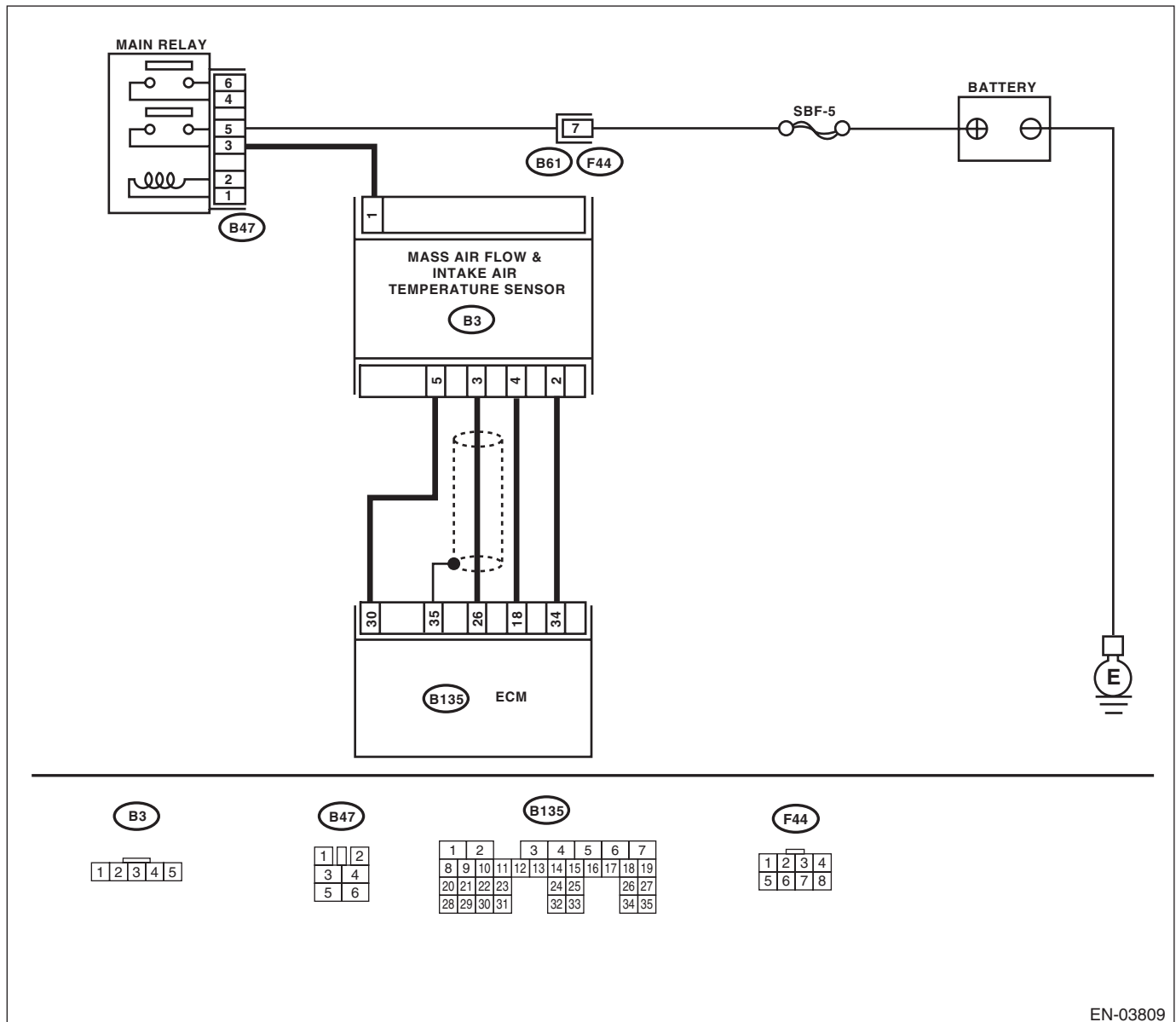
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03809

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1 CONNECT SUBARU SELECT MONITOR OR THE GENERAL SCAN TOOL, AND READ DATA.</p> <p>1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or general scan tool to data link connector. 3) Turn the ignition switch to ON, and run the Subaru Select Monitor or general scan tool. 4) Start the engine. 5) Read the mass air flow sensor voltage using Subaru Select Monitor or general scan tool.</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Is the voltage 0.2 — 4.7 V?</p>	<p>Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Temporary poor contact of connector or harness may be the cause. Repair the harness or connector in mass air flow sensor.</p> <p>NOTE: In this case, repair the following item: • Open or ground short circuit in harness between mass air flow sensor and ECM connector • Poor contact in mass air flow sensor or ECM connector</p>	<p>Go to step 2.</p>
<p>2 CHECK INPUT SIGNAL OF ECM. Measure the voltage between ECM connector and chassis ground while engine is idling. Connector & terminal (B135) No. 26 (+) — Chassis ground (-):</p>	<p>Is the voltage 0.2 V or more?</p>	<p>Go to step 3.</p>	<p>Repair the poor contact in ECM connector.</p>
<p>3 CHECK POWER SUPPLY TO MASS AIR FLOW SENSOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass air flow sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between mass air flow sensor connector and chassis ground. Connector & terminal (B3) No. 1 (+) — Chassis ground (-):</p>	<p>Is the voltage 5 V or more?</p>	<p>Go to step 4.</p>	<p>Repair the open circuit between mass air flow sensor and main relay.</p>
<p>4 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM and mass air flow sensor connector. Connector & terminal (B135) No. 26 — (B3) No. 3: (B135) No. 34 — (B3) No. 2: (B135) No. 30 — (B3) No. 5:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 5.</p>	<p>Repair the open circuit between ECM and mass air flow sensor connector.</p>
<p>5 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR. Measure the resistance of harness between ECM and chassis ground. Connector & terminal (B135) No. 26 — Chassis ground: (B135) No. 34 — Chassis ground: (B135) No. 30 — Chassis ground:</p>	<p>Is the resistance 1 MΩ or more?</p>	<p>Go to step 6.</p>	<p>Repair the ground short circuit between ECM and mass air flow sensor connector.</p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
6	CHECK POOR CONTACT. Check poor contact of mass air flow sensor connector.	Is there poor contact in mass air flow sensor connector?	Repair the poor contact of mass air flow sensor connector.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-30, Mass Air Flow and Intake Air Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

M: DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-30, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

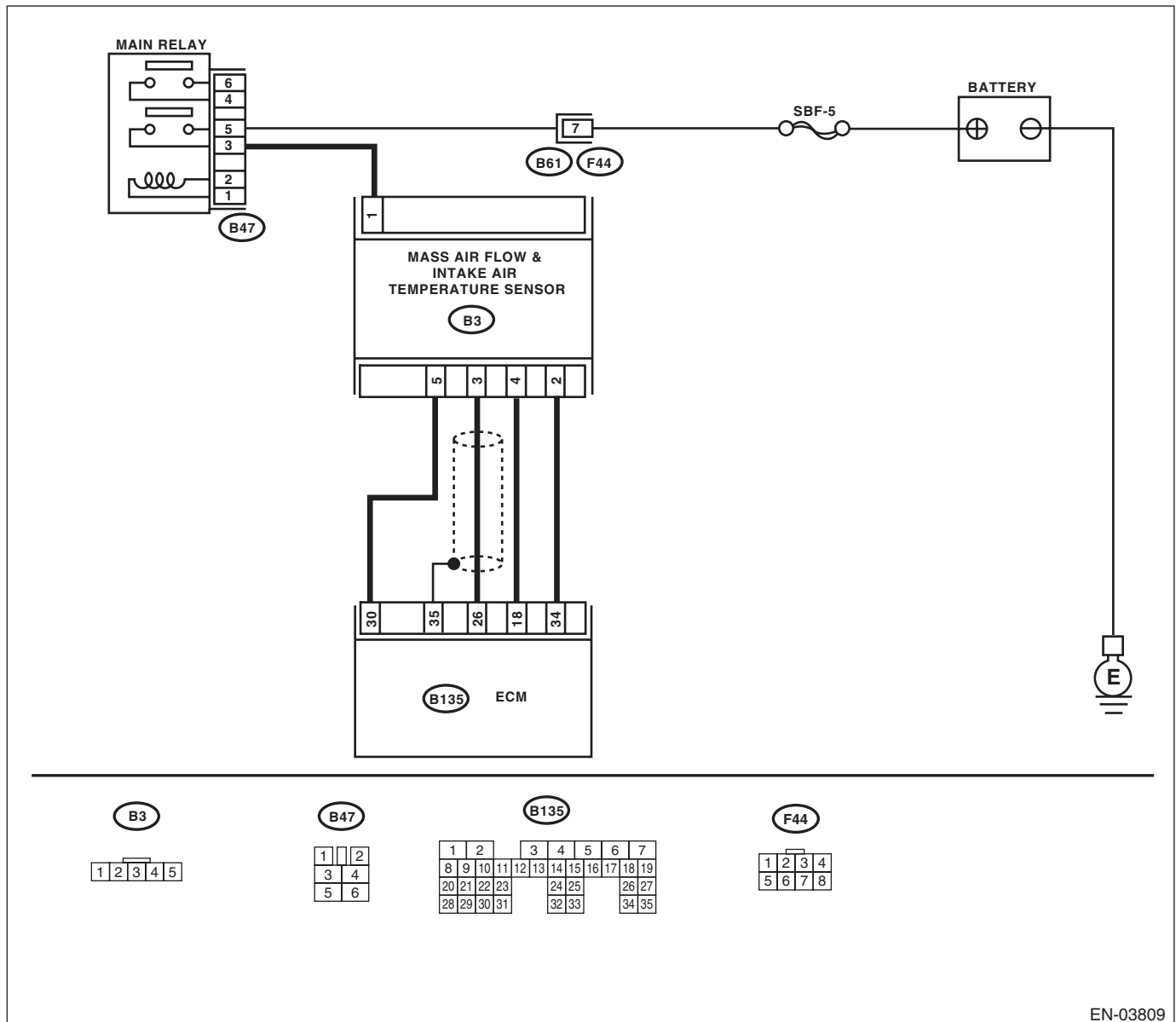
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03809

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1 CONNECT SUBARU SELECT MONITOR OR THE GENERAL SCAN TOOL, AND READ DATA.</p> <ol style="list-style-type: none"> 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor or general scan tool to data link connector. 3) Turn the ignition switch to ON, and run the Subaru Select Monitor or general scan tool. 4) Start the engine. 5) Read the mass air flow sensor voltage using Subaru Select Monitor or general scan tool. <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • General scan tool <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Is the voltage 0.2 — 4.7 V?</p>	<p>Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.</p>	<p>Go to step 2.</p>
<p>2 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.</p> <ol style="list-style-type: none"> 1) Turn the ignition switch to OFF. 2) Disconnect the connector from mass airflow sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between mass air flow sensor connector and chassis ground. <p>Connector & terminal (B3) No. 3 (+) — Chassis ground (-):</p>	<p>Is the voltage 5 V or more?</p>	<p>Repair the short circuit to power supply in the harness between the mass air flow sensor connector and ECM connector.</p>	<p>Go to step 3.</p>
<p>3 CHECK HARNESS BETWEEN ECM AND MASS AIR FLOW SENSOR CONNECTOR.</p> <ol style="list-style-type: none"> 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM connector and mass air flow sensor connector. <p>Connector & terminal (B3) No. 2 — (B135) No. 34:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Replace the mass air flow sensor. <Ref. to FU(H4DOTC)-30, Mass Air Flow and Intake Air Temperature Sensor.></p>	<p>Repair the open circuit of harness between mass air flow sensor connector and ECM connector.</p>

N: DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

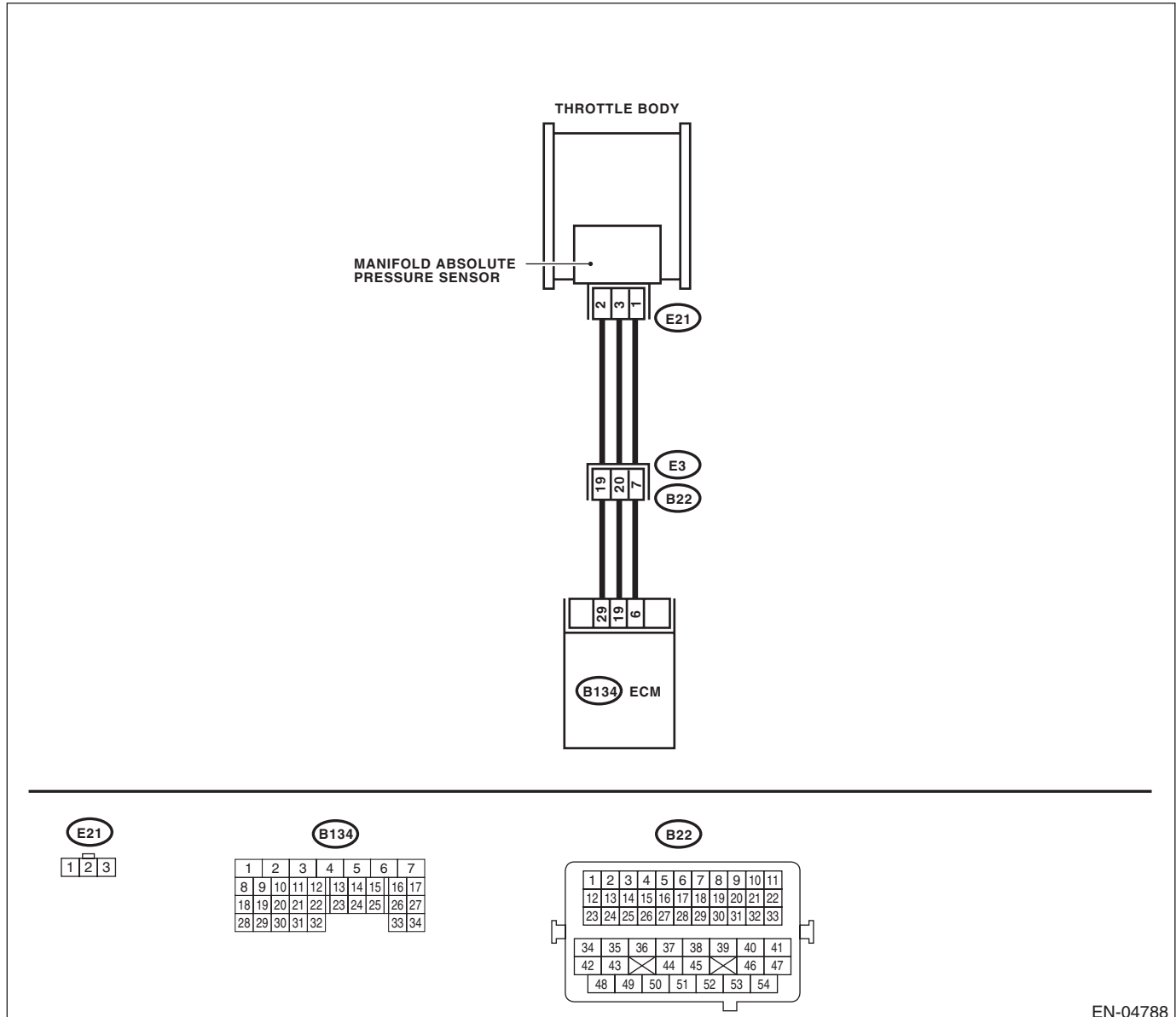
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-32, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04788

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT SIGNAL OF ECM. Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 19 (+) — Chassis ground (-):</i>	Is the voltage 4.5 V or more?	Go to step 2.	Repair the poor contact in ECM connector.
2 CHECK INPUT SIGNAL OF ECM. Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 6 (+) — Chassis ground (-):</i>	Is the voltage less than 0.7 V?	Go to step 3.	Repair the poor contact in ECM connector.
3 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from manifold absolute pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between manifold absolute pressure sensor connector and engine ground. <i>Connector & terminal</i> <i>(E21) No. 3 (+) — Engine ground (-):</i>	Is the voltage 4.5 V or more?	Go to step 4.	Repair the open circuit of harness between ECM and manifold absolute pressure sensor connector.
4 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. <i>Connector & terminal</i> <i>(B134) No. 29 — (E21) No. 2:</i>	Is the resistance less than 1 Ω ?	Go to step 5.	Repair the open circuit of harness between ECM and manifold absolute pressure sensor connector.
5 CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR. Measure the resistance of harness between manifold absolute pressure sensor connector and engine ground. <i>Connector & terminal</i> <i>(E21) No. 1 — Engine ground:</i>	Is the resistance 1 M Ω or more?	Go to step 6.	Repair ground short circuit of harness between ECM and manifold absolute pressure sensor connector.
6 CHECK POOR CONTACT. Check poor contact of manifold absolute pressure sensor connector.	Is there poor contact in manifold absolute pressure sensor connector?	Repair the poor contact of manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-31, Manifold Absolute Pressure Sensor.>

O: DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

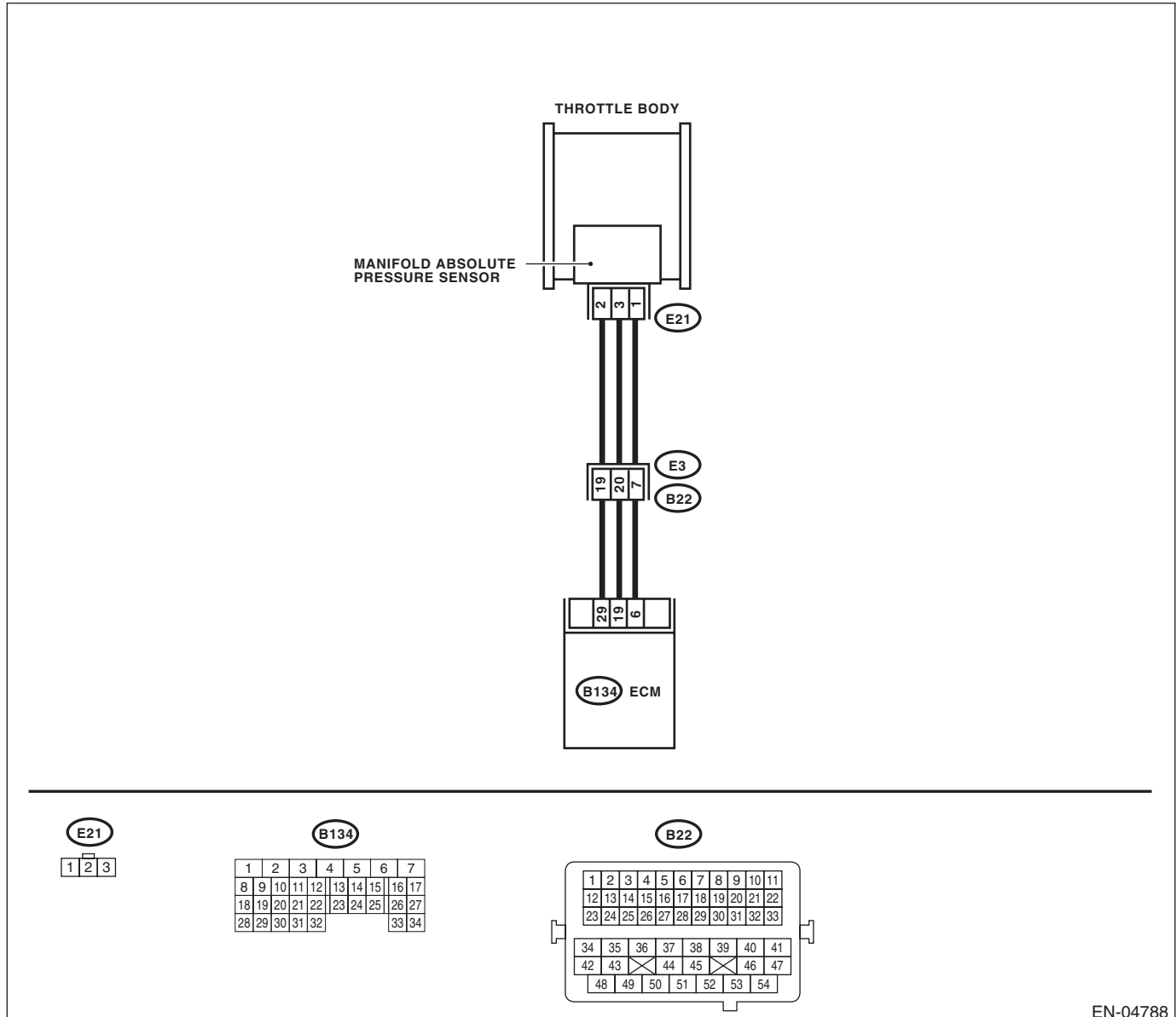
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-34, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04788

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK INPUT SIGNAL OF ECM. Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 19 (+) — Chassis ground (-):</i>	Is the voltage 4.5 V or more?	Go to step 2.	Repair the poor contact in ECM connector.
2	CHECK INPUT SIGNAL OF ECM. Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 6 (+) — Chassis ground (-):</i>	Is the voltage 4.5 V or more?	Go to step 3.	Repair the poor contact in ECM connector.
3	CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from manifold absolute pressure sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between manifold absolute pressure sensor connector and engine ground. <i>Connector & terminal</i> <i>(E21) No. 3 (+) — Engine ground (-):</i>	Is the voltage 4.5 V or more?	Go to step 4.	Repair the open circuit of harness between ECM and manifold absolute pressure sensor connector.
4	CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. <i>Connector & terminal</i> <i>(B134) No. 6 — (E21) No. 1:</i>	Is the resistance less than 1 Ω ?	Go to step 5.	Repair the open circuit of harness between ECM and manifold absolute pressure sensor connector.
5	CHECK HARNESS BETWEEN ECM AND MANIFOLD ABSOLUTE PRESSURE SENSOR CONNECTOR. Measure the resistance of harness between ECM and manifold absolute pressure sensor connector. <i>Connector & terminal</i> <i>(B134) No. 29 — (E21) No. 2:</i>	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the open circuit of harness between ECM and manifold absolute pressure sensor connector.
6	CHECK POOR CONTACT. Check poor contact of manifold absolute pressure sensor connector.	Is there poor contact in manifold absolute pressure sensor connector?	Repair the poor contact of manifold absolute pressure sensor connector.	Replace the manifold absolute pressure sensor. <Ref. to FU(H4DOTC)-31, Manifold Absolute Pressure Sensor.>

P: DTC P0111 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/ PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-36, DTC P0111 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

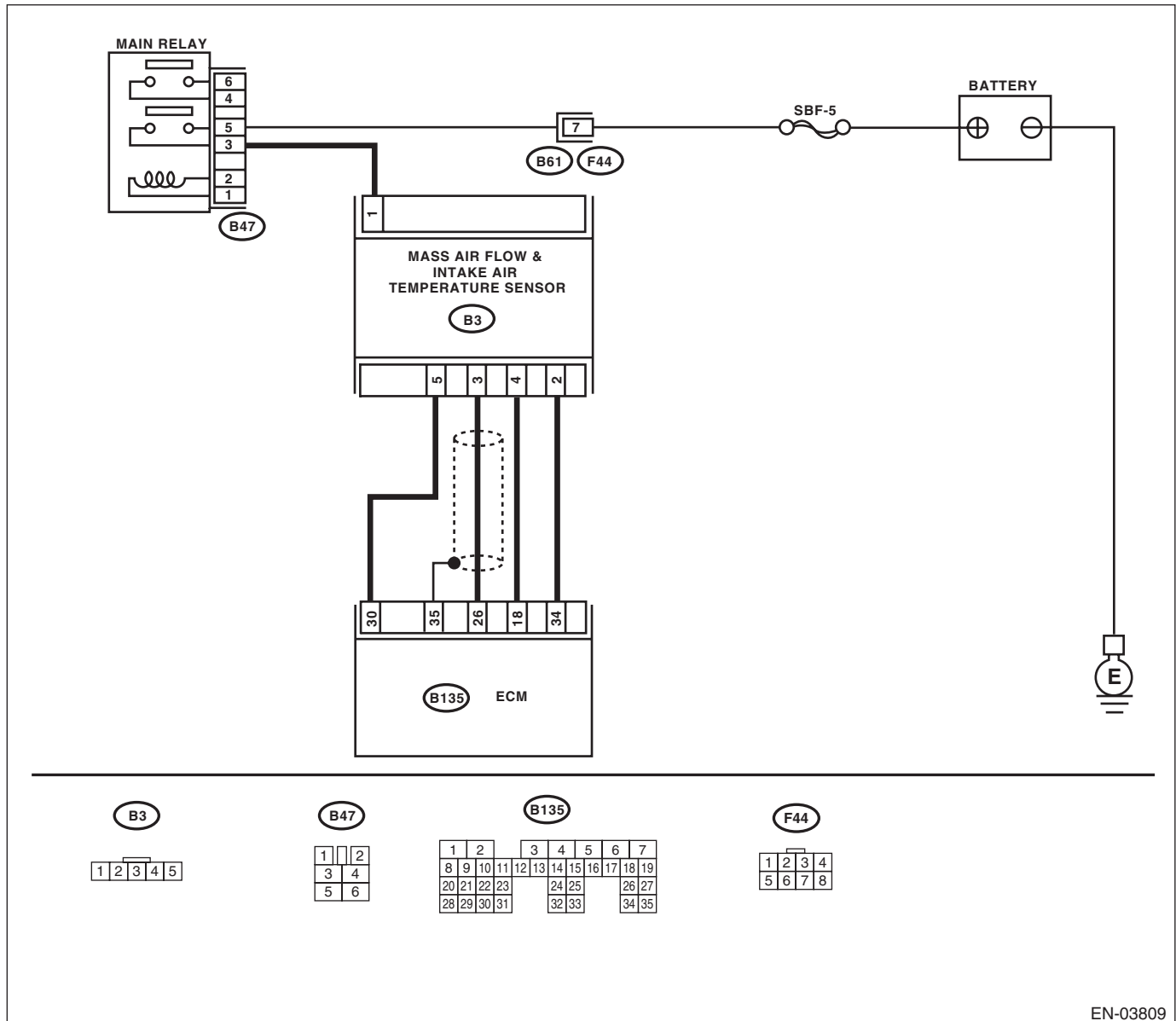
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03809

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0111.	Go to step 2.
2 CHECK ENGINE COOLANT TEMPERATURE. 1) Start the engine and warm-up completely. 2) Measure the engine coolant temperature using the Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is the engine coolant temperature 75 — 95°C (167 — 203°F)?	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-30, Mass Air Flow and Intake Air Temperature Sensor.>	Check DTC P0125 using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Q: DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-38, DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

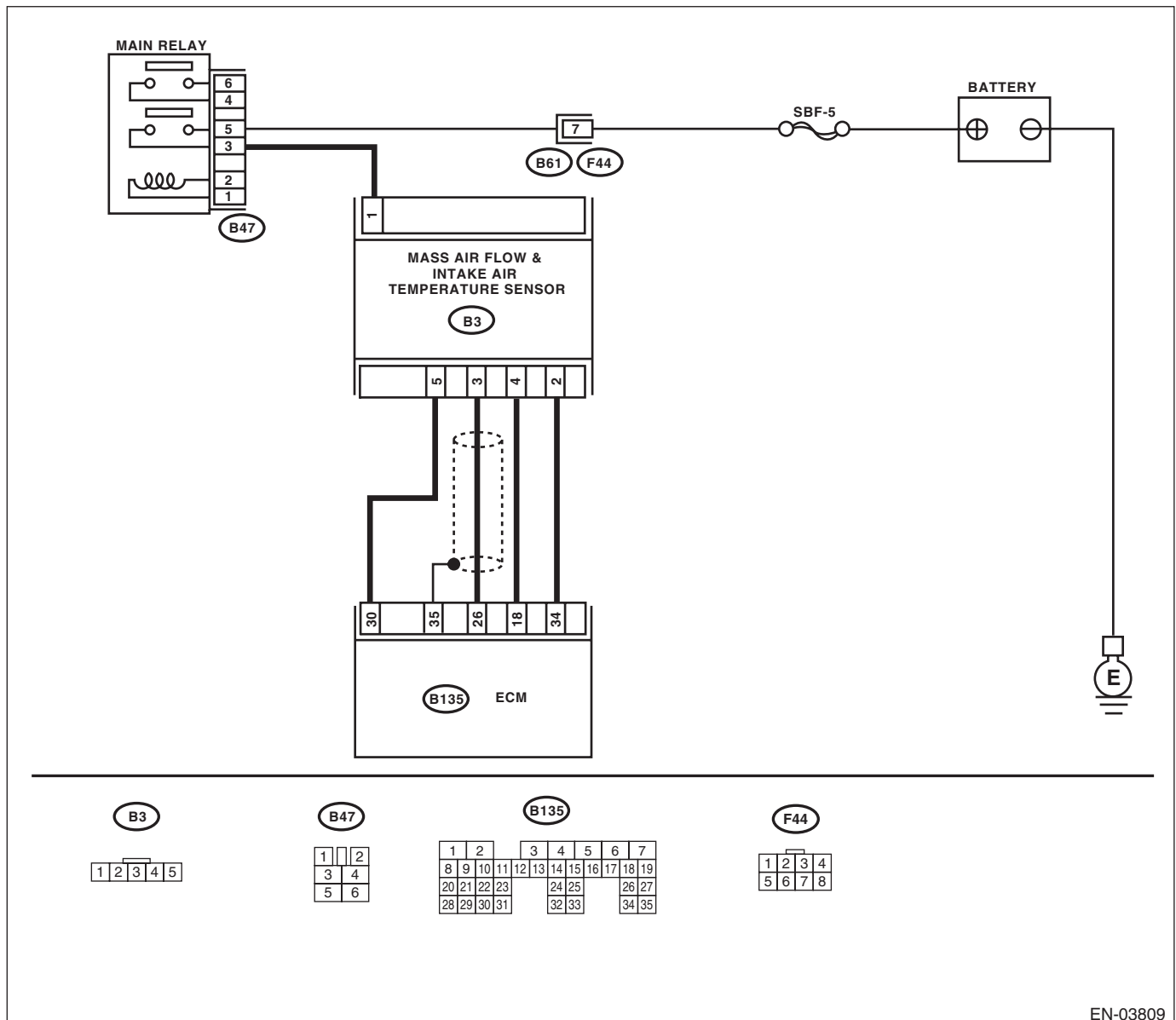
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>

WIRING DIAGRAM:



EN-03809

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK CURRENT DATA.</p> <p>1) Start the engine.</p> <p>2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • General scan tool <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Is the temperature 55°C (131°F) or more?</p>	<p>Go to step 2.</p>	<p>Repair the poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following item:</p> <ul style="list-style-type: none"> • Poor contact of mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector
<p>2</p> <p>CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND THE ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from the mass air flow and intake air temperature sensor.</p> <p>3) Turn the ignition switch to ON.</p> <p>4) Read the data of intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • General scan tool <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Is the temperature less than –36°C (–33°F)?</p>	<p>Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-30, Mass Air Flow and Intake Air Temperature Sensor.></p>	<p>Repair the ground short circuit of the harness between the mass air flow and intake air temperature sensor and ECM connector.</p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

R: DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-40, DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

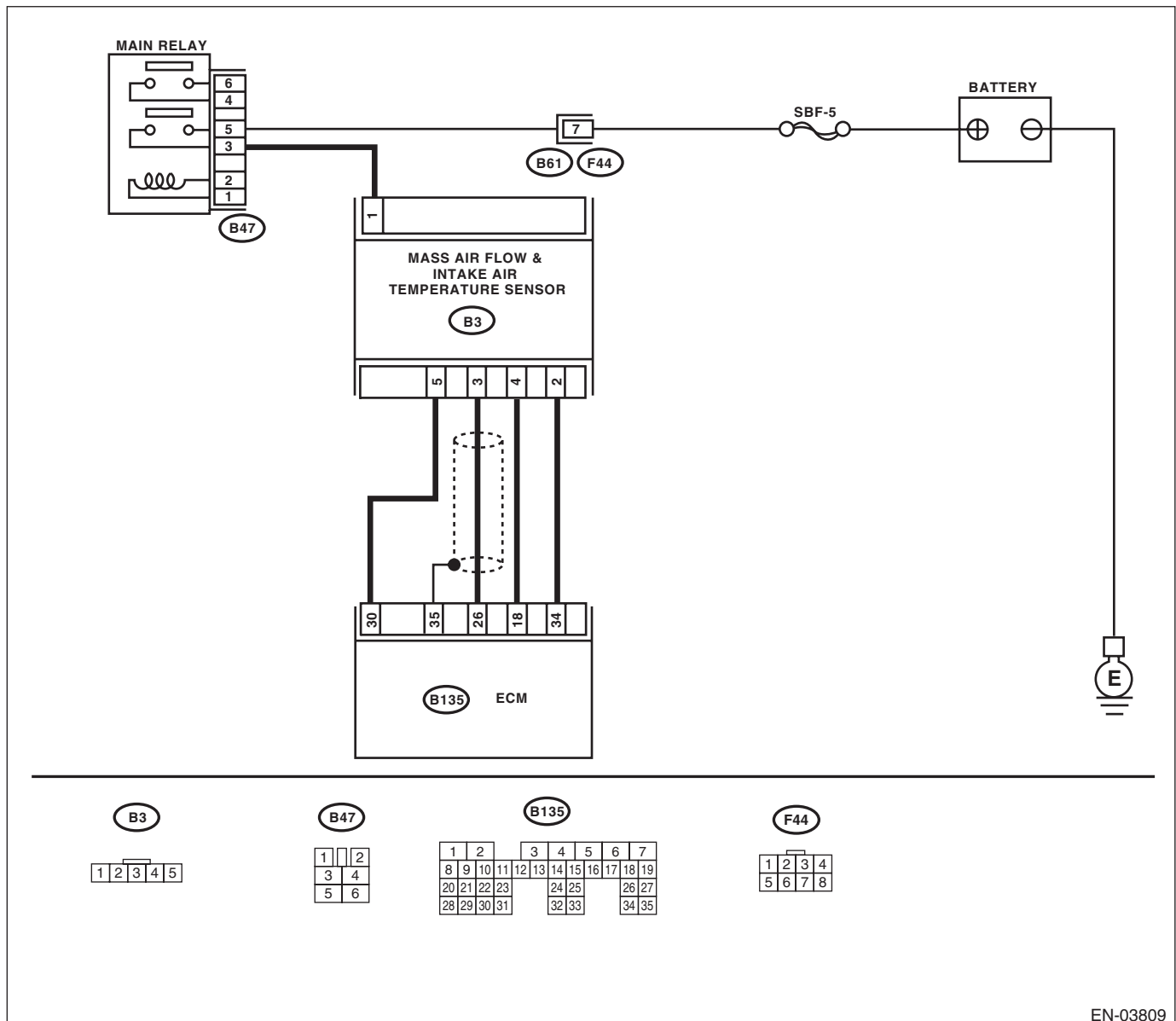
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>

WIRING DIAGRAM:



EN-03809

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK CURRENT DATA.</p> <p>1) Start the engine.</p> <p>2) Read the data of intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> Subaru Select Monitor <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.></p> <ul style="list-style-type: none"> General scan tool <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	Is the temperature less than – 36°C (–33°F)?	Go to step 2.	<p>Repair the poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following item:</p> <ul style="list-style-type: none"> Poor contact of mass air flow and intake air temperature sensor Poor contact in ECM Poor contact in joint connector
2	<p>CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND THE ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from the mass air flow and intake air temperature sensor.</p> <p>3) Measure the voltage between the mass air flow and intake air temperature sensor connectors and engine ground.</p> <p>Connector & terminal (B3) No. 4 (+) — Engine ground (-):</p>	Is the voltage 10 V or more?	Repair the short circuit to power supply in the harness between the mass air flow and intake air temperature sensor and ECM connector.	Go to step 3.
3	<p>CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND THE ECM CONNECTOR.</p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between connectors of mass air flow and intake air temperature sensor and engine ground.</p> <p>Connector & terminal (B3) No. 4 (+) — Engine ground (-):</p>	Is the voltage 10 V or more?	Repair the short circuit to power supply in the harness between the mass air flow and intake air temperature sensor and ECM connector.	Go to step 4.
4	<p>CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND THE ECM CONNECTOR.</p> <p>Measure the voltage between the mass air flow and intake air temperature sensor, manifold absolute pressure sensor connector, and engine ground.</p> <p>Connector & terminal (B3) No. 4 (+) — Engine ground (-):</p>	Is the voltage 4 V or more?	Go to step 5.	<p>Repair the harness and connector.</p> <p>NOTE:</p> <p>In this case, repair the following item:</p> <ul style="list-style-type: none"> Open circuit between mass air flow and intake air temperature sensor and ECM connector. Poor contact of mass air flow and intake air temperature sensor Poor contact in ECM Poor contact in joint connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>5</p> <p>CHECK HARNESS BETWEEN MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR AND THE ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Measure the resistance of harness between mass air flow and intake air temperature sensor and engine ground.</p> <p>Connector & terminal (B3) No. 5 — Engine ground:</p>	<p>Is the resistance less than 5 Ω?</p>	<p>Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-30, Mass Air Flow and Intake Air Temperature Sensor.></p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit between mass air flow and intake air temperature sensor and ECM connector. • Poor contact of mass air flow and intake air temperature sensor • Poor contact in ECM • Poor contact in joint connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

S: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-42, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

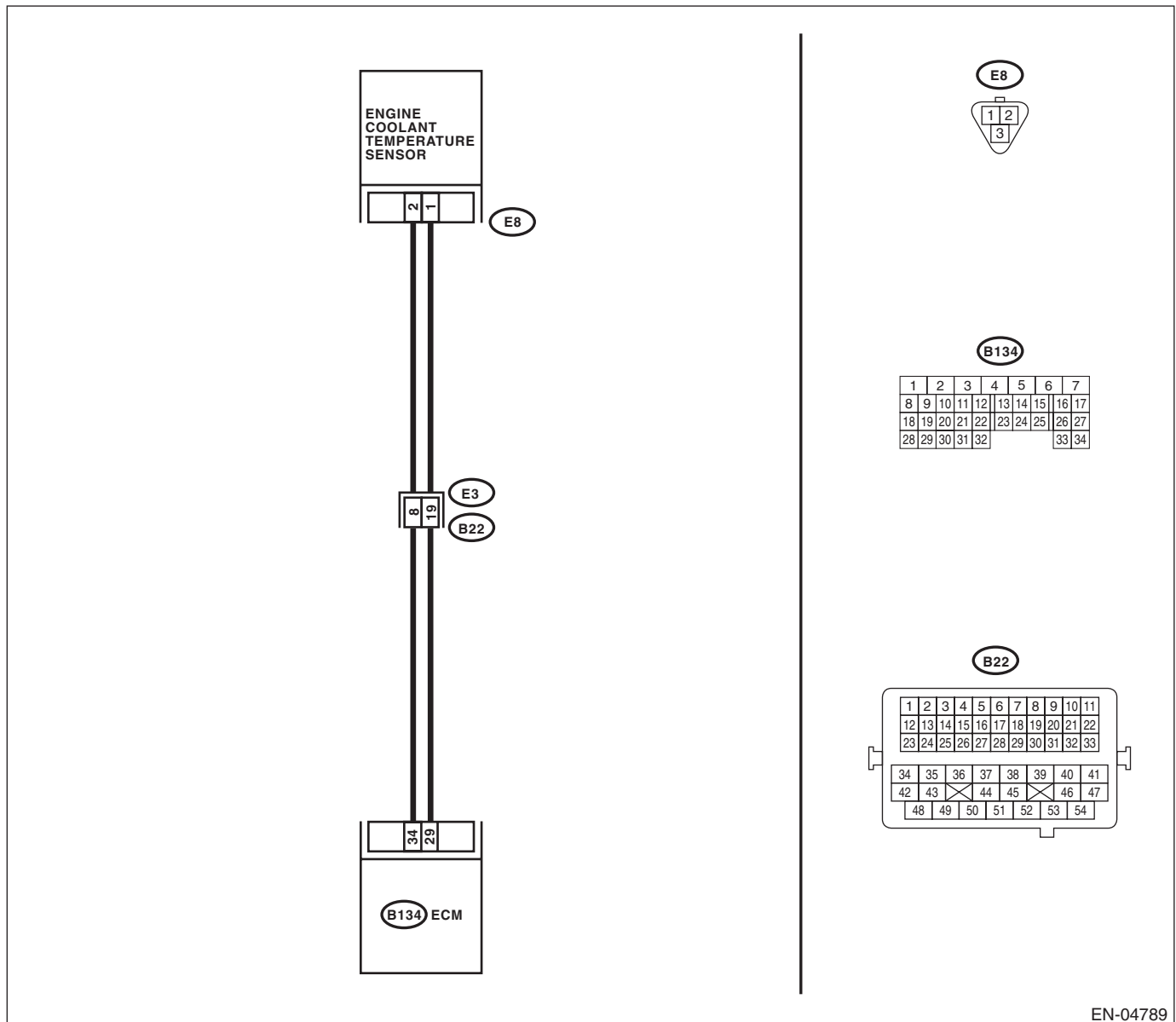
TROUBLE SYMPTOM:

- Hard to start
- Improper idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04789

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK CURRENT DATA.</p> <p>1) Start the engine.</p> <p>2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> Subaru Select Monitor <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.></p> <ul style="list-style-type: none"> General scan tool <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Is the temperature 120°C (248°F) or more?</p>	<p>Go to step 2.</p>	<p>Repair the poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following item:</p> <ul style="list-style-type: none"> Poor contact in engine coolant temperature sensor Poor contact in ECM Poor contact in coupling connector Poor contact in joint connector
2	<p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connectors from the engine coolant temperature sensor.</p> <p>3) Turn the ignition switch to ON.</p> <p>4) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> Subaru Select Monitor <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.></p> <ul style="list-style-type: none"> General scan tool <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Is the temperature -40°C (-40°F) or more?</p>	<p>Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-26, Engine Coolant Temperature Sensor.></p>	<p>Repair the ground short circuit of harness between engine coolant temperature sensor and ECM connector.</p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

T: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-44, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

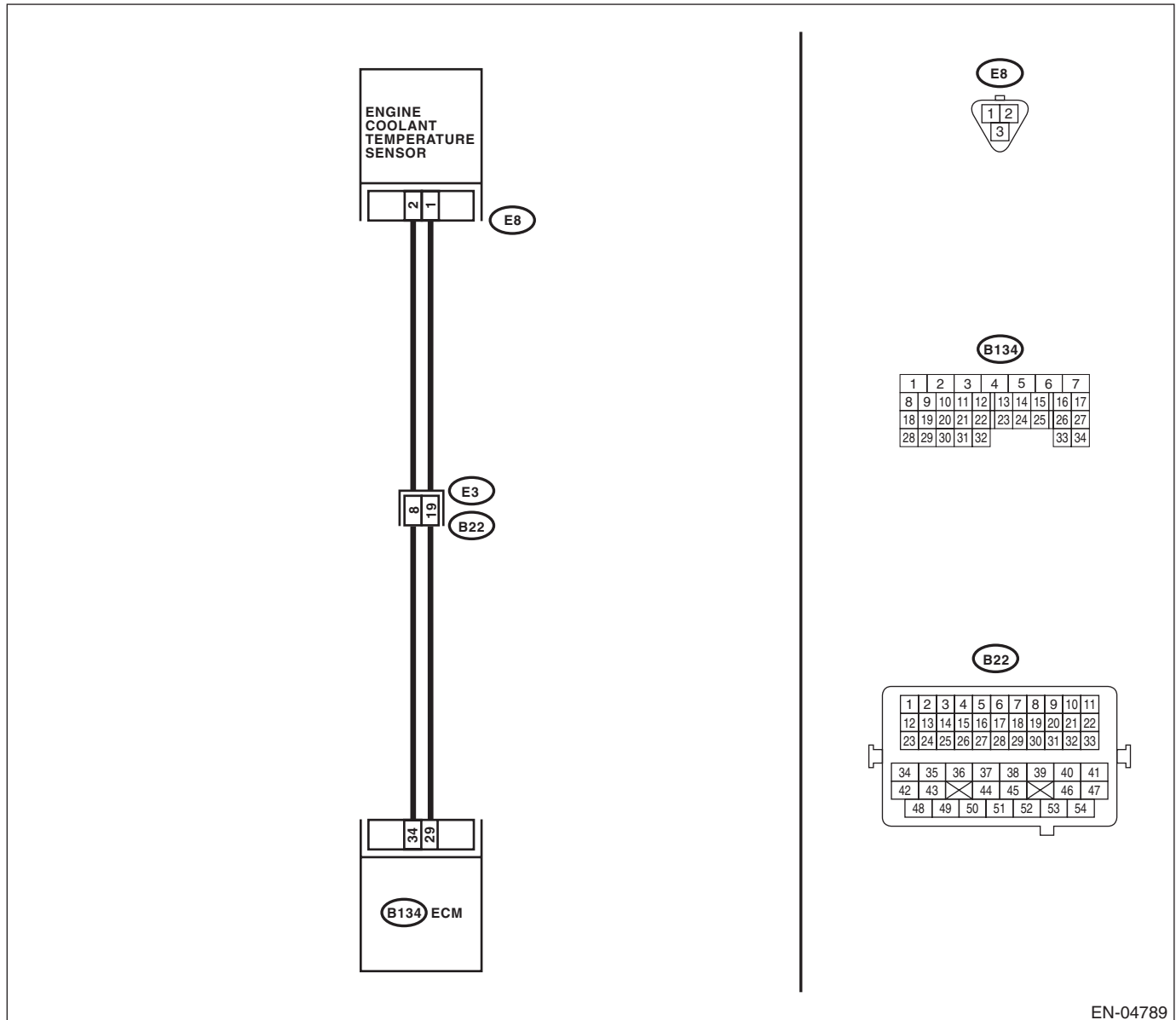
TROUBLE SYMPTOM:

- Hard to start
- Improper idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04789

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK CURRENT DATA.</p> <p>1) Start the engine.</p> <p>2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> Subaru Select Monitor <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.></p> <ul style="list-style-type: none"> General scan tool <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	Is the temperature less than –40°C (–40°F)?	Go to step 2.	<p>Repair the poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following item:</p> <ul style="list-style-type: none"> Poor contact in engine coolant temperature sensor Poor contact in ECM Poor contact in coupling connector Poor contact in joint connector
2	<p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connectors from the engine coolant temperature sensor.</p> <p>3) Measure the voltage between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal (E8) No. 2 (+) — Engine ground (–):</p>	Is the voltage 10 V or more?	Repair the short circuit to power supply in the harness between ECM and engine coolant temperature sensor connector.	Go to step 3.
3	<p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal (E8) No. 2 (+) — Engine ground (–):</p>	Is the voltage 10 V or more?	Repair the short circuit to power supply in the harness between ECM and engine coolant temperature sensor connector.	Go to step 4.
4	<p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>Measure the voltage between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal (E8) No. 2 (+) — Engine ground (–):</p>	Is the voltage 4 V or more?	Go to step 5.	<p>Repair the harness and connector.</p> <p>NOTE:</p> <p>In this case, repair the following item:</p> <ul style="list-style-type: none"> Open circuit in harness between ECM and engine coolant temperature sensor connector Poor contact in engine coolant temperature sensor connector Poor contact in ECM connector Poor contact in coupling connector Poor contact in joint connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>5</p> <p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Measure the resistance of harness between engine coolant temperature sensor connector and engine ground.</p> <p>Connector & terminal (E8) No. 1 — Engine ground:</p>	<p>Is the resistance less than 5 Ω?</p>	<p>Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-26, Engine Coolant Temperature Sensor.></p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and engine coolant temperature sensor connector • Poor contact in engine coolant temperature sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

U: DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-46, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

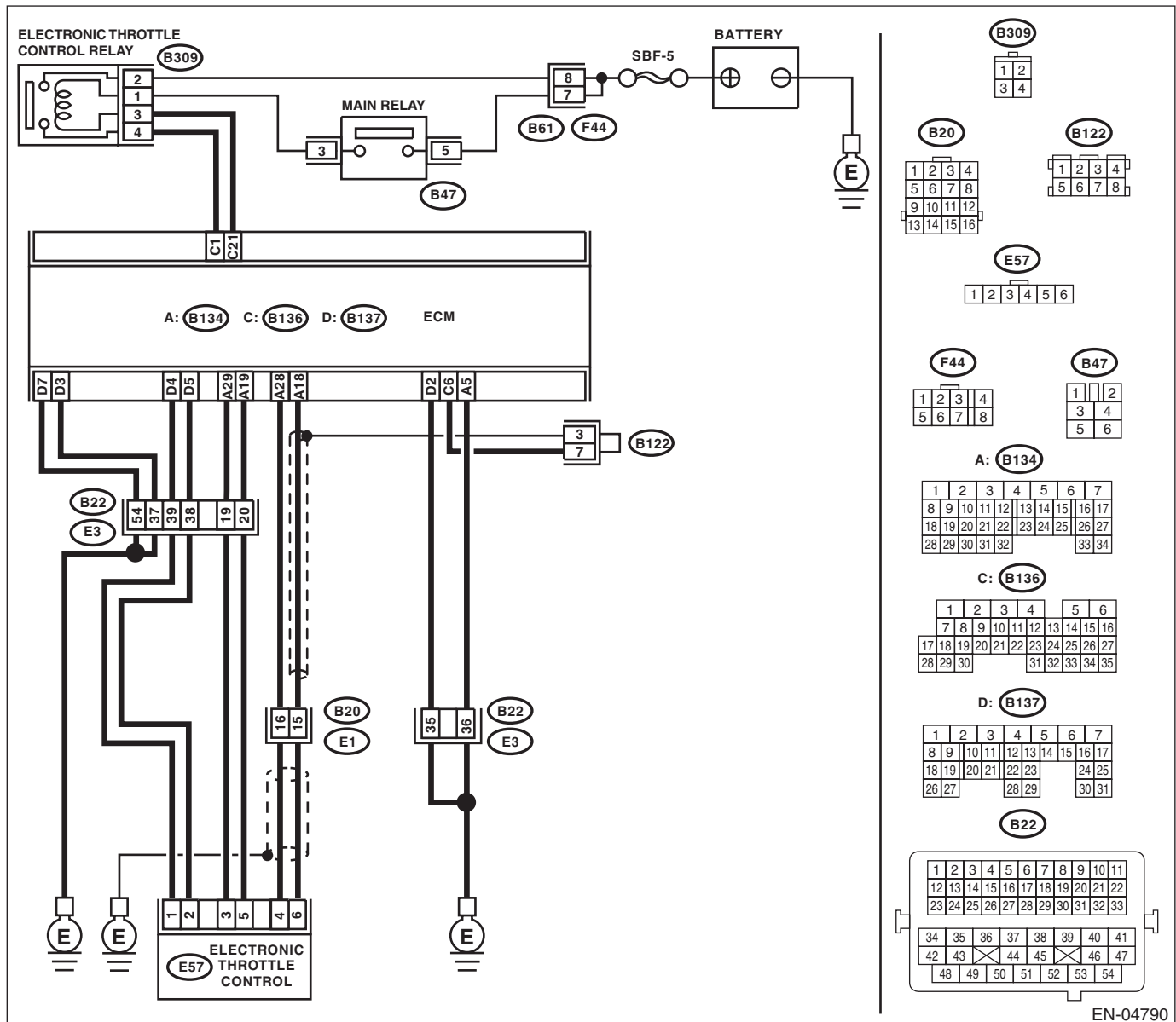
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SENSOR OUTPUT. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and terminal. <i>Connector & terminal</i> <i>(B134) No. 28 (+) — (B134) No. 29 (-):</i> 3) Check the voltage change while shaking the ECM harness and connector, engine harness connector, and electronic throttle control connector harness.	Is the voltage 0.4 V or more?	Go to step 2.	Go to step 3.
2 CHECK POOR CONTACT. Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact in connector between ECM and electronic throttle control?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. <i>Connector & terminal</i> <i>(B134) No. 19 — (E57) No. 5:</i>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit of harness connector.
4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. Measure the resistance between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 18 — Chassis ground:</i> <i>(B134) No. 19 — Chassis ground:</i>	Is the resistance 1 $M\Omega$ or more?	Go to step 5.	Repair the chassis short circuit of harness.
5 CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. <i>Connector & terminal</i> <i>(E57) No. 5 (+) — Engine ground (-):</i> 4) Check the voltage change by shaking the harness and connector of ECM, and engine harness connector, while monitoring the value with voltage meter.	Is the voltage 4.5 — 5.5 V?	Go to step 6.	Repair poor contact in ECM connector.
6 CHECK SHORT CIRCUIT INSIDE THE ECM. 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. <i>Connector & terminal</i> <i>(E57) No. 6 — Engine ground:</i>	Is the resistance 10 Ω or more?	Repair the poor contact of electronic throttle control connector. Replace the accelerator pedal position sensor if defective.	Repair poor contact in ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

V: DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-48, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

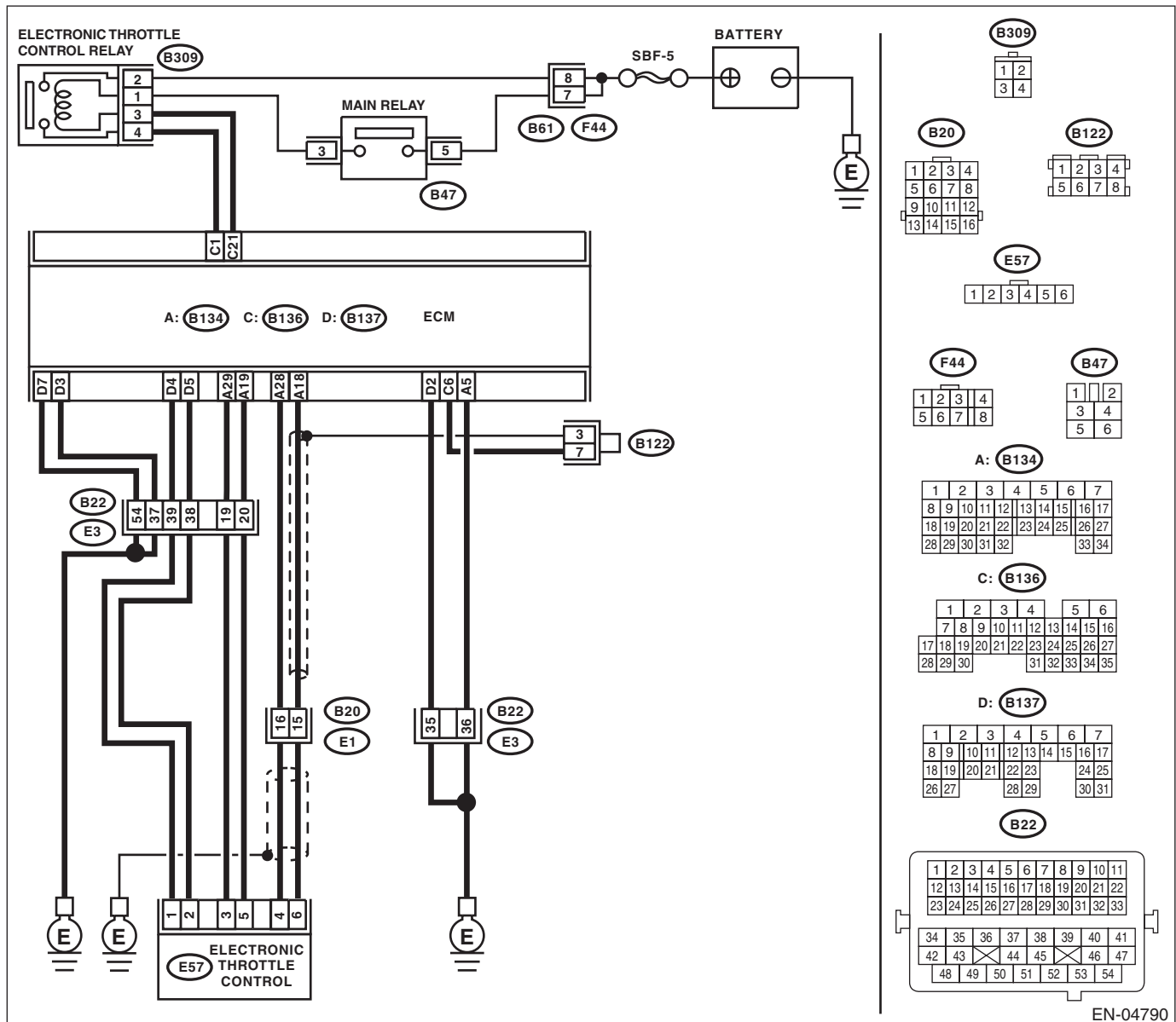
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK SENSOR OUTPUT. 1) Turn the ignition switch to ON. 2) Read the data of main throttle sensor signal using Subaru Select Monitor. 3) Check the voltage change while shaking the ECM harness and connector, engine harness connector, and electronic throttle control connector harness.	Is the voltage less than 4.63 V?	Go to step 2.	Go to step 3.
2	CHECK POOR CONTACT. Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact in connector between ECM and electronic throttle control?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. Connector & terminal (B134) No. 18 — (E57) No. 6: (B134) No. 29 — (E57) No. 3:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit of harness connector.
4	CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM connector. 2) Measure the voltage between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 3 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 5.	Repair poor contact in ECM connector.
5	CHECK SENSOR OUTPUT POWER SUPPLY. Measure the voltage between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 6 (+) — Engine ground (-):	Is the voltage less than 10 V?	Replace the electronic throttle control. <Ref. to FU(H4DOTC)-13, Throttle Body.>	Repair the short circuit to power supply in the harness between the ECM connector and electronic throttle control connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

W: DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-50, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Trouble Code (DTC) Detecting Criteria.>

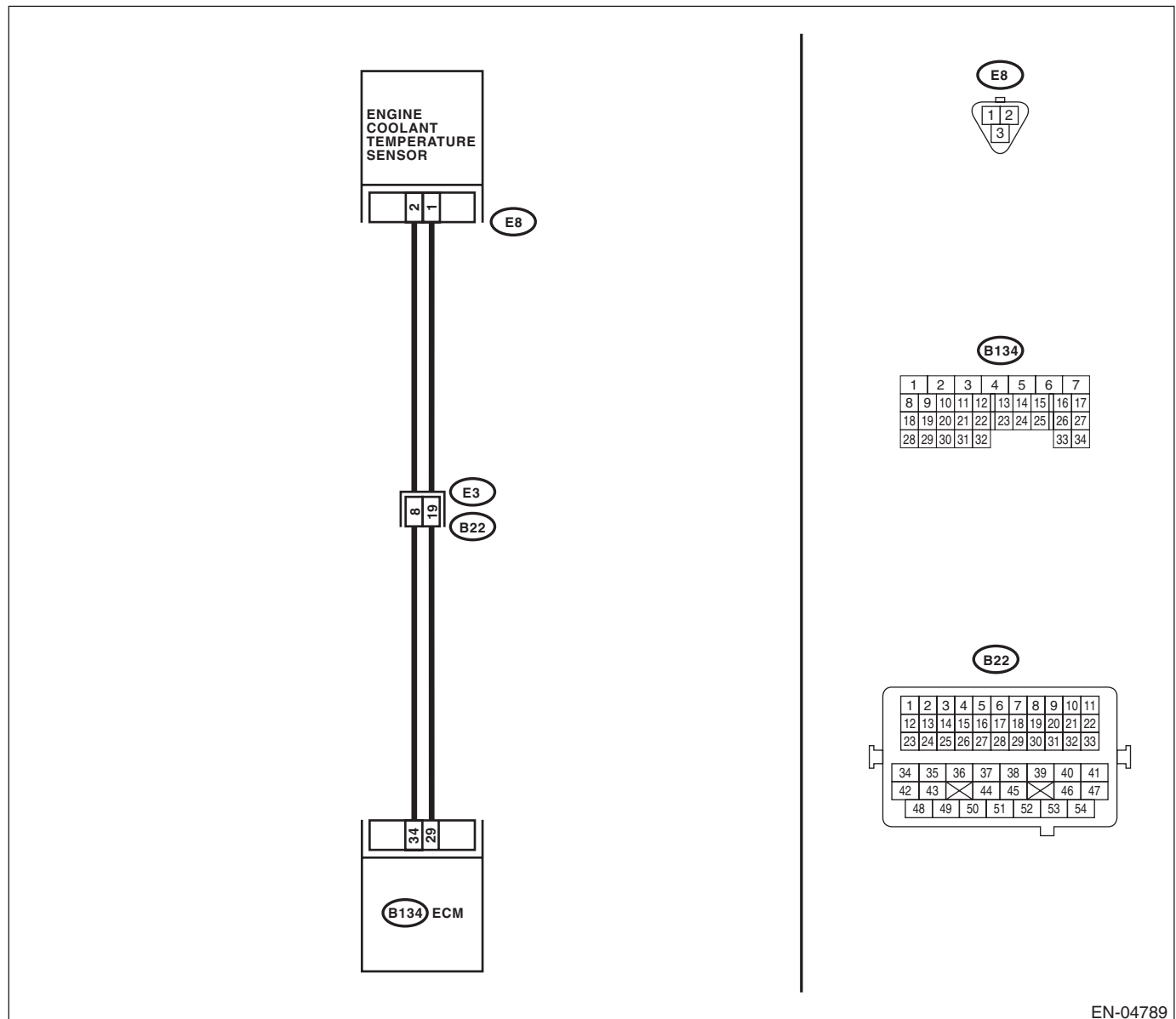
TROUBLE SYMPTOM:

Engine does not return to idle.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04789

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0125.	Go to step 2.
2	CHECK ENGINE COOLING SYSTEM. NOTE: Check the following items. <ul style="list-style-type: none">• Thermostat open stuck• Coolant level• Engine coolant freeze• Tire diameter	Is there any fault in engine cooling system?	Replace the thermostat. <Ref. to CO(H4SO)-25, Thermostat.>	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-26, Engine Coolant Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

X: DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-52, DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

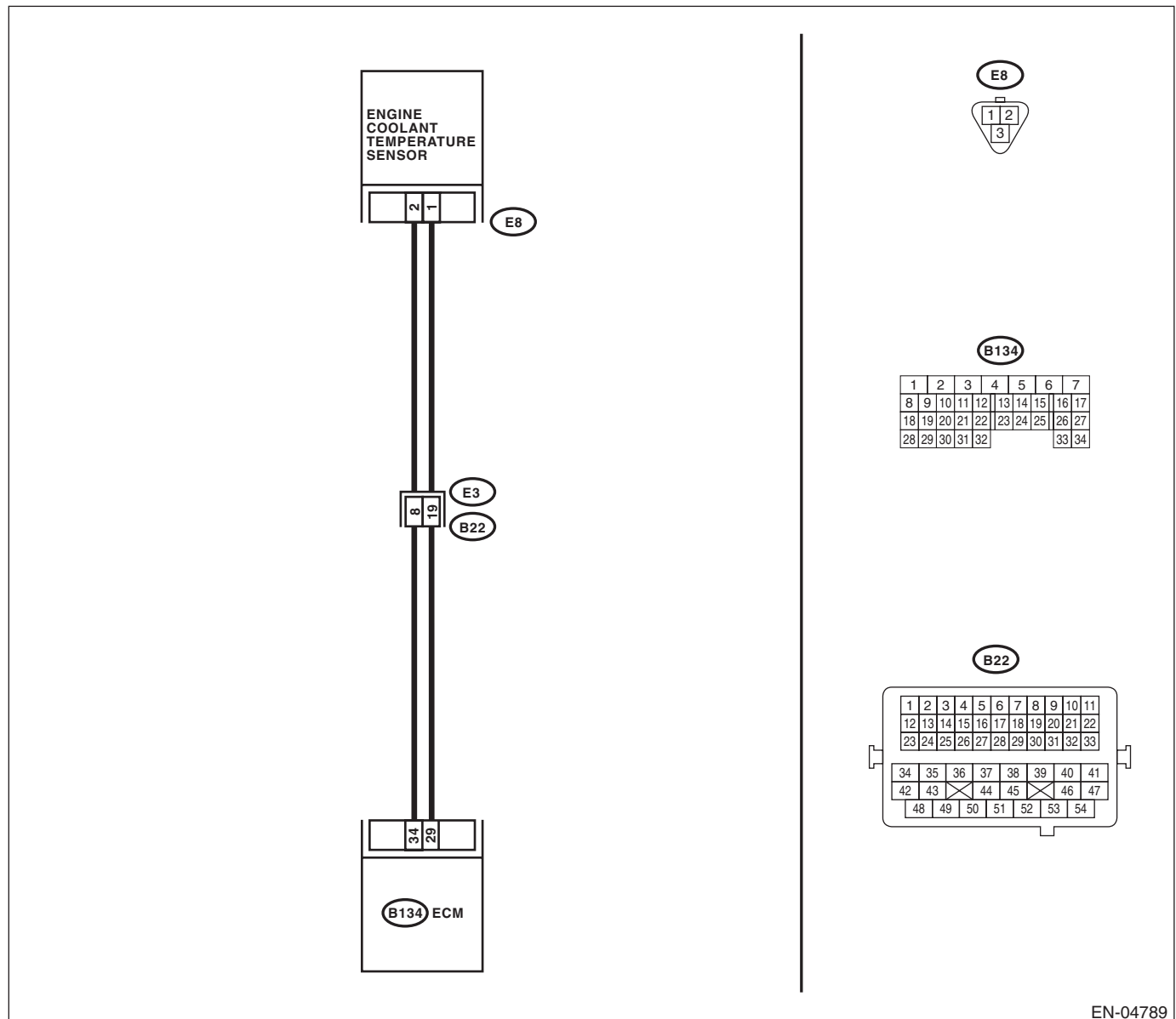
TROUBLE SYMPTOM:

Engine does not return to idle.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04789

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK ENGINE COOLANT TEMPERATURE SENSOR. Measure the resistance between the engine coolant temperature sensor terminals when the engine coolant is cold and after warm-up. <i>Terminals</i> <i>No. 1 — No. 2:</i>	Is there a change in resistance between the cold condition and after warm up?	Repair the poor contact in ECM.	Replace the engine coolant temperature sensor. <Ref. to FU(H4SO)-22, Engine Coolant Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Y: DTC P0128 COOLANT THERMOSTAT (ENGINE COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-54, DTC P0128 COOLANT THERMOSTAT (ENGINE COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

Thermostat remains open.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	CHECK VEHICLE.	Was the vehicle driven or idled with the engine partially submerged under water?	In this case, it is not necessary to inspect DTC P0128.	Go to step 2.
2	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).>	Go to step 3.
3	CHECK ENGINE COOLANT.	Are the coolant level and mixture ratio of engine coolant to anti-freeze solution correct?	Go to step 4.	Replace the engine coolant. <Ref. to CO(H4SO)-18, REPLACEMENT, Engine Coolant.>
4	CHECK RADIATOR FAN. 1) Start the engine. 2) Check radiator fan operation.	Does the radiator fan continuously rotate for more than 3 minutes during idling?	Repair radiator fan circuit. <Ref. to CO(H4SO)-34, Radiator Main Fan and Fan Motor.> and <Ref. to CO(H4SO)-41, Radiator Sub Fan and Fan Motor.>.	Replace the thermostat. <Ref. to CO(H4SO)-25, Thermostat.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Z: DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

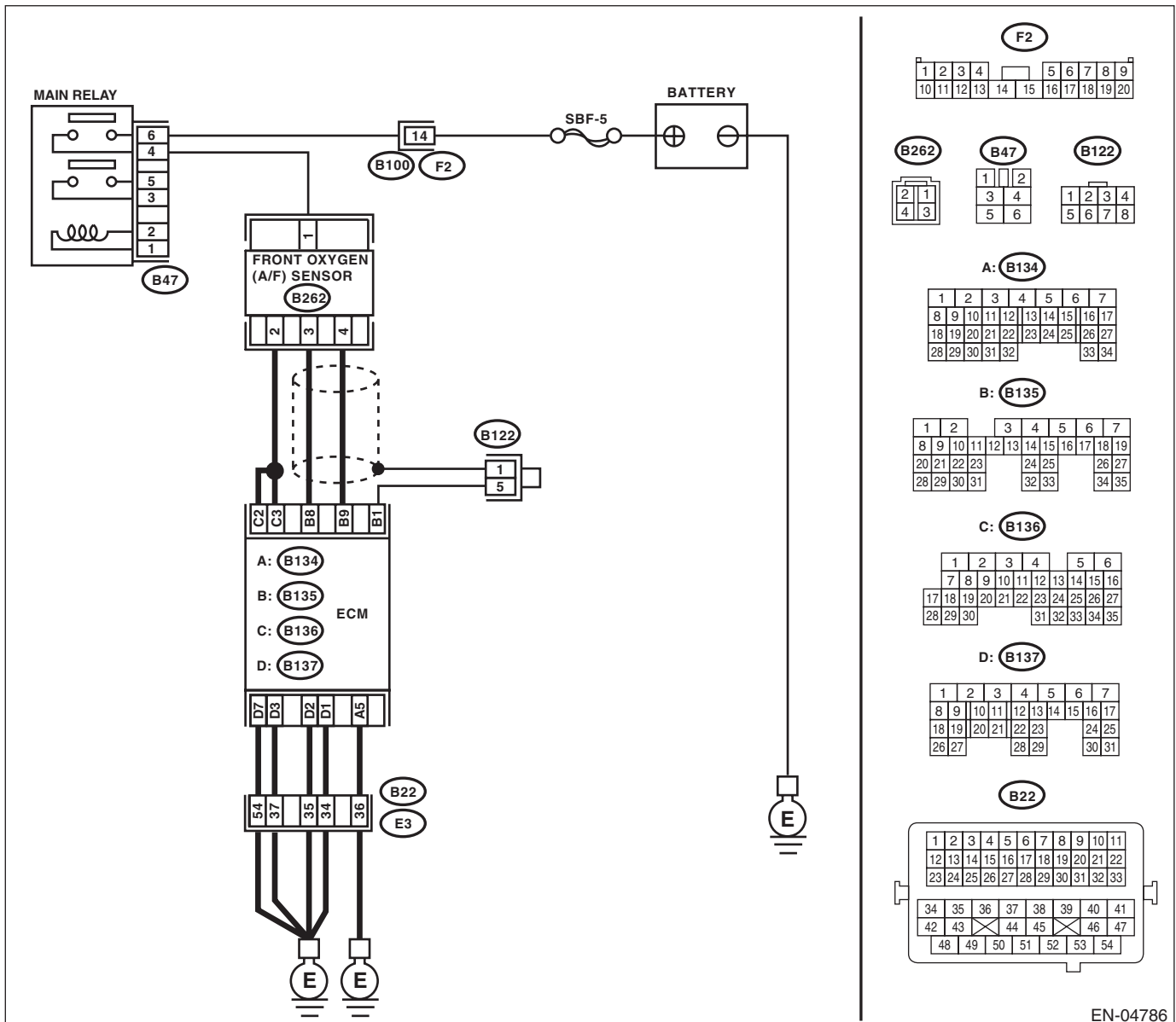
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-56, DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04786

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.	Does water enter the connector?	Dry the water thoroughly.	Go to step 2.
2	CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. Connector & terminal (B135) No. 8 — Chassis ground: (B135) No. 9 — Chassis ground:	Is the resistance 1 MΩ or more?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-36, Front Oxygen (A/F) Sensor.>	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AA:DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

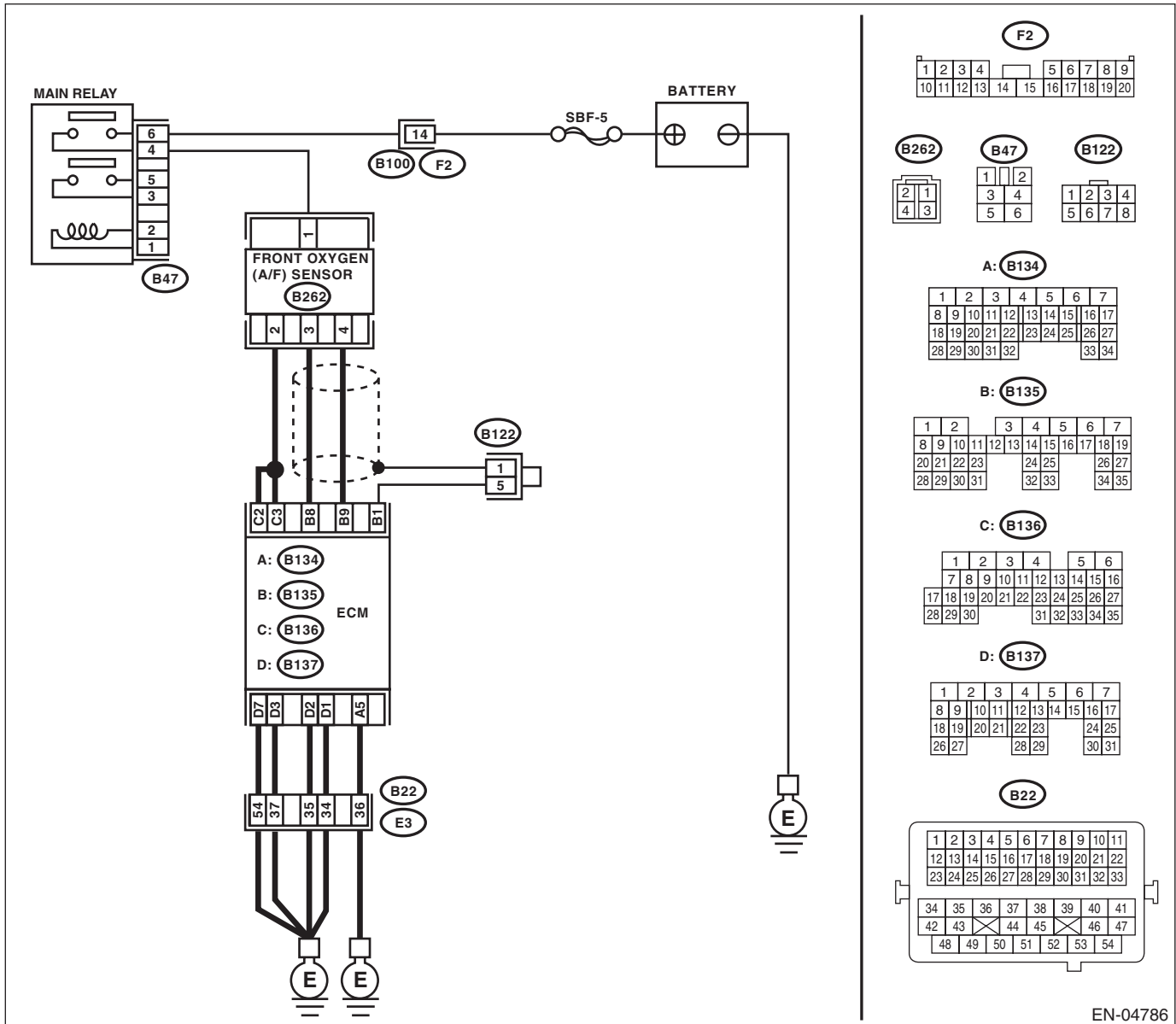
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-58, DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04786

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.	Does water enter the connector?	Dry the water thoroughly.	Go to step 2.
2	CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. 1) Turn the ignition switch to ON. 2) Disconnect the connector from front oxygen (A/F) sensor. 3) Measure the voltage of harness between ECM connector and chassis ground. Connector & terminal (B135) No. 8 (+) — Chassis ground (-): (B135) No. 9 (+) — Chassis ground (-):	Is the voltage 8 V or more?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-36, Front Oxygen (A/F) Sensor.>	Repair the short to power supply in the harness between ECM and front oxygen (A/F) sensor connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AB:DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

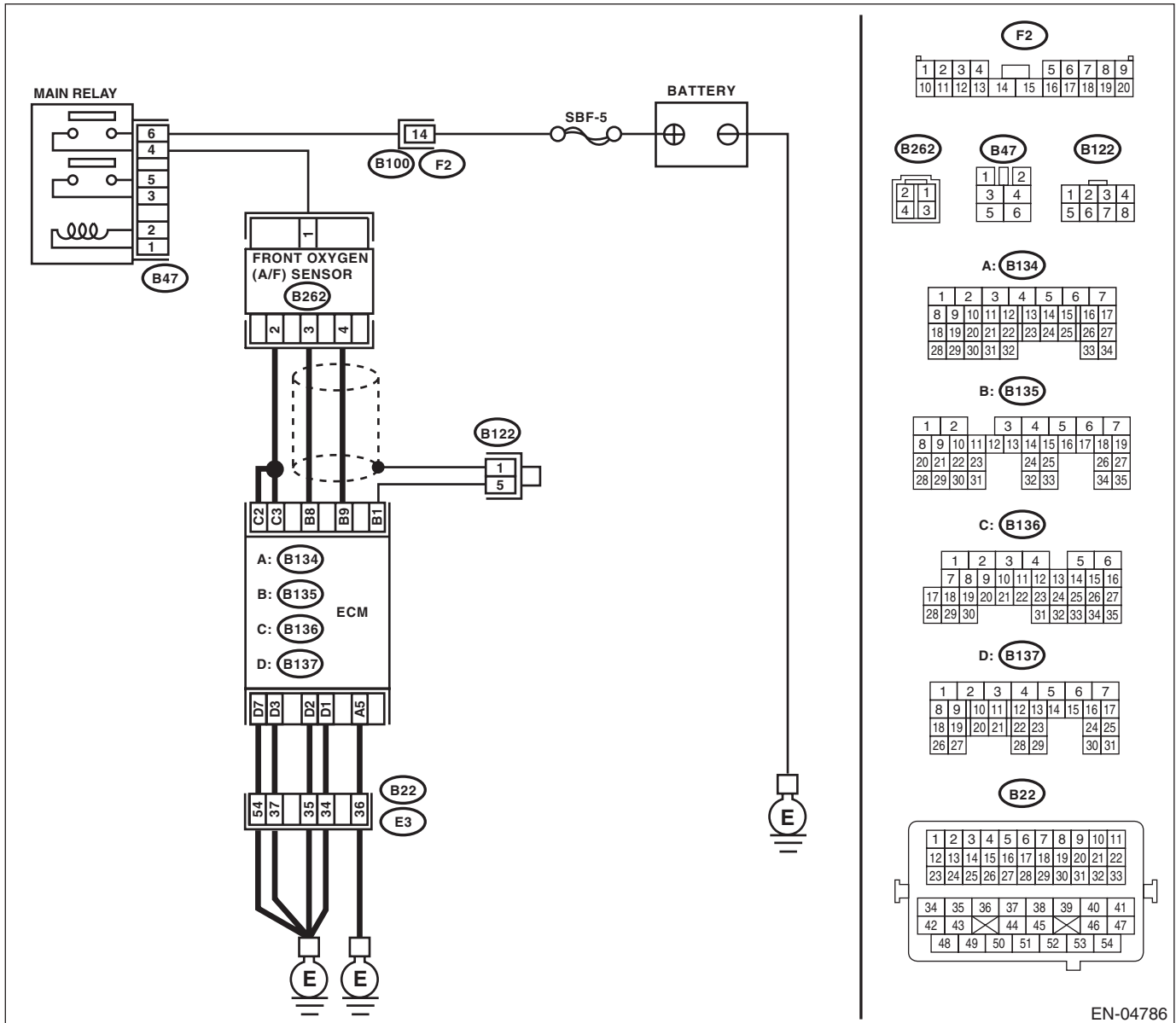
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-60, DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04786

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0133.	Go to step 2.
2	CHECK EXHAUST SYSTEM. NOTE: Check the following items. <ul style="list-style-type: none">• Loose installation of front portion of exhaust pipe onto cylinder heads• Loose connection between front exhaust pipe and front catalytic converter• Damage of exhaust pipe resulting in a hole	Is there any fault in exhaust system?	Repair the exhaust system.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-36, Front Oxygen (A/F) Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AC:DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

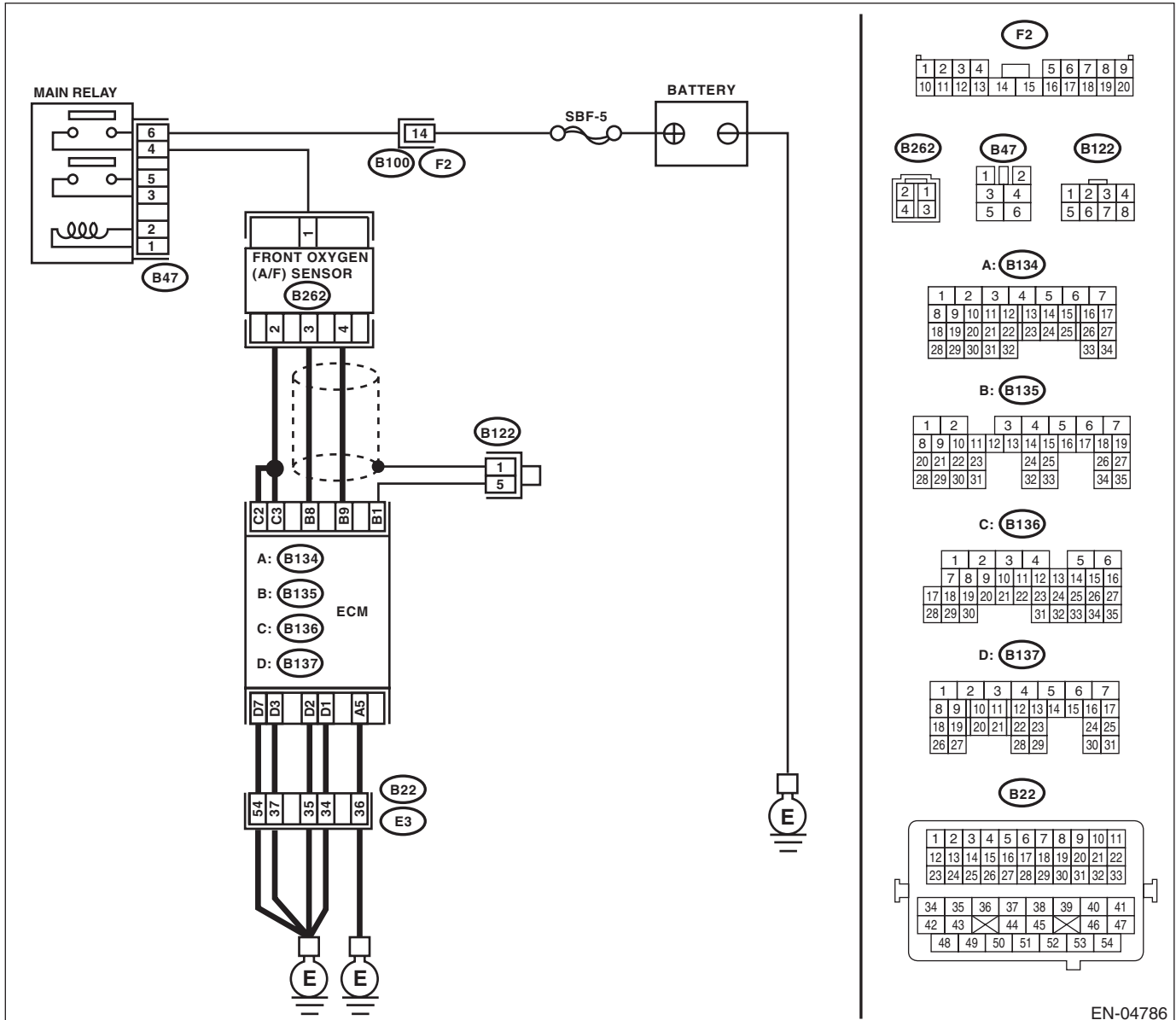
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-63, DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>

WIRING DIAGRAM:



EN-04786

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector.</p> <p>Connector & terminal (B135) No. 8 — (B262) No. 3: (B135) No. 9 — (B262) No. 4:</p>	Is the resistance less than 1 Ω ?	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-36, Front Oxygen (A/F) Sensor.>	Repair the open circuit of harness between ECM and front oxygen (A/F) sensor connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AD:DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

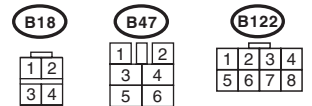
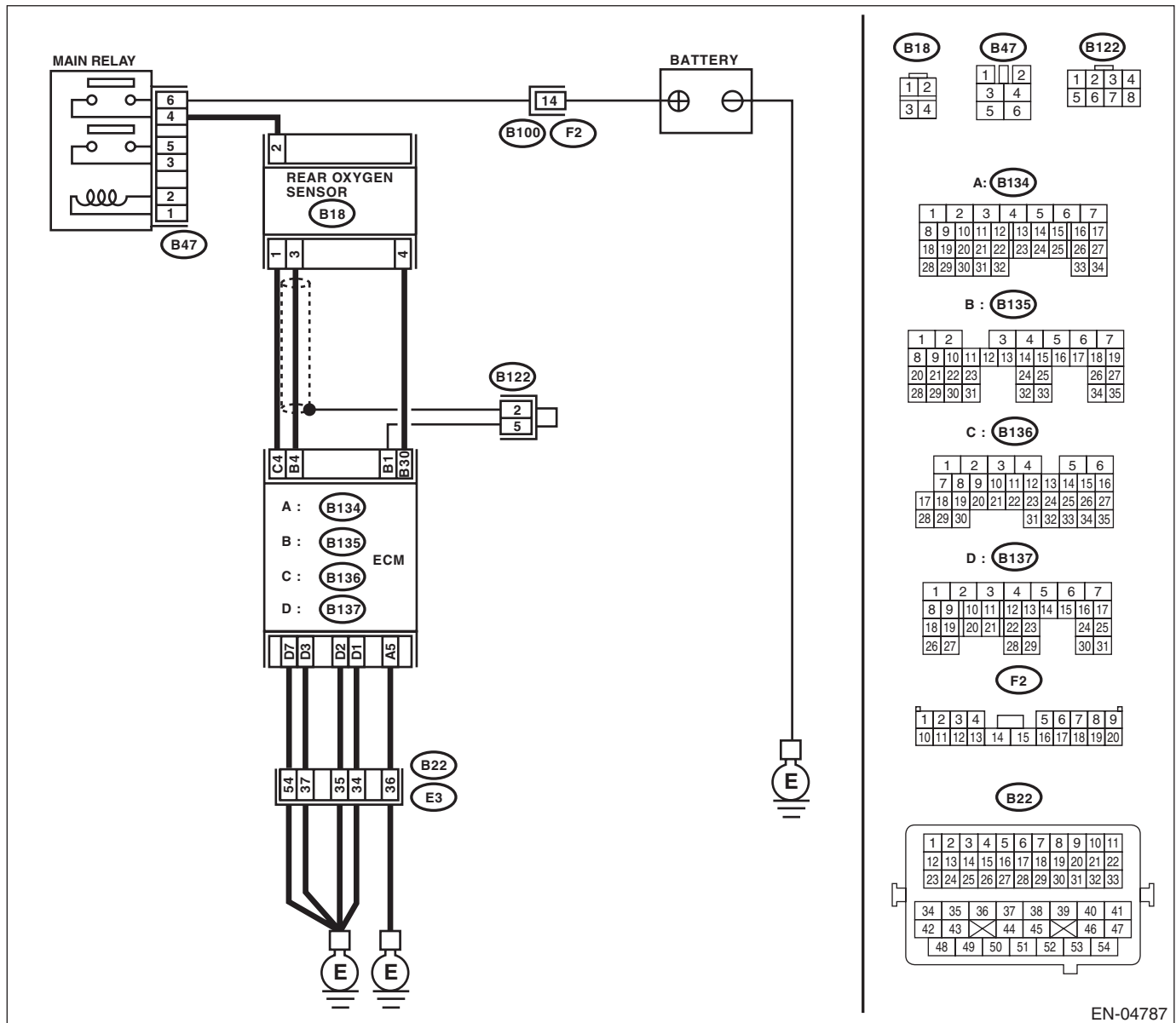
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-65, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

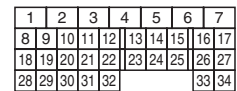
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

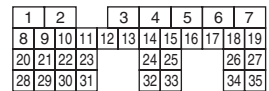
WIRING DIAGRAM:



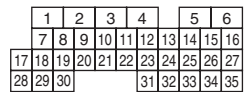
A: B134



B: B135



C: B136



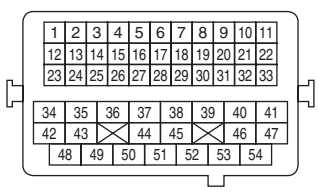
D: B137



F2



B22



EN-04787

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0137.	Go to step 2.
2	CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (Max. 2 minutes) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: <ul style="list-style-type: none"> For MT vehicles, depress the clutch pedal. Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.> <ul style="list-style-type: none"> General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is the voltage 490 mV or more?	Go to step 6.	Go to step 3.
3	CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.	Does water enter the connector?	Dry the water thoroughly.	Go to step 4.
4	CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. Connector & terminal (B135) No. 4 — (B18) No. 3: (B135) No. 30 — (B18) No. 4:	Is the resistance 3 Ω or more?	Repair the open circuit of harness between ECM and rear oxygen sensor connector.	Go to step 5.
5	CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and chassis ground. Connector & terminal (B18) No. 3 (+) — Chassis ground (-):	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-42, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> Open circuit in harness between rear oxygen sensor and ECM connector Poor contact in rear oxygen sensor connector Poor contact in ECM connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
6	CHECK EXHAUST SYSTEM. Check exhaust system parts. NOTE: Check the following items. <ul style="list-style-type: none">• Looseness and improper attachment of exhaust system parts• Damage (crack, hole etc.) of parts• Looseness and improper attachment of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-42, Rear Oxygen Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AE:DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

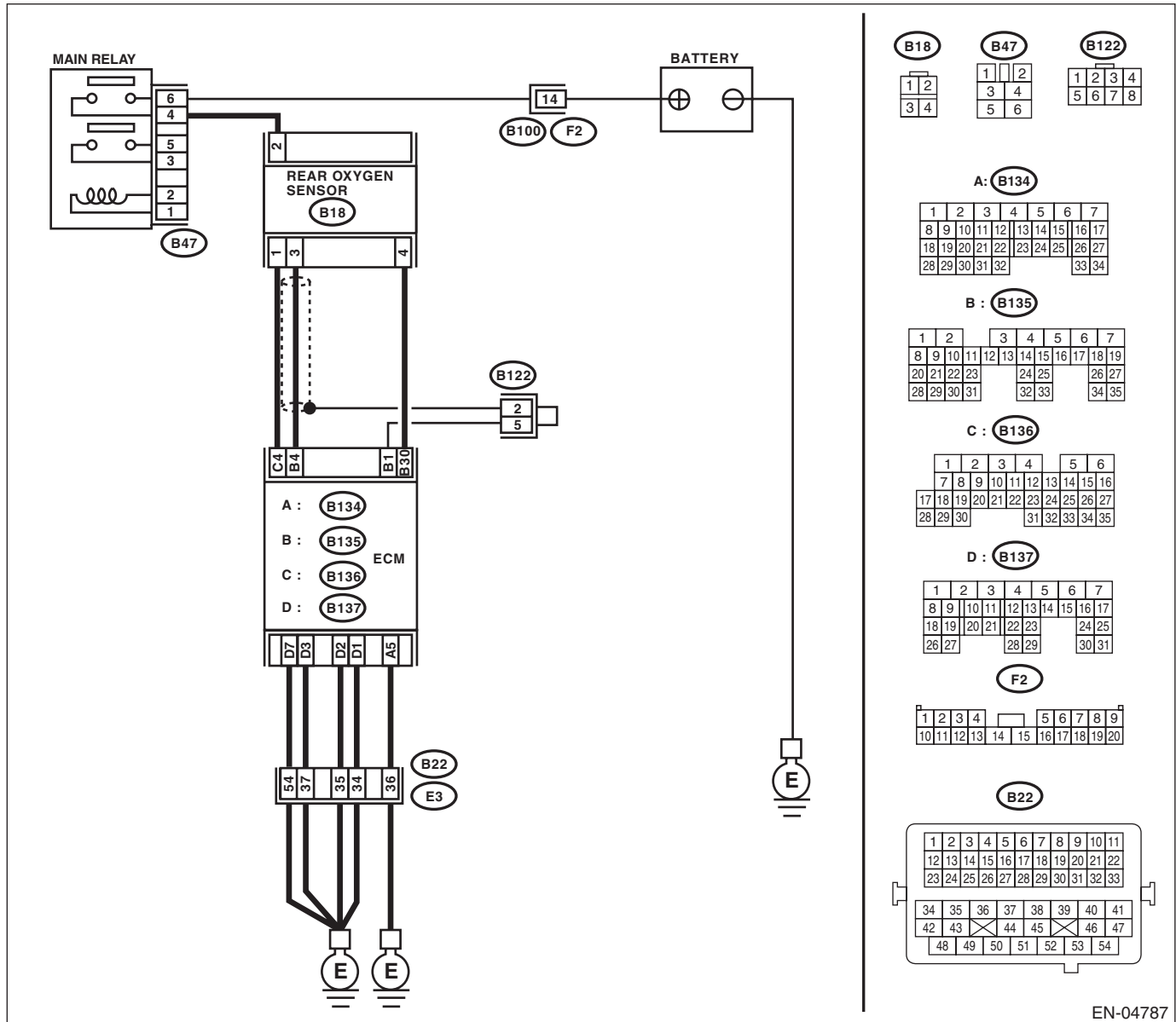
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-67, DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04787

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0138.	Go to step 2.
2 CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • For MT vehicles, depress the clutch pedal. • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is the voltage 250 mV or less?	Go to step 6.	Go to step 3.
3 CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.	Does water enter the connector?	Dry the water thoroughly.	Go to step 4.
4 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. Connector & terminal (B135) No. 4 — (B18) No. 3: (B135) No. 30 — (B18) No. 4:	Is the resistance 3 Ω or more?	Repair the open circuit of harness between ECM and rear oxygen sensor connector.	Go to step 5.
5 CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and chassis ground. Connector & terminal (B18) No. 3 (+) — Chassis ground (-):	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-42, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
6	CHECK EXHAUST SYSTEM. Check exhaust system parts. NOTE: Check the following items. <ul style="list-style-type: none">Looseness and improper attachment of exhaust system partsDamage (crack, hole etc.) of partsLooseness and improper attachment of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-42, Rear Oxygen Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AF:DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

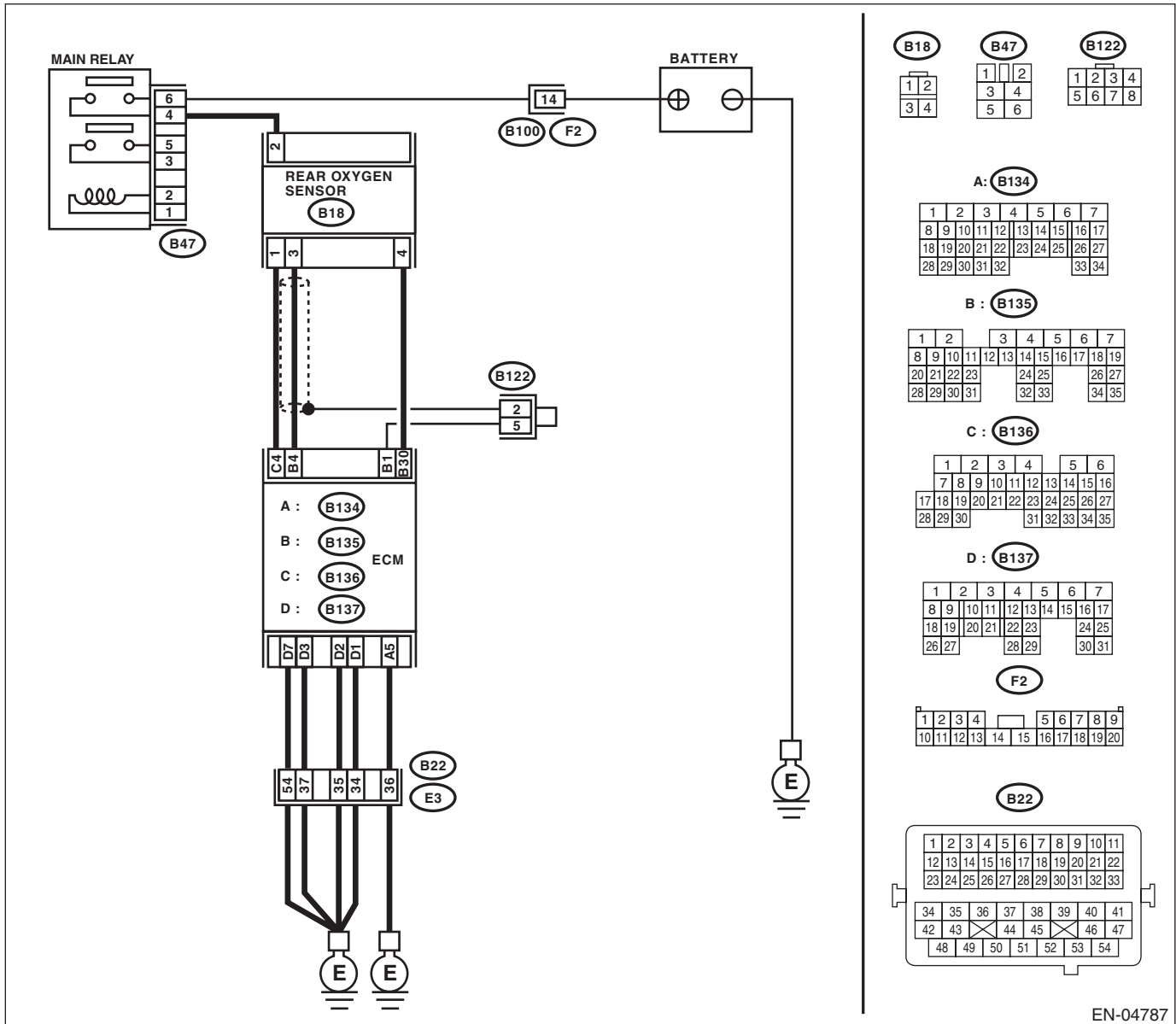
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-68, DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04787

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0139.	Go to step 2.
2	CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. Connector & terminal (B135) No. 4 — (B18) No. 3:	Is the resistance less than 1 Ω?	Go to step 3.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between rear oxygen sensor and ECM connector
3	CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. Measure the resistance between rear oxygen sensor harness connector and chassis ground. Connector & terminal (B18) No. 3 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 4.	Repair the chassis short circuit of the harness between the rear oxygen sensor and ECM connector.
4	CHECK REAR OXYGEN SENSOR. Measure the resistance between rear oxygen sensor terminals. Terminals No. 3 — No. 4:	Is the resistance less than 1 Ω?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-42, Rear Oxygen Sensor.>	Repair the poor contact in rear oxygen sensor connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AG:DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2)

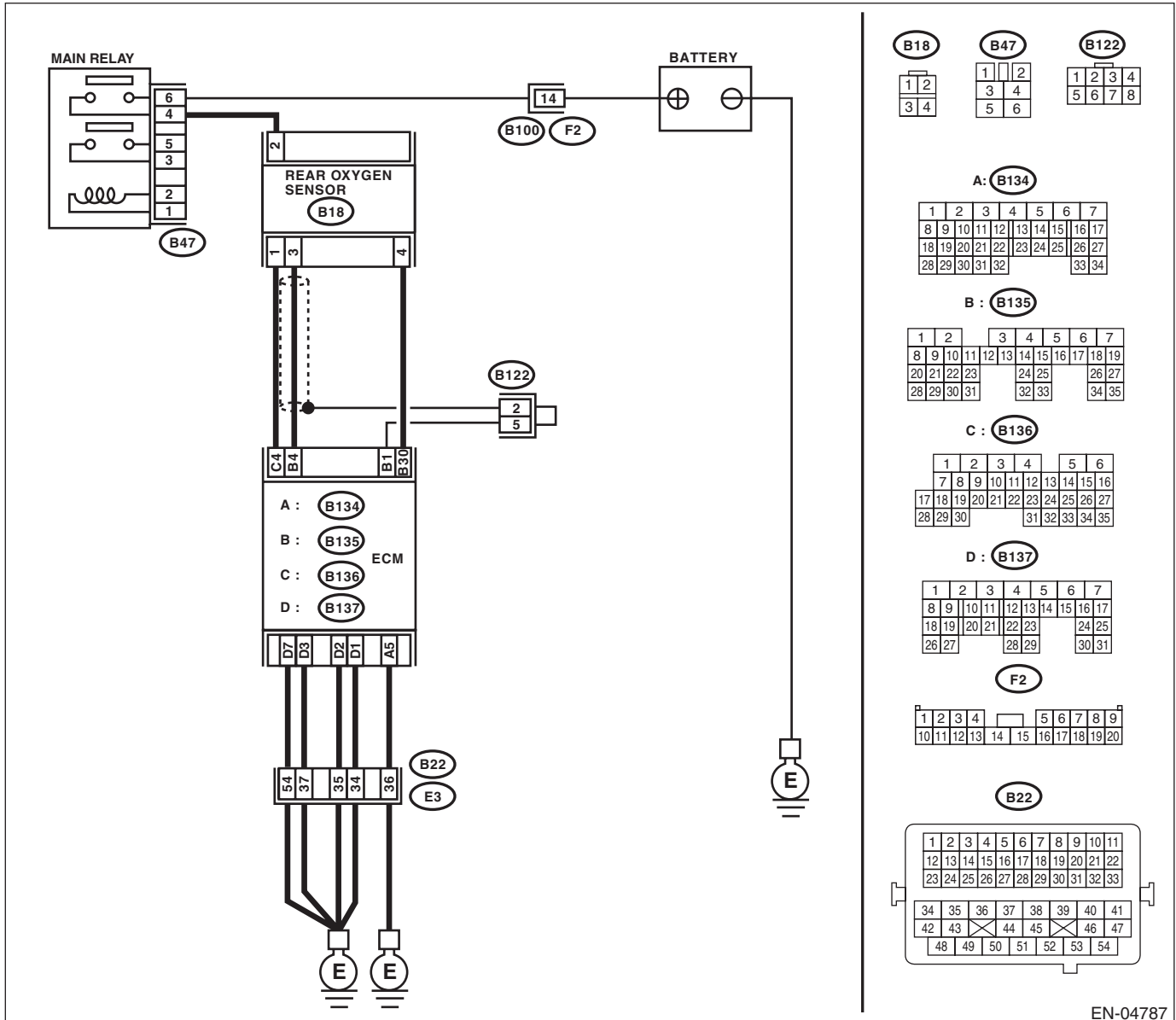
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-73, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04787

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0140.
2	CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (Max. 2 minutes) 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • For MT vehicles, depress the clutch pedal. • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is the voltage 490 mV or more?	Go to step 7.
3	CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool. NOTE: • For MT vehicles, depress the clutch pedal. • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is the voltage 250 mV or less?	Go to step 7.
4	CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.	Does water enter the connector?	Dry the water thoroughly.
5	CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and rear oxygen sensor. 3) Measure the resistance of harness between ECM and rear oxygen sensor connector. Connector & terminal (B135) No. 4 — (B18) No. 3: (B135) No. 30 — (B18) No. 4:	Is the resistance 3 Ω or more?	Repair the open circuit of harness between ECM and rear oxygen sensor connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the rear oxygen sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between rear oxygen sensor harness connector and chassis ground. Connector & terminal (B18) No. 3 (+) — Chassis ground (-):	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-42, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector
7 CHECK EXHAUST SYSTEM. Check exhaust system parts. NOTE: Check the following items. • Looseness and improper attachment of exhaust system parts • Damage (crack, hole etc.) of parts • Looseness and improper attachment of parts between front oxygen (A/F) sensor and rear oxygen sensor	Is there any fault in exhaust system?	Repair or replace faulty parts.	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-42, Rear Oxygen Sensor.>

AH:DTC P0171 SYSTEM TOO LEAN (BANK 1)

NOTE:

For the diagnostic procedure, refer to DTC P0172. <Ref. to EN(H4DOTC)(diag)-147, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AI: DTC P0172 SYSTEM TOO RICH (BANK 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-75, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.> and <Ref. to GD(H4DOTC)-78, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1	CHECK EXHAUST SYSTEM.	Are there holes or loose bolts on exhaust system?	Repair the exhaust system. Go to step 2.
2	CHECK AIR INTAKE SYSTEM.	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system. Go to step 3.
3	CHECK FUEL PRESSURE. WARNING: • Place “NO FIRE” signs near the working area. • Be careful not to spill fuel. Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. <Ref. to ME(H4DOTC)-27, INSPECTION, Fuel Pressure.> WARNING: Release fuel pressure before removing the fuel pressure gauge. NOTE: If fuel pressure does not increase, squeeze the fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value 284 — 314 kPa (2.9 — 3.2 kgf/cm ² , 41 — 46 psi)?	Go to step 4. Repair the following item. Fuel pressure is too high: • Clogged fuel return line or bent hose Fuel pressure is too low: • Improper fuel pump discharge • Clogged fuel supply line
4	CHECK FUEL PRESSURE. After connecting the pressure regulator vacuum hose, measure fuel pressure. <Ref. to ME(H4DOTC)-27, INSPECTION, Fuel Pressure.> WARNING: Release fuel pressure before removing the fuel pressure gauge. NOTE: • If fuel pressure does not increase, squeeze the fuel return hose 2 to 3 times, then measure fuel pressure again. • If the measured value at this step is out of specification, check or replace pressure regulator and pressure regulator vacuum hose.	Is the measured value 230 — 260 kPa (2.35 — 2.65 kgf/cm ² , 33 — 38 psi)?	Go to step 5. Repair the following item. Fuel pressure is too high: • Faulty pressure regulator • Clogged fuel return line or bent hose Fuel pressure is too low: • Faulty pressure regulator • Improper fuel pump discharge • Clogged fuel supply line

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>5</p> <p>CHECK ENGINE COOLANT TEMPERATURE SENSOR.</p> <p>1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Is the engine coolant temperature 60°C (140°F) or more?</p>	<p>Go to step 6.</p>	<p>Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-26, Engine Coolant Temperature Sensor.></p>
<p>6</p> <p>CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.</p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Is the measured value 2.7 — 4.7 g/s (0.36 — 0.62 lb/m)?</p>	<p>Go to step 7.</p>	<p>Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-30, Mass Air Flow and Intake Air Temperature Sensor.></p>
<p>7</p> <p>CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.</p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Subtract the ambient temperature from intake air temperature. Is the obtained value -10 — 50°C (-18 — 90°F)?</p>	<p>Replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).></p>	<p>Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-30, Mass Air Flow and Intake Air Temperature Sensor.></p>

AJ:DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/ PERFORMANCE

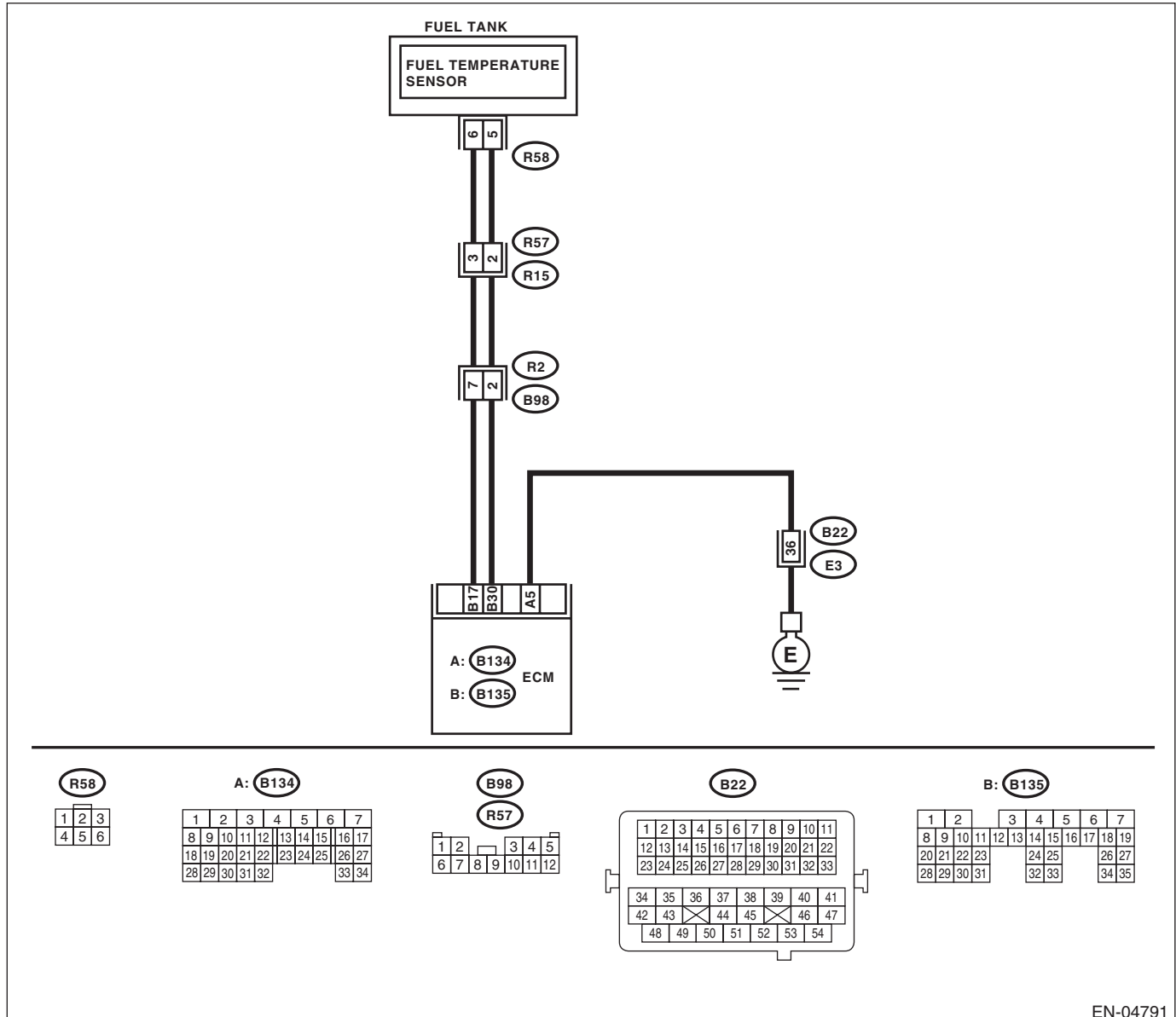
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-81, DTC P0181 FUEL TEMPERATURE SENSOR “A” CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04791

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0181.	Replace the fuel temperature sensor. <Ref. to EC (H4DOTC)-13, Fuel Temperature Sensor.>

AK:DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT

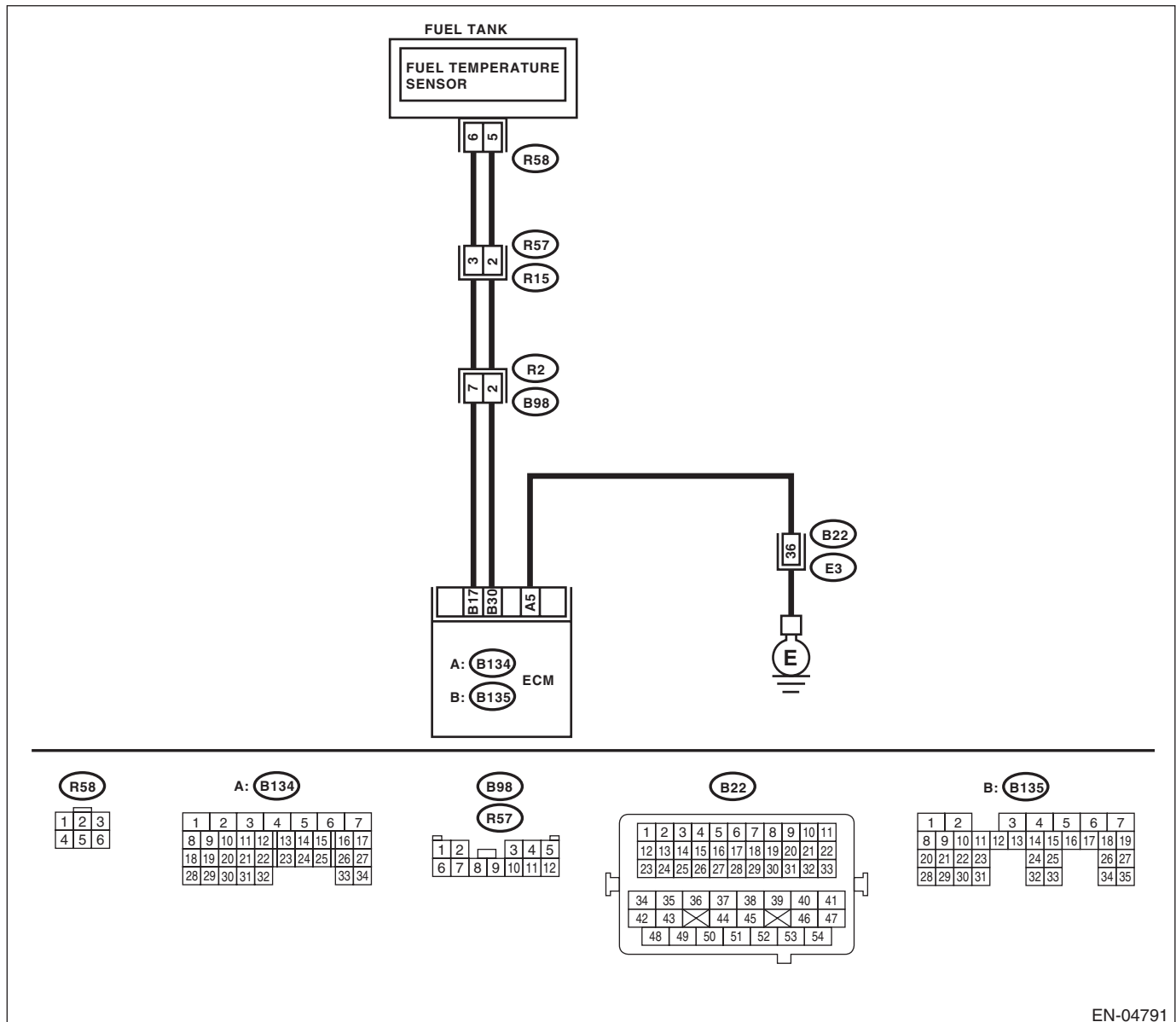
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-84, DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04791

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK CURRENT DATA.</p> <p>1) Start the engine.</p> <p>2) Read the data of the fuel temperature sensor signal using the Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • General scan tool <p>For detailed operation procedure, refer to the general scan tool operation manual.</p>	<p>Is the temperature 150°C (302°F) or more?</p>	<p>Go to step 2.</p>	<p>Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.</p>
<p>2</p> <p>CHECK CURRENT DATA.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Remove the access hole lid.</p> <p>3) Disconnect the connector from fuel pump.</p> <p>4) Turn the ignition switch to ON.</p> <p>5) Read data of the fuel temperature sensor signal using the Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • General scan tool <p>For detailed operation procedure, refer to the general scan tool operation manual.</p>	<p>Is the temperature less than –40°C (–40°F)?</p>	<p>Replace the fuel temperature sensor. <Ref. to EC (H4DOTC)-13, Fuel Temperature Sensor.></p>	<p>Repair ground short circuit of harness between fuel pump and ECM connector.</p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AL:DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT

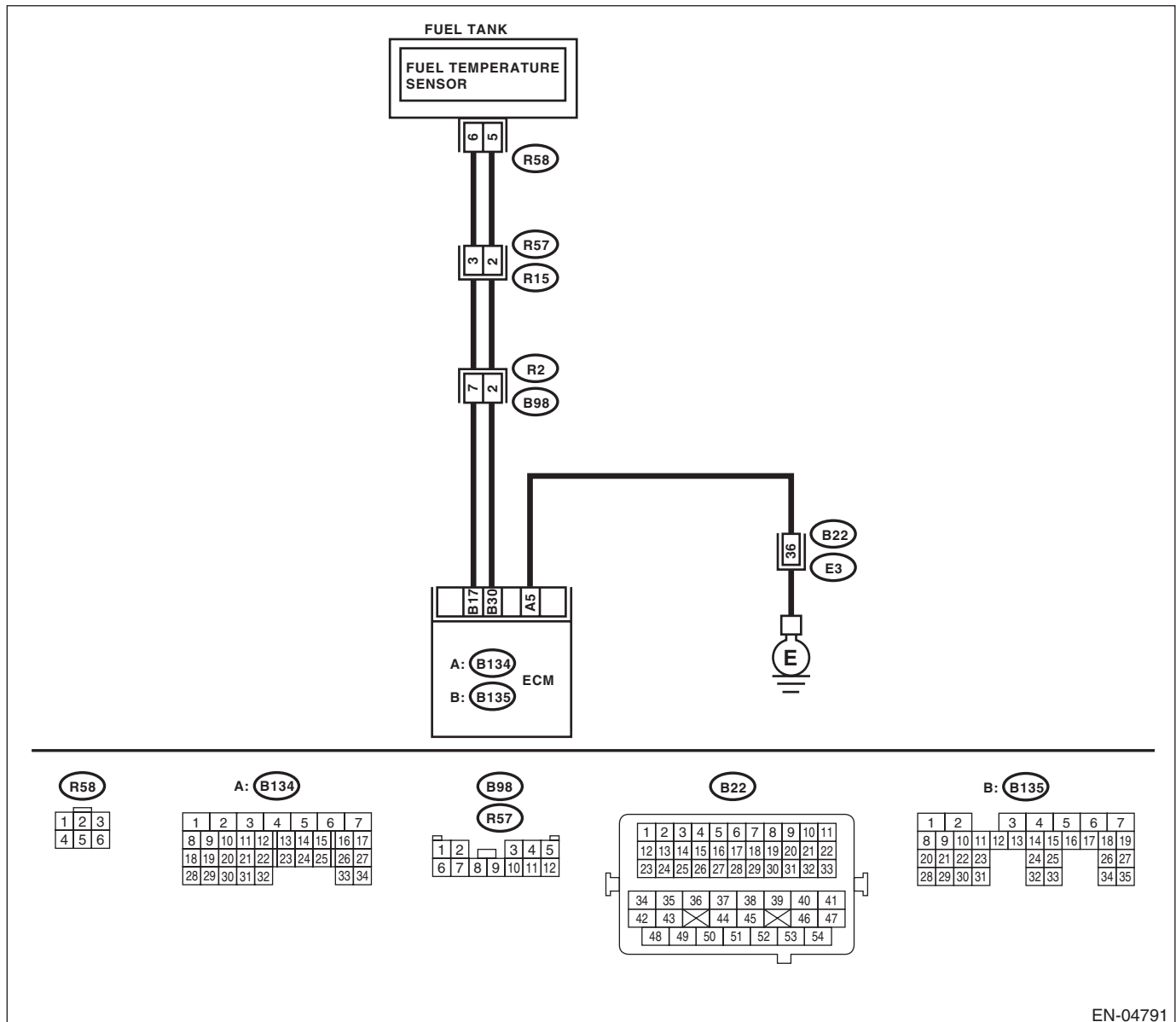
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-86, DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04791

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK CURRENT DATA.</p> <p>1) Start the engine.</p> <p>2) Read the data of the fuel temperature sensor signal using the Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • General scan tool <p>For detailed operation procedure, refer to the general scan tool operation manual.</p>	<p>Is the temperature less than –40°C (–40°F)?</p>	<p>Go to step 2.</p>	<p>Repair the poor contact.</p> <p>NOTE:</p> <p>In this case, repair the following item:</p> <ul style="list-style-type: none"> • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector
<p>2</p> <p>CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Remove the access hole lid.</p> <p>3) Disconnect the connector from fuel pump.</p> <p>4) Measure the voltage between fuel pump connector and chassis ground.</p> <p>Connector & terminal (R58) No. 6 (+) — Chassis ground (–):</p>	<p>Is the voltage 10 V or more?</p>	<p>Repair the short circuit to power supply in the harness between the ECM and fuel pump connector.</p>	<p>Go to step 3.</p>
<p>3</p> <p>CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between fuel pump connector and chassis ground.</p> <p>Connector & terminal (R58) No. 6 (+) — Chassis ground (–):</p>	<p>Is the voltage 10 V or more?</p>	<p>Repair the short circuit to power supply in the harness between the ECM and fuel pump connector.</p>	<p>Go to step 4.</p>
<p>4</p> <p>CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>Measure the voltage between fuel pump connector and chassis ground.</p> <p>Connector & terminal (R58) No. 6 (+) — Chassis ground (–):</p>	<p>Is the voltage 4 V or more?</p>	<p>Go to step 5.</p>	<p>Repair the harness and connector.</p> <p>NOTE:</p> <p>In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and fuel pump connector • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>5</p> <p>CHECK HARNESS BETWEEN FUEL TEMPERATURE SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between fuel pump connector and ECM.</p> <p>Connector & terminal (R58) No. 5 — (B135) No. 30:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Replace the fuel temperature sensor. <Ref. to EC (H4DOTC)-13, Fuel Temperature Sensor.></p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and fuel pump connector • Poor contact in fuel pump connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AM:DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-88, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

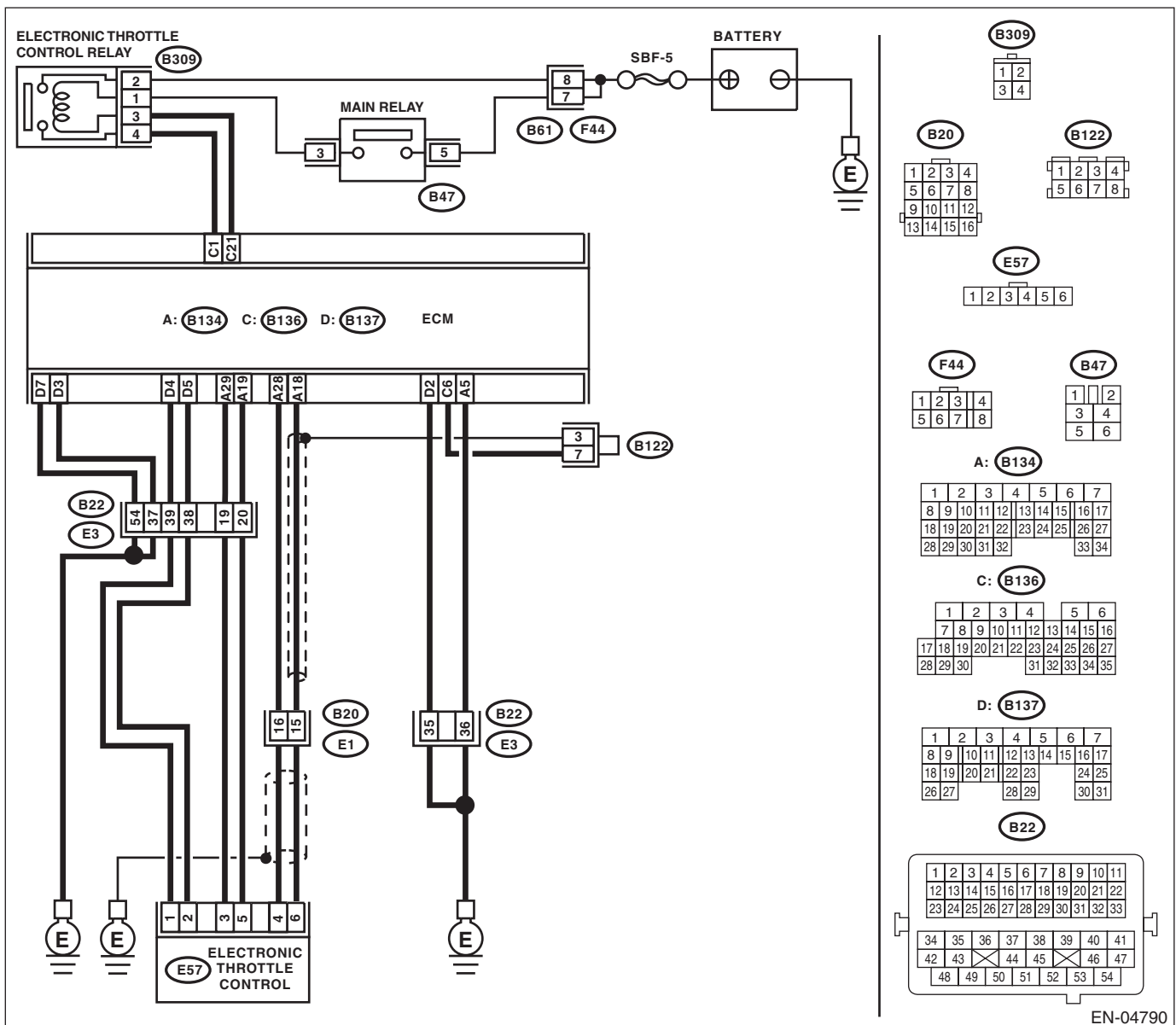
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK SENSOR OUTPUT.</p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between ECM connector and terminal.</p> <p>Connector & terminal (B134) No. 28 (+) — (B134) No. 29 (-):</p> <p>3) Check the voltage change while shaking the ECM harness and connector, engine harness connector, and electronic throttle control connector harness.</p>	Is the voltage 0.8 V or more?	Go to step 2.	Go to step 3.
2	<p>CHECK POOR CONTACT.</p> <p>Check poor contact in connector between ECM and electronic throttle control.</p>	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	<p>CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connectors from ECM.</p> <p>3) Disconnect the connectors from electronic throttle control.</p> <p>4) Measure the resistance between ECM connector and electronic throttle control connector.</p> <p>Connector & terminal (B134) No. 19 — (E57) No. 5:</p>	Is the resistance less than 1 Ω?	Go to step 4.	Repair the open circuit of harness connector.
4	<p>CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</p> <p>Measure the resistance between ECM connector and chassis ground.</p> <p>Connector & terminal (B134) No. 19 — Chassis ground: (B134) No. 28 — Chassis ground:</p>	Is the resistance 1 MΩ or more?	Go to step 5.	Repair the chassis short circuit of harness.
5	<p>CHECK SENSOR POWER SUPPLY.</p> <p>1) Connect the ECM connector.</p> <p>2) Turn the ignition switch to ON.</p> <p>3) Measure the voltage between electronic throttle control connector and engine ground.</p> <p>Connector & terminal (E57) No. 5 (+) — Engine ground (-):</p> <p>4) Check the voltage change by shaking the harness and connector of ECM, and engine harness connector, while monitoring the value with voltage meter.</p>	Is the voltage 4.5 — 5.5 V?	Go to step 6.	Repair poor contact in ECM connector.
6	<p>CHECK SHORT CIRCUIT INSIDE THE ECM.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Measure the resistance between electronic throttle control connector and engine ground.</p> <p>Connector & terminal (E57) No. 4 — Engine ground:</p>	Is the resistance 10 Ω or more?	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective.	Repair poor contact in ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AN:DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-90, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

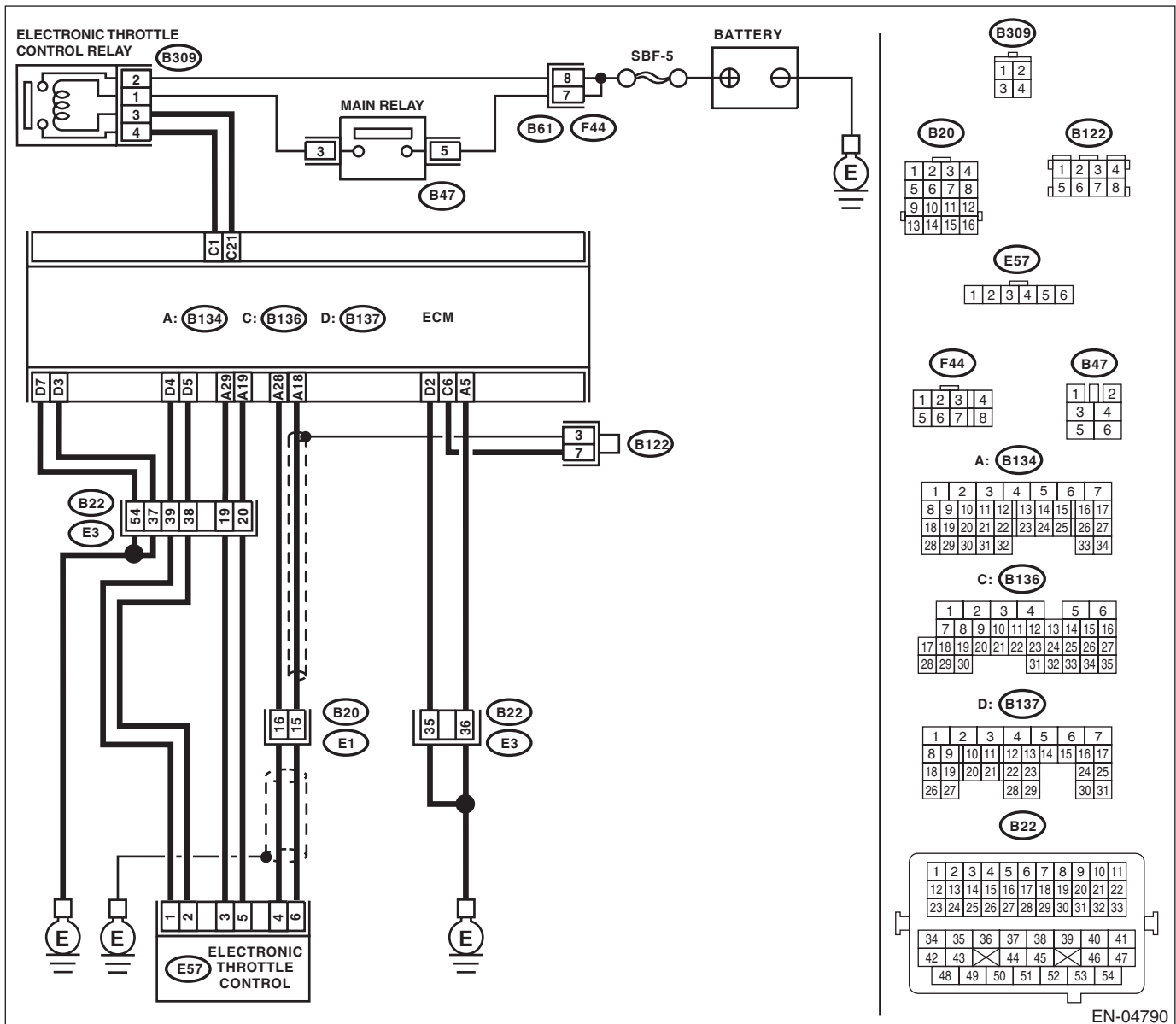
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK SENSOR OUTPUT. 1) Turn the ignition switch to ON. 2) Read the data of sub throttle sensor signal using Subaru Select Monitor. 3) Check the voltage change while shaking the ECM harness and connector, engine harness connector, and electronic throttle control connector harness.	Is the voltage less than 4.73 V?	Go to step 2.	Go to step 3.
2	CHECK POOR CONTACT. Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact in connector between ECM and electronic throttle control?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. Connector & terminal (B134) No. 28 — (E57) No. 4: (B134) No. 29 — (E57) No. 3:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit of harness connector.
4	CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM connector. 2) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 3 — Engine ground:	Is the resistance less than 5 Ω ?	Go to step 5.	Repair poor contact in ECM connector.
5	CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 5 (+) — Engine ground (-): 4) Check the voltage change by shaking the harness and connector of ECM, and engine harness connector, while monitoring the value with voltage meter.	Is the voltage 10 V or more?	Go to step 6.	Repair the short circuit to power supply in the harness between the ECM connector and electronic throttle control connector.
6	CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Measure the voltage between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 4 (+) — Engine ground (-): 2) Check the voltage change by shaking the harness and connector of ECM, and engine harness connector, while monitoring the value with voltage meter.	Is the voltage less than 10 V?	Go to step 7.	Repair the short circuit to power supply in the harness between the ECM connector and electronic throttle control connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
7	CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between connector terminals. Connector & terminal (B134) No. 28 — (B134) No. 19:	Is the resistance 1 M Ω or more?	Repair the poor contact. Replace the electronic throttle control if defective.	Sensor power supply circuit may be shorted.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AO:DTC P0230 FUEL PUMP PRIMARY CIRCUIT

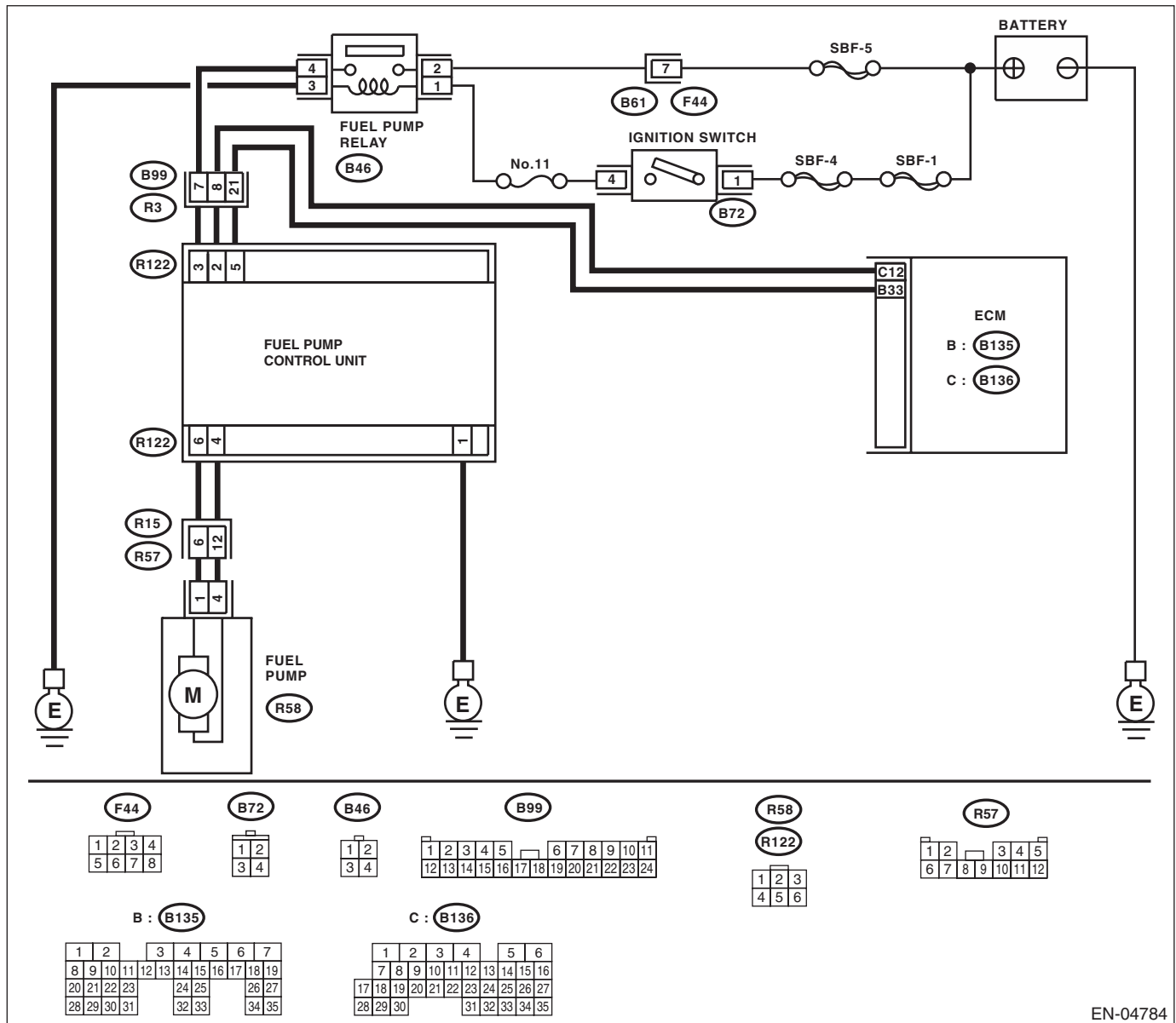
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-92, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04784

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK POWER SUPPLY CIRCUIT TO FUEL PUMP CONTROL UNIT.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel pump control unit. 3) Turn the ignition switch to ON. 4) Measure the voltage between fuel pump control unit and chassis ground.</p> <p>Connector & terminal (R122) No. 3 (+) — Chassis ground (-):</p>	Is the voltage 10 V or more?	Go to step 2.	<p>Repair the power supply circuit.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open or ground short circuit of harness between fuel pump relay and fuel pump control unit • Poor contact of fuel pump control unit connector • Poor contact of fuel pump relay connector
<p>2</p> <p>CHECK GROUND CIRCUIT OF FUEL PUMP CONTROL UNIT.</p> <p>1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between fuel pump control unit and chassis ground.</p> <p>Connector & terminal (R122) No. 1 — Chassis ground:</p>	Is the resistance less than 5 Ω?	Go to step 3.	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit between fuel pump control unit and chassis ground • Poor contact of fuel pump control unit connector
<p>3</p> <p>CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR.</p> <p>1) Disconnect the connector from fuel pump. 2) Measure the resistance of harness between fuel pump control unit and fuel pump connector.</p> <p>Connector & terminal (R122) No. 4 — (R58) No. 4: (R122) No. 6 — (R58) No. 1:</p>	Is the resistance less than 1 Ω?	Go to step 4.	<p>Repair the open circuit between fuel pump control unit and fuel pump.</p>
<p>4</p> <p>CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND FUEL PUMP CONNECTOR.</p> <p>Measure the resistance of harness between fuel pump control unit and chassis ground.</p> <p>Connector & terminal (R122) No. 6 — Chassis ground: (R122) No. 4 — Chassis ground:</p>	Is the resistance 1 MΩ or more?	Go to step 5.	<p>Repair the ground short circuit between fuel pump control unit and fuel pump.</p>
<p>5</p> <p>CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between fuel pump control unit and ECM connector.</p> <p>Connector & terminal (R122) No. 2 — (B136) No. 12: (R122) No. 5 — (B135) No. 33:</p>	Is the resistance less than 1 Ω?	Go to step 6.	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit between fuel pump control unit and ECM • Poor contact of fuel pump control unit and ECM connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK HARNESS BETWEEN FUEL PUMP CONTROL UNIT AND ECM CONNECTOR. Measure the resistance of harness between fuel pump control unit and chassis ground. Connector & terminal (R122) No. 2 — Chassis ground: (R122) No. 5 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 7.	Repair the ground short circuit between fuel pump control unit and ECM.
7 CHECK POOR CONTACT. Check poor contact of ECM and fuel pump control unit connector.	Is there poor contact of ECM and fuel pump control unit connector?	Repair poor contact in ECM and fuel pump control unit.	Go to step 8.
8 CHECK EXPERIENCE OF RUNNING OUT OF FUEL.	Has the vehicle experienced running out of fuel?	Finish the diagnosis. NOTE: DTC may be recorded as a result of fuel pump idling while running out of fuel.	Replace the fuel pump control unit. <Ref. to FU(H4DOTC)-48, Fuel Pump Control Unit.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AP:DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-94, DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

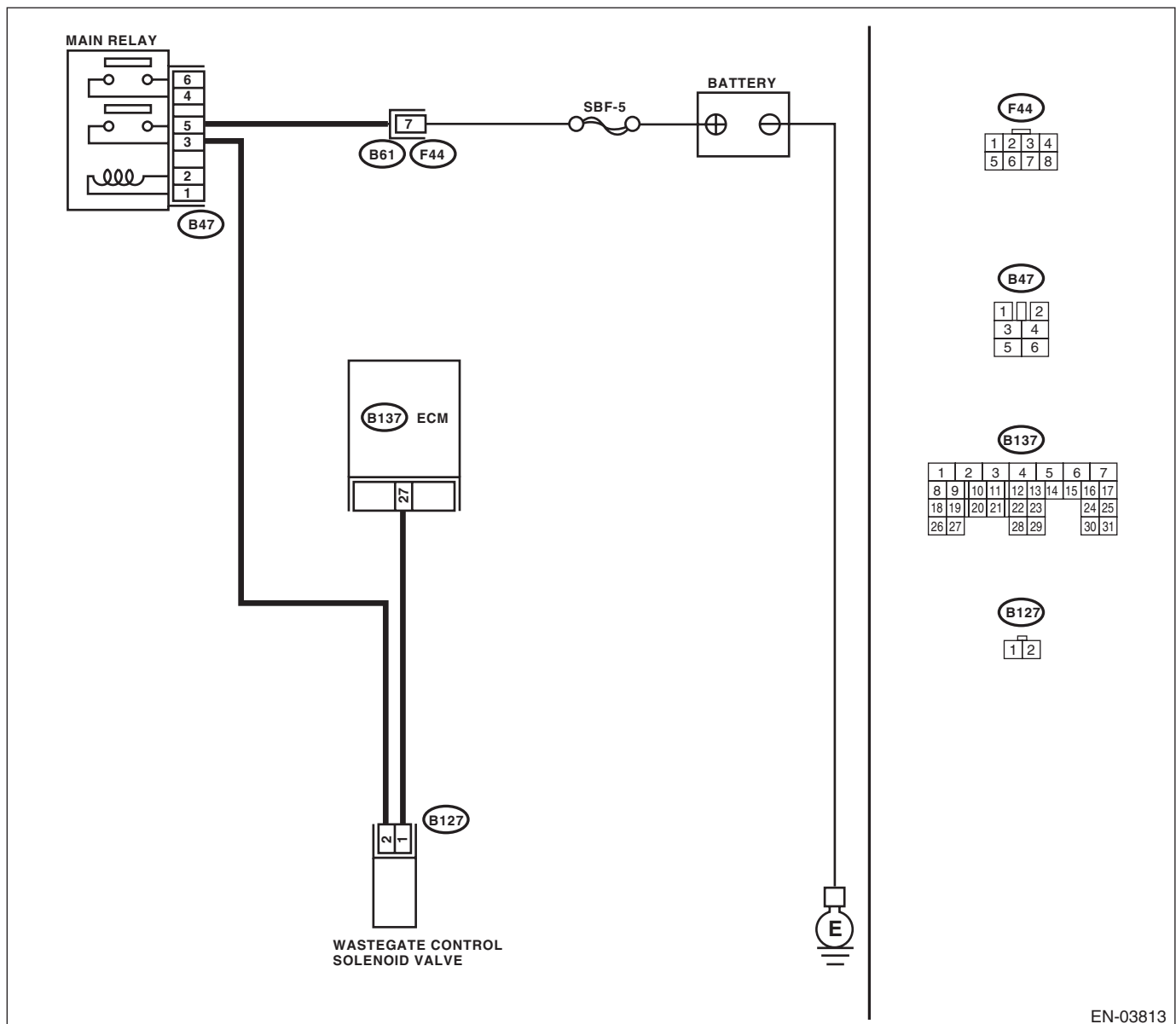
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0244.	Replace the wastegate control solenoid valve. <Ref. to FU(H4DOTC)-39, Wastegate Control Solenoid Valve.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AQ:DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-96, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

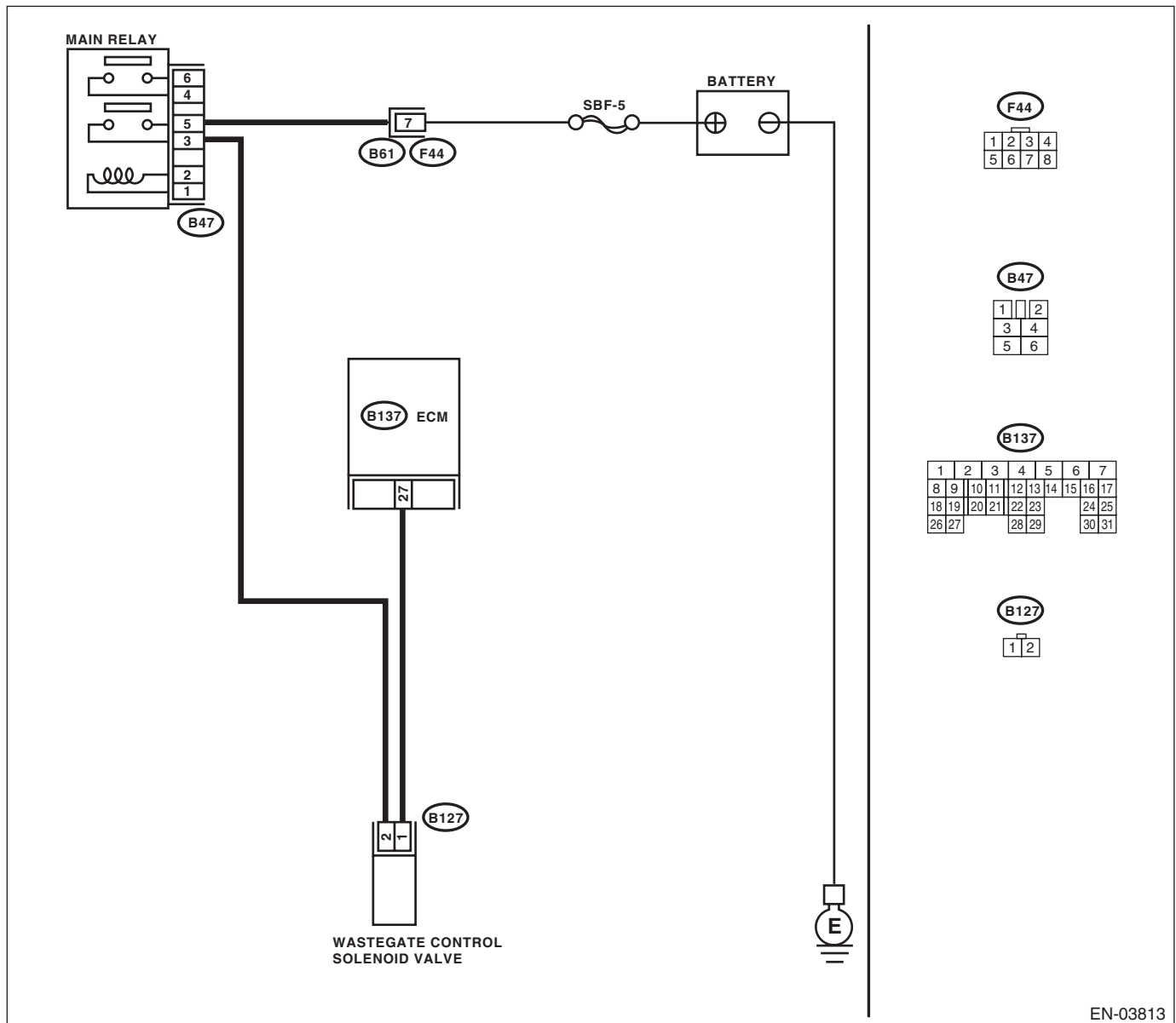
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B137) No. 27 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.	Go to step 2.
2 CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from wastegate control solenoid valve and ECM. 3) Measure the resistance of harness between wastegate control solenoid valve connector and engine ground. <i>Connector & terminal</i> <i>(B127) No. 1 — Engine ground:</i>	Is the resistance less than 10 Ω ?	Repair ground short circuit of harness between ECM and wastegate control solenoid valve connector.	Go to step 3.
3 CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR. Measure the resistance of harness between wastegate control solenoid valve of harness connector and ECM. <i>Connector & terminal</i> <i>(B137) No. 27 — (B127) No. 1:</i>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair open circuit of harness between ECM and wastegate control solenoid valve connector. NOTE: In this case, repair the following item: • Open circuit of harness between ECM and wastegate control solenoid valve connector
4 CHECK WASTEGATE CONTROL SOLENOID VALVE. 1) Remove the wastegate control solenoid valve. 2) Measure the resistance between wastegate control solenoid valve terminals. <i>Terminals</i> <i>No. 1 — No. 2:</i>	Is the resistance between 30 — 34 Ω ?	Go to step 5.	Replace the wastegate control solenoid valve. <Ref. to FU(H4DOTC)-39, Wastegate Control Solenoid Valve.>
5 CHECK POWER SUPPLY TO WASTEGATE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to ON. 2) Measure the voltage between wastegate control solenoid valve and engine ground. <i>Connector & terminal</i> <i>(B127) No. 2 (+) — Engine ground (-):</i>	Is the voltage 10 V or more?	Repair poor contact in wastegate control solenoid valve connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit of harness between main relay and wastegate control solenoid valve connector • Poor contact in main relay connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AR:DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" HIGH DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-98, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

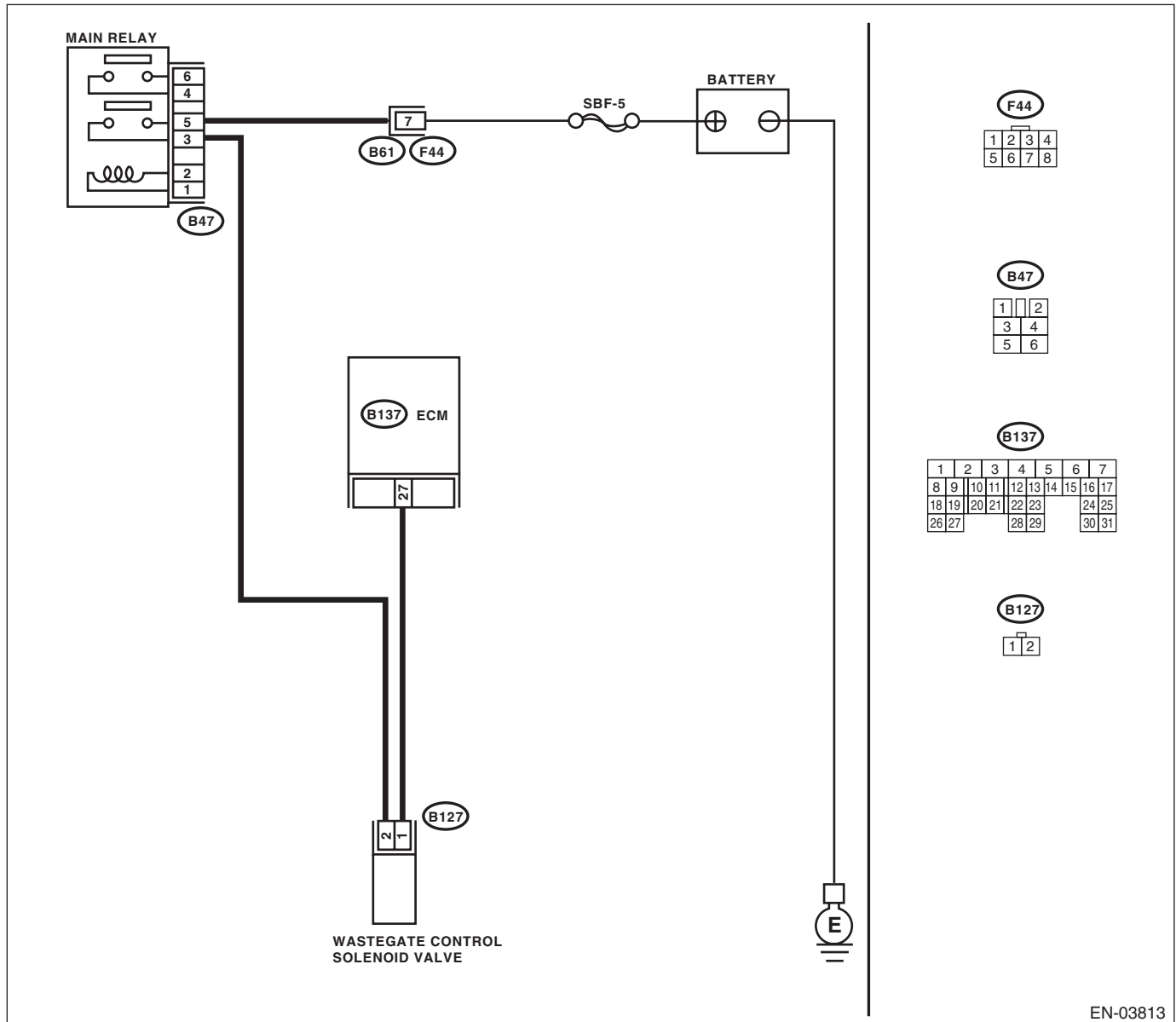
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B137) No. 27 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Go to step 3.	Go to step 2.
2 CHECK POOR CONTACT. Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>
3 CHECK HARNESS BETWEEN WASTEGATE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from wastegate control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B137) No. 27 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Repair the short circuit to power supply in the harness between the ECM and wastegate control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	Go to step 4.
4 CHECK WASTEGATE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Measure the resistance between wastegate control solenoid valve terminals. <i>Terminals</i> <i>No. 1 — No. 2:</i>	Is the resistance less than 1 Ω ?	Replace the wastegate control solenoid valve and ECM. <Ref. to FU(H4DOTC)-39, Wastegate Control Solenoid Valve.> <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	Go to step 5.
5 CHECK POOR CONTACT. Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>

AS:DTC P0301 CYLINDER 1 MISFIRE DETECTED

NOTE:

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC)(diag)-170, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AT:DTC P0302 CYLINDER 2 MISFIRE DETECTED

NOTE:

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC)(diag)-170, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AU:DTC P0303 CYLINDER 3 MISFIRE DETECTED

NOTE:

For the diagnostic procedure, refer to DTC P0304. <Ref. to EN(H4DOTC)(diag)-170, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AV:DTC P0304 CYLINDER 4 MISFIRE DETECTED

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- Immediately at fault recognition (A misfire which could damage catalyst occurs.)
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-105, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

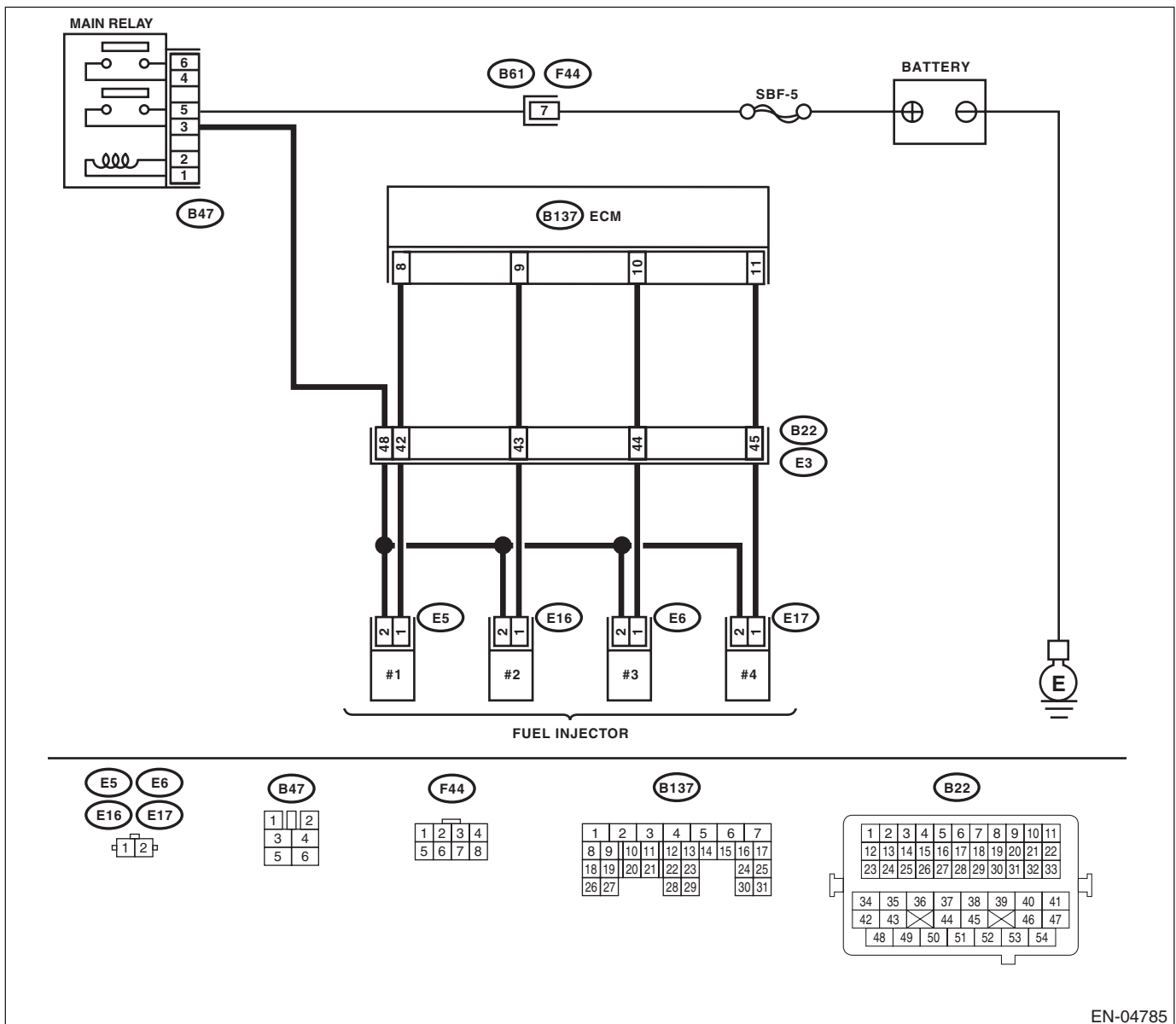
TROUBLE SYMPTOM:

- Engine stalls.
- Improper idling
- Rough driving

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04785

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK OUTPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground on faulty cylinders. Connector & terminal <i>#1 (B137) No. 8 (+) — Chassis ground (-):</i> <i>#2 (B137) No. 9 (+) — Chassis ground (-):</i> <i>#3 (B137) No. 10 (+) — Chassis ground (-):</i> <i>#4 (B137) No. 11 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Go to step 7.	Go to step 3.
3 CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Disconnect the connectors from ECM. 4) Measure the resistance between ECM connector and engine ground on faulty cylinders. Connector & terminal <i>#1 (E5) No. 1 — Engine ground:</i> <i>#2 (E16) No. 1 — Engine ground:</i> <i>#3 (E6) No. 1 — Engine ground:</i> <i>#4 (E17) No. 1 — Engine ground:</i>	Is the resistance 1 MΩ or more?	Go to step 4.	Repair the ground short circuit of harness between fuel injector and ECM connector.
4 CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR. Measure the resistance of harness connector between ECM connector and fuel injector on faulty cylinders. Connector & terminal <i>#1 (B137) No. 8 — (E5) No. 1:</i> <i>#2 (B137) No. 9 — (E16) No. 1:</i> <i>#3 (B137) No. 10 — (E6) No. 1:</i> <i>#4 (B137) No. 11 — (E17) No. 1:</i>	Is the resistance less than 1 Ω?	Go to step 5.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
5 CHECK FUEL INJECTOR. Measure the resistance between fuel injector terminals on faulty cylinder. Terminals <i>No. 1 — No. 2:</i>	Is the resistance between 5 — 20 Ω?	Go to step 6.	Replace the faulty fuel injector. <Ref. to FU(H4DOTC)-32, Fuel Injector.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>6</p> <p>CHECK POWER SUPPLY LINE. 1) Turn the ignition switch to ON. 2) Measure the voltage between fuel injector and engine ground on faulty cylinders.</p> <p>Connector & terminal #1 (E5) No. 2 (+) — Engine ground (-): #2 (E16) No. 2 (+) — Engine ground (-): #3 (E6) No. 2 (+) — Engine ground (-): #4 (E17) No. 2 (+) — Engine ground (-):</p>	Is the voltage 10 V or more?	Repair the poor contact of all connectors in fuel injector circuit.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between main relay and fuel injector connector on faulty cylinders • Poor contact in coupling connector • Poor contact in main relay connector • Poor contact in fuel injector connector on faulty cylinders
<p>7</p> <p>CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground on faulty cylinders.</p> <p>Connector & terminal #1 (B137) No. 8 (+) — Chassis ground (-): #2 (B137) No. 9 (+) — Chassis ground (-): #3 (B137) No. 10 (+) — Chassis ground (-): #4 (B137) No. 11 (+) — Chassis ground (-):</p>	Is the voltage 10 V or more?	Repair the short circuit to power supply in the harness between the ECM connector and fuel injector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	Go to step 8.
<p>8</p> <p>CHECK FUEL INJECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between fuel injector terminals on faulty cylinder.</p> <p>Terminals No. 1 — No. 2:</p>	Is the resistance less than 1 Ω ?	Replace the faulty fuel injector and ECM. <Ref. to FU(H4DOTC)-32, Fuel Injector.> <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	Go to step 9.
<p>9</p> <p>CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.</p>	Is the camshaft position sensor or crankshaft position sensor loosely installed?	Tighten the camshaft position sensor or crankshaft position sensor.	Go to step 10.
<p>10</p> <p>CHECK CRANKSHAFT SPROCKET. Remove the timing belt cover.</p>	Is the crank sprocket rusted or does it have broken teeth?	Replace the crank sprocket. <Ref. to ME(H4DOTC)-53, Crank Sprocket.>	Go to step 11.
<p>11</p> <p>CHECK INSTALLATION CONDITION OF TIMING BELT. Turn the crankshaft using ST, and align the alignment mark on crank sprocket with alignment mark on cylinder block. ST 499987500 CRANKSHAFT SOCKET</p>	Is the timing belt dislocated from its proper position?	Repair the installation condition of the timing belt. <Ref. to ME(H4DOTC)-44, Timing Belt.>	Go to step 12.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
12 CHECK FUEL LEVEL.	Is the fuel meter indication higher than the "Lower" level?	Go to step 13 .	Replenish the fuel so that fuel meter indication is higher than the "Lower" level. After refueling, Go to step 13 .
13 CHECK STATUS OF MALFUNCTION INDICATOR LIGHT. 1) Clear the memory using Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-50, Clear Memory Mode.> 2) Start the engine, and drive the vehicle more than 10 minutes.	Does the malfunction indicator light illuminate or blink?	Go to step 15 .	Go to step 14 .
14 CHECK CAUSE OF MISFIRE.	Has the cause of misfire diagnosed when the engine is running?	Finish diagnostics operation, if the engine has no abnormality.	Repair the poor contact. NOTE: In this case, repair the following item: • Poor contact of ignition coil connector • Poor contact in fuel injector connector on faulty cylinders • Poor contact in ECM connector • Poor contact in coupling connector
15 CHECK AIR INTAKE SYSTEM.	Is there any fault in air intake system?	Repair the air intake system. NOTE: Check the following items. • Are there air leaks or air suction caused by loose or dislocated nuts and bolts? • Are there cracks or any disconnection of hoses?	Go to step 16 .
16 CHECK CYLINDER.	Is there any fault in the cylinder?	Repair or replace faulty parts. NOTE: Check the following items. • Spark plug • Fuel injector • Compression	Go to DTC P0171 and P0172. <Ref. to EN(H4DOTC)(diag)-146, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AW:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-106, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

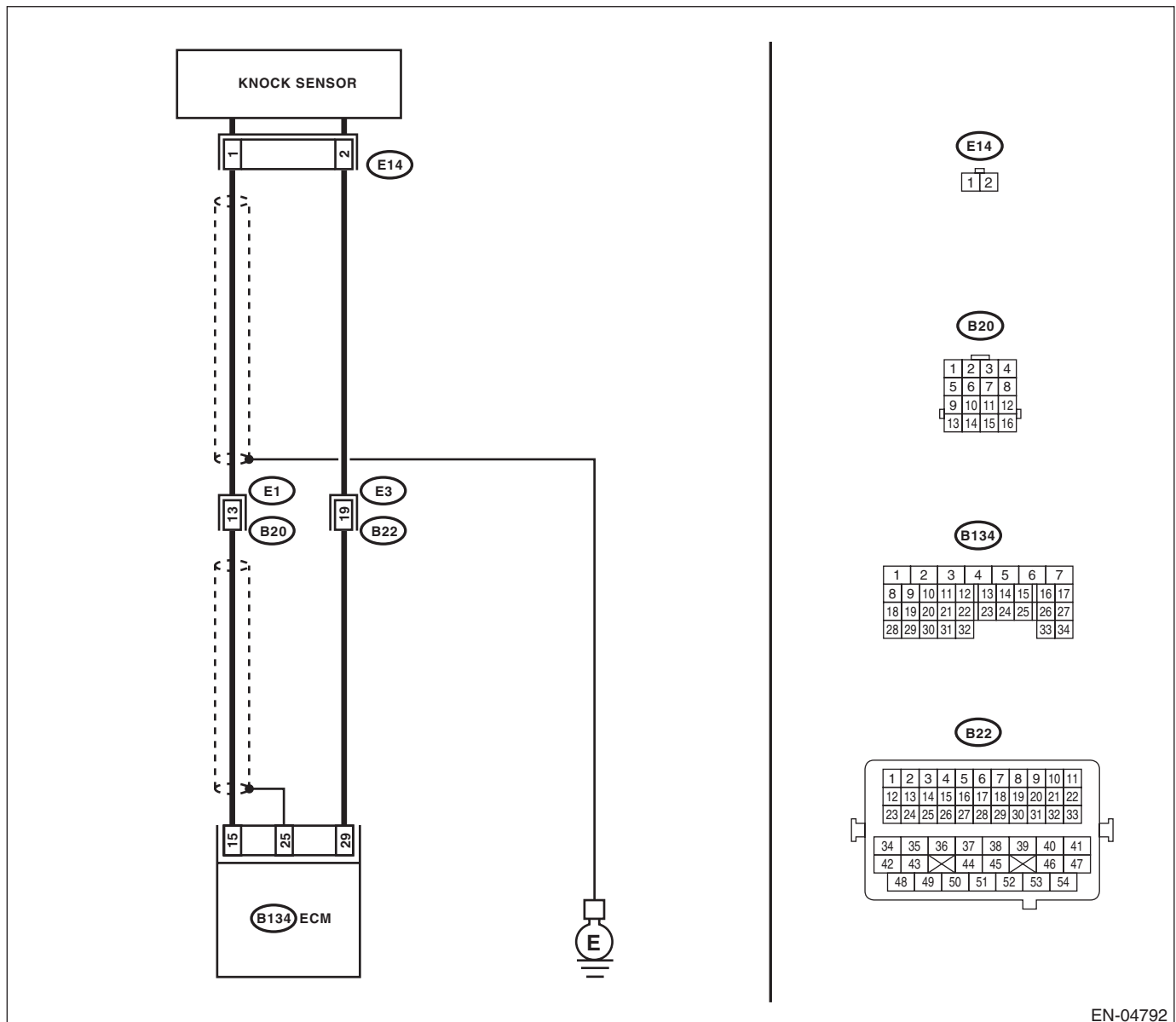
TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04792

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM harness connector and chassis ground.</p> <p>Connector & terminal (B134) No. 15 — Chassis ground:</p>	Is the resistance 700 kΩ or more?	Go to step 2.	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit in harness between knock sensor and ECM connector • Poor contact in knock sensor connector • Poor contact in coupling connector
2	<p>CHECK KNOCK SENSOR.</p> <p>1) Disconnect the connector from knock sensor. 2) Measure the resistance between knock sensor connector terminal and engine ground.</p> <p>Terminals No. 1 — Engine ground:</p>	Is the resistance 700 kΩ or more?	Go to step 3.	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Poor contact in knock sensor connector • Poor contact in coupling connector
3	<p>CHECK INSTALLATION CONDITION OF KNOCK SENSOR.</p>	Is the knock sensor installation bolt tightened securely?	Replace the knock sensor. <Ref. to FU(H4DOTC)-29, Knock Sensor.>	Tighten the knock sensor installation bolt securely.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AX:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-108, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

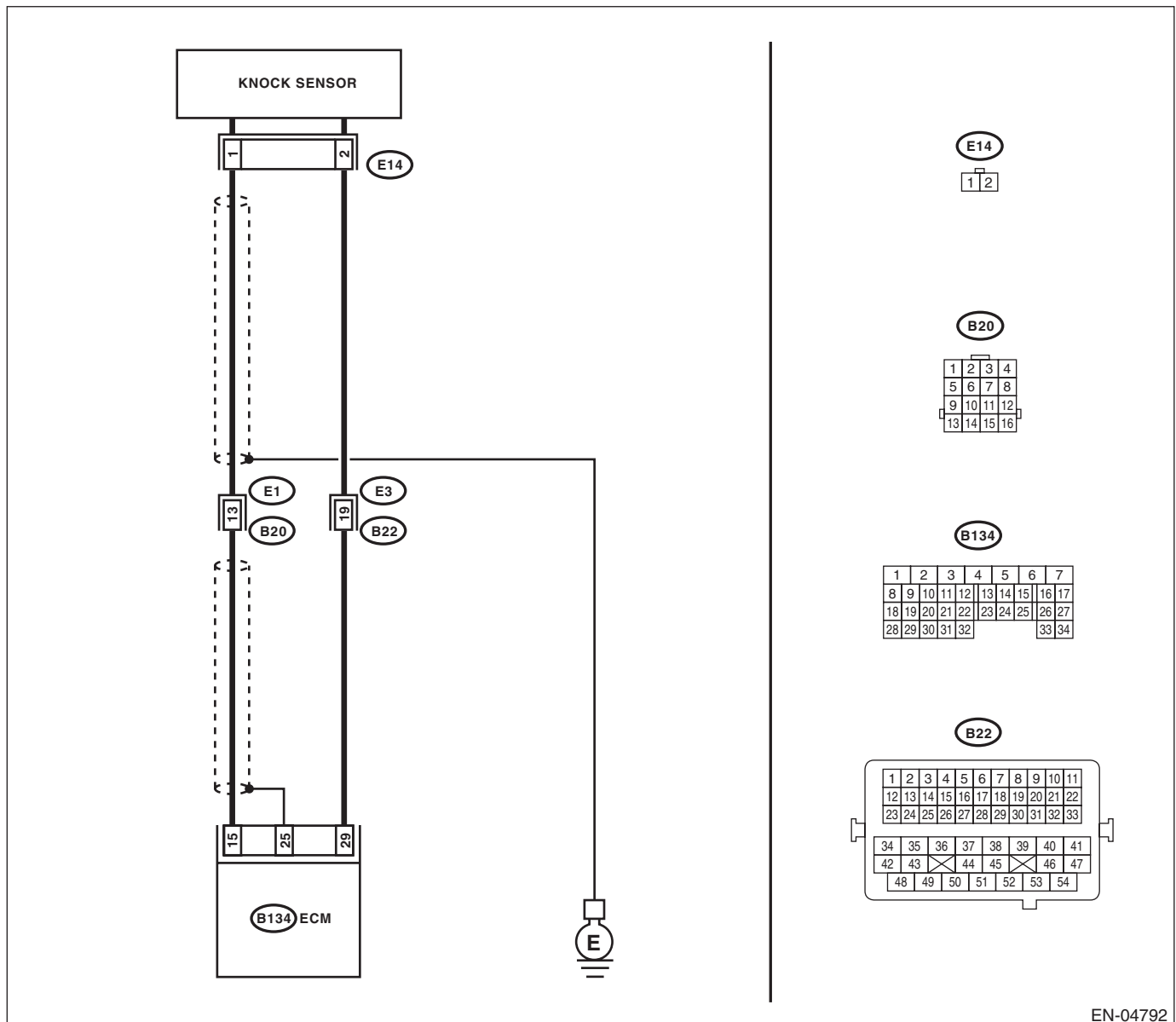
TROUBLE SYMPTOM:

- Poor driving performance
- Knocking occurs.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04792

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK HARNESS BETWEEN KNOCK SENSOR AND ECM CONNECTOR. Measure the resistance of harness between ECM connector and chassis ground.</p> <p>Connector & terminal (B134) No. 15 — Chassis ground:</p>	Is the resistance less than 400 kΩ?	Go to step 2.	Go to step 3.
2	<p>CHECK KNOCK SENSOR.</p> <p>1) Disconnect the connector from knock sensor.</p> <p>2) Measure the resistance between knock sensor connector terminal and engine ground.</p> <p>Terminals No. 1 — Engine ground:</p>	Is the resistance less than 400 kΩ?	Replace the knock sensor. <Ref. to FU(H4DOTC)-29, Knock Sensor.>	<p>Repair the ground short circuit of harness between knock sensor connector and ECM connector.</p> <p>NOTE: The harness between both connectors are shielded. Remove the shield and repair the short circuit of harness.</p>
3	<p>CHECK INPUT SIGNAL OF ECM.</p> <p>1) Connect the connectors to ECM and knock sensor.</p> <p>2) Turn the ignition switch to ON.</p> <p>3) Measure the voltage between ECM and chassis ground.</p> <p>Connector & terminal (B134) No. 15 (+) — Chassis ground (-):</p>	Is the voltage 2 V or more?	<p>Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.)</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Poor contact in knock sensor connector • Poor contact in ECM connector • Poor contact in coupling connector 	Repair poor contact in ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AY:DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-110, DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

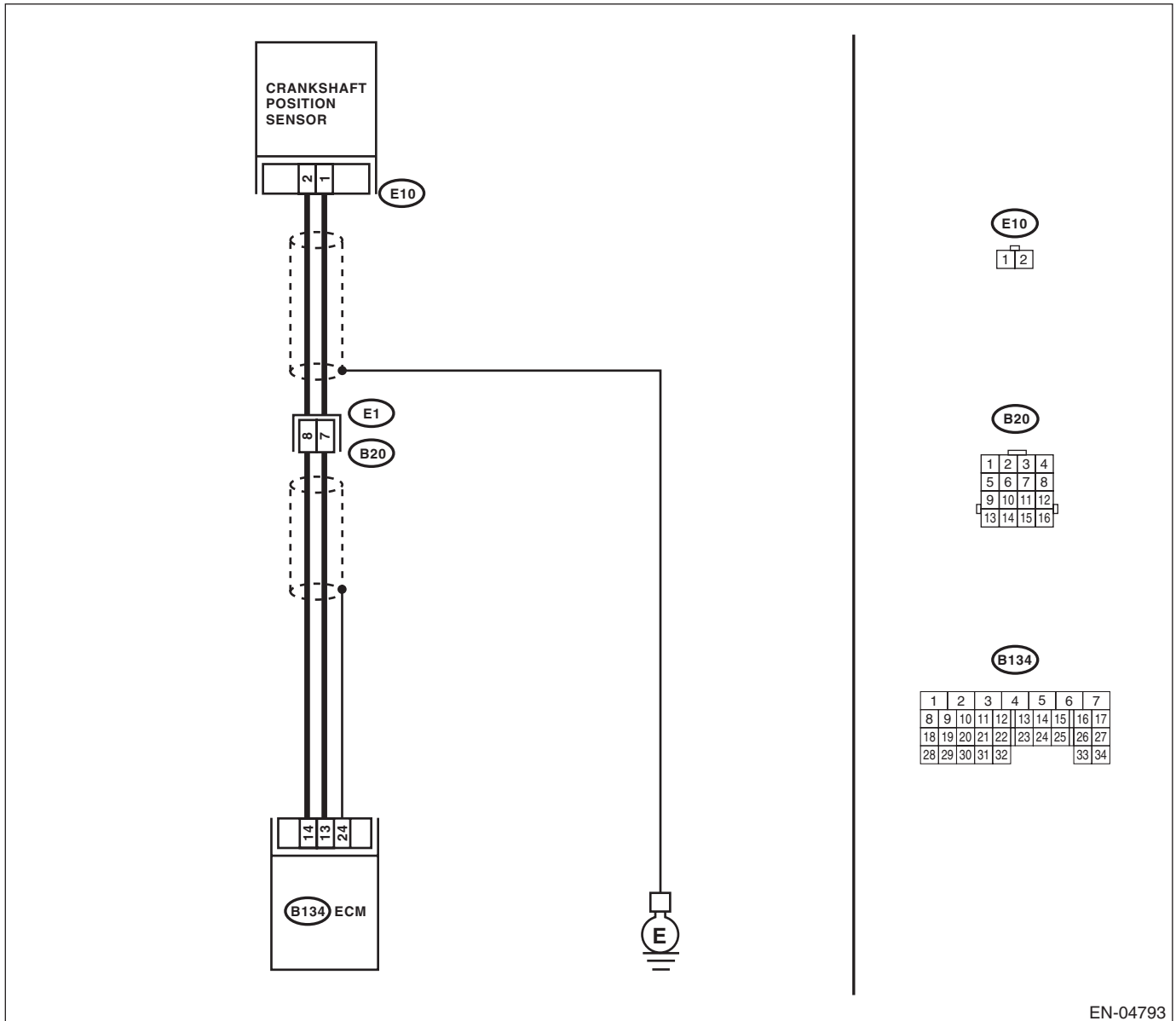
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04793

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from crankshaft position sensor. 3) Measure the resistance of harness between crankshaft position sensor connector and engine ground.</p> <p>Connector & terminal (E10) No. 1 — Engine ground:</p>	<p>Is the resistance 100 kΩ or more?</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector 	<p>Go to step 2.</p>
<p>2</p> <p>CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.</p> <p>Measure the resistance of harness between crankshaft position sensor connector and engine ground.</p> <p>Connector & terminal (E10) No. 1 — Engine ground:</p>	<p>Is the resistance 1 MΩ or more?</p>	<p>Go to step 3.</p>	<p>Repair the ground short circuit of harness between crankshaft position sensor and ECM connector.</p> <p>NOTE: The harness between both connectors are shielded. Remove the shield and repair the ground short circuit of harness.</p>
<p>3</p> <p>CHECK HARNESS BETWEEN CRANKSHAFT POSITION SENSOR AND ECM CONNECTOR.</p> <p>Measure the resistance of harness between crankshaft position sensor connector and engine ground.</p> <p>Connector & terminal (E10) No. 2 — Engine ground:</p>	<p>Is the resistance less than 5 Ω?</p>	<p>Go to step 4.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit in harness between crankshaft position sensor and ECM connector • Poor contact in ECM connector • Poor contact in coupling connector
<p>4</p> <p>CHECK CONDITION OF CRANKSHAFT POSITION SENSOR.</p>	<p>Is the crankshaft position sensor installation bolt tightened securely?</p>	<p>Go to step 5.</p>	<p>Tighten the crankshaft position sensor installation bolt securely.</p>
<p>5</p> <p>CHECK CRANKSHAFT POSITION SENSOR.</p> <p>1) Remove the crankshaft position sensor. 2) Measure the resistance between connector terminals of crankshaft position sensor.</p> <p>Terminals No. 1 — No. 2:</p>	<p>Is the resistance between 1 — 4 kΩ?</p>	<p>Repair the poor contact of crankshaft position sensor connector.</p>	<p>Replace the crankshaft position sensor. <Ref. to FU(H4DOTC)-27, Crankshaft Position Sensor.></p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

AZ:DTC P0336 CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-112, DTC P0336 CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

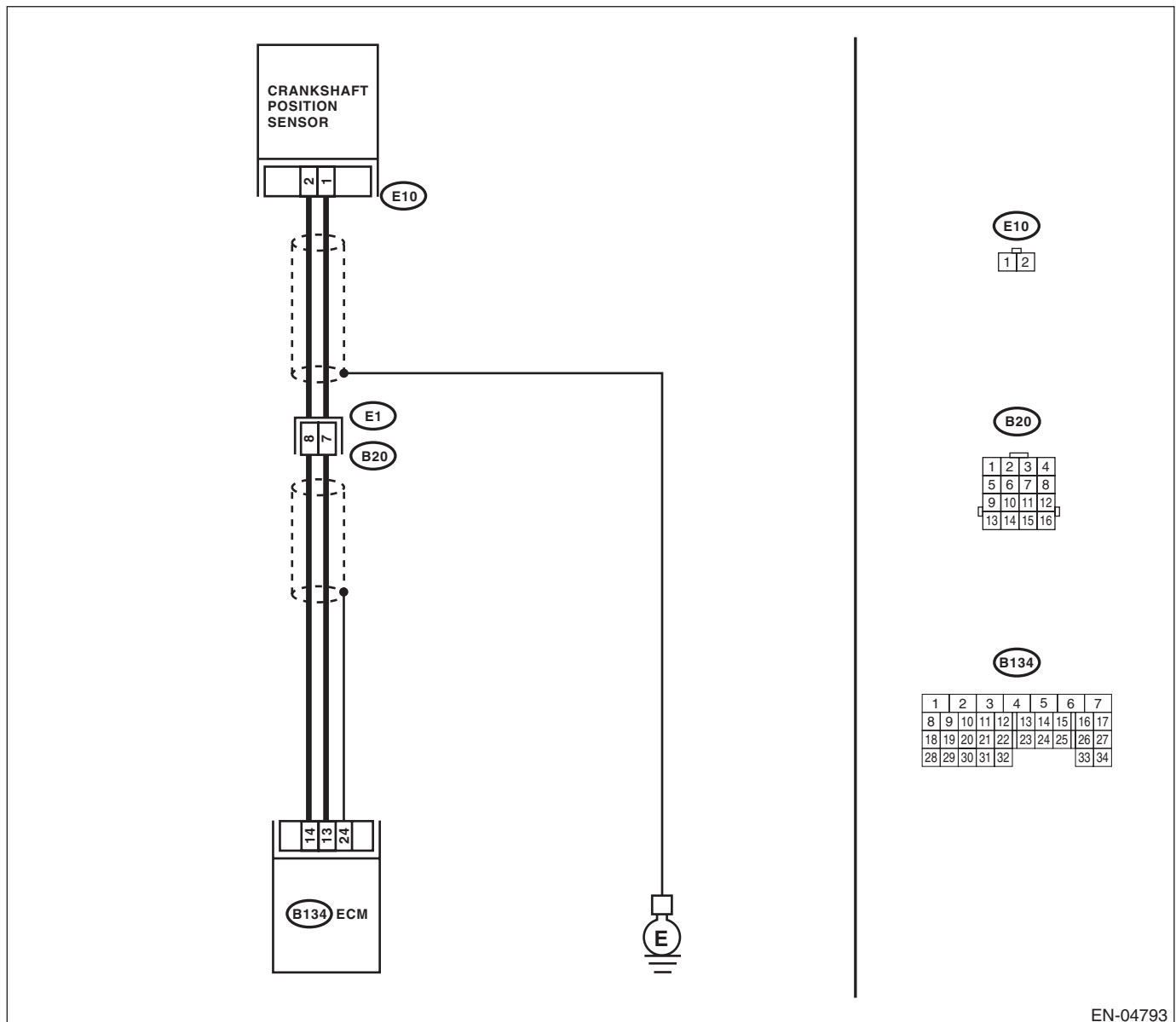
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04793

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK CONDITION OF CRANKSHAFT POSITION SENSOR. Turn the ignition switch to OFF.	Is the crankshaft position sensor installation bolt tightened securely?	Go to step 3.	Tighten the crankshaft position sensor installation bolt securely.
3	CHECK CRANKSHAFT SPROCKET. Remove the front belt cover.	Are crank sprocket teeth cracked or damaged?	Replace the crank sprocket. <Ref. to ME(H4DOTC)-53, Crank Sprocket.>	Go to step 4.
4	CHECK INSTALLATION CONDITION OF TIMING BELT. Turn the crankshaft using ST, and align the alignment mark on crank sprocket with alignment mark on cylinder block. ST 499987500 CRANKSHAFT SOCKET	Is the timing belt dislocated from its proper position?	Repair the installation condition of the timing belt. <Ref. to ME(H4DOTC)-44, Timing Belt.>	Replace the crankshaft position sensor. <Ref. to FU(H4DOTC)-27, Crankshaft Position Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BA:DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-114, DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

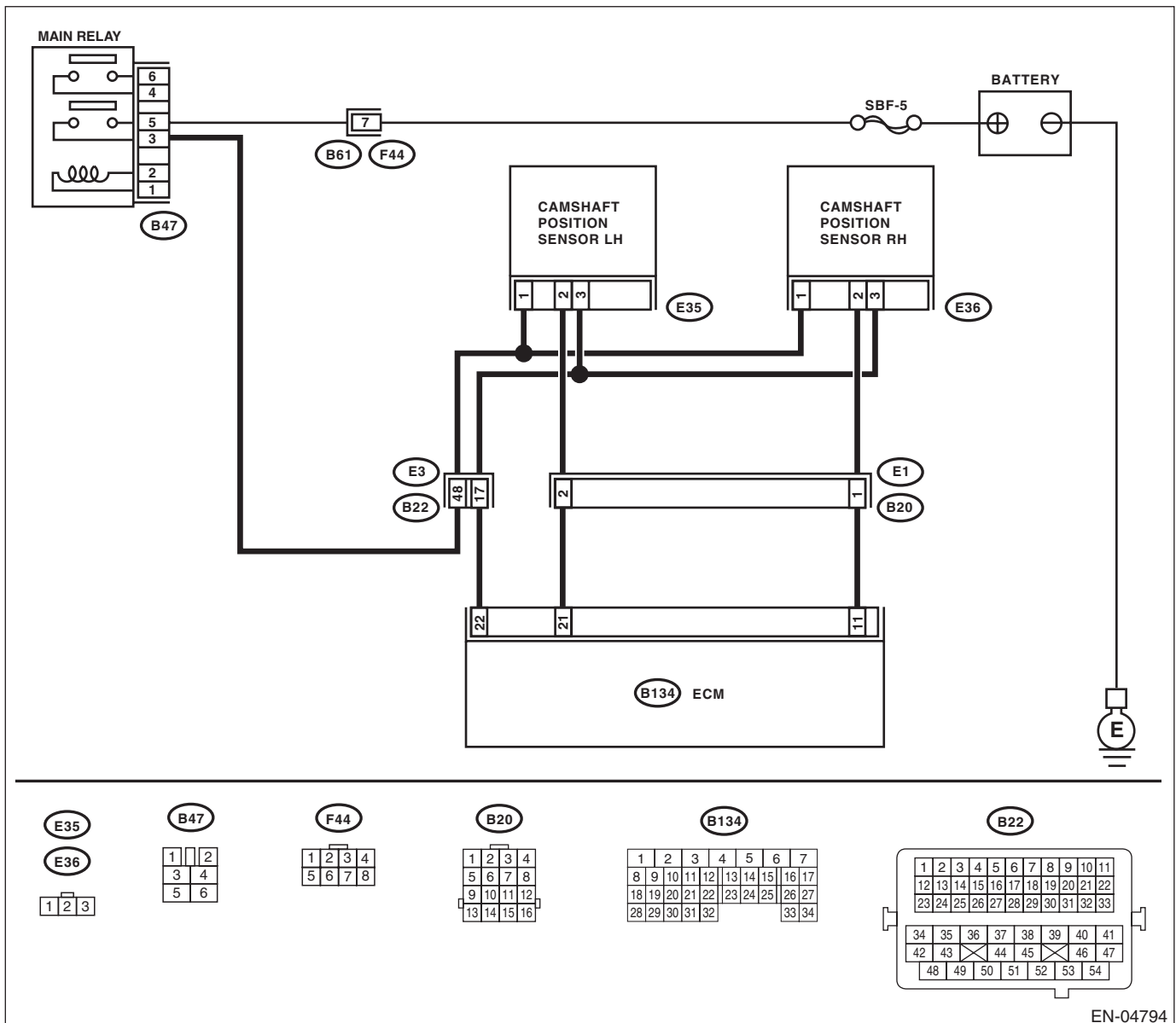
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04794

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the voltage between camshaft position sensor and engine ground. Connector & terminal (E36) No. 1 (+) — Engine ground (-):	Is the voltage 10 V or more?	Repair the short circuit to power supply between the main relay connector and camshaft position sensor connector.	Go to step 2.
2	CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between camshaft position sensor and engine ground. Connector & terminal (E36) No. 1 (+) — Engine ground (-):	Is the voltage 10 V or more?	Go to step 3.	Repair the open or ground short circuit between main relay connector and camshaft position sensor connector.
3	CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between camshaft position sensor and ECM. Connector & terminal (E36) No. 2 — (B134) No. 11: (E35) No. 3 — (B134) No. 22:	Is the resistance less than 1 Ω?	Go to step 4.	Repair the open circuit between camshaft position sensor and ECM.
4	CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM. Measure the resistance between camshaft position sensor and engine ground. Connector & terminal (E36) No. 2 — Engine ground: (E35) No. 3 — Engine ground:	Is the resistance 1 MΩ or more?	Go to step 5.	Repair the ground short between the camshaft position sensor and ECM.
5	CHECK CONDITION OF CAMSHAFT POSITION SENSOR.	Is the camshaft position sensor installation bolt tightened securely?	Go to step 6.	Tighten the camshaft position sensor installation bolt securely.
6	CHECK CAMSHAFT POSITION SENSOR. Check the waveform of the camshaft position sensor. <Ref. to EN(H4DOTC)(diag)-18, Engine Control Module (ECM) I/O Signal.>	Is there any abnormality in waveform?	Replace the camshaft position sensor. <Ref. to FU(H4DOTC)-28, Camshaft Position Sensor.>	Go to step 7.
7	CHECK POOR CONTACT. Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BB:DTC P0345 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-115, DTC P0345 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

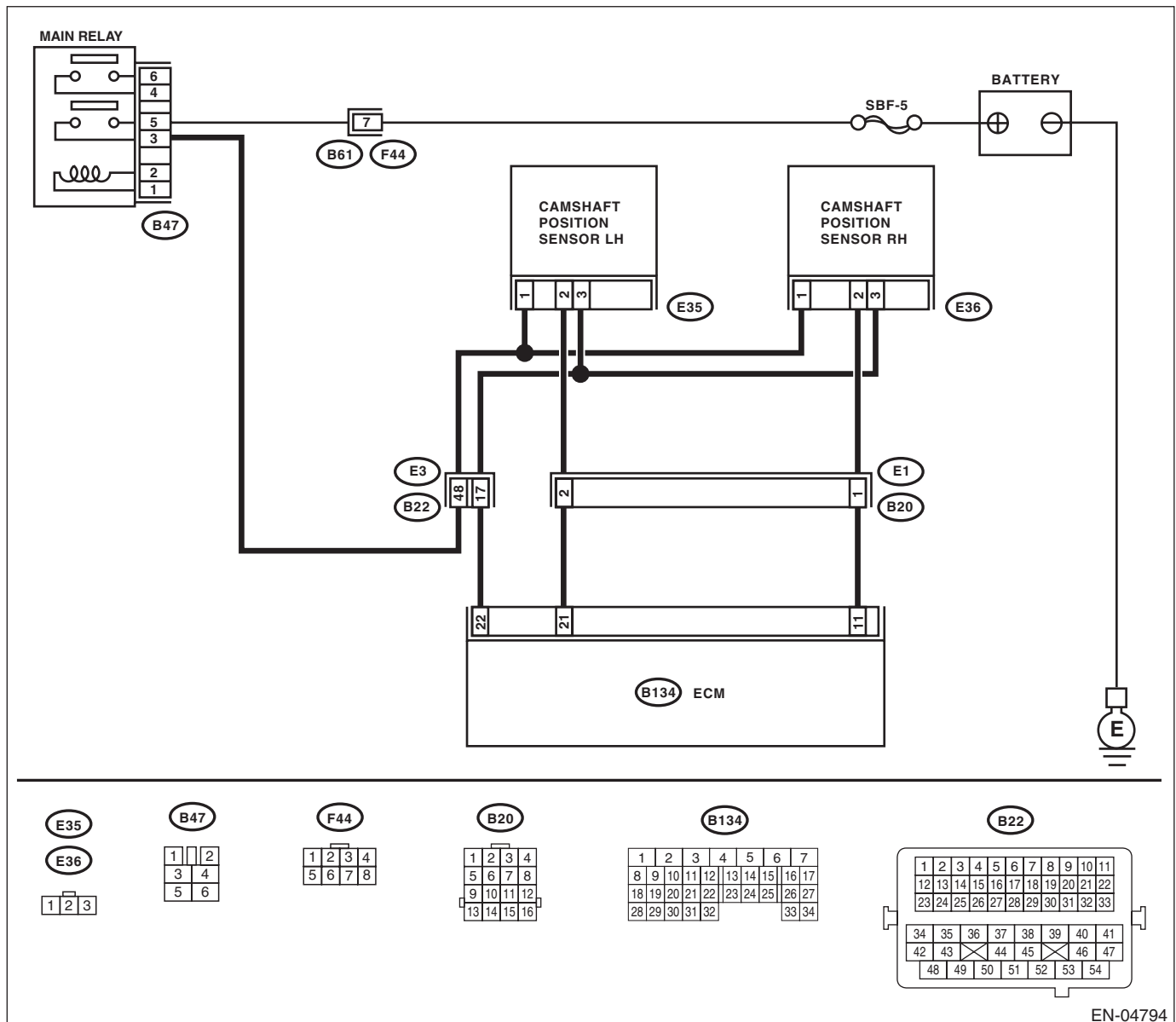
TROUBLE SYMPTOM:

- Engine stalls.
- Failure of engine to start

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from camshaft position sensor. 3) Measure the voltage between camshaft position sensor and engine ground. Connector & terminal (E35) No. 1 (+) — Engine ground (-):	Is the voltage 10 V or more?	Repair the short circuit to power supply between the main relay connector and camshaft position sensor connector.	Go to step 2.
2	CHECK POWER SUPPLY OF CAMSHAFT POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between camshaft position sensor and engine ground. Connector & terminal (E35) No. 1 (+) — Engine ground (-):	Is the voltage 10 V or more?	Go to step 3.	Repair the open or ground short circuit between main relay connector and camshaft position sensor connector.
3	CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM. 3) Measure the resistance between camshaft position sensor and ECM. Connector & terminal (E35) No. 2 — (B134) No. 21: (E35) No. 3 — (B134) No. 22:	Is the resistance less than 1 Ω?	Go to step 4.	Repair the open circuit between camshaft position sensor and ECM.
4	CHECK HARNESS BETWEEN CAMSHAFT POSITION SENSOR AND ECM. Measure the resistance between camshaft position sensor and engine ground. Connector & terminal (E35) No. 2 — Engine ground: (E35) No. 3 — Engine ground:	Is the resistance 1 MΩ or more?	Go to step 5.	Repair the ground short between the camshaft position sensor and ECM.
5	CHECK CONDITION OF CAMSHAFT POSITION SENSOR.	Is the camshaft position sensor installation bolt tightened securely?	Go to step 6.	Tighten the camshaft position sensor installation bolt securely.
6	CHECK CAMSHAFT POSITION SENSOR. Check the waveform of the camshaft position sensor. <Ref. to EN(H4DOTC)(diag)-18, Engine Control Module (ECM) I/O Signal.>	Is there any abnormality in waveform?	Replace the camshaft position sensor. <Ref. to FU(H4DOTC)-28, Camshaft Position Sensor.>	Go to step 7.
7	CHECK POOR CONTACT. Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BC:DTC P0410 SECONDARY AIR INJECTION SYSTEM

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-116, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

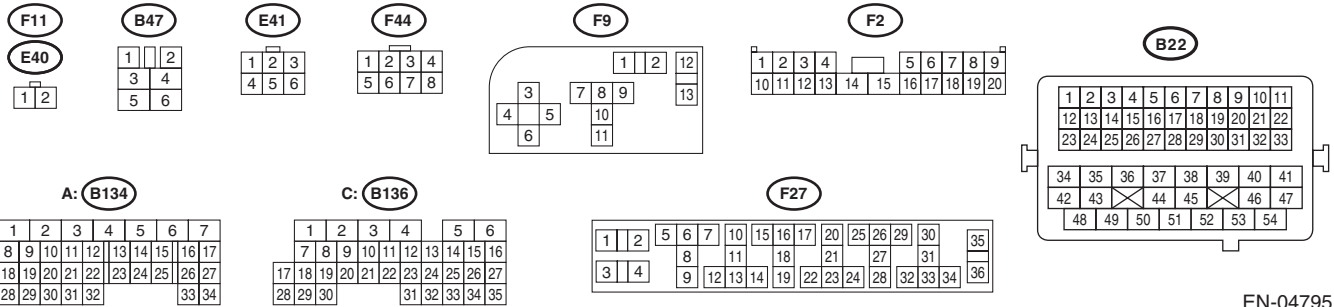
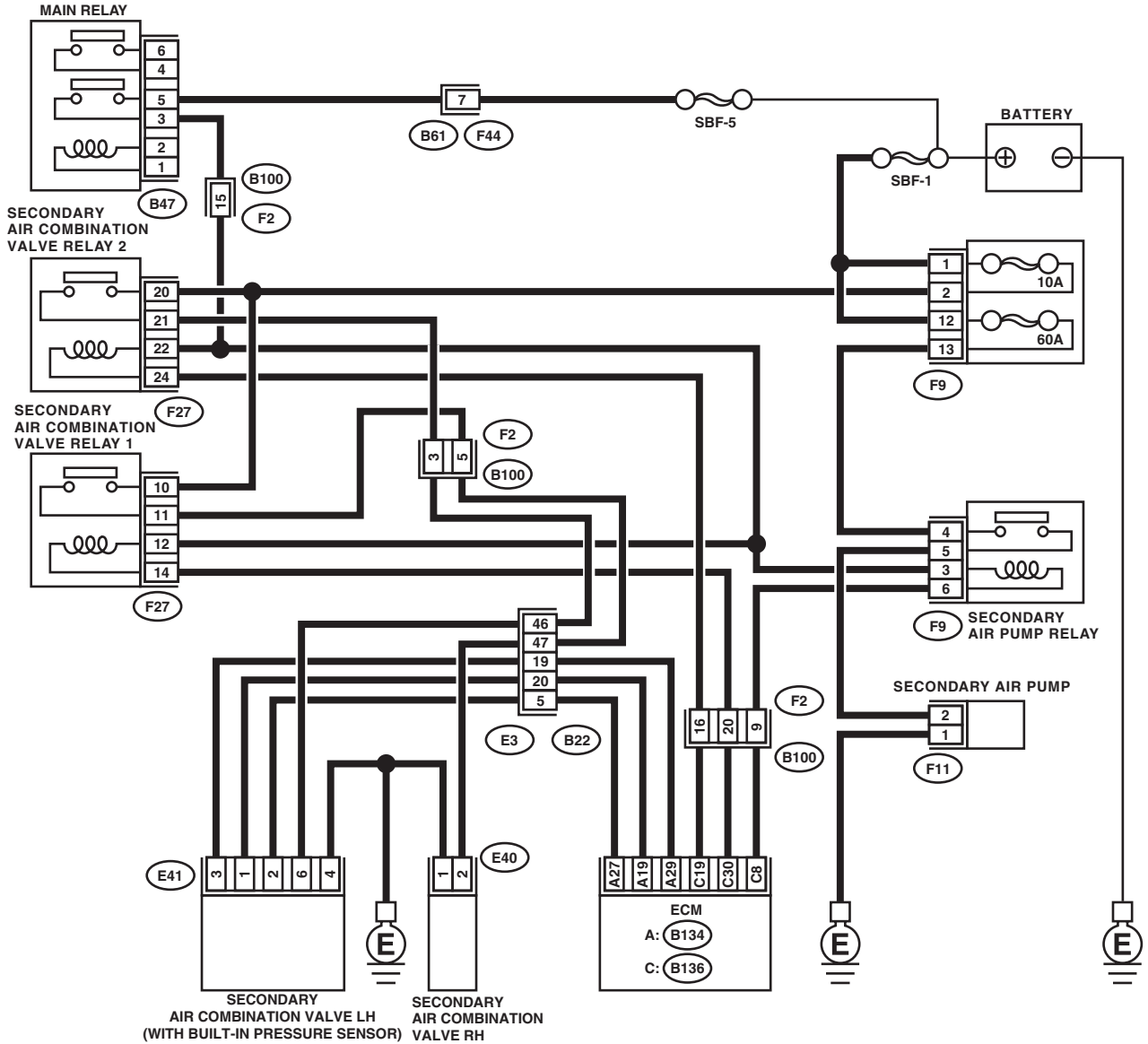
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04795

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SECONDARY AIR PUMP OPERATION. 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Perform operation check for the secondary air pump using the Subaru Select Monitor. NOTE: Refer to "Compulsory Valve Operation Check Mode" for more operation procedure. <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.>	Does the secondary air pump operate?	Go to step 2.	Go to step 3.
2 CHECK DUCT BETWEEN SECONDARY AIR PUMP AND COMBINATION VALVE. Inspection of the duct between the secondary air pump and combination valve.	Is there damage or disconnection of the duct?	Replace or connect the duct.	Temporary poor contact occurs. Check the poor contact of connector.
3 CHECK POWER SUPPLY TO SECONDARY AIR PUMP. In the condition of step 1, measure the voltage between the secondary air pump and the chassis ground. <i>Connector & terminal</i> <i>(F11) No. 2 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Replace the secondary air pump.	Go to step 4.
4 CHECK HARNESS BETWEEN SECONDARY AIR PUMP RELAY AND SECONDARY AIR PUMP CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the secondary air pump relay and secondary air pump. 3) Measure resistance between the secondary air pump relay and secondary air pump connector terminal. <i>Connector & terminal</i> <i>(F9) No. 5 — (F11) No. 2 :</i>	Is the resistance less than 1 Ω ?	Go to step 5.	Repair the open circuit between secondary air pump relay and secondary air pump connector terminal.
5 CHECK SECONDARY AIR PUMP RELAY. 1) Turn the ignition switch to OFF. 2) Remove the secondary air pump relay from the relay box. 3) Connect the battery to the secondary air pump relay terminals No. 3 and No. 6. 4) Measure the resistance between secondary air pump relay terminals. <i>Terminals</i> <i>No. 4 — No. 5</i>	Is the resistance less than 1 Ω ?	Go to step 6.	Replace the secondary air pump relay.
6 CHECK SECONDARY AIR PUMP RELAY POWER SOURCE. 1) Turn the ignition switch to ON. 2) Measure the voltage between the secondary air pump relay connector and chassis ground. <i>Connector & terminal</i> <i>(F9) No. 3 (+) — Chassis ground (-):</i> <i>(F9) No. 4 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Go to step 7.	Repair the open or ground short circuit of power supply circuit.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>7</p> <p>CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector of ECM. 3) Measure the resistance of the harness between the ECM and secondary air pump relay connector terminal.</p> <p>Connector & terminal (B136) No. 8 — (F9) No. 6:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).></p>	<p>Repair open circuit of the harness between the ECM and secondary air pump relay connector terminal.</p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BD:DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-125, DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

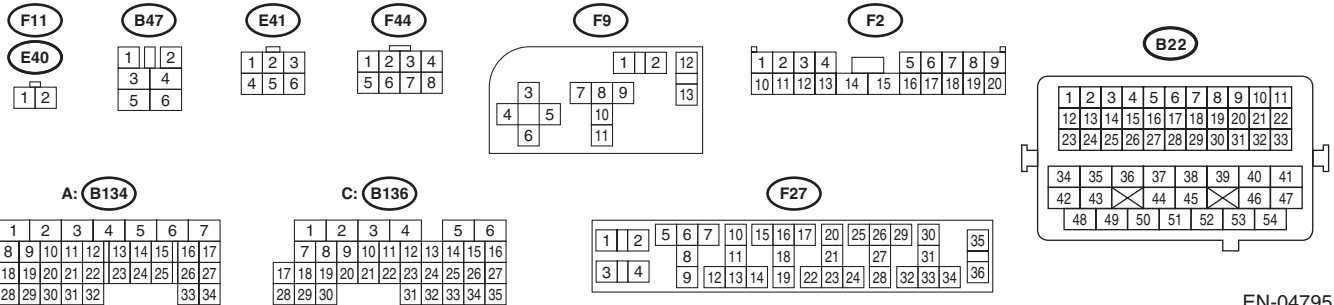
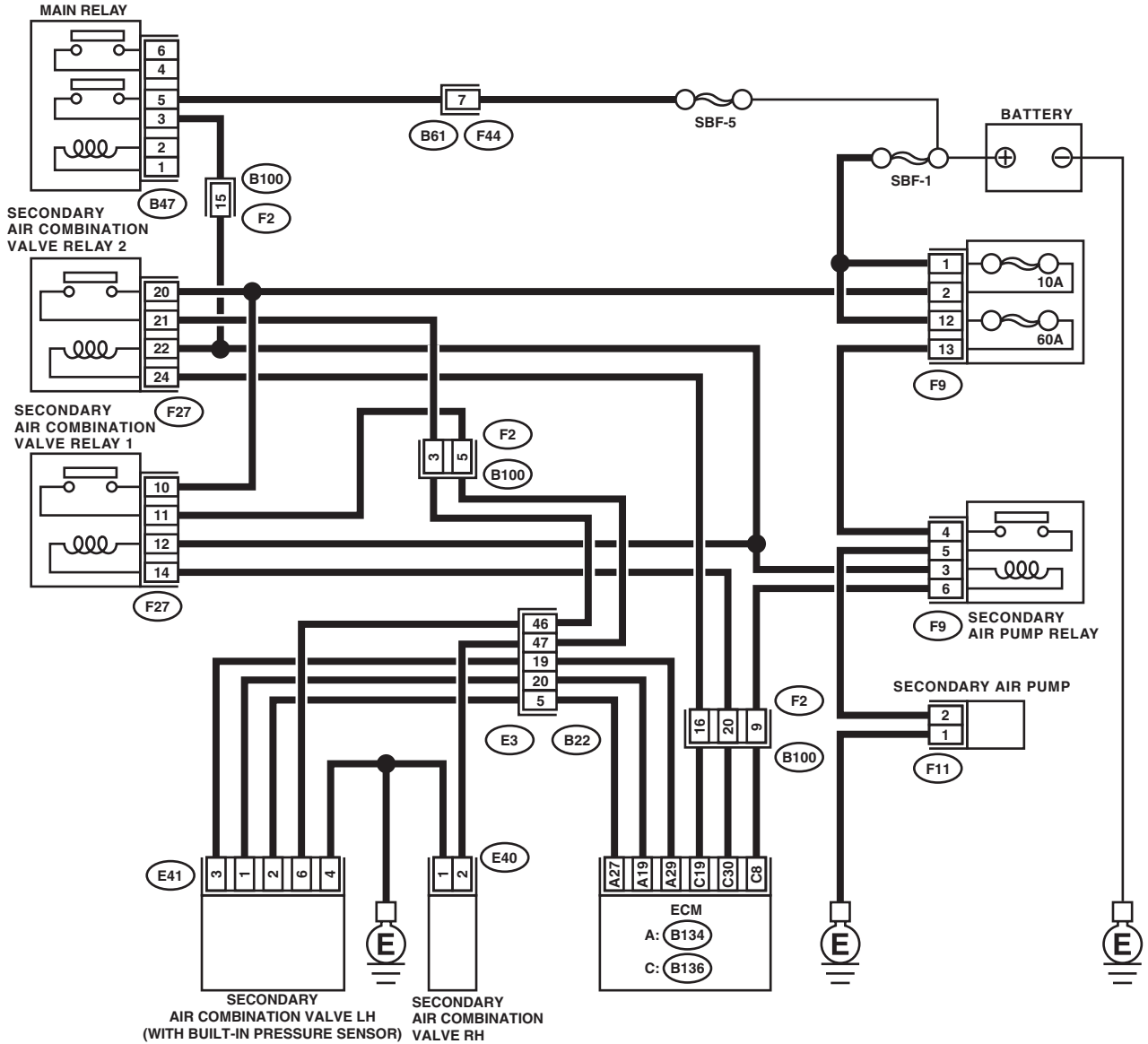
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04795

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK SECONDARY AIR COMBINATION VALVE. Inspection of the pipe between the secondary air combination valve and cylinder head.	Is there damage or disconnection of the pipe?	Replace the pipe between the secondary air combination valve and cylinder head.	Go to step 2.
2	CHECK SECONDARY AIR COMBINATION VALVE. Race the engine at 2000 RPM and check whether an exhaust leak can be heard.	Is there an exhaust leaking sound?	Replace the pipe between the secondary air combination valve and cylinder head.	Repair the poor contact in ECM connector.

BE:DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT OPEN

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-126, DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

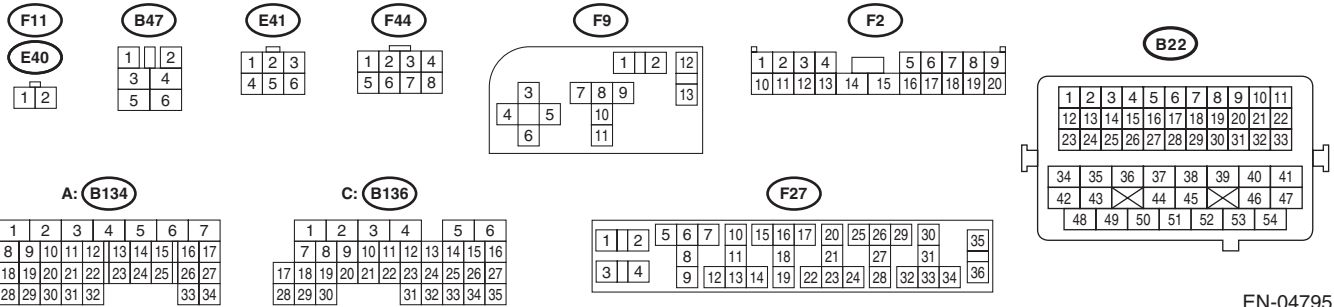
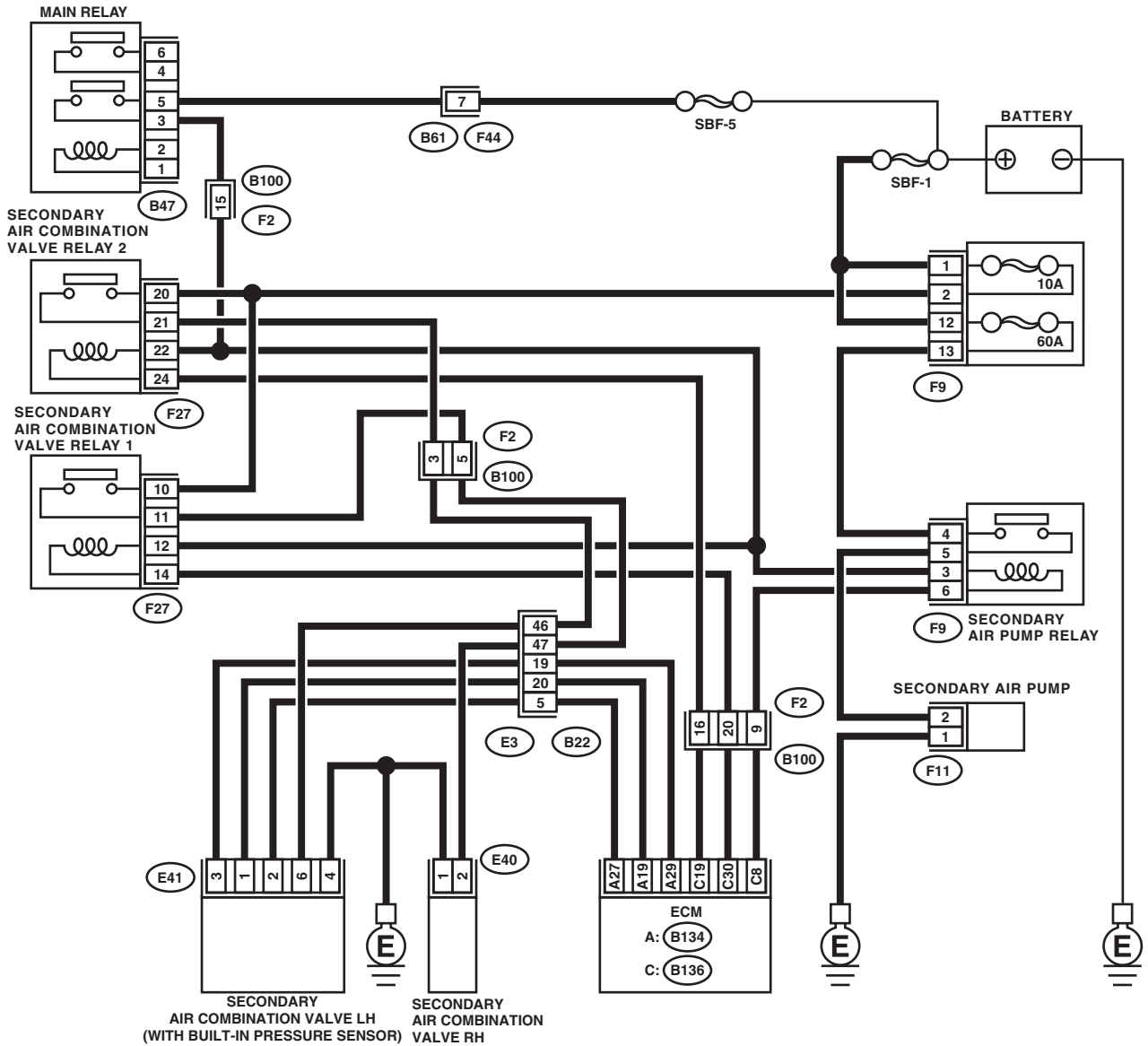
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04795

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 1. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and secondary air combination valve relay 1. 3) Measure the resistance of the harness between the ECM and secondary air combination valve relay 1 terminal. Connector & terminal (B136) No. 30 — (F27) No. 14:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair open circuit of the harness between the ECM and secondary air combination valve relay 1 terminal.
2	CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 1. Measure the resistance of harness between ECM and chassis ground. Connector & terminal (B136) No. 30 — Chassis ground:	Is the resistance 1 M Ω or more?	Temporary poor contact occurs. Check the poor contact of connector.	Repair open circuit of the harness between the ECM and secondary air combination valve relay 1 terminal.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BF:DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT SHORTED

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-127, DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

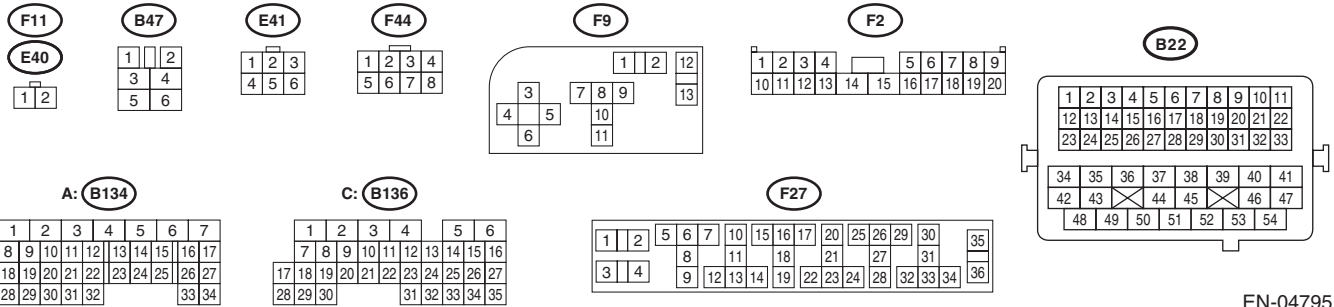
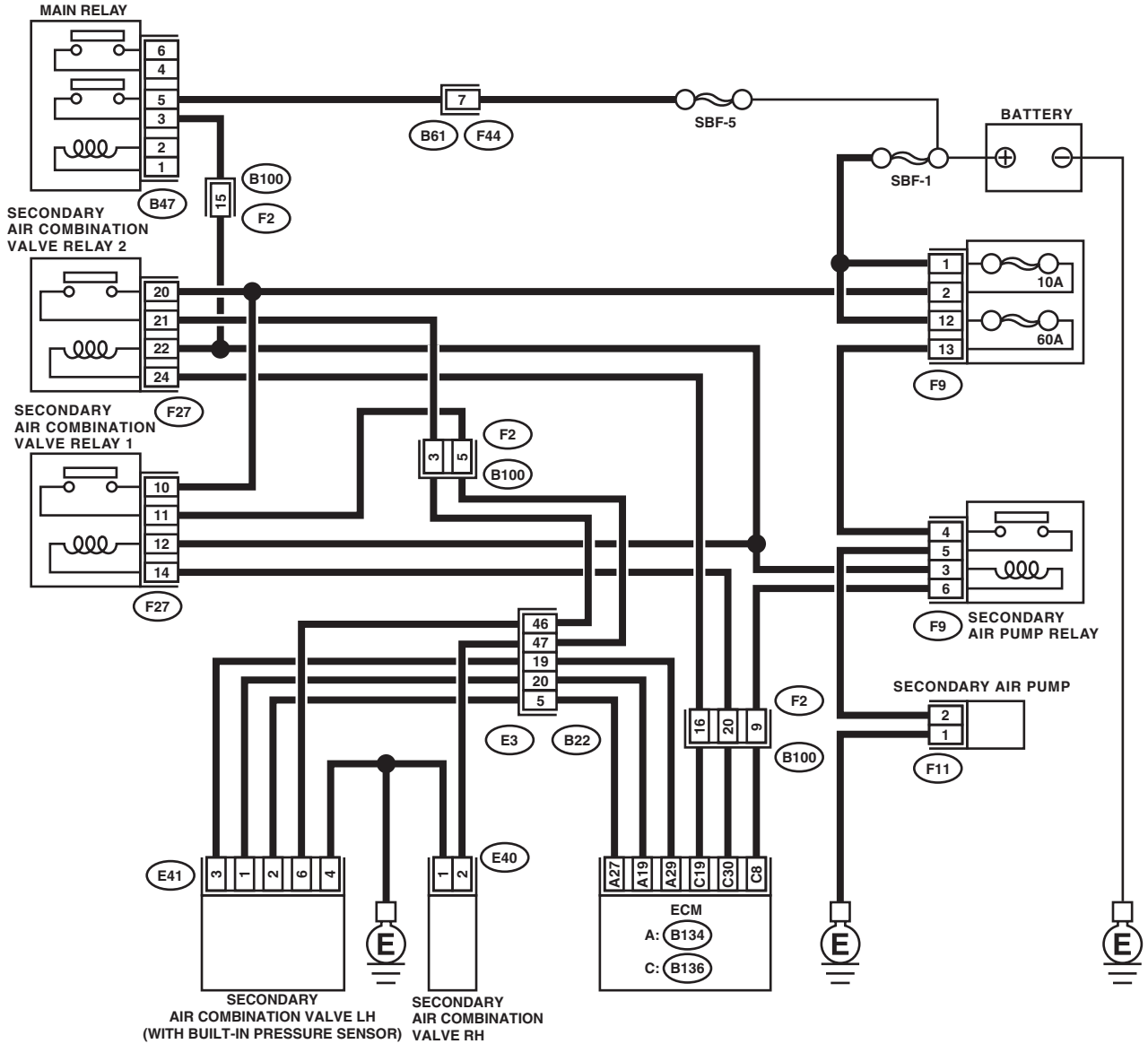
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04795

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 1.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and secondary air combination valve relay 1. 3) Measure the resistance of the harness between the ECM and secondary air combination valve relay 1 terminal.</p> <p>Connector & terminal (B136) No. 30 — (F27) No. 14:</p>	Is the resistance less than 1 Ω?	Go to step 2.	Repair open circuit of the harness between the ECM and secondary air combination valve relay 1 terminal.
2	<p>CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 1.</p> <p>Measure the voltage between ECM and chassis ground.</p> <p>Connector & terminal (B136) No. 30 (+) — Chassis ground (-):</p>	Is the voltage 10 V or more?	Repair the short circuit to the power supply in the harness between the ECM and secondary air combination valve relay 1 terminal.	Temporary poor contact occurs. Check the poor contact of connector.

BG:DTC P0416 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT OPEN

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-128, DTC P0416 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

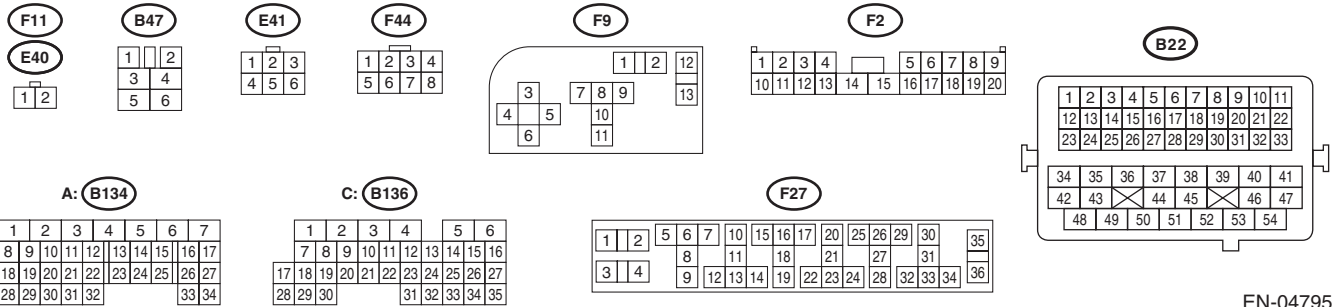
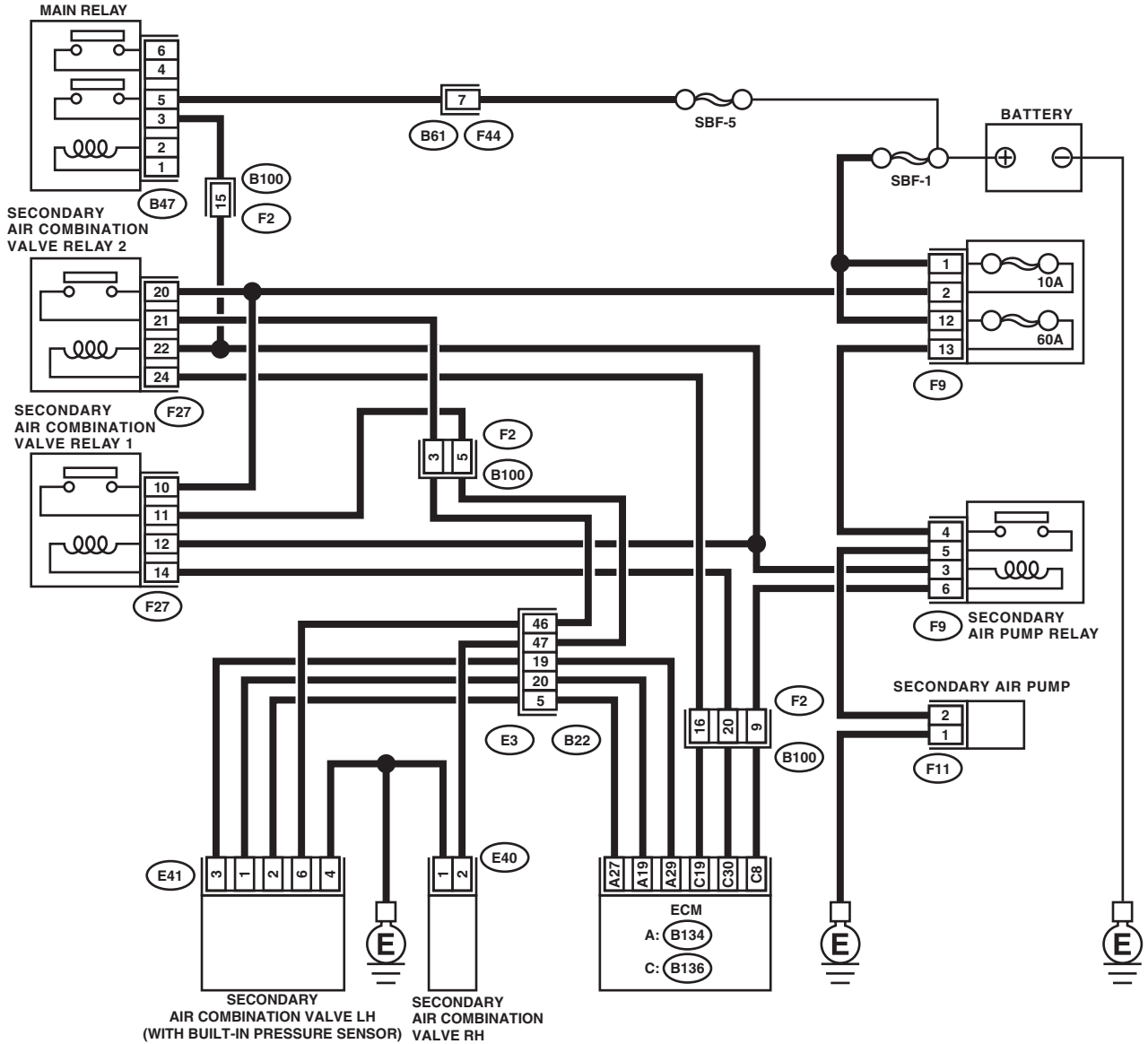
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04795

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 2. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and secondary air combination valve relay 2. 3) Measure the resistance of the harness between the ECM and secondary air combination valve relay 2 terminal. Connector & terminal (B136) No. 19 — (F27) No. 24:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair open circuit of the harness between the ECM and secondary air combination valve relay 2 terminal.
2	CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 2. Measure the resistance of harness between ECM and chassis ground. Connector & terminal (B136) No. 19 — Chassis ground:	Is the resistance 1 M Ω or more?	Temporary poor contact occurs. Check the poor contact of connector.	Repair open circuit of the harness between the ECM and secondary air combination valve relay 2 terminal.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BH:DTC P0417 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT SHORTED

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-128, DTC P0417 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

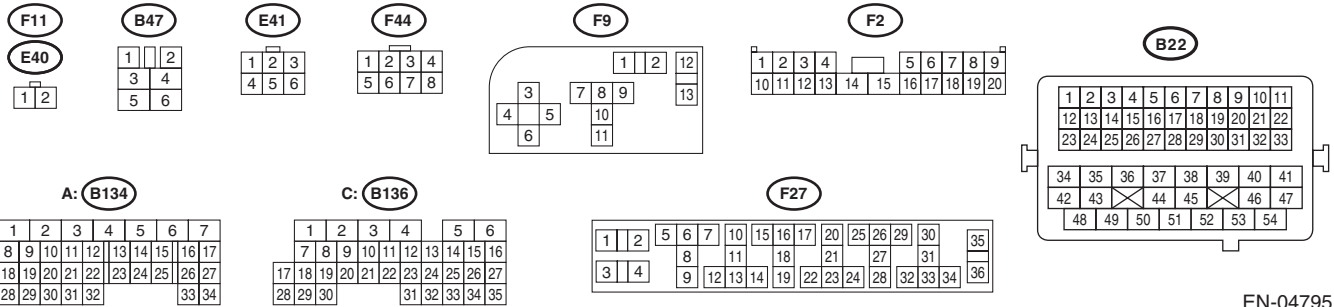
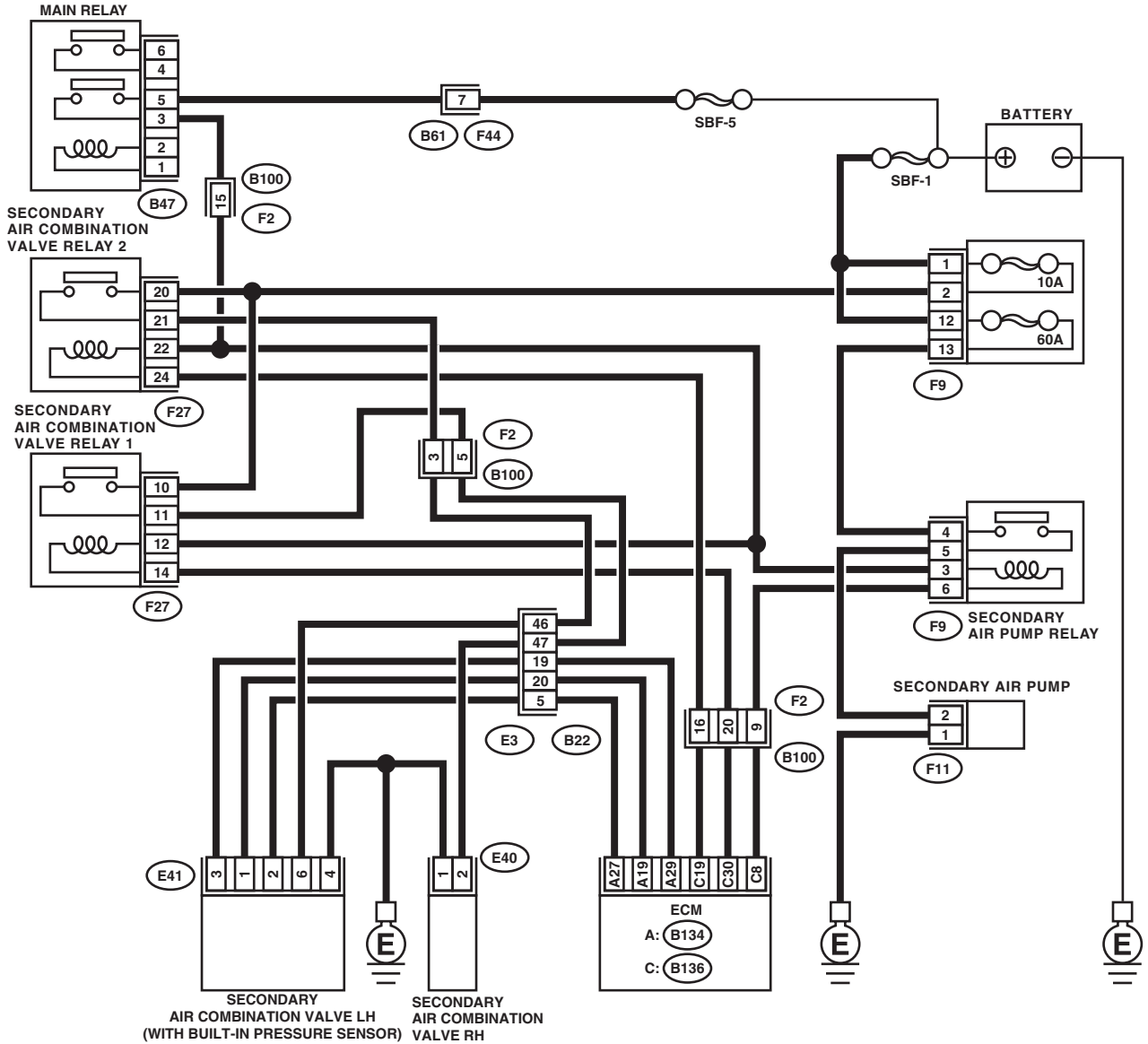
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04795

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 2. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and secondary air combination valve relay 2. 3) Measure the resistance of the harness between the ECM and secondary air combination valve relay 2 terminal. Connector & terminal (B136) No. 19 — (F27) No. 24:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair open circuit of the harness between the ECM and secondary air combination valve relay 2 terminal.
2	CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY 2. Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 19 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the short circuit to the power supply in the harness between the ECM and secondary air combination valve relay 2 terminal.	Temporary poor contact occurs. Check the poor contact of connector.

BI: DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT OPEN

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-129, DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

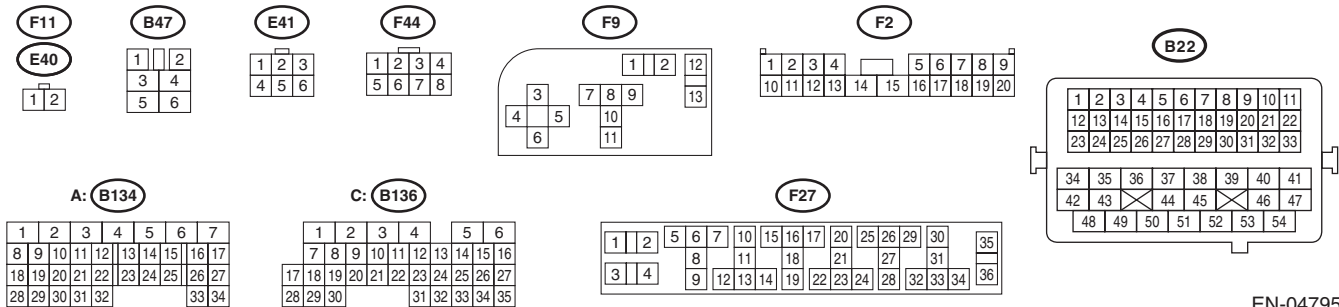
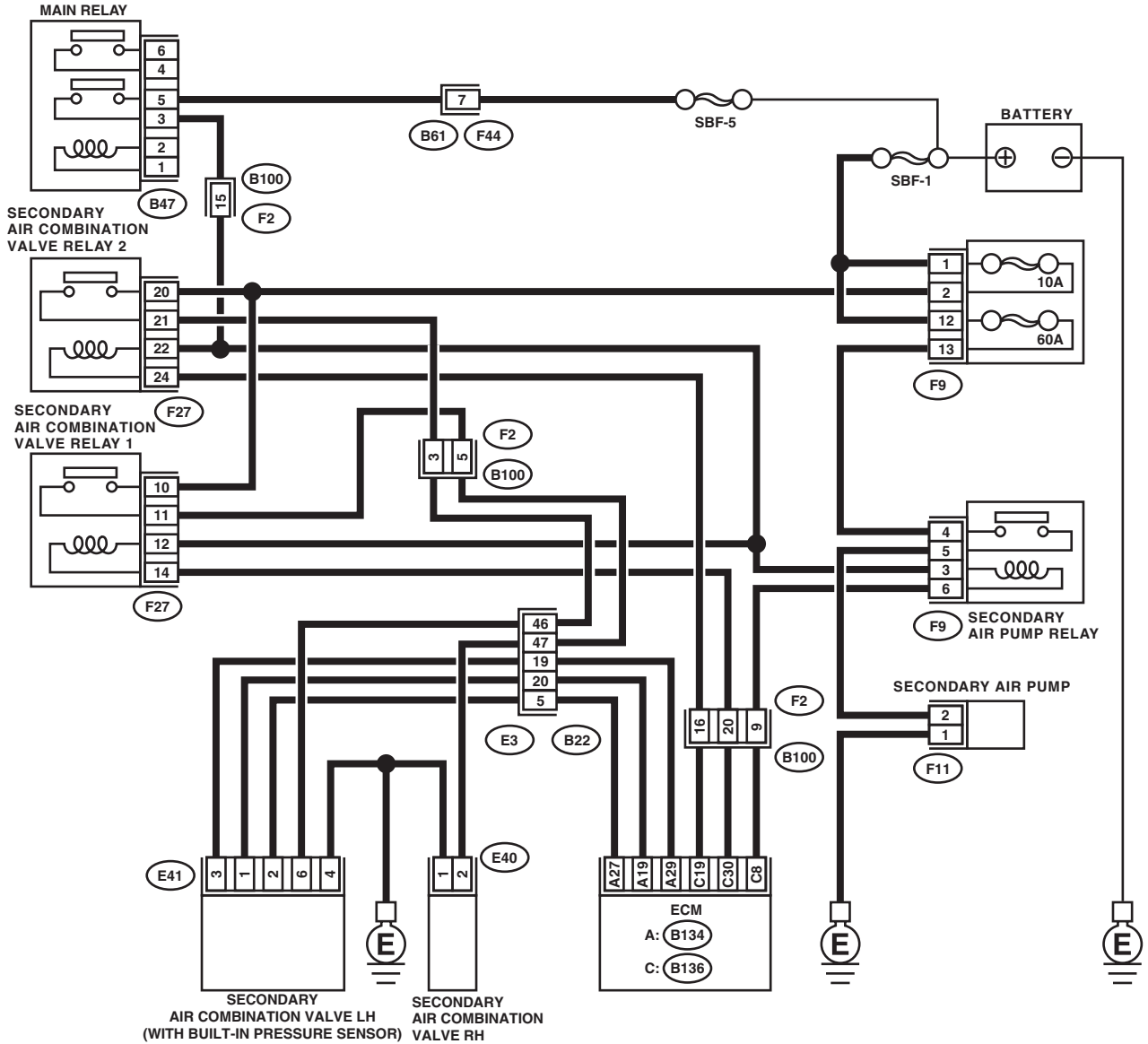
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04795

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and secondary air pump relay. 3) Measure the resistance of the harness between the ECM and secondary air pump relay terminal. Connector & terminal (B136) No. 8 — (F9) No. 6:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair open circuit of the harness between the ECM and secondary air pump relay terminal.
2	CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY. Measure the resistance of harness between ECM and chassis ground. Connector & terminal (B136) No. 8 — Chassis ground:	Is the resistance 1 M Ω or more?	Temporary poor contact occurs. Check the poor contact of connector.	Repair ground short of the harness between the ECM and secondary air pump relay terminal.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BJ: DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-130, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

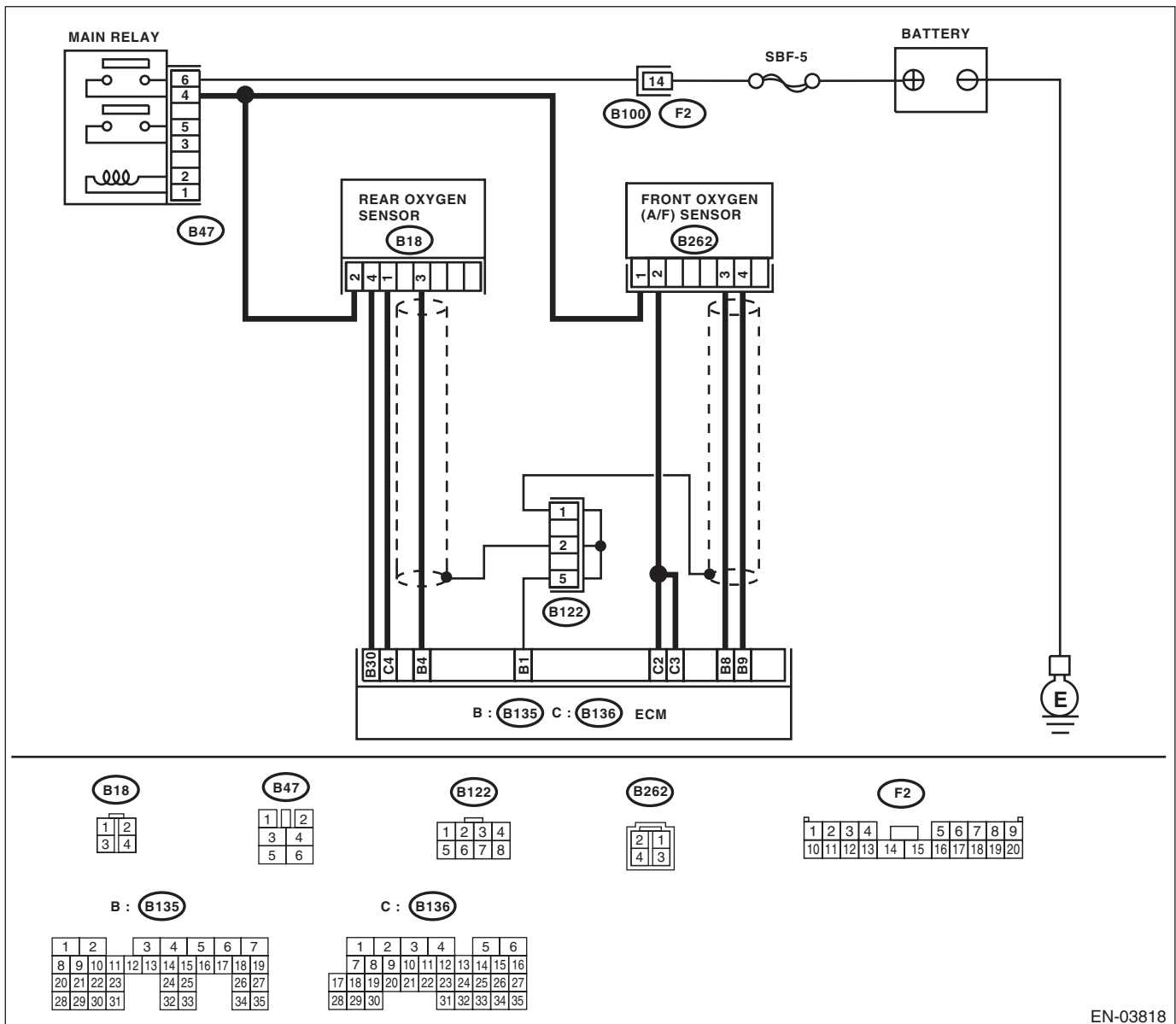
TROUBLE SYMPTOM:

- Engine stalls.
- Idle mixture is out of specifications.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03818

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK EXHAUST SYSTEM. Check for gas leaks or air suction caused by loose or dislocated nuts and bolts, and open hole at exhaust pipes.</p> <p>NOTE: Check the following positions.</p> <ul style="list-style-type: none"> • Between cylinder head and front exhaust pipe • Between front exhaust pipe and front catalytic converter • Between front catalytic converter and rear catalytic converter • Looseness and improper attachment of parts between front oxygen (A/F) sensor and rear oxygen sensor 	Is there any fault in exhaust system?	Repair or replace the exhaust system. <Ref. to EX(H4DOTC)-2, General Description.>	Go to step 2.
2	<p>CHECK WAVEFORM DATA ON SUBARU SELECT MONITOR (WHILE DRIVING).</p> <p>1) Drive the vehicle at a constant speed of 80 — 112 km/h (50 — 70 MPH).</p> <p>2) Keep the condition of step 1) for 5 minutes, then read the waveform data in a driving condition using Subaru Select Monitor.</p> <div> </div> <p style="text-align: right;">EN-04895</p>	Is normal waveform pattern displayed?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. Reproduce the failure, and then perform the diagnosis again. NOTE: In this case, temporary poor contact of connector may be the cause.	Go to step 3.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>3</p> <p>CHECK WAVEFORM DATA ON SUBARU SELECT MONITOR (WHILE IDLING).</p> <p>1) Idle the engine.</p> <p>2) Under the condition of step 1), read the waveform data using Subaru Select Monitor.</p> <div> <p>RrO2 SENSOR</p> <p>TIME[ms] 0 10 20 30 40</p> </div> <div> <p>RrO2 SENSOR</p> <p>TIME[ms] 0 10 20 30 40</p> </div> <p style="text-align: right;">EN-04896</p>	<p>Is normal waveform pattern displayed?</p>	<p>Go to step 4.</p>	<p>Go to step 5.</p>
<p>4</p> <p>CHECK CATALYTIC CONVERTER.</p>	<p>Is the catalytic converter damaged?</p>	<p>Replace the catalytic converter. <Ref. to EC (H4DOTC)-5, Front Catalytic Converter.></p>	<p>Go to step 5.</p>
<p>5</p> <p>CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.</p>	<p>Does water enter the connector?</p>	<p>Dry the water thoroughly.</p>	<p>Go to step 6.</p>
<p>6</p> <p>CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from ECM and rear oxygen sensor.</p> <p>3) Measure the resistance of harness between ECM and rear oxygen sensor connector.</p> <p>Connector & terminal (B135) No. 4 — (B18) No. 3: (B135) No. 30 — (B18) No. 4:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 7.</p>	<p>Repair the open circuit of harness between ECM and rear oxygen sensor connector.</p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>7</p> <p>CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between rear oxygen sensor connector and chassis ground.</p> <p>Connector & terminal (B18) No. 3 (+) — Chassis ground (-):</p>	<p>Is the voltage 0.2 — 0.5 V?</p>	<p>Go to step 8.</p>	<p>Repair the harness and connector.</p> <p>NOTE: Repair the following points.</p> <ul style="list-style-type: none"> • Open circuit in the harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor and ECM connector • Poor contact in ECM connector
<p>8</p> <p>CHECK REAR OXYGEN SENSOR SHIELD.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Bare the harness sensor shield on the body side of rear oxygen sensor connector.</p> <p>3) Measure the resistance between sensor shield and chassis ground.</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-42, Rear Oxygen Sensor.></p>	<p>Repair the open circuit in rear oxygen sensor harness.</p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BK:DTC P0441 EVAPORATIVE EMISSION SYSTEM INCORRECT PURGE FLOW

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-131, DTC P0441 EVAPORATIVE EMISSION SYSTEM INCORRECT PURGE FLOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the **Clear Memory Mode** <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and **Inspection Mode** <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK PURGE CONTROL SOLENOID VALVE 2 PURGE LINE.	Are there any clogged, crushed or bent lines in the purge control solenoid valve 2 purge line?	Repair or replace the purge control solenoid valve 2 purge line.	Go to step 3.
3 CHECK PURGE CONTROL SOLENOID VALVE 2. 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Using the Subaru Select Monitor, operate the purge control solenoid valve 2. NOTE: The purge control solenoid valve 2 can be operated using Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve 2 operate?	Repair the poor contact in ECM connector.	Replace the purge control solenoid valve 2. <Ref. to EC (H4DOTC)-8, Purge Control Solenoid Valve.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BL:DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-132, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

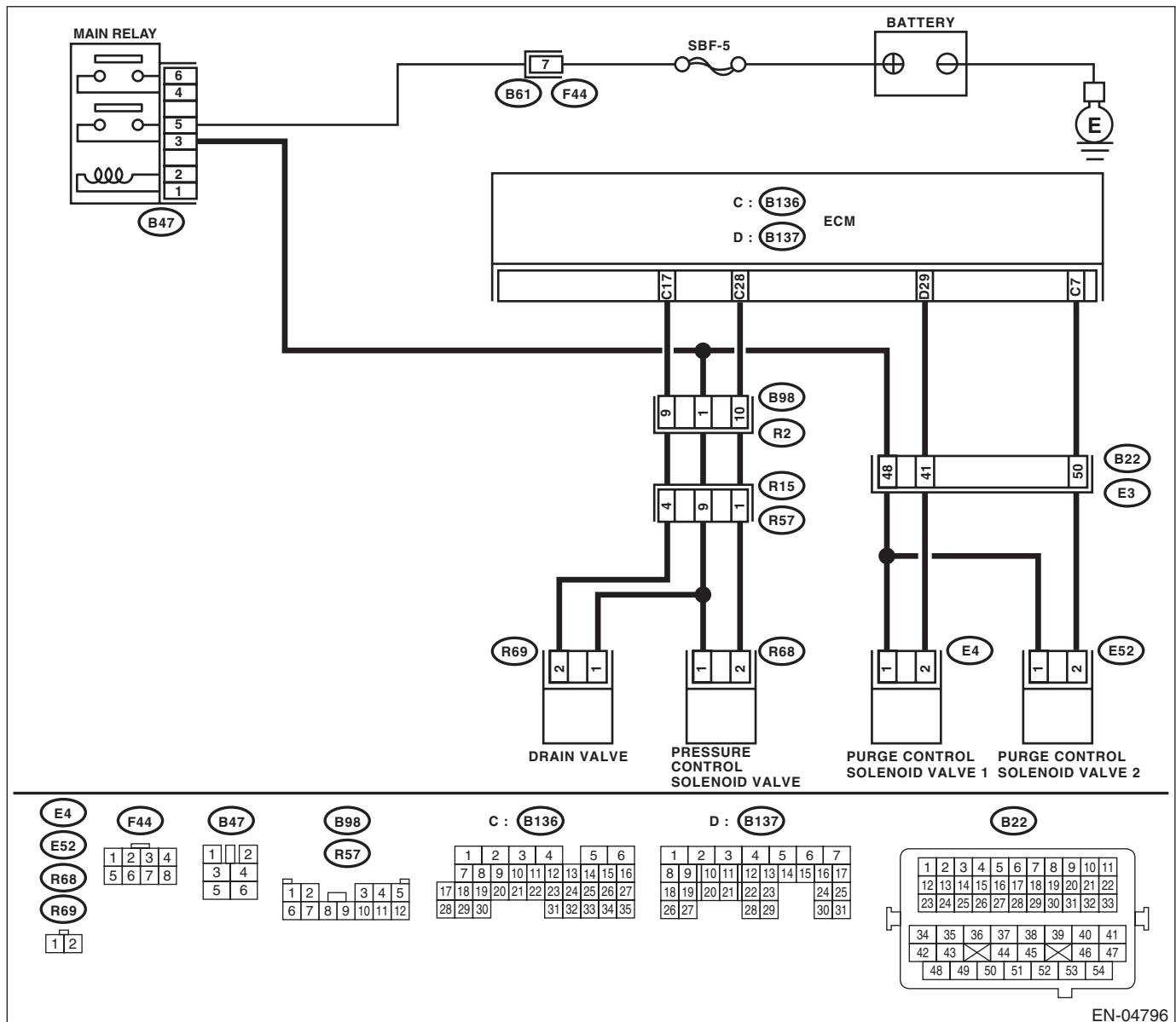
TROUBLE SYMPTOM:

- Fuel odor
- There is a hole of more than 1.0 mm (0.04 in) dia. in evaporation system or fuel tank.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04796

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No	
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK FUEL FILLER CAP. 1) Turn the ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step 3.	Tighten fuel filler cap securely.
3	CHECK FUEL FILLER CAP.	Is a genuine fuel filler cap being used?	Go to step 4.	Replace with a genuine fuel filler cap.
4	CHECK FUEL FILLER PIPE PACKING.	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4DOTC)-53, Fuel Filler Pipe.>	Go to step 5.
5	CHECK DRAIN VALVE. 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Operate the drain valve. NOTE: The drain valve can be operated using Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step 6.	Replace the drain valve. <Ref. to EC (H4DOTC)-21, Drain Valve.>
6	CHECK PURGE CONTROL SOLENOID VALVE. Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step 7.	Replace the purge control solenoid valve. <Ref. to EC (H4DOTC)-8, Purge Control Solenoid Valve.>
7	CHECK PRESSURE CONTROL SOLENOID VALVE. Operate the pressure control solenoid valve. NOTE: The pressure control solenoid valve operation can be executed using the Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step 8.	Replace the pressure control solenoid valve. <Ref. to EC (H4DOTC)-16, Pressure Control Solenoid Valve.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
8	CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE. Turn the ignition switch to OFF.	Are there any holes of more than 1.0 mm (0.04 in) dia. in the evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H4DOTC)-64, Fuel Delivery, Return and Evaporation Lines.>	Go to step 9.
9	CHECK CANISTER.	Is the canister damaged or is there a hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace the canister. <Ref. to EC (H4DOTC)-7, Canister.>	Go to step 10.
10	CHECK FUEL TANK. Remove the fuel tank. <Ref. to FU(H4DOTC)-50, Fuel Tank.>	Is the fuel tank damaged or is there any hole of more than 1.0 mm (0.04 in) dia. in it?	Repair or replace the fuel tank. <Ref. to FU(H4DOTC)-50, Fuel Tank.>	Go to step 11.
11	CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.	Is there any hole of more than 1.0 mm (0.04 in) dia., crack, clogging, or disconnections, bend, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Repair the poor contact in ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BM:DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN

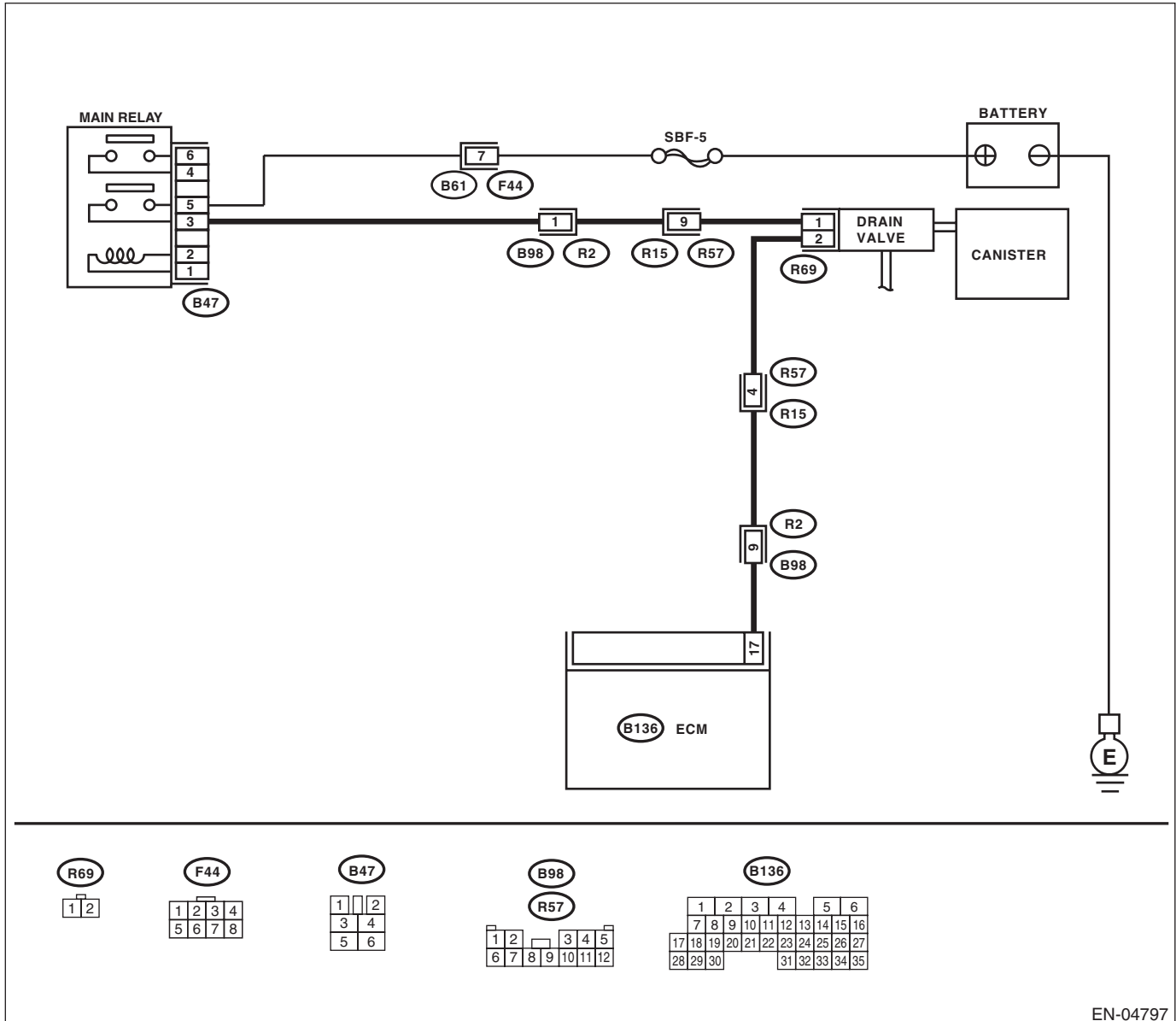
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-148, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04797

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK OUTPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 17 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 2.	Go to step 3.
2	CHECK POOR CONTACT. Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. (However, the possibility of poor contact still remains.) NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Poor contact in drain valve connector • Poor contact in ECM connector • Poor contact in coupling connector
3	CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from drain valve and ECM. 3) Measure the resistance of harness between drain valve connector and chassis ground. Connector & terminal (R69) No. 2 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 4.	Repair the ground short circuit of harness between ECM and drain valve connector.
4	CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR. Measure the resistance of harness between ECM and drain valve connector. Connector & terminal (B136) No. 17 — (R69) No. 2:	Is the resistance less than 1 Ω ?	Go to step 5.	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open circuit in harness between ECM and drain valve connector • Poor contact in coupling connector
5	CHECK DRAIN VALVE. Measure the resistance between drain valve terminals. Terminals No. 1 — No. 2:	Is the resistance between 10 — 100 Ω ?	Go to step 6.	Replace the drain valve. <Ref. to EC (H4DOTC)-21, Drain Valve.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
6	CHECK POWER SUPPLY TO DRAIN VALVE. 1) Turn the ignition switch to ON. 2) Measure the voltage between drain valve and chassis ground. Connector & terminal (R69) No. 1 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the poor contact of drain valve connector.	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none">• Open circuit in harness between main relay and drain valve• Poor contact in coupling connector• Poor contact in main relay connector

BN:DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED

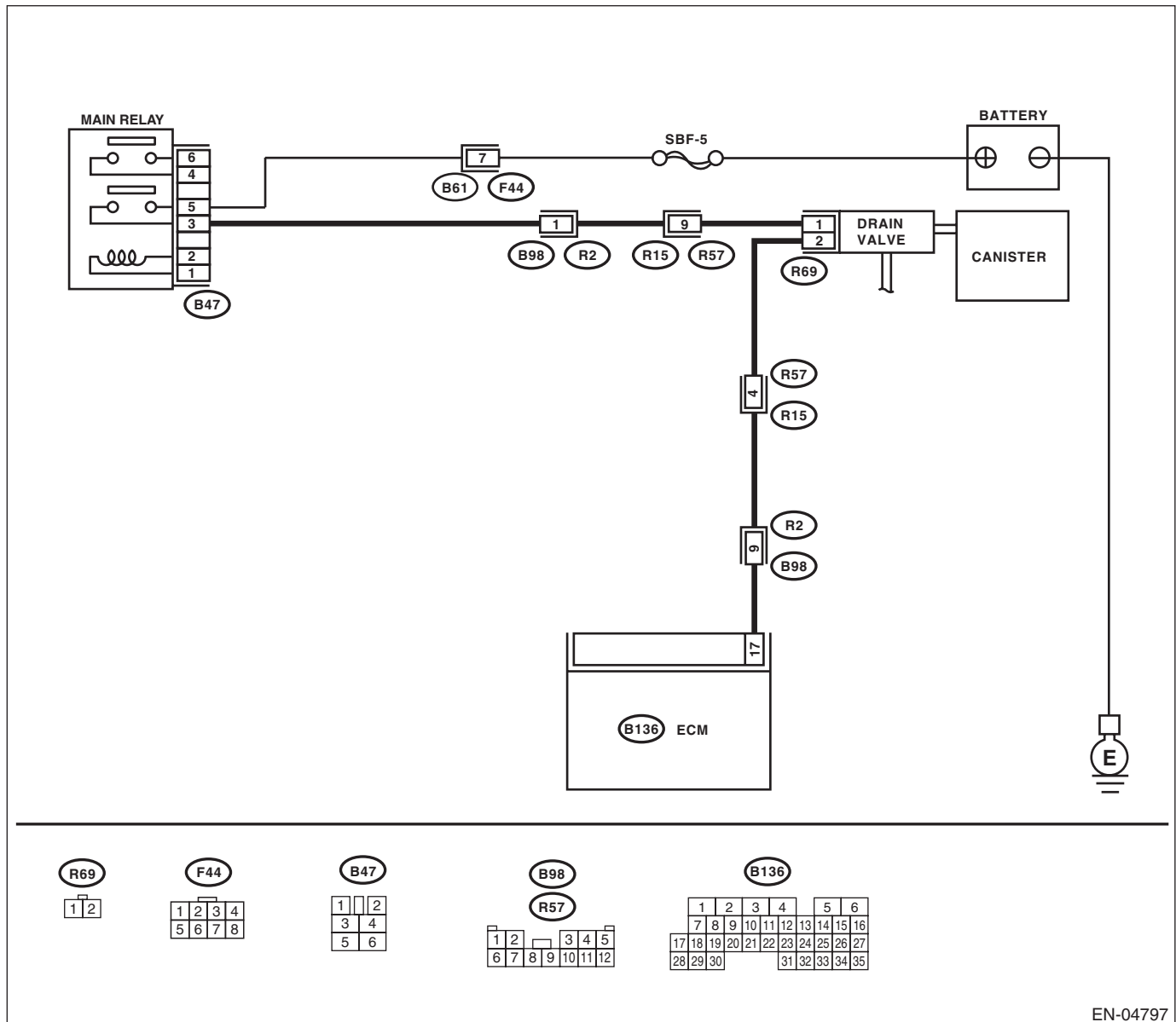
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-150, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04797

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT SIGNAL OF ECM. 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground while operating the drain valve. NOTE: Drain valve operation can be executed using Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.> Connector & terminal (B136) No. 17 (+) — Chassis ground (-):	Is the voltage 0 — 10 V?	Go to step 2.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector.
2 CHECK INPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 17 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 4.	Go to step 3.
3 CHECK POOR CONTACT. Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>
4 CHECK HARNESS BETWEEN DRAIN VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the drain valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 17 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the short circuit to the power supply in the harness between the ECM and drain valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	Go to step 5.
5 CHECK DRAIN VALVE. 1) Turn the ignition switch to OFF. 2) Measure the resistance between drain valve terminals. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω?	Replace the drain valve <Ref. to EC (H4DOTC)-21, Drain Valve.> and ECM <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>.	Go to step 6.
6 CHECK POOR CONTACT. Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>

BO:DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR

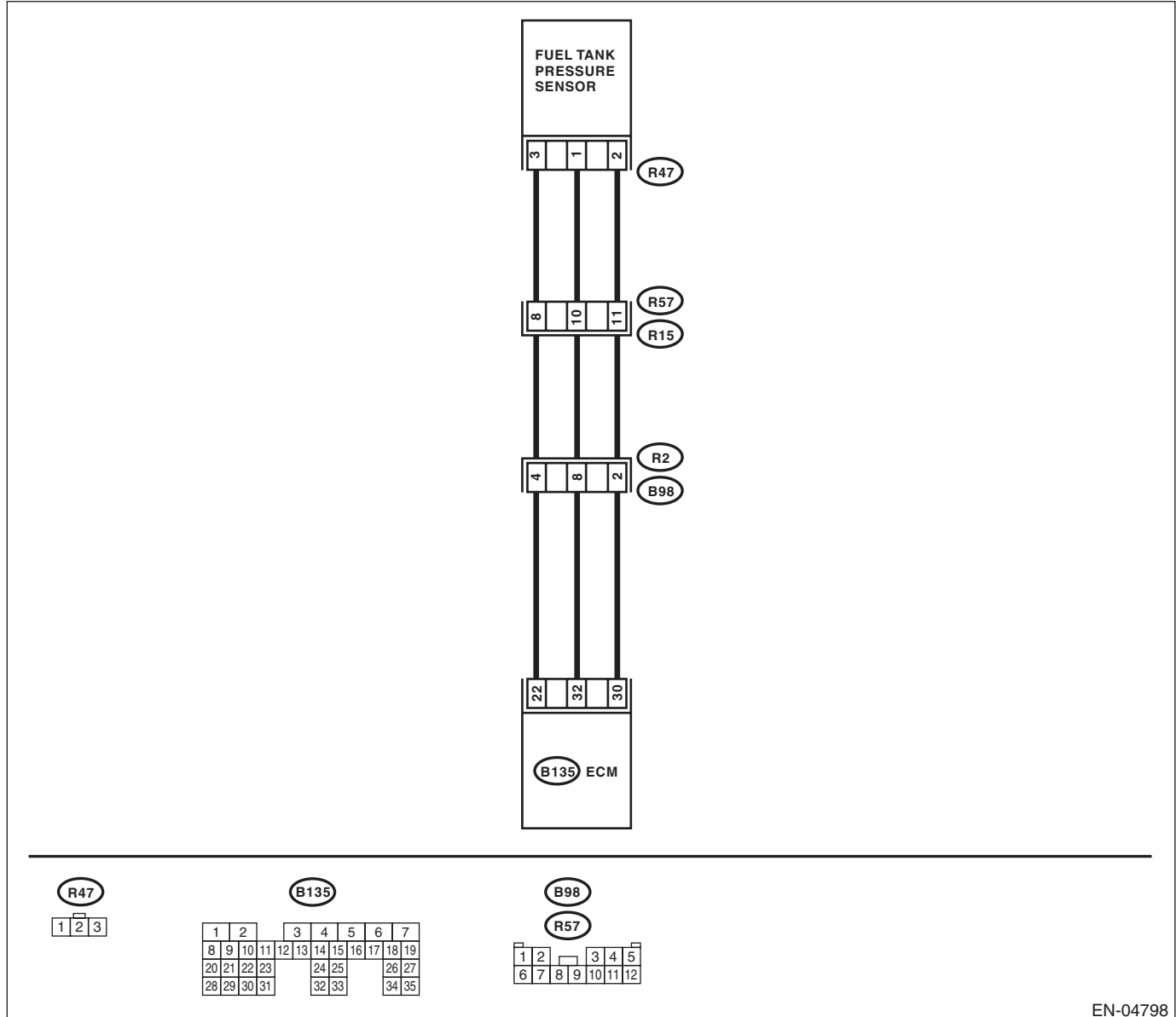
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-152, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04798

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK FUEL FILLER CAP. 1) Turn the ignition switch to OFF. 2) Open the fuel flap.	Is the fuel filler cap tightened securely?	Go to step 3.	Tighten fuel filler cap securely.
3	CHECK PRESSURE VACUUM LINE. NOTE: Check the following items. <ul style="list-style-type: none">• Disconnection, leakage and clogging of the vacuum hoses and pipes between fuel tank pressure sensor and fuel tank• Disconnection, leakage and clogging of the air ventilation hoses and pipes between the fuel filler pipe and fuel tank	Is there a fault in the pressure vacuum line?	Repair or replace the hoses and pipes.	Replace the fuel tank pressure sensor. <Ref. to EC (H4DOTC)-15, Fuel Tank Pressure Sensor.>

BP:DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT

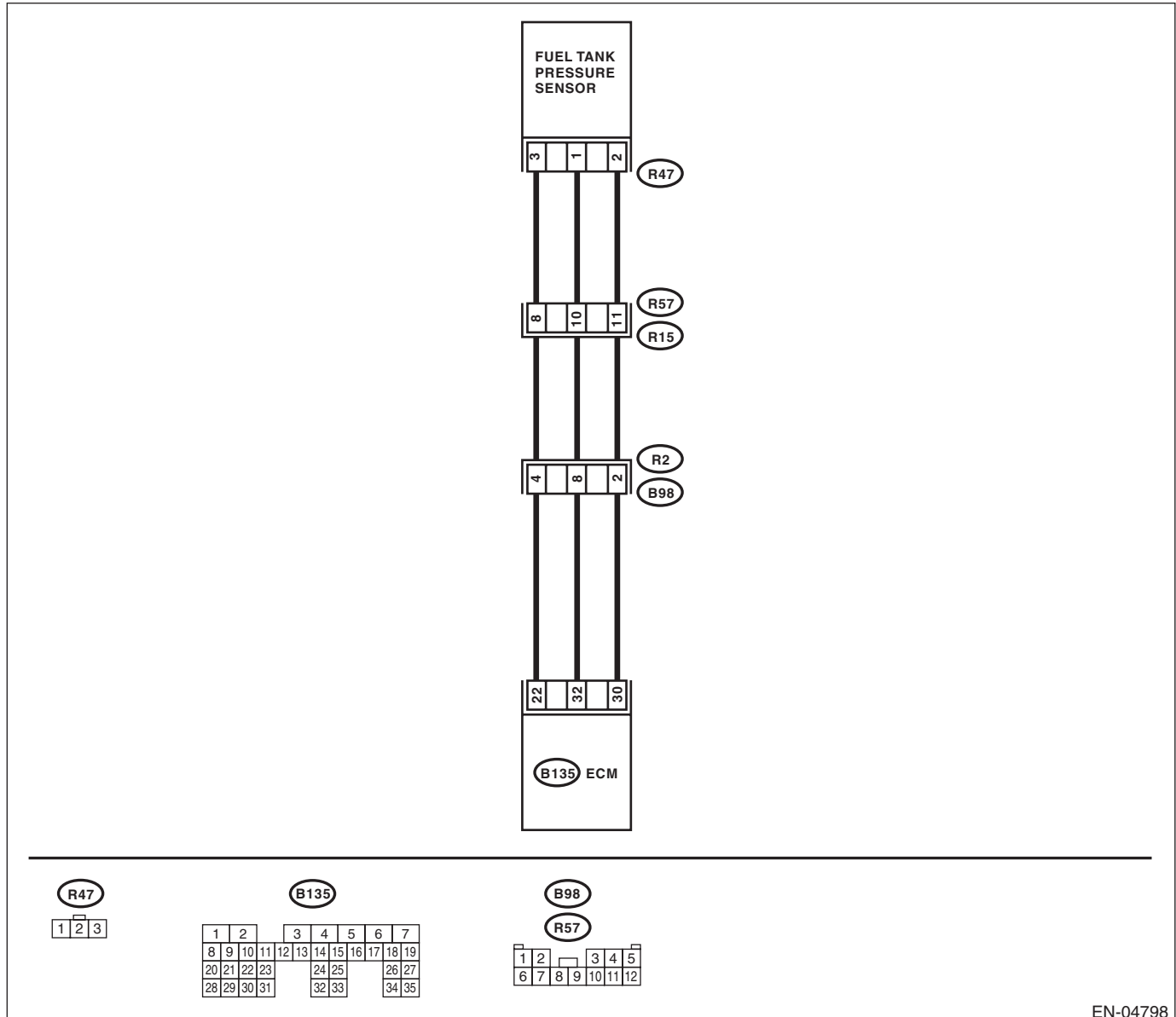
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-154, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04798

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK CURRENT DATA.</p> <ol style="list-style-type: none"> 1) Turn the ignition switch to OFF. 2) Remove the fuel filler cap. 3) Install the fuel filler cap. 4) Turn the ignition switch to ON. 5) Read the data of the fuel tank pressure sensor signal using Subaru Select Monitor or general scan tool. <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • General scan tool <p>For detailed operation procedure, refer to the general scan tool operation manual.</p>	Is the measured value less than -2.8 kPa (-21.0 mmHg, -0.827 inHg)?	Go to step 2.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.
2	<p>CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.</p> <p>Measure the voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B135) No. 22 (+) — Chassis ground (-):</p>	Is the voltage 4.5 V or more?	Go to step 3.	Repair the poor contact in ECM connector.
3	<p>CHECK INPUT SIGNAL OF ECM.</p> <p>Measure the voltage between ECM and chassis ground.</p> <p>Connector & terminal (B135) No. 32 (+) — Chassis ground (-):</p>	Is the voltage less than 0.2 V?	Go to step 5.	Go to step 4.
4	<p>CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR).</p> <p>Read the data of fuel tank pressure sensor signal using Subaru Select Monitor.</p> <p>NOTE:</p> <p>For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.></p>	Does the measured value change when shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Go to step 5.
5	<p>CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</p> <ol style="list-style-type: none"> 1) Turn the ignition switch to OFF. 2) Remove the rear seat cushion. 3) Separate rear wiring harness and fuel tank cord. 4) Turn the ignition switch to ON. 5) Measure the voltage between rear wiring harness connector and chassis ground. <p>Connector & terminal (R15) No. 8 (+) — Chassis ground (-):</p>	Is the voltage 4.5 V or more?	Go to step 6.	<p>Repair the harness and connector.</p> <p>NOTE:</p> <p>In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>6</p> <p>CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM and rear wiring harness connector.</p> <p>Connector & terminal (B135) No. 32 — (R15) No. 10:</p>	Is the resistance less than 1 Ω?	Go to step 7.	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector • Poor contact in joint connector
<p>7</p> <p>CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</p> <p>Measure the resistance of harness between rear wiring harness connector and chassis ground.</p> <p>Connector & terminal (R15) No. 10 — Chassis ground:</p>	Is the resistance 1 MΩ or more?	Go to step 8.	Repair the ground short circuit of harness between ECM and rear wiring harness connector.
<p>8</p> <p>CHECK FUEL TANK CORD.</p> <p>1) Disconnect the connector from fuel tank pressure sensor. 2) Measure the resistance of fuel tank cord.</p> <p>Connector & terminal (R57) No. 8 — (R47) No. 3:</p>	Is the resistance less than 1 Ω?	Go to step 9.	Repair the open circuit in fuel tank cord.
<p>9</p> <p>CHECK FUEL TANK CORD.</p> <p>Measure the resistance of fuel tank cord.</p> <p>Connector & terminal (R57) No. 10 — (R47) No. 1:</p>	Is the resistance less than 1 Ω?	Go to step 10.	Repair the open circuit in fuel tank cord.
<p>10</p> <p>CHECK FUEL TANK CORD.</p> <p>Measure the resistance of harness between fuel tank pressure sensor connector and engine ground.</p> <p>Connector & terminal (R47) No. 1 — Chassis ground:</p>	Is the resistance 1 MΩ or more?	Go to step 11.	Repair the ground short circuit of fuel tank cord.
<p>11</p> <p>CHECK POOR CONTACT.</p> <p>Check for poor contact in the fuel tank pressure sensor connector.</p>	Is there poor contact in fuel tank pressure sensor connector?	Repair the poor contact in fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC (H4DOTC)-15, Fuel Tank Pressure Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BQ:DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT

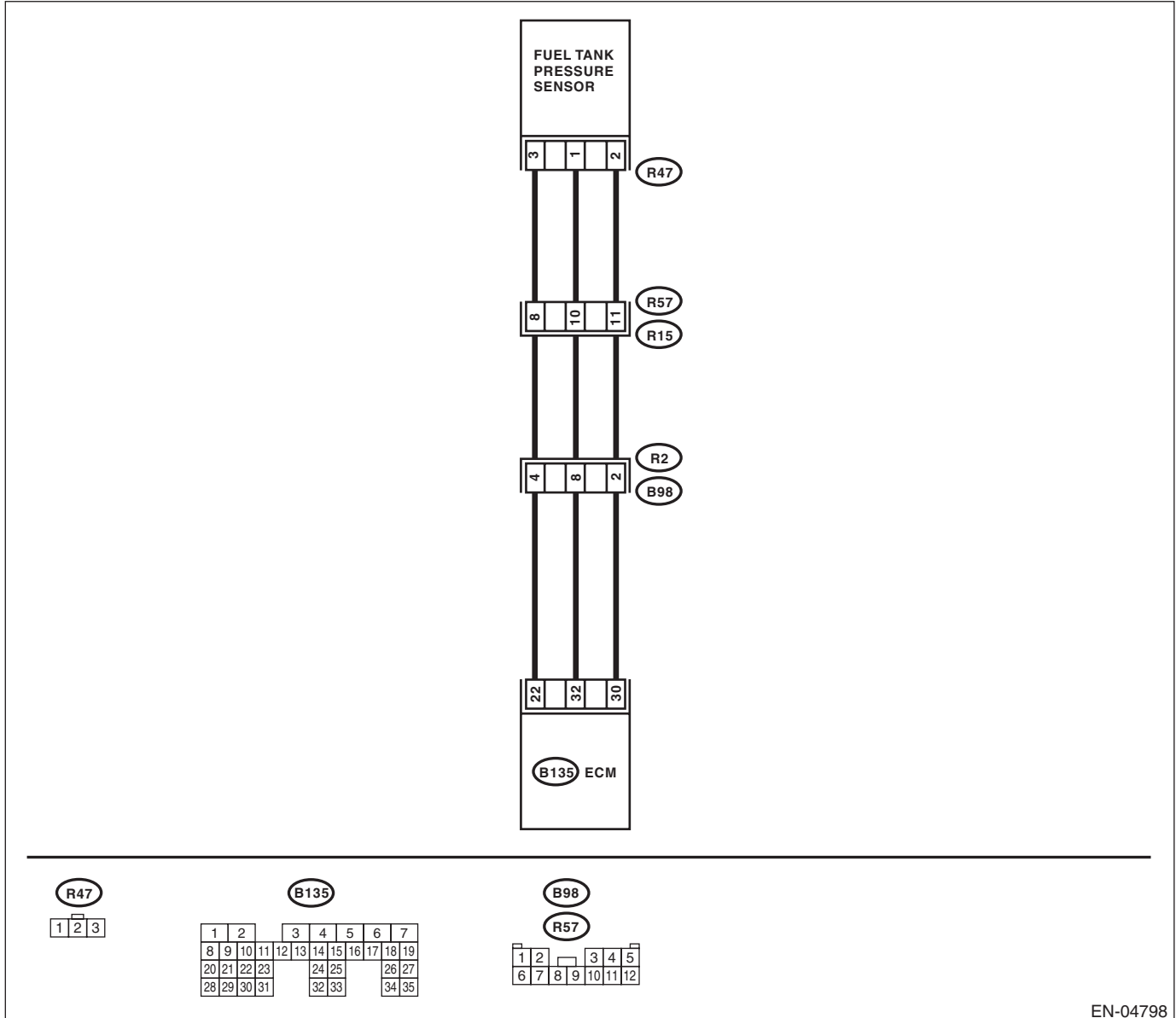
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-156, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04798

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK CURRENT DATA.</p> <ol style="list-style-type: none"> Turn the ignition switch to OFF. Remove the fuel filler cap. Install the fuel filler cap. Turn the ignition switch to ON. Read the data of the fuel tank pressure sensor signal using Subaru Select Monitor or general scan tool. <p>NOTE:</p> <ul style="list-style-type: none"> Subaru Select Monitor <p>For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.></p> <ul style="list-style-type: none"> General scan tool <p>For detailed operation procedure, refer to the general scan tool operation manual.</p>	Is the measured value 2.8 kPa (21.0 mmHg, 0.827 inHg) or more?	Go to step 11.	Go to step 2.
2	<p>CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.</p> <p>Measure the voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B135) No. 22 (+) — Chassis ground (-):</p>	Is the voltage 4.5 V or more?	Go to step 4.	Go to step 3.
3	<p>CHECK POWER SUPPLY TO FUEL TANK PRESSURE SENSOR.</p> <p>Measure the voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B135) No. 22 (+) — Chassis ground (-):</p>	Does the measured value change when shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>
4	<p>CHECK INPUT SIGNAL OF ECM.</p> <p>Measure the voltage between ECM and chassis ground.</p> <p>Connector & terminal (B135) No. 32 (+) — Chassis ground (-):</p>	Is the voltage less than 0.2 V?	Go to step 6.	Go to step 5.
5	<p>CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR).</p> <p>Read the data of fuel tank pressure sensor signal using Subaru Select Monitor.</p> <p>NOTE:</p> <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.></p>	Is the measured value -2.8 kPa (-21.0 mmHg, -0.827 inHg) or more when shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Go to step 6.
6	<p>CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS.</p> <ol style="list-style-type: none"> Turn the ignition switch to OFF. Remove the rear seat cushion. Separate rear wiring harness and fuel tank cord. Turn the ignition switch to ON. Measure the voltage between rear wiring harness connector and chassis ground. <p>Connector & terminal (R15) No. 8 (+) — Chassis ground (-):</p>	Is the voltage 4.5 V or more?	Go to step 7.	<p>Repair the harness and connector.</p> <p>NOTE:</p> <p>In this case, repair the following item:</p> <ul style="list-style-type: none"> Open circuit in harness between ECM and rear wiring harness connector Poor contact in coupling connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK HARNESS BETWEEN ECM AND COUPLING CONNECTOR IN REAR WIRING HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM and rear wiring harness connector. Connector & terminal (B135) No. 32 — (R15) No. 10: (B135) No. 30 — (R15) No. 11:	Is the resistance less than 1 Ω?	Go to step 8.	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open circuit in harness between ECM and rear wiring harness connector • Poor contact in coupling connector
8 CHECK FUEL TANK CORD. 1) Disconnect the connector from the fuel tank pressure sensor. 2) Measure the resistance of fuel tank cord. Connector & terminal (R57) No. 10 — (R47) No. 1:	Is the resistance less than 1 Ω?	Go to step 9.	Repair the open circuit in fuel tank cord.
9 CHECK FUEL TANK CORD. Measure the resistance of fuel tank cord. Connector & terminal (R57) No. 11 — (R47) No. 2:	Is the resistance less than 1 Ω?	Go to step 10.	Repair the open circuit in fuel tank cord.
10 CHECK POOR CONTACT. Check for poor contact in fuel tank pressure sensor connector.	Is there poor contact in fuel tank pressure sensor connector?	Repair the poor contact in fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC (H4DOTC)-15, Fuel Tank Pressure Sensor.>
11 CHECK HARNESS BETWEEN ECM AND FUEL TANK PRESSURE SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel tank pressure sensor. 3) Turn the ignition switch to ON. 4) Read the data of the fuel tank pressure sensor signal using Subaru Select Monitor or general scan tool. NOTE: <ul style="list-style-type: none"> • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.> <ul style="list-style-type: none"> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".	Is the measured value 2.8 kPa (21.0 mmHg, 0.827 inHg) or more?	Repair the short circuit to power supply in the harness between the ECM and fuel tank pressure sensor connector.	Replace the fuel tank pressure sensor. <Ref. to EC (H4DOTC)-15, Fuel Tank Pressure Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BR:DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-157, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

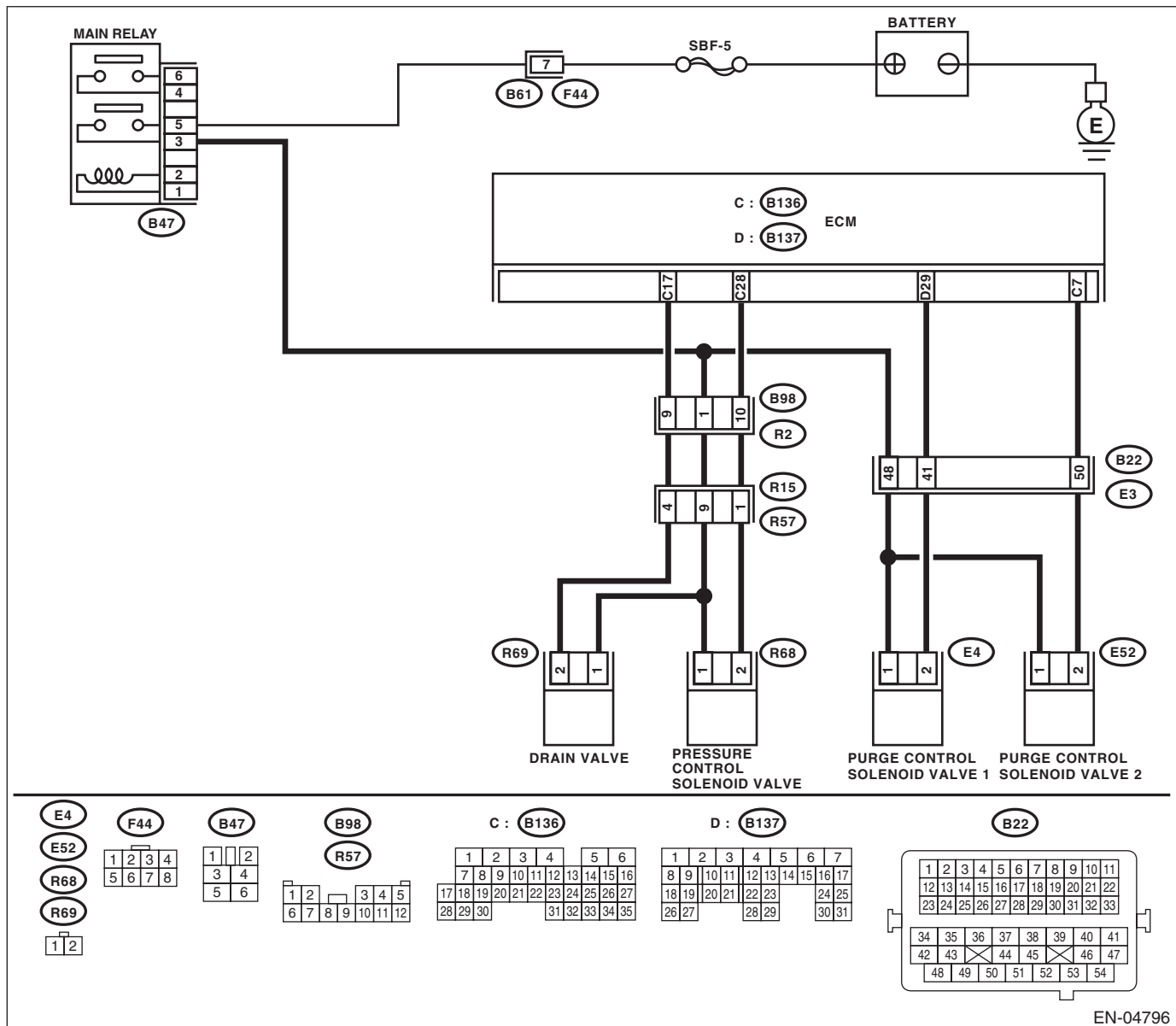
TROUBLE SYMPTOM:

- Fuel odor
- There is a hole of more than 0.5 mm (0.020 in) dia. in evaporation system or fuel tank.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



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Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No	
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK FUEL FILLER CAP. 1) Turn the ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step 3.	Tighten fuel filler cap securely.
3	CHECK FUEL FILLER CAP.	Is a genuine fuel filler cap being used?	Go to step 4.	Replace with a genuine fuel filler cap.
4	CHECK FUEL FILLER PIPE PACKING.	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4DOTC)-53, Fuel Filler Pipe.>	Go to step 5.
5	CHECK DRAIN VALVE. 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can be executed using Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step 6.	Replace the drain valve. <Ref. to EC (H4DOTC)-21, Drain Valve.>
6	CHECK PURGE CONTROL SOLENOID VALVE. Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step 7.	Replace the purge control solenoid valve. <Ref. to EC (H4DOTC)-8, Purge Control Solenoid Valve.>
7	CHECK PRESSURE CONTROL SOLENOID VALVE. Operate the pressure control solenoid valve. NOTE: The pressure control solenoid valve operation can be executed using the Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step 8.	Replace the pressure control solenoid valve. <Ref. to EC (H4DOTC)-16, Pressure Control Solenoid Valve.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No	
8	CHECK EVAPORATIVE EMISSION CONTROL SYSTEM LINE. Turn the ignition switch to OFF.	Are there any holes of more than 0.5 mm (0.020 in) dia. in the evaporation line?	Repair or replace the evaporation line. <Ref. to FU(H4DOTC)-64, Fuel Delivery, Return and Evaporation Lines.>	Go to step 9.
9	CHECK CANISTER.	Is the canister damaged or is there a hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace the canister. <Ref. to EC (H4DOTC)-7, Canister.>	Go to step 10.
10	CHECK FUEL TANK. Remove the fuel tank. <Ref. to FU(H4DOTC)-50, Fuel Tank.>	Is the fuel tank damaged or is there any hole of more than 0.5 mm (0.020 in) dia. in it?	Repair or replace the fuel tank. <Ref. to FU(H4DOTC)-50, Fuel Tank.>	Go to step 11.
11	CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.	Is there any hole of more than 0.5 mm (0.020 in) dia., crack, clogging, or disconnections, bend, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Repair the poor contact in ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BS:DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-157, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Trouble Code (DTC) Detecting Criteria.>

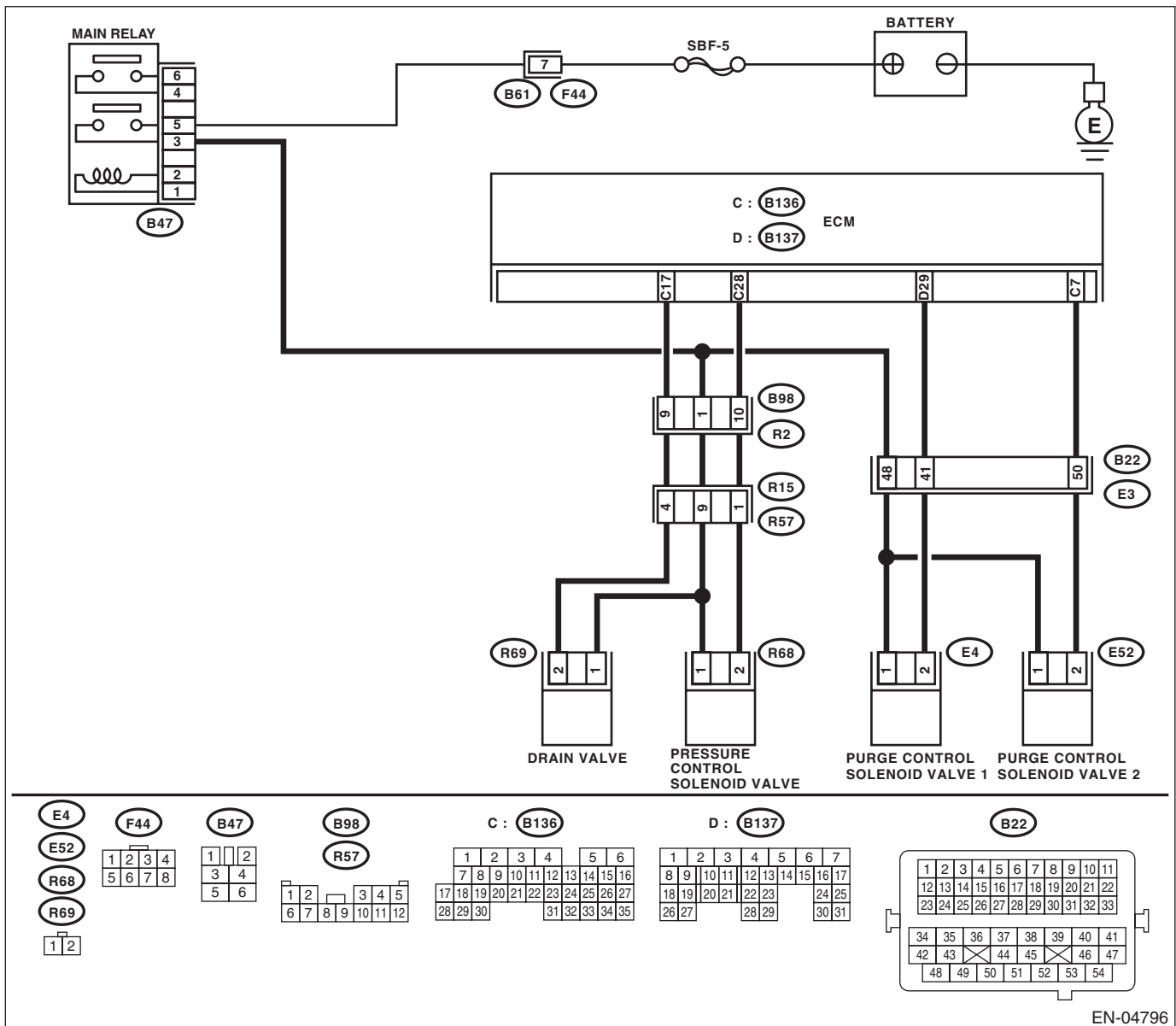
TROUBLE SYMPTOM:

- Fuel odor
- Fuel filler cap is loose or not installed.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04796

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK FUEL FILLER CAP. 1) Turn the ignition switch to OFF. 2) Check the fuel filler cap. NOTE: The DTC is stored in memory if fuel filler cap is or was loose or if the cap chain was caught while tightening.	Is the fuel filler cap tightened securely?	Go to step 3.	Tighten fuel filler cap securely.
3	CHECK FUEL FILLER CAP.	Is a genuine fuel filler cap being used?	Go to step 4.	Replace with a genuine fuel filler cap.
4	CHECK FUEL FILLER PIPE PACKING.	Is there any damage to the seal between fuel filler cap and fuel filler pipe?	Repair or replace the fuel filler cap and fuel filler pipe. <Ref. to FU(H4DOTC)-53, Fuel Filler Pipe.>	Go to step 5.
5	CHECK DRAIN VALVE. 1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Operate the drain valve. NOTE: Drain valve operation can be executed using Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Go to step 6.	Replace the drain valve. <Ref. to EC (H4DOTC)-21, Drain Valve.>
6	CHECK PURGE CONTROL SOLENOID VALVE. Operate the purge control solenoid valve. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.>	Does the purge control solenoid valve operate?	Go to step 7.	Replace the purge control solenoid valve. <Ref. to EC (H4DOTC)-8, Purge Control Solenoid Valve.>
7	CHECK PRESSURE CONTROL SOLENOID VALVE. Operate the pressure control solenoid valve. NOTE: The pressure control solenoid valve operation can be executed using the Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.>	Does the pressure control solenoid valve operate?	Go to step 8.	Replace the pressure control solenoid valve. <Ref. to EC (H4DOTC)-16, Pressure Control Solenoid Valve.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
8	CHECK CANISTER.	Is the canister damaged?	Repair or replace the canister. <Ref. to EC (H4DOTC)-7, Canister.>	Go to step 9.
9	CHECK FUEL TANK. Remove the fuel tank. <Ref. to FU(H4DOTC)-50, Fuel Tank.>	Is the fuel tank damaged?	Repair or replace the fuel tank. <Ref. to FU(H4DOTC)-50, Fuel Tank.>	Go to step 10.
10	CHECK ANY OTHER MECHANICAL TROUBLE IN EVAPORATIVE EMISSION CONTROL SYSTEM.	Are there holes of more than 0.5 mm (0.020 in) dia., cracks, clogging, or disconnections, misconnection of hoses or pipes in evaporative emission control system?	Repair or replace the hoses or pipes.	Repair the poor contact in ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BT:DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-158, DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

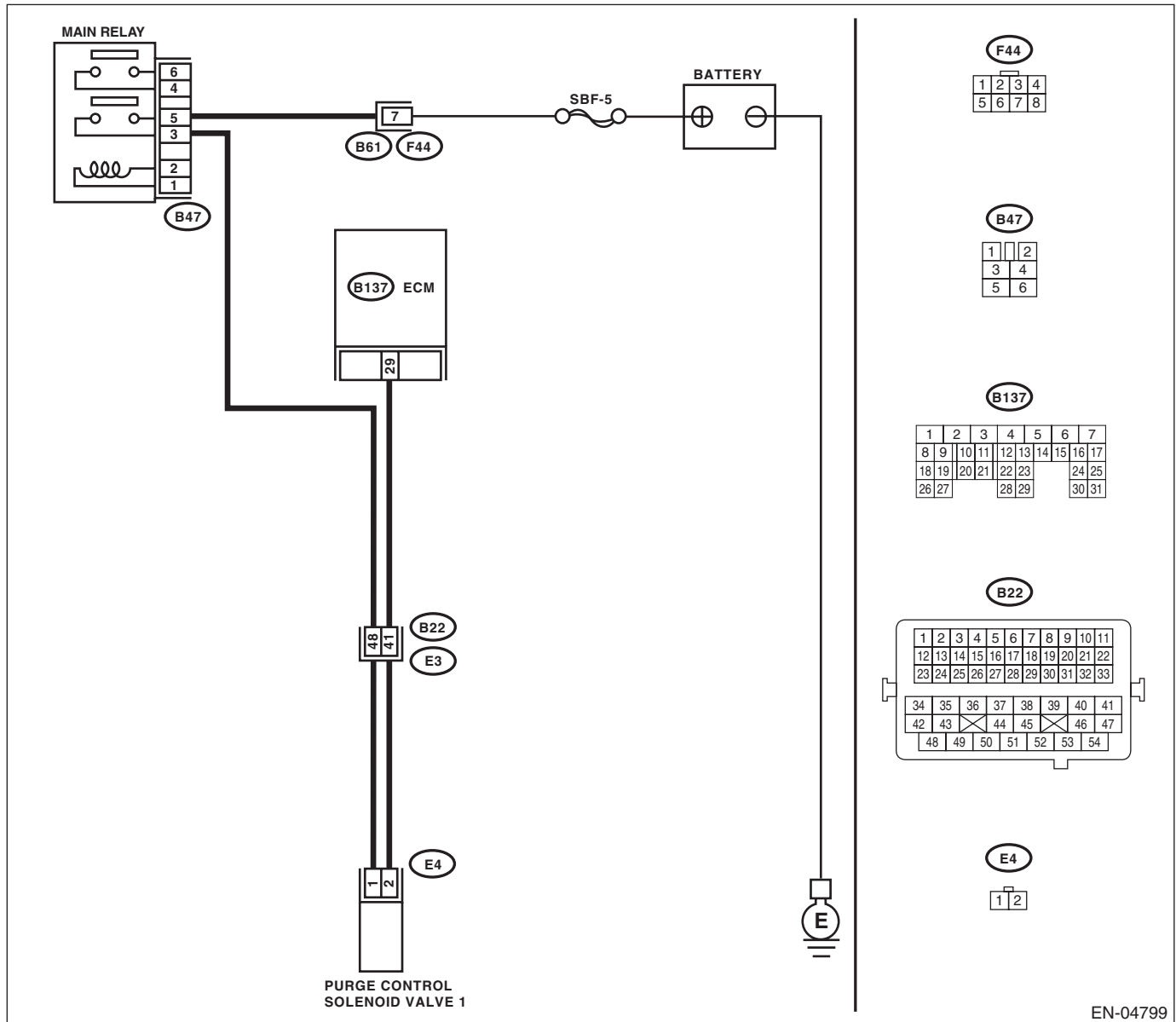
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>

WIRING DIAGRAM:



EN-04799

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 29 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.	Go to step 2.
2 CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from purge control solenoid valve and ECM. 3) Measure the resistance of harness between purge control solenoid valve connector and engine ground. Connector & terminal (E4) No. 2 — Engine ground:	Is the resistance 1 M Ω or more?	Go to step 3.	Repair the ground short circuit of harness between ECM and purge control solenoid valve connector.
3 CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR. Measure the resistance of harness between ECM and purge control solenoid valve. Connector & terminal (B137) No. 29 — (E4) No. 2:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit of harness between ECM and purge control solenoid valve connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open circuit in harness between ECM and purge control solenoid valve connector • Poor contact in coupling connector
4 CHECK PURGE CONTROL SOLENOID VALVE. 1) Remove the purge control solenoid valve. 2) Measure the resistance between purge control solenoid valve terminals. Terminals No. 1 — No. 2:	Is the resistance between 10 — 100 Ω ?	Go to step 5.	Replace the purge control solenoid valve. <Ref. to EC (H4DOTC)-8, Purge Control Solenoid Valve.>
5 CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to ON. 2) Measure the voltage between purge control solenoid valve and engine ground. Connector & terminal (E4) No. 1 (+) — Engine ground (-):	Is the voltage 10 V or more?	Repair the poor contact in purge control solenoid valve connector.	Repair the harness and connector. NOTE: <ul style="list-style-type: none"> • Open circuit of harness between main relay and purge control solenoid valve connector • Poor contact in coupling connector • Poor contact in main relay connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BU:DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-160, DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

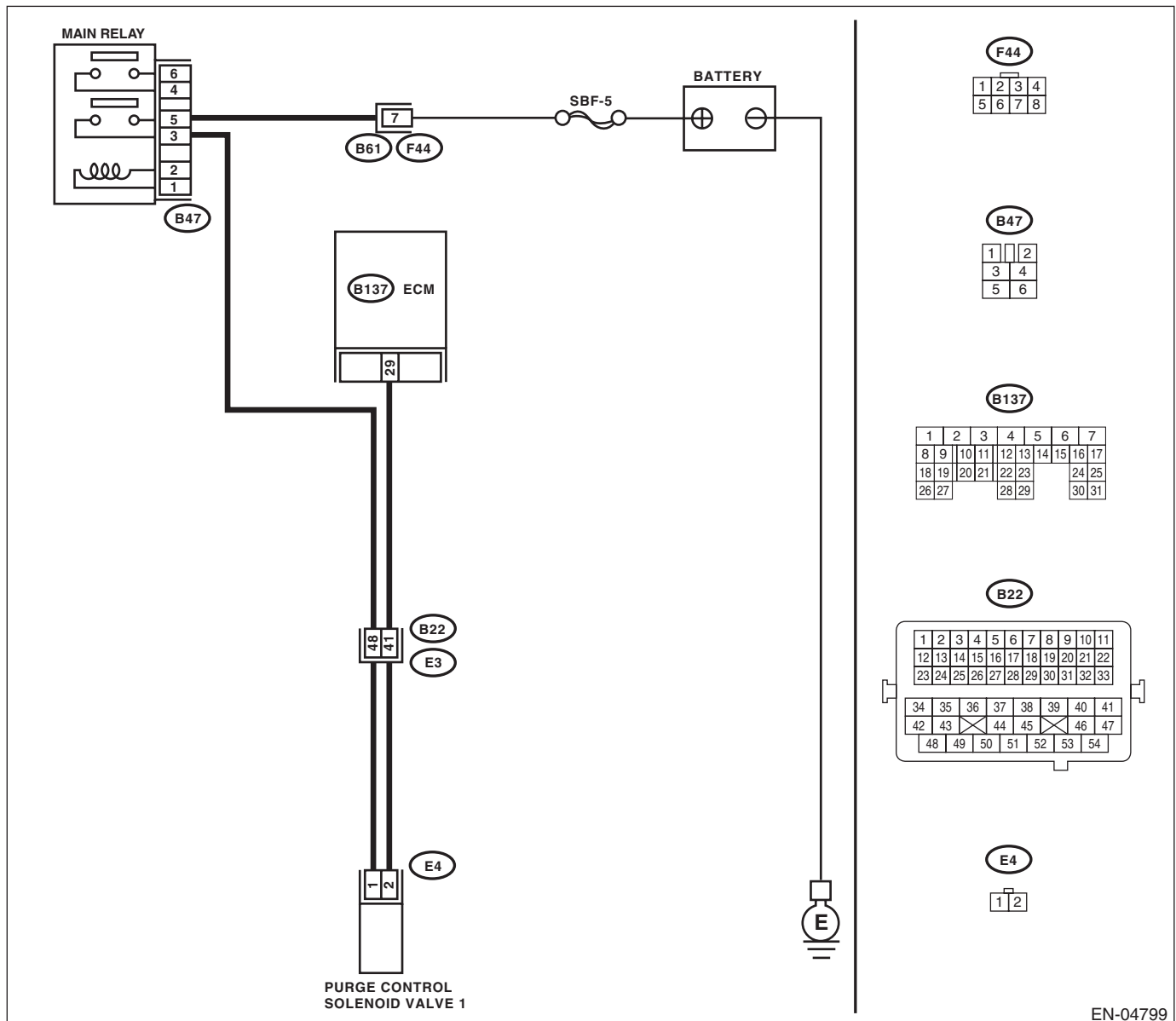
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL OF ECM. 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground while operating the purge control solenoid valve. NOTE: Purge control solenoid valve operation can be executed using Subaru Select Monitor. For procedure, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.> Connector & terminal (B137) No. 29 (+) — Chassis ground (-):	Is the voltage 0 — 13 V?	Go to step 2.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector.
2 CHECK OUTPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 29 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 4.	Go to step 3.
3 CHECK POOR CONTACT. Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>
4 CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from purge control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B137) No. 29 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the short circuit to power supply in the harness between the ECM and purge control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	Go to step 5.
5 CHECK PURGE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Measure the resistance between purge control solenoid valve terminals. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Replace the purge control solenoid valve and ECM. <Ref. to EC (H4DOTC)-8, Purge Control Solenoid Valve.> <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	Go to step 6.
6 CHECK POOR CONTACT. Check poor contact of ECM connector.	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BV:DTC P0461 FUEL LEVEL SENSOR "A" CIRCUIT RANGE/PERFORMANCE

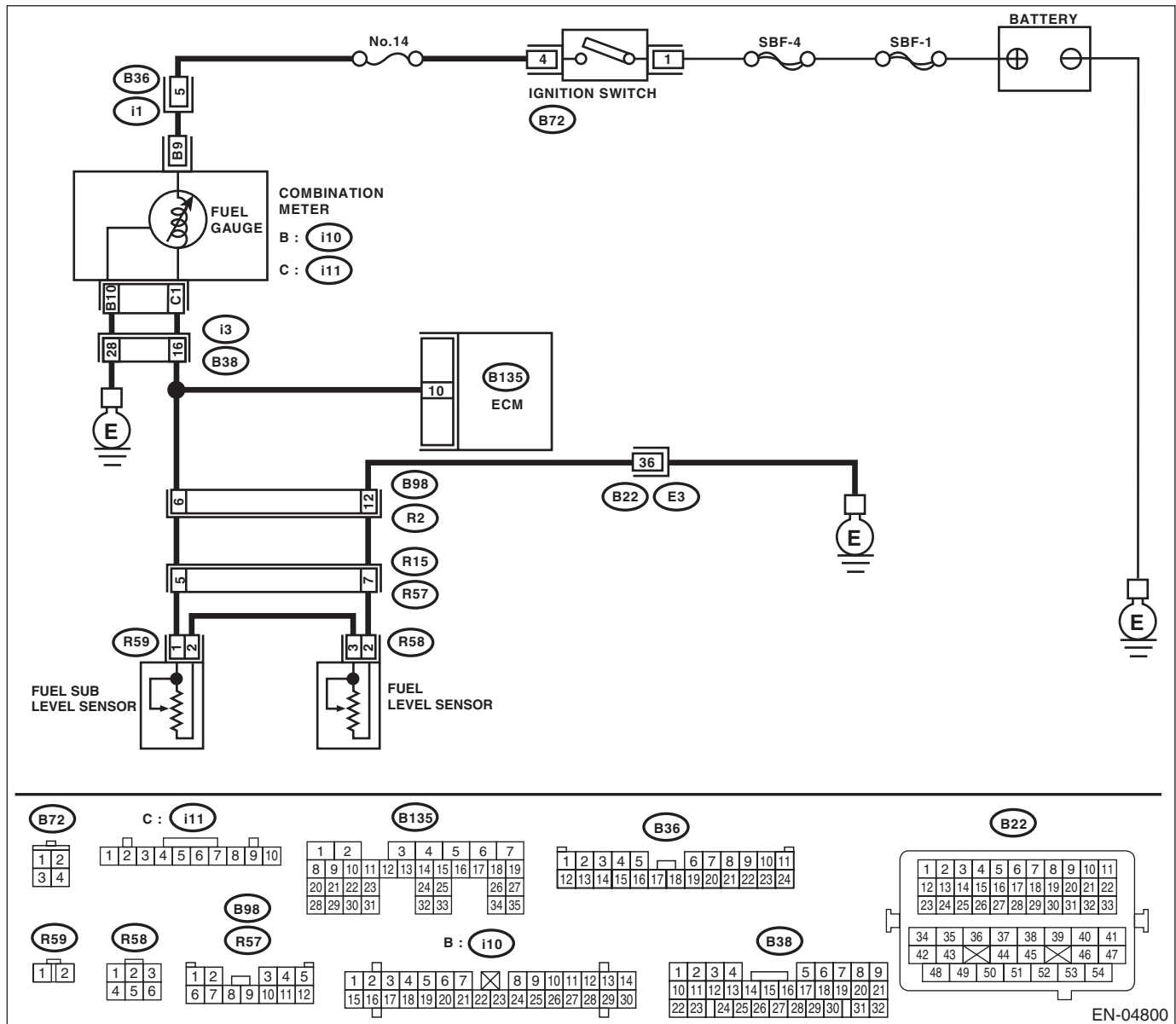
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-162, DTC P0461 FUEL LEVEL SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0461.	Replace the fuel level sensor and fuel sub level sensor. <Ref. to FU(H4DOTC)-59, Fuel Level Sensor.> <Ref. to FU(H4DOTC)-60, Fuel Sub Level Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BW:DTC P0462 FUEL LEVEL SENSOR "A" CIRCUIT LOW

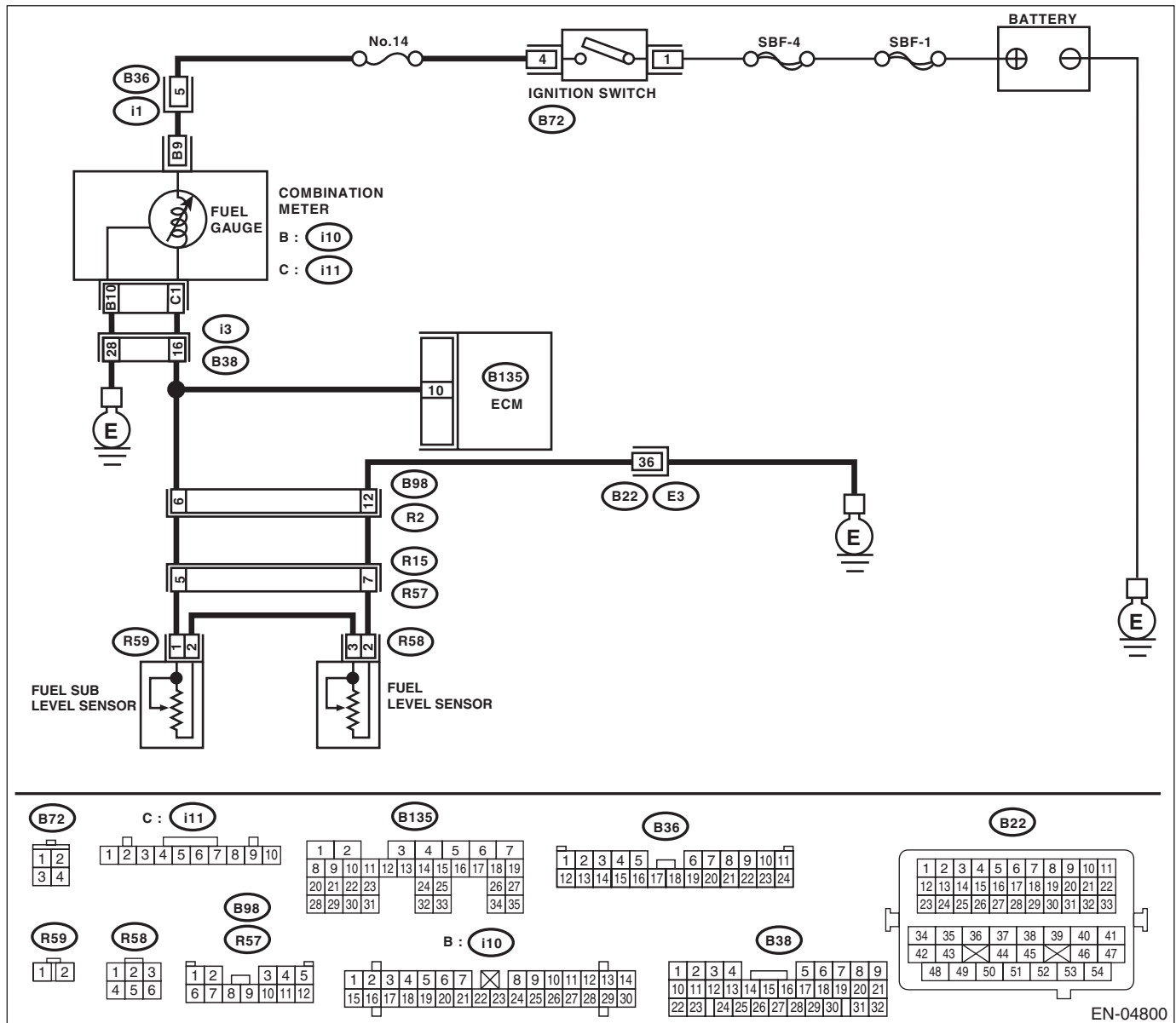
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-164, DTC P0462 FUEL LEVEL SENSOR "A" CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04800

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.	Does the speedometer and tachometer operate normally?	Go to step 2.	Repair or replace the combination meter. <Ref. to IDI-10, Combination Meter.>
2 CHECK INPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 10 (+) — Chassis ground (-):	Is the voltage less than 0.12 V?	Go to step 4.	Go to step 3.
3 CHECK INPUT SIGNAL FOR ECM (USING SUBARU SELECT MONITOR). Read the data of fuel level sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.>	Does the voltage change when shaking the ECM harness and connector?	Repair poor contact in ECM connector.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Poor contact in combination meter connector • Poor contact in ECM connector • Poor contact in coupling connector
4 CHECK INPUT VOLTAGE OF ECM. 1) Turn the ignition switch to OFF. 2) Separate fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between ECM connector and chassis ground. Connector & terminal (B135) No. 10 (+) — Chassis ground (-):	Is the voltage 0.12 V or more?	Go to step 5.	Go to step 6.
5 CHECK HARNESS BETWEEN ECM AND COMBINATION METER. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from connector (i11), (i12) and ECM connector. 3) Measure the resistance between ECM and chassis ground. Connector & terminal (B135) No. 10 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 7.	Repair the ground short circuit of harness between ECM and combination meter connector.
6 CHECK HARNESS BETWEEN ECM AND COMBINATION METER. Measure the resistance between ECM and combination meter connector. Connector & terminal (B135) No. 10 — (i11) No. 1:	Is the resistance less than 10 Ω ?	Repair or replace the combination meter. <Ref. to IDI-10, Combination Meter.>	Repair the open circuit between ECM and combination meter connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Poor contact in coupling connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>7 CHECK FUEL TANK CORD. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the fuel sub level sensor. 3) Measure the resistance between fuel sub level sensor and chassis ground. <i>Connector & terminal</i> <i>(R59) No. 1 — Chassis ground:</i></p>	<p>Is the resistance 1 MΩ or more?</p>	<p>Go to step 8.</p>	<p>Repair the ground short circuit of fuel tank cord.</p>
<p>8 CHECK FUEL TANK CORD. 1) Disconnect the connector from fuel pump assembly. 2) Measure the resistance between fuel pump assembly and chassis ground. <i>Connector & terminal</i> <i>(R59) No. 2 — Chassis ground:</i></p>	<p>Is the resistance 1 MΩ or more?</p>	<p>Go to step 9.</p>	<p>Repair the ground short circuit of fuel tank cord.</p>
<p>9 CHECK FUEL LEVEL SENSOR. 1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-57, Fuel Pump.> 2) Measure the resistance between fuel level sensor and terminals with its float set to the full position. <i>Terminals</i> <i>No. 2 — No. 3:</i></p>	<p>Is the resistance between 0.5 — 2.5 Ω?</p>	<p>Go to step 10.</p>	<p>Replace the fuel level sensor.</p>
<p>10 CHECK FUEL SUB LEVEL SENSOR. 1) Remove the fuel sub level sensor. <Ref. to FU(H4DOTC)-60, Fuel Sub Level Sensor.> 2) Measure the resistance between fuel sub level sensor and terminals with its float set to the full position. <i>Terminals</i> <i>No. 1 — No. 2:</i></p>	<p>Is the resistance between 0.5 — 2.5 Ω?</p>	<p>Repair the poor contact in harness between ECM and combination meter connector.</p>	<p>Replace the fuel sub level sensor.</p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BX:DTC P0463 FUEL LEVEL SENSOR "A" CIRCUIT HIGH

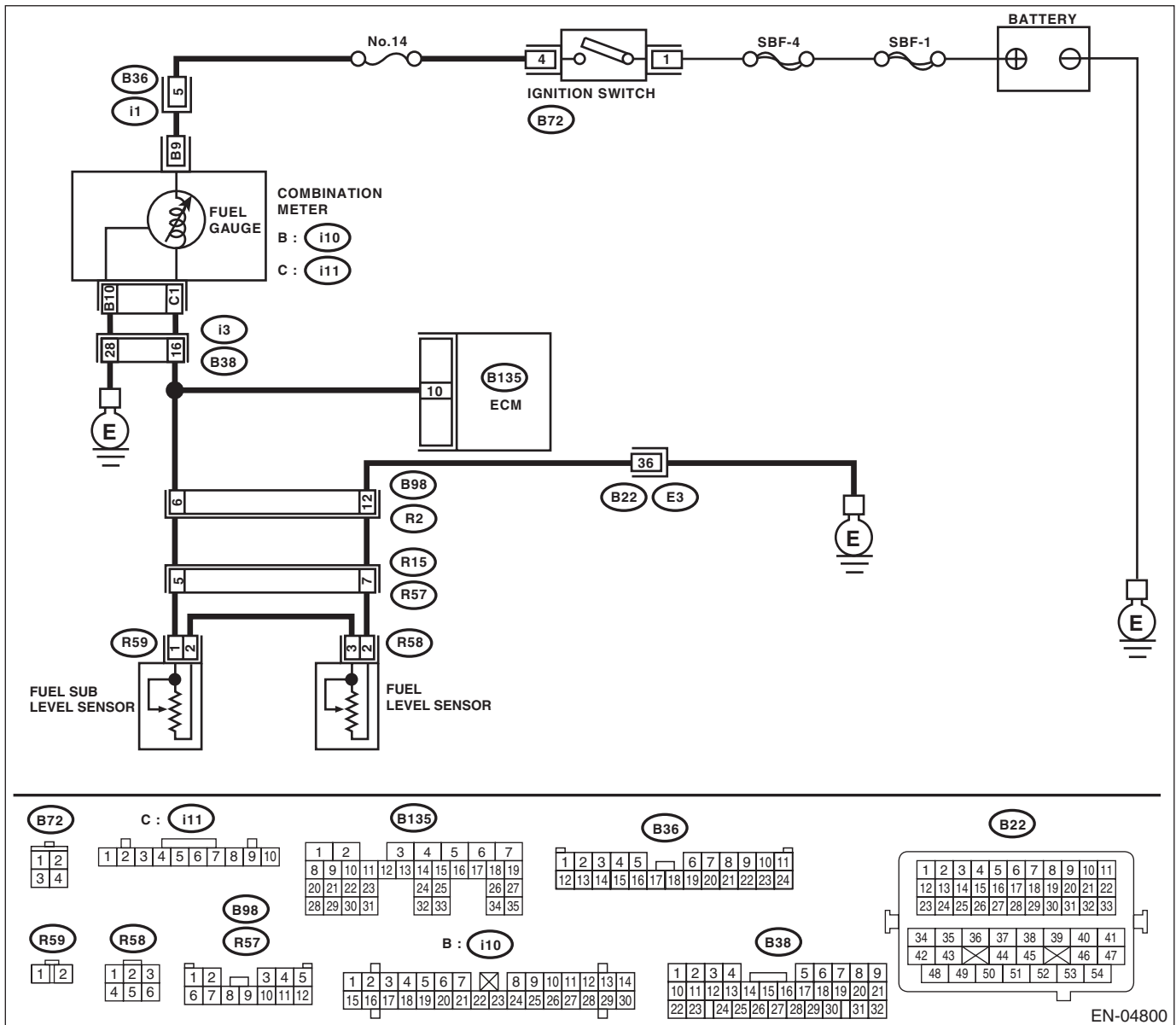
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-166, DTC P0463 FUEL LEVEL SENSOR "A" CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04800

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No	
1	CHECK SPEEDOMETER AND TACHOMETER OPERATION IN COMBINATION METER.	Does the speedometer and tachometer operate normally?	Go to step 2.	Repair or replace the combination meter. <Ref. to IDI-10, Combination Meter.>
2	CHECK INPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 10 (+) — Chassis ground (-):	Is the voltage 4.75 V or more?	Go to step 3.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause. NOTE: In this case, repair the following item: • Poor contact in fuel pump connector • Poor contact in coupling connector
3	CHECK INPUT VOLTAGE OF ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the combination meter connector (i11) and ECM connector. 3) Turn the ignition switch to ON. 4) Measure the voltage of harness between ECM and chassis ground. Connector & terminal (B135) No. 10 (+) — Chassis ground (-):	Is the voltage 4.75 V or more?	Go to step 4.	Repair the short circuit to power supply between the ECM and combination meter connector.
4	CHECK HARNESS BETWEEN ECM AND FUEL TANK CORD. 1) Turn the ignition switch to OFF. 2) Separate fuel tank cord connector (R57) and rear wiring harness connector (R15). 3) Measure the resistance between ECM and fuel tank cord. Connector & terminal (B135) No. 10 — (R15) No. 5:	Is the resistance less than 5 Ω ?	Go to step 5.	Repair the open circuit between ECM and fuel tank cord.
5	CHECK HARNESS BETWEEN FUEL TANK CORD AND CHASSIS GROUND. Measure the resistance between fuel tank cord and chassis ground. Connector & terminal (R15) No. 7 — Chassis ground:	Is the resistance less than 5 Ω ?	Go to step 6.	Repair the open circuit between fuel tank cord and chassis ground. NOTE: In this case, repair the following item: Poor contact in coupling connector
6	CHECK FUEL TANK CORD. 1) Disconnect the connector from the fuel level sensor. 2) Measure the resistance between fuel level sensor and coupling connector. Connector & terminal (R57) No. 7 — (R58) No. 2:	Is the resistance less than 10 Ω ?	Go to step 7.	Repair the open circuit between coupling connector and fuel level sensor.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
7	CHECK FUEL TANK CORD. 1) Disconnect the connector from the fuel sub level sensor. 2) Measure the resistance between fuel level sensor and fuel sub level sensor. Connector & terminal (R58) No. 3 — (R59) No. 2:	Is the resistance less than 10 Ω?	Go to step 8.	Repair the open circuit between fuel level sensor and fuel sub level sensor.
8	CHECK FUEL TANK CORD. Measure the resistance between the fuel sub level sensor and coupling connector. Connector & terminal (R57) No. 5 — (R59) No. 1:	Is the resistance less than 10 Ω?	Go to step 9.	Repair the open circuit between the coupling connector and fuel sub level sensor.
9	CHECK FUEL LEVEL SENSOR. 1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-57, Fuel Pump.> 2) While moving the fuel level sensor float up and down, measure resistance between fuel level sensor terminals. Terminals No. 2 — No. 3:	Is the resistance 53 Ω or more?	Replace the fuel level sensor. <Ref. to FU(H4DOTC)-59, Fuel Level Sensor.>	Go to step 10.
10	CHECK FUEL SUB LEVEL SENSOR. 1) Remove the fuel sub level sensor. <Ref. to FU(H4DOTC)-60, Fuel Sub Level Sensor.> 2) While moving the fuel sub level sensor float up and down, measure resistance between fuel sub level sensor terminals. Terminals No. 1 — No. 2:	Is the resistance 45 Ω or more?	Replace the fuel sub level sensor. <Ref. to FU(H4DOTC)-60, Fuel Sub Level Sensor.>	Replace the combination meter. <Ref. to IDI-10, Combination Meter.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BY:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT

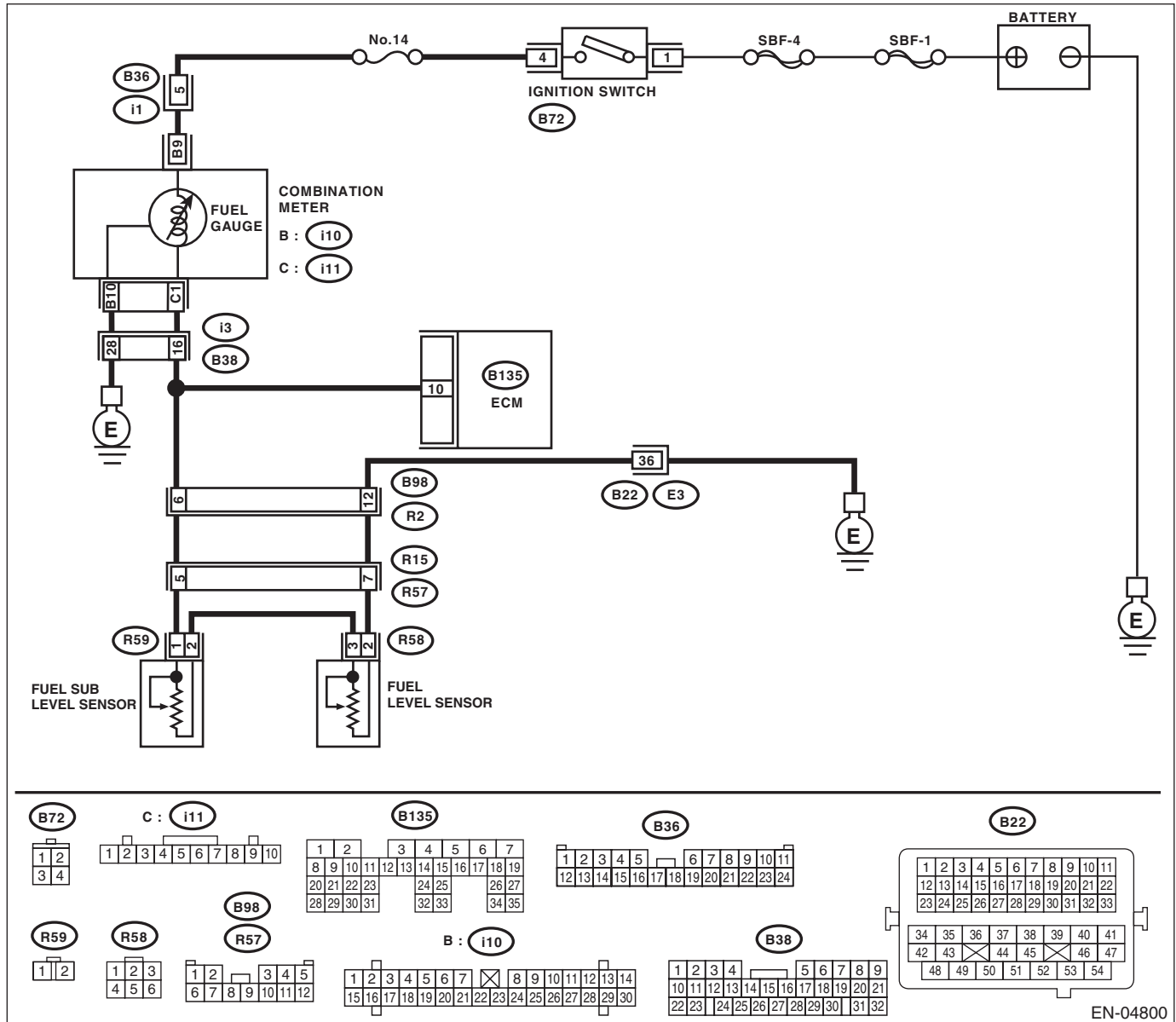
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-168, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04800

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK FUEL LEVEL SENSOR. 1) Remove the fuel pump assembly. <Ref. to FU(H4DOTC)-57, Fuel Pump.> 2) While moving the fuel level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. Terminals No. 3 — No. 2:	Does the resistance change gradually?	Go to step 3.	Replace the fuel level sensor. <Ref. to FU(H4DOTC)-59, Fuel Level Sensor.>
3 CHECK FUEL SUB LEVEL SENSOR. 1) Remove the fuel sub level sensor. <Ref. to FU(H4DOTC)-60, Fuel Sub Level Sensor.> 2) While moving the fuel sub level sensor float up and down, make sure that the resistance between fuel level sensor terminals changes smoothly. Terminals No. 1 — No. 2:	Does the resistance change gradually?	Repair poor contact in ECM, combination meter and coupling connectors.	Replace the fuel sub level sensor. <Ref. to FU(H4DOTC)-60, Fuel Sub Level Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

BZ:DTC P0483 FAN RATIONALITY CHECK

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-171, DTC P0483 FAN RATIONALITY CHECK, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Occurrence of noise
- Overheating

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

NOTE:

If the vehicle, with the engine idling, is placed very close to a wall or another vehicle, preventing normal cooling function, the OBD system may detect malfunction.

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).>	Check radiator fan, fan motor and thermostat and if thermostat is stuck, replace thermostat. <Ref. to CO(H4SO)-34, Radiator Main Fan and Fan Motor.> <Ref. to CO(H4SO)-41, Radiator Sub Fan and Fan Motor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CA:DTC P0502 VEHICLE SPEED SENSOR "A" CIRCUIT LOW INPUT

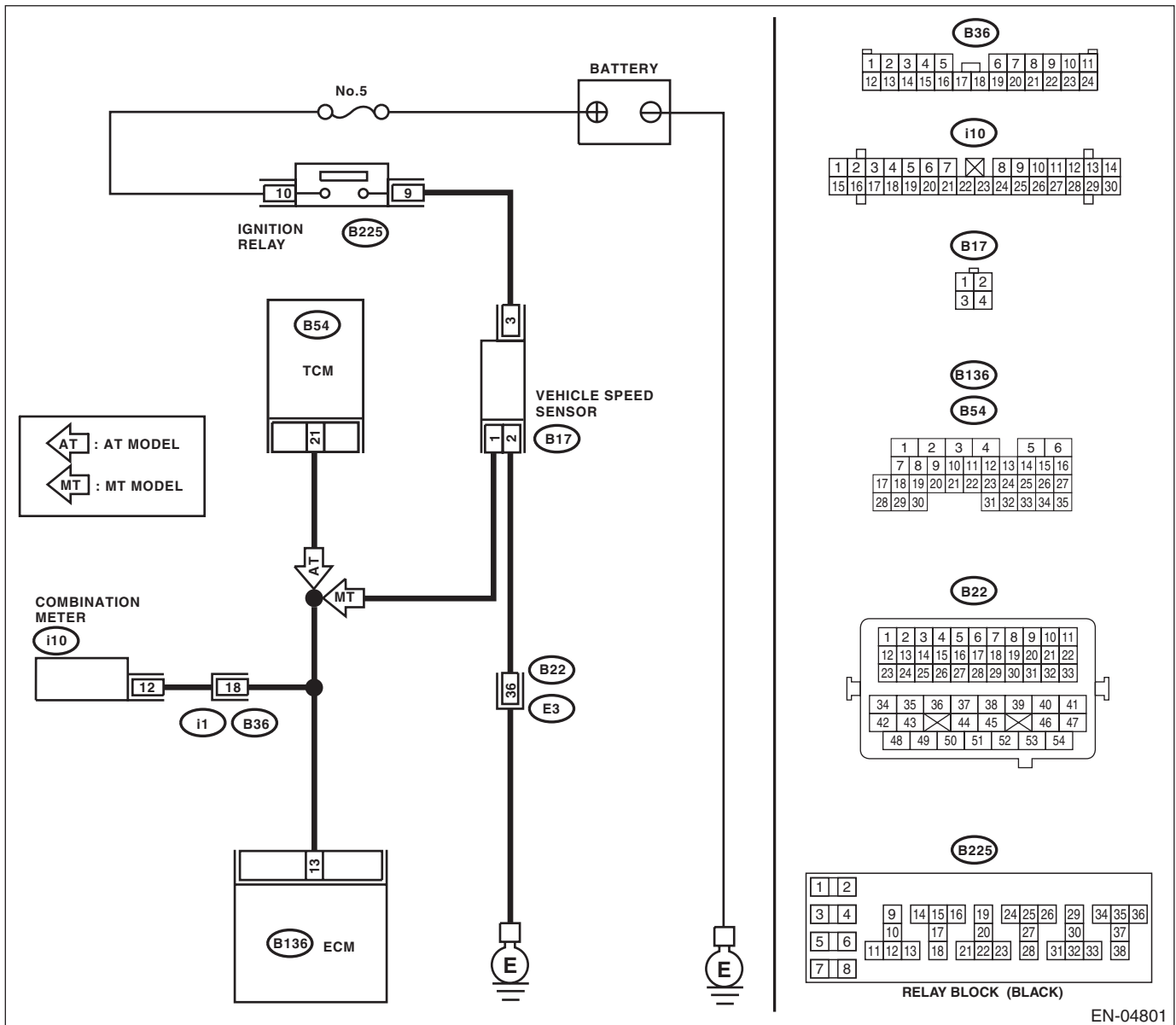
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-172, DTC P0502 VEHICLE SPEED SENSOR "A" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from vehicle speed sensor and ECM. 3) Measure the resistance of harness between vehicle speed sensor connector and chassis ground. Connector & terminal (B17) No. 1 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 2.	Repair ground short circuit of harness between vehicle speed sensor and ECM connector.
2	CHECK POOR CONTACT. Check poor contact in vehicle speed sensor connector.	Is there poor contact in vehicle speed sensor connector?	Repair the poor contact in vehicle speed sensor connector.	Replace the vehicle speed sensor. <Ref. to 5MT-37, Vehicle Speed Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

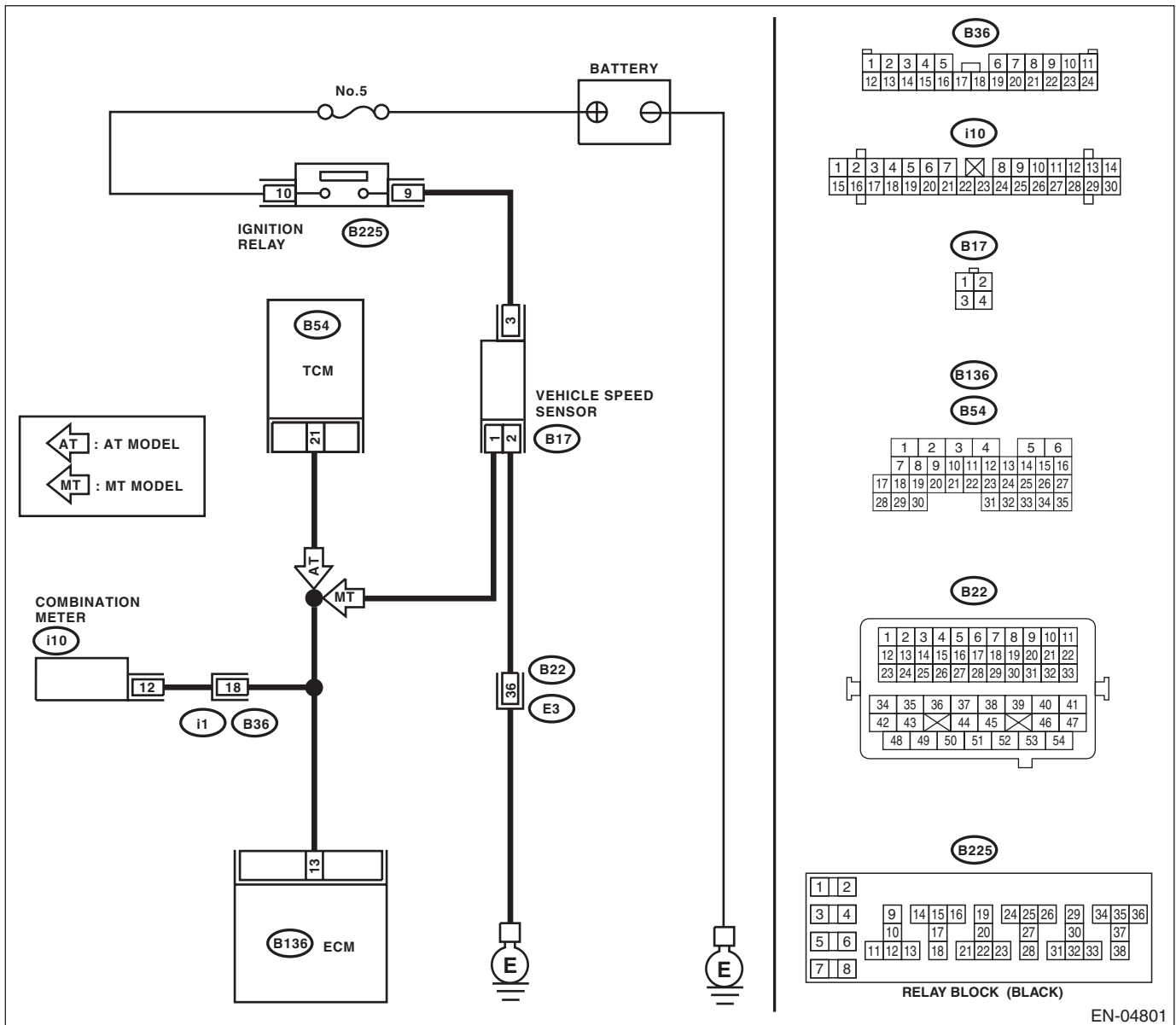
CB:DTC P0503 VEHICLE SPEED SENSOR "A" INTERMITTENT/ERRATIC/HIGH DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-173, DTC P0503 VEHICLE SPEED SENSOR "A" INTERMITTENT/ERRATIC/HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SPEEDOMETER OPERATION IN COMBINATION METER.	Does the speedometer operate normally?	Go to step 2.	Check the speedometer. <Ref. to IDI-12, Speedometer.>
2 CHECK HARNESS BETWEEN ECM AND COMBINATION METER CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the combination meter. 3) Measure resistance between ECM and combination meter. Connector & terminal (B136) No. 13 — (i10) No. 12:	Is the resistance less than 10 Ω?	Repair poor contact in ECM connector.	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none">• Open circuit in harness between ECM and combination meter connector• Poor contact in ECM connector• Poor contact in combination meter connector• Poor contact in coupling connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CC:DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-174, DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

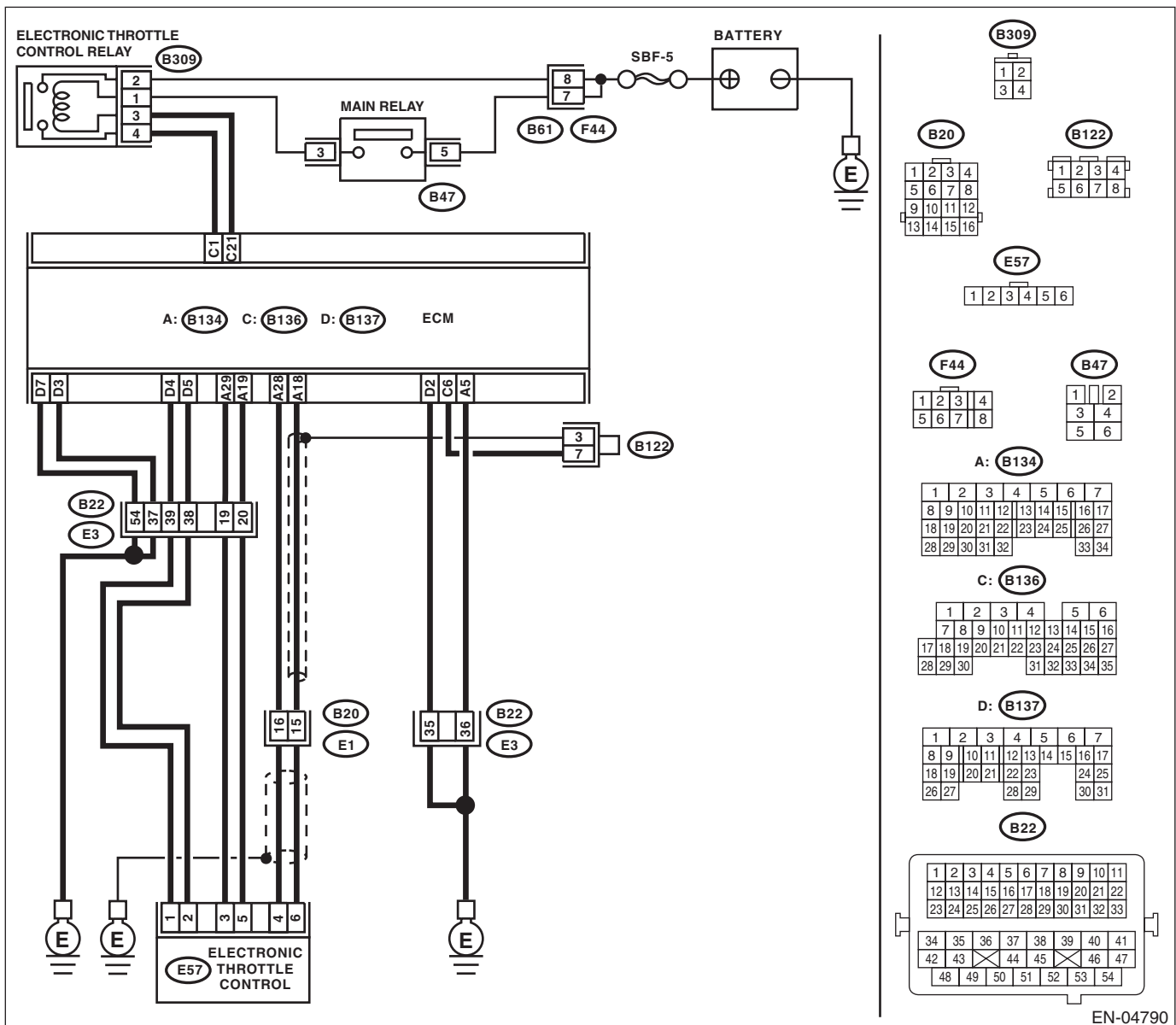
TROUBLE SYMPTOM:

- Hard to start the engine.
- Engine does not start.
- Improper idling
- Engine stalls.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04790

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0506.	Go to step 2.
2	CHECK AIR CLEANER ELEMENT. 1) Turn the ignition switch to OFF. 2) Check the air cleaner element.	Is the air cleaner element excessively clogged?	Replace the air cleaner element. <Ref. to IN(H4DOTC)-8, Air Cleaner Case.>	Go to step 3.
3	CHECK ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control. 3) Check the electronic throttle control.	Are foreign matter found inside electronic throttle control?	Remove foreign matter from electronic throttle control.	Perform the diagnosis of DTC P2101.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CD:DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-176, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

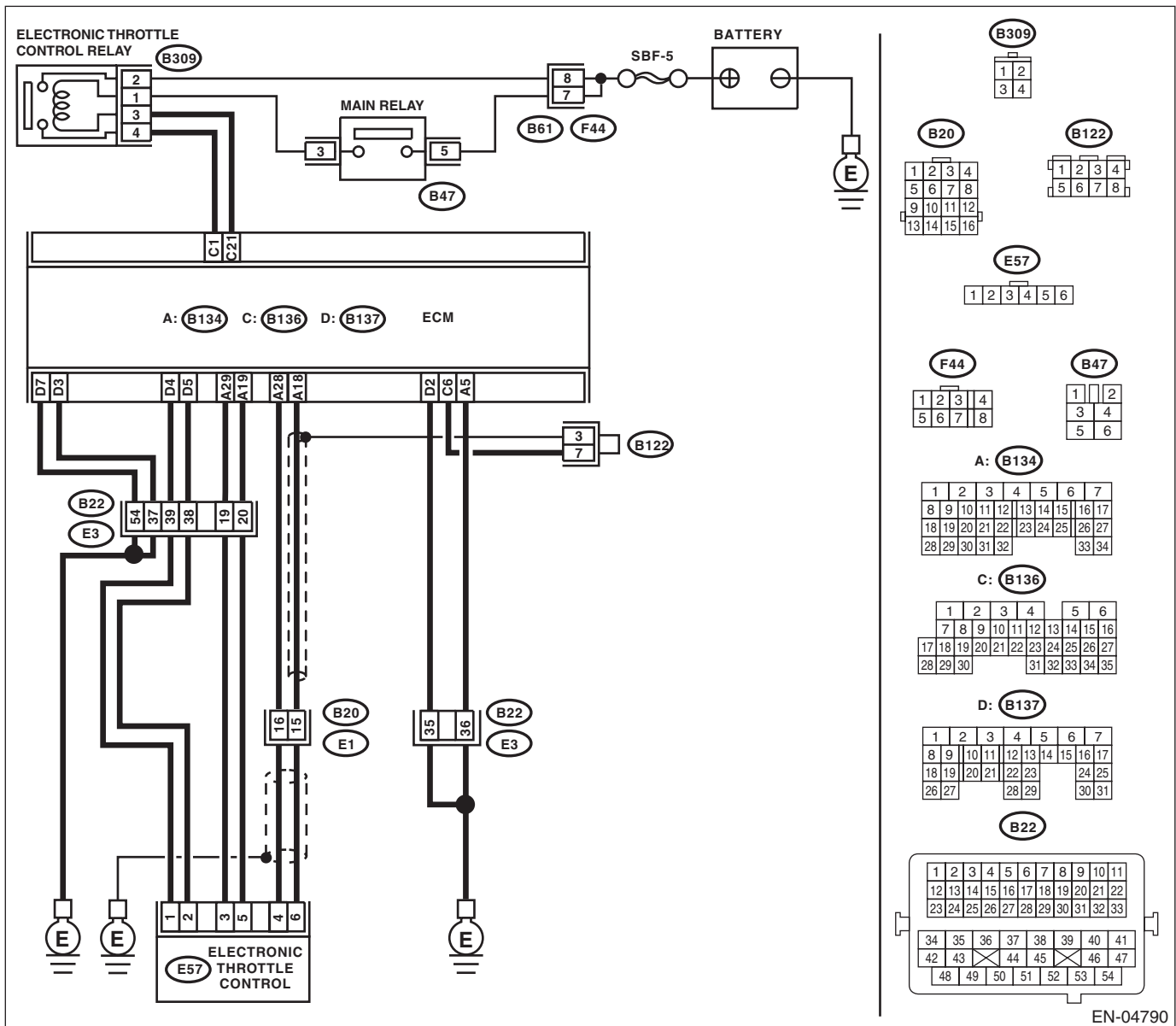
TROUBLE SYMPTOM:

Engine keeps running at higher speed than specified idle speed.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0507.	Go to step 2.
2	CHECK AIR INTAKE SYSTEM. 1) Turn the ignition switch to ON. 2) Start and idle the engine. 3) Check the following items. <ul style="list-style-type: none">• Loose installation of intake manifold and throttle body• Cracks of intake manifold gasket and throttle body gasket• Disconnection of vacuum hoses	Is there any fault in air intake system?	Repair air suction and leaks.	Go to step 3.
3	CHECK ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control. 3) Check the electronic throttle control.	Are foreign matter found inside electronic throttle control?	Remove foreign matter from electronic throttle control.	Perform the diagnosis of DTC P2101.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CE:DTC P0512 STARTER REQUEST CIRCUIT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-178, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

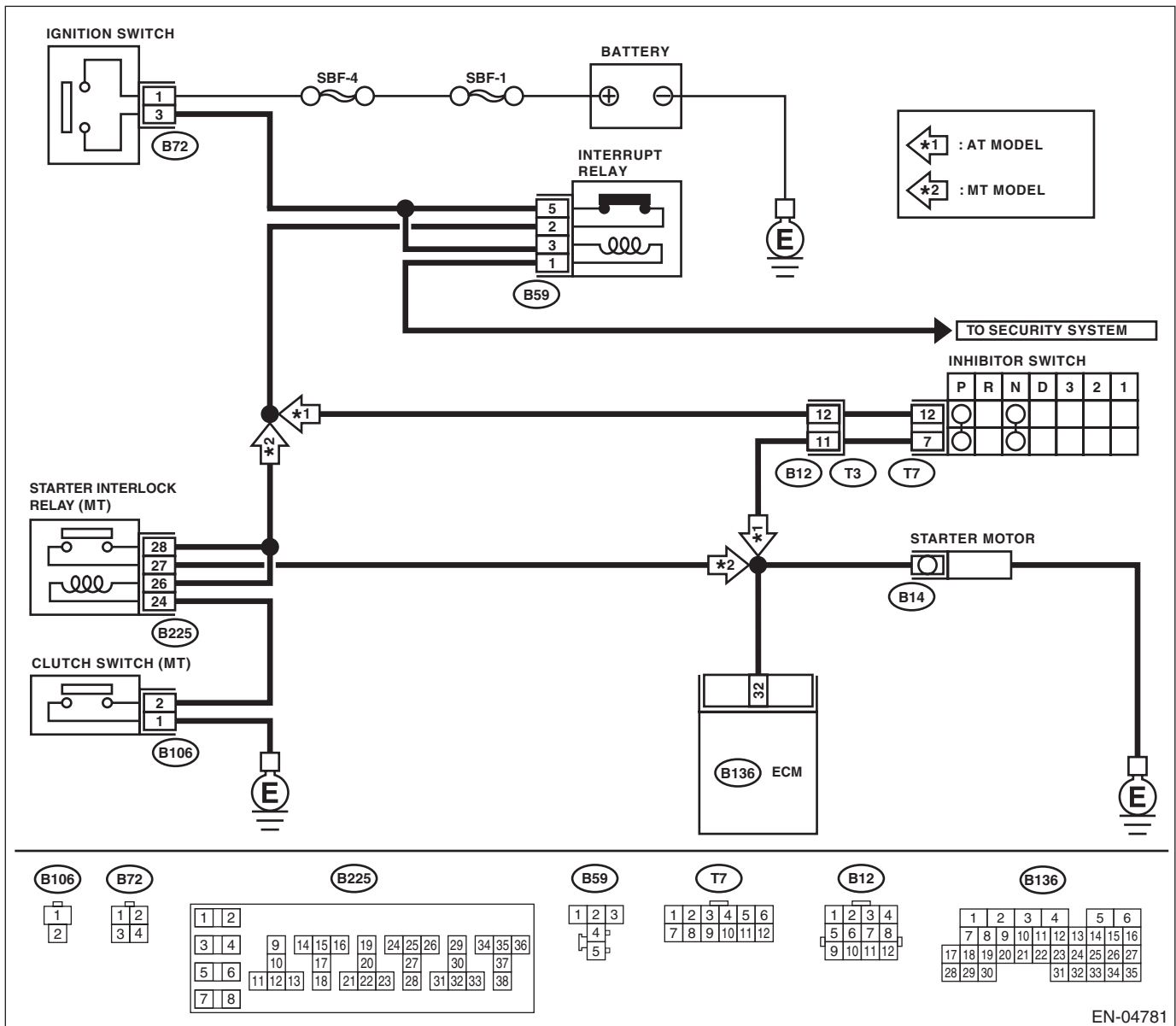
TROUBLE SYMPTOM:

Failure of engine to start

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OPERATION OF STARTER MOTOR.	Does the starter motor operate when ignition switch is turned ON?	Repair the short circuit to power supply in the starter motor circuit. After repair, replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	Check the starter motor circuit. <Ref. to EN(H4DOTC)(diag)-59, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CF:DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-180, DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

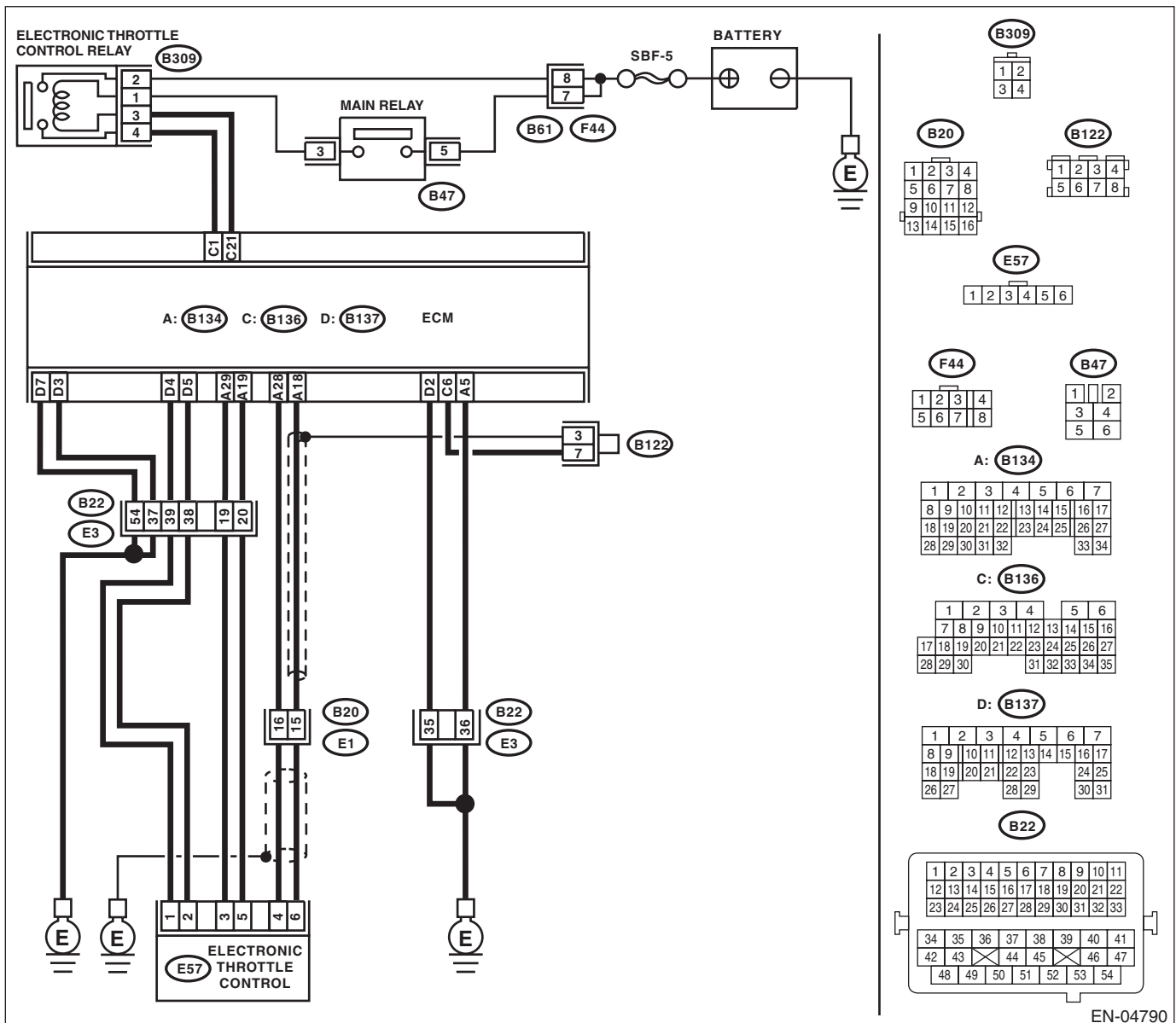
TROUBLE SYMPTOM:

- Engine keeps running at higher speed than specified idle speed.
- Fuel is cut according to fail-safe function.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P0519.	Go to step 2.
2	CHECK AIR INTAKE SYSTEM. 1) Turn the ignition switch to ON. 2) Start and idle the engine. 3) Check the following items. <ul style="list-style-type: none">• Loose installation of intake manifold and throttle body• Cracks of intake manifold gasket and throttle body gasket• Disconnection of vacuum hoses	Is there any fault in air intake system?	Repair air suction and leaks.	Go to step 3.
3	CHECK ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control. 3) Check the electronic throttle control.	Are foreign matter found inside electronic throttle control?	Remove foreign matter from electronic throttle control.	Perform the diagnosis of DTC P2101.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CG:DTC P0600 SERIAL COMMUNICATION LINK

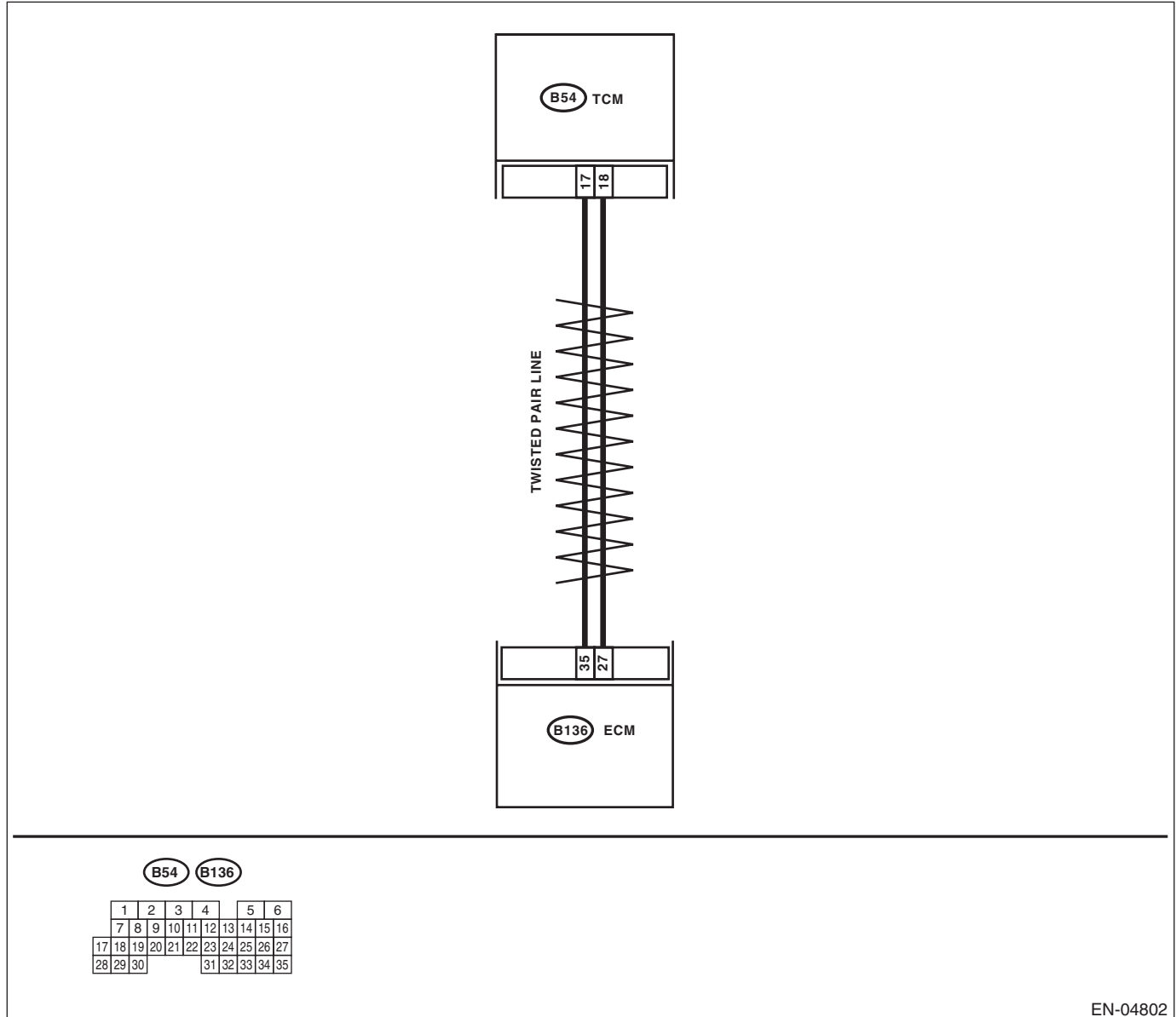
DTC DETECTING CONDITION:

Immediately at fault recognition

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, Inspection Mode.>.

WIRING DIAGRAM:



EN-04802

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK HARNESS BETWEEN ECM AND TCM.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connector from TCM. 4) Measure the resistance between ECM, TCM connectors.</p> <p>Connector & terminal (B136) No. 35 — (B54) No. 17: (B136) No. 27 — (B54) No. 18:</p>	Is the resistance 1 Ω or less?	Go to step 2.	Repair the harness and connector.
2	<p>CHECK HARNESS BETWEEN ECM AND TCM.</p> <p>Measure the resistance between ECM connector and chassis ground.</p> <p>Connector & terminal (B136) No. 35 — Chassis ground: (B136) No. 27 — Chassis ground:</p>	Is the resistance 1 MΩ or more?	Go to step 3.	Repair the harness and connector.
3	<p>CHECK HARNESS BETWEEN ECM AND TCM.</p> <p>Check the resistance between ECM connectors.</p> <p>Connector & terminal (B136) No. 35 — (B136) No. 27:</p>	Is the resistance 1 MΩ or more?	Go to step 4.	Repair the harness and connector.
4	<p>CHECK THE STATUS OF THE AT SYSTEM.</p> <p>Diagnose the AT using the Subaru Select Monitor.</p>	Is DTC P1718 displayed?	Check the AT system.	Replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CH:DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-182, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine does not start.
- Engine stalls.

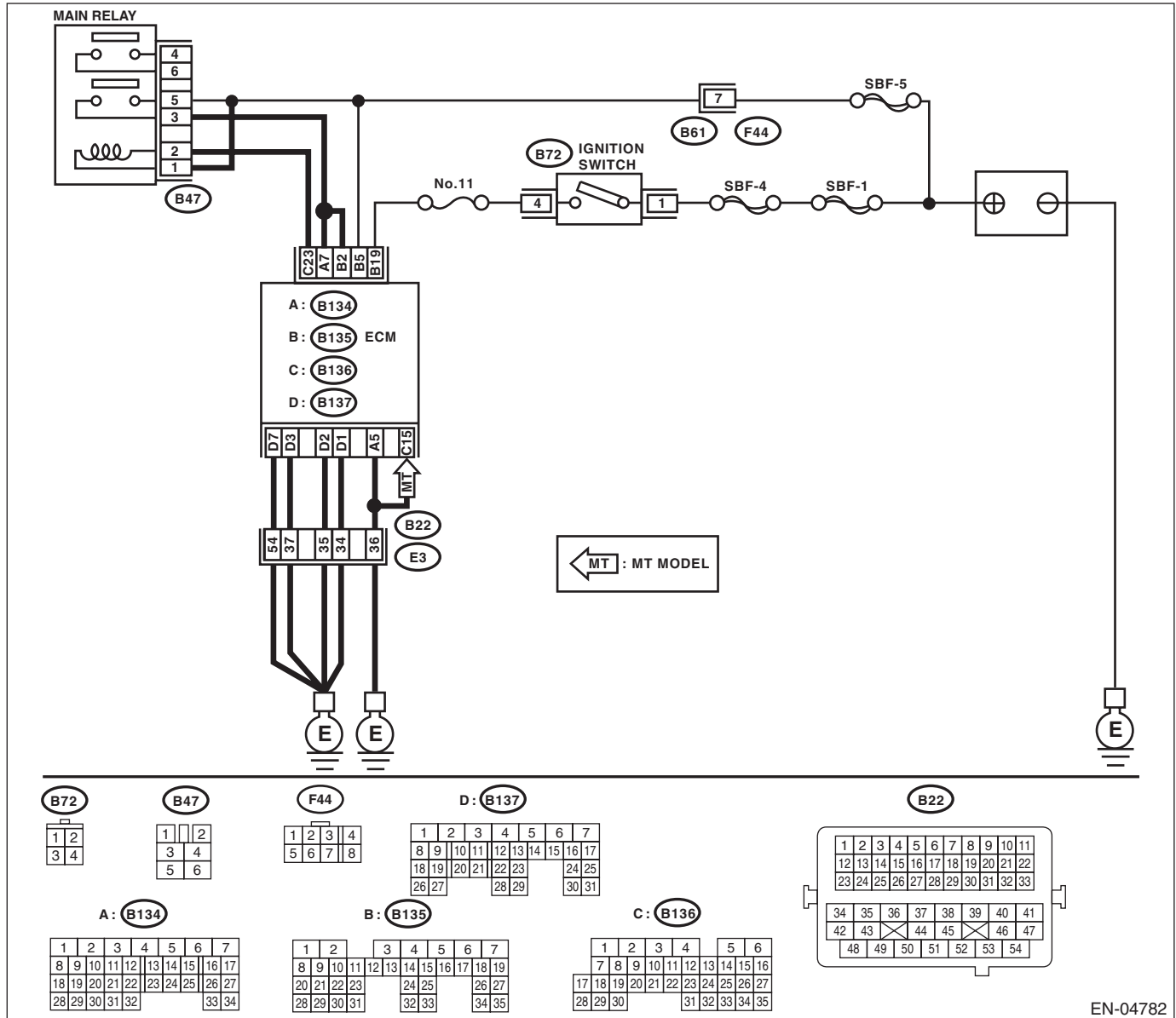
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



Step	Check	Yes	No	
1	CHECK ANY OTHER DTC ON DISPLAY.	Is DTC P0604 displayed on the Subaru Select Monitor or general scan tool?	Replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	Temporary poor contact occurs.

CI: DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR

NOTE:

For the diagnostic procedure, refer to DTC P0607. <Ref. to EN(H4DOTC)(diag)-266, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CJ:DTC P0607 CONTROL MODULE PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-184, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

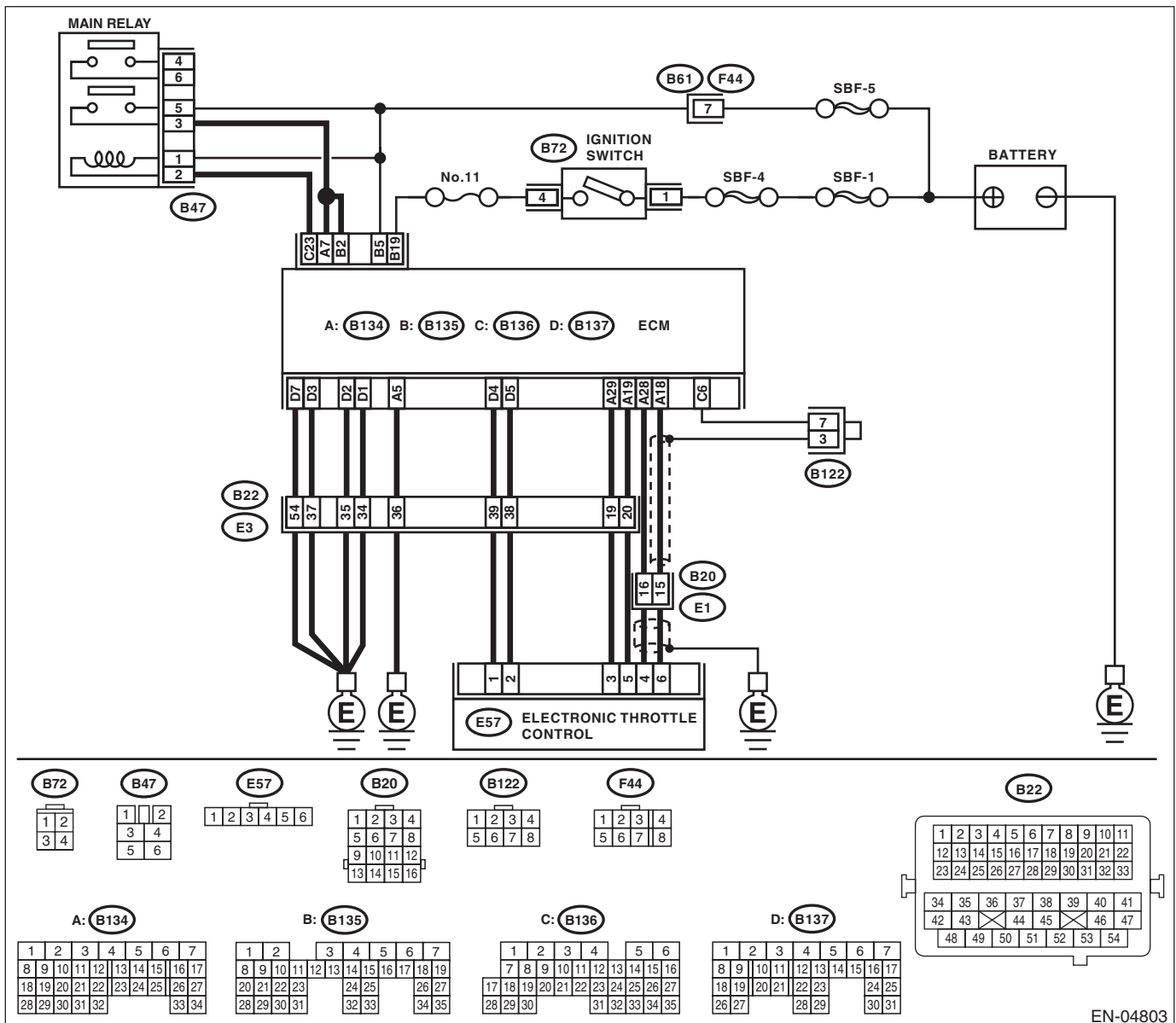
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04803

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT VOLTAGE OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal <i>(B134) No. 7 (+) — Chassis ground (-):</i> <i>(B135) No. 2 (+) — Chassis ground (-):</i>	Is the voltage 10 — 13 V?	Go to step 2.	Repair the open or ground short circuit of power supply circuit.
2 CHECK INPUT VOLTAGE OF ECM. 1) Start the engine. 2) Measure the voltage between ECM connector and chassis ground. Connector & terminal <i>(B134) No. 7 (+) — Chassis ground (-):</i> <i>(B135) No. 2 (+) — Chassis ground (-):</i>	Is the voltage 13 — 15 V?	Go to step 3.	Repair the open or ground short circuit of power supply circuit.
3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM and electronic throttle control. 3) Measure the resistance of harness between ECM and electronic throttle control connector. Connector & terminal <i>(E57) No. 5 — (B134) No. 19:</i> <i>(E57) No. 3 — (B134) No. 29:</i>	Is the resistance less than 1 Ω?	Go to step 4.	Repair the open circuit of harness between ECM and electronic throttle control connector.
4 CHECK ECM GROUND HARNESS. Measure the voltage between ECM connector and chassis ground. Connector & terminal <i>(B134) No. 5 (+) — Chassis ground (-):</i> <i>(B137) No. 7 (+) — Chassis ground (-):</i> <i>(B137) No. 1 (+) — Chassis ground (-):</i> <i>(B137) No. 2 (+) — Chassis ground (-):</i> <i>(B137) No. 3 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	Repair the following item. • Further tighten the engine ground terminal. • Poor contact in ECM connector • Poor contact in coupling connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CK:DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1)

NOTE:

For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC)(diag)-351, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

CL:DTC P0691 FAN 1 CONTROL CIRCUIT LOW

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-189, DTC P0691 FAN 1 CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Radiator fan does not operate properly.
- Overheating

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is DTC P0691 displayed on the Subaru Select Monitor?	Inspect the radiator fan relay. <Ref. to CO(H4SO)-12, Radiator Fan System.>	Temporary poor contact occurs.

CM:DTC P0692 FAN 1 CONTROL CIRCUIT HIGH

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-190, DTC P0692 FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Radiator fan does not operate properly.
- Overheating

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is DTC P0692 displayed on the Subaru Select Monitor?	Inspect the radiator fan relay. <Ref. to CO(H4SO)-12, Radiator Fan System.>	Temporary poor contact occurs.

CN:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-191, DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST), Diagnostic Trouble Code (DTC) Detecting Criteria.>

NOTE:

For the diagnostic procedure, refer to AT section. <Ref. to 4AT(D)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CO:DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-192, DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

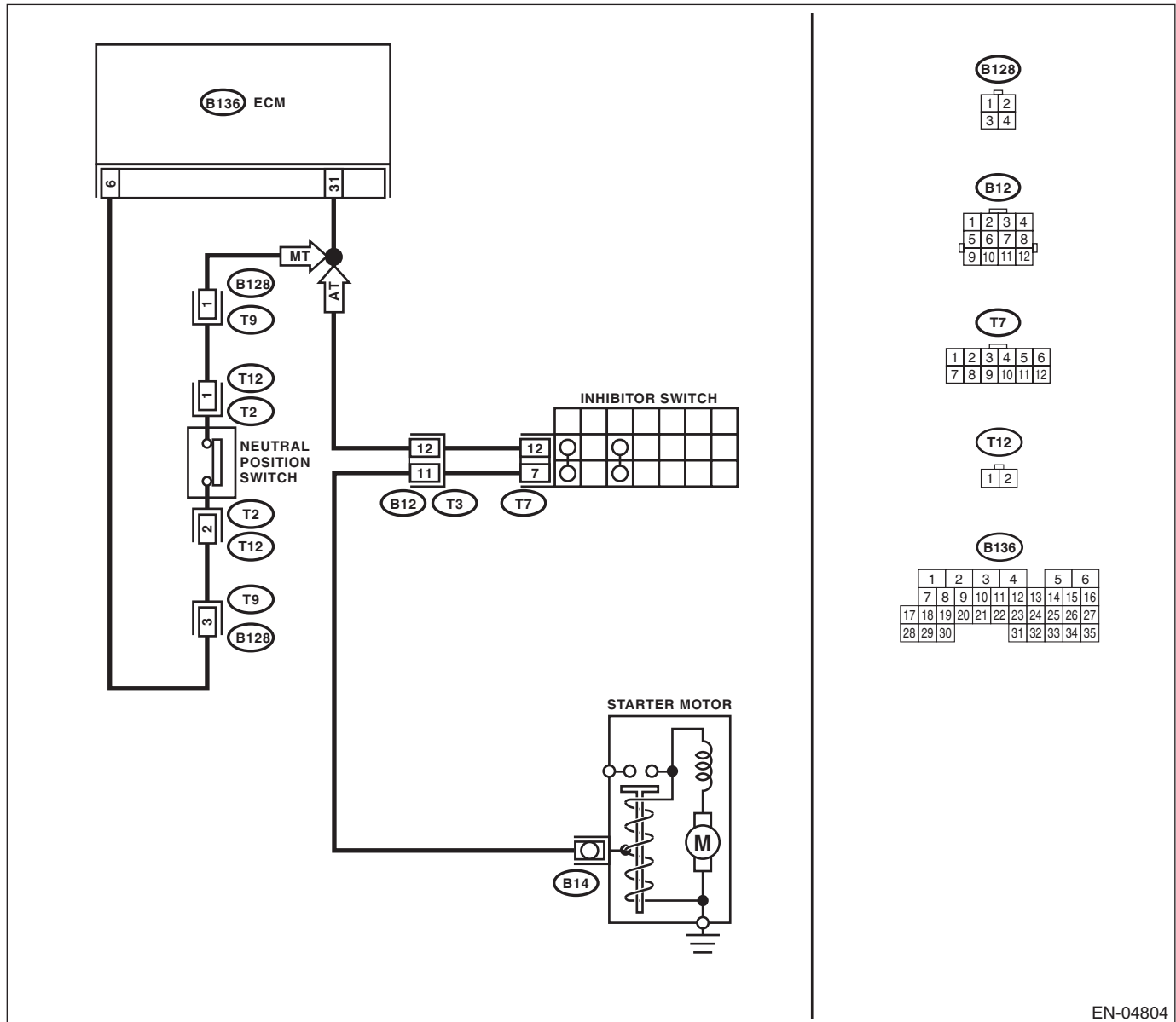
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04804

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SELECT CABLE.	Is there any fault in the select cable?	Repair or adjust the selector cable. <Ref. to CS-25, Select Cable.>	Go to step 2.
2 CHECK INPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Place the select lever other than "N" and "P" range. 3) Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B136) No. 31 (+) — Chassis ground (-):</i>	Is the voltage 4.5 — 5.5 V?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and transmission harness connector (T3). 3) Measure the resistance of harness between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B136) No. 31 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 4.	Repair the ground short circuit of harness between ECM and transmission harness connector.
4 CHECK TRANSMISSION HARNESS CONNECTOR. 1) Disconnect the connector from inhibitor switch. 2) Measure the resistance of harness between transmission harness connector and engine ground. <i>Connector & terminal</i> <i>(T3) No. 12 — Engine ground:</i>	Is the resistance 1 MΩ or more?	Replace the inhibitor switch. <Ref. to 4AT-47, Inhibitor Switch.>	Repair the ground short circuit of harness between transmission harness connector and inhibitor switch connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CP:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-193, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

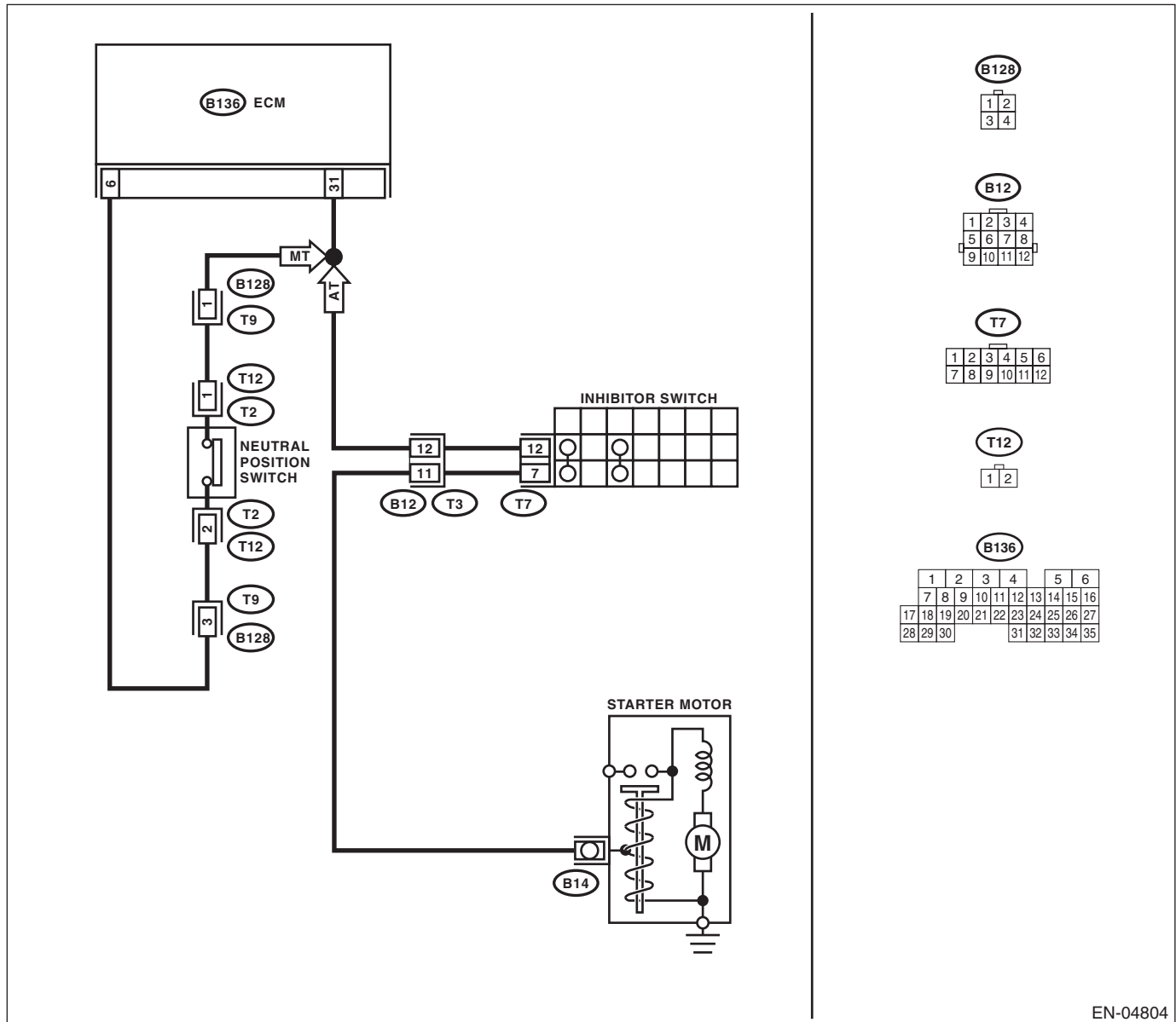
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04804

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Place the shift lever in a position except for neutral. 3) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 31 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 2.	Go to step 4.
2 CHECK INPUT SIGNAL OF ECM. 1) Place the shift lever in neutral. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 31 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Repair the poor contact in ECM connector.	Go to step 3.
3 CHECK NEUTRAL POSITION SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the transmission harness. 3) Place the shift lever in a position except for neutral. 4) Measure the resistance between transmission harness and connector terminals. Connector & terminal (T9) No. 1 — No. 3:	Is the resistance 1 M Ω or more?	Go to step 4.	Repair the short circuit in transmission harness, or replace the neutral position switch.
4 CHECK NEUTRAL POSITION SWITCH. 1) Place the shift lever in neutral. 2) Measure the resistance between transmission harness connector terminals.	Is the resistance less than 1 Ω ?	Go to step 5.	Repair the short circuit in transmission harness, or replace the neutral position switch.
5 CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR. Measure the resistance between ECM and chassis ground. Connector & terminal (B136) No. 31 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 6.	Repair the ground short circuit of harness between ECM and transmission harness connector.
6 CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR. 1) Disconnect the connectors from ECM. 2) Measure the resistance of harness between ECM and transmission harness connector. Connector & terminal (B136) No. 31 — (B128) No. 1:	Is the resistance less than 1 Ω ?	Go to step 7.	Repair the open circuit of harness between ECM and transmission harness connector.
7 CHECK HARNESS BETWEEN ECM AND NEUTRAL POSITION SWITCH CONNECTOR. Measure the resistance of the harness between the ECM and transmission harness connector. Connector & terminal (B128) No. 3 — (B136) No. 6:	Is the resistance less than 5 Ω ?	Repair the poor contact of transmission harness connector.	Repair the open circuit between the transmission harness connector and ECM.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CQ:DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-194, DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

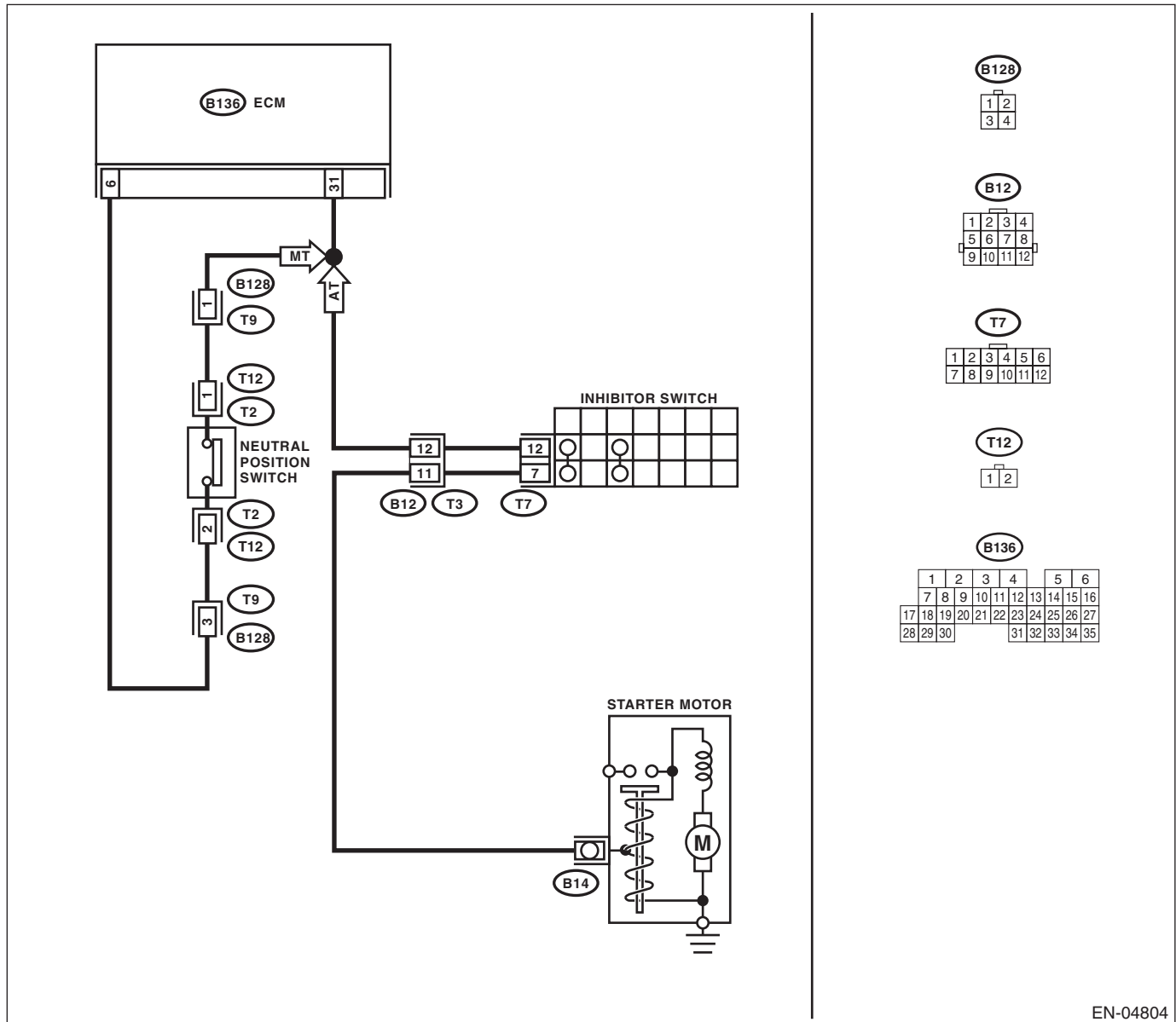
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04804

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SELECT CABLE.	Is there any fault in the select cable?	Repair or adjust the selector cable. <Ref. to CS-26, INSPECTION, Select Cable.>	Go to step 2.
2 CHECK INPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground with select lever at "N" and "P" range. Connector & terminal (B136) No. 31 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 3.	Go to step 4.
3 CHECK INPUT SIGNAL OF ECM. Measure the voltage between ECM and chassis ground with select lever at other than "N" and "P" range. Connector & terminal (B136) No. 31 (+) — Chassis ground (-):	Is the voltage 4.5 — 5.5 V?	Repair the poor contact in ECM connector.	Go to step 5.
4 CHECK INPUT SIGNAL OF ECM. Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 31 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the short circuit to the power supply in the harness between the ECM and inhibitor switch connector.	Go to step 5.
5 CHECK HARNESS BETWEEN ECM AND INHIBITOR SWITCH CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and inhibitor switch. 3) Measure the resistance of harness between ECM and inhibitor switch connector. Connector & terminal (B136) No. 31 — (T7) No. 12:	Is the resistance less than 1 Ω?	Go to step 6.	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open circuit in harness between ECM and inhibitor switch connector • Poor contact in coupling connector • Poor contact of inhibitor switch connector • Poor contact in ECM connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>6 CHECK INHIBITOR SWITCH GROUND LINE. Measure the resistance of harness between inhibitor switch connector and engine ground. <i>Connector & terminal</i> <i>(T7) No. 12 — Engine ground:</i></p>	<p>Is the resistance less than 5 Ω?</p>	<p>Replace the inhibitor switch. <Ref. to 4AT-47, Inhibitor Switch.></p>	<p>Repair open circuit of harness between inhibitor switch connector and starter motor ground line. NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit in harness between inhibitor switch connector and starter motor ground line • Poor contact in starter motor connector • Poor contact in starter motor ground • Starter motor

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CR:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-195, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>

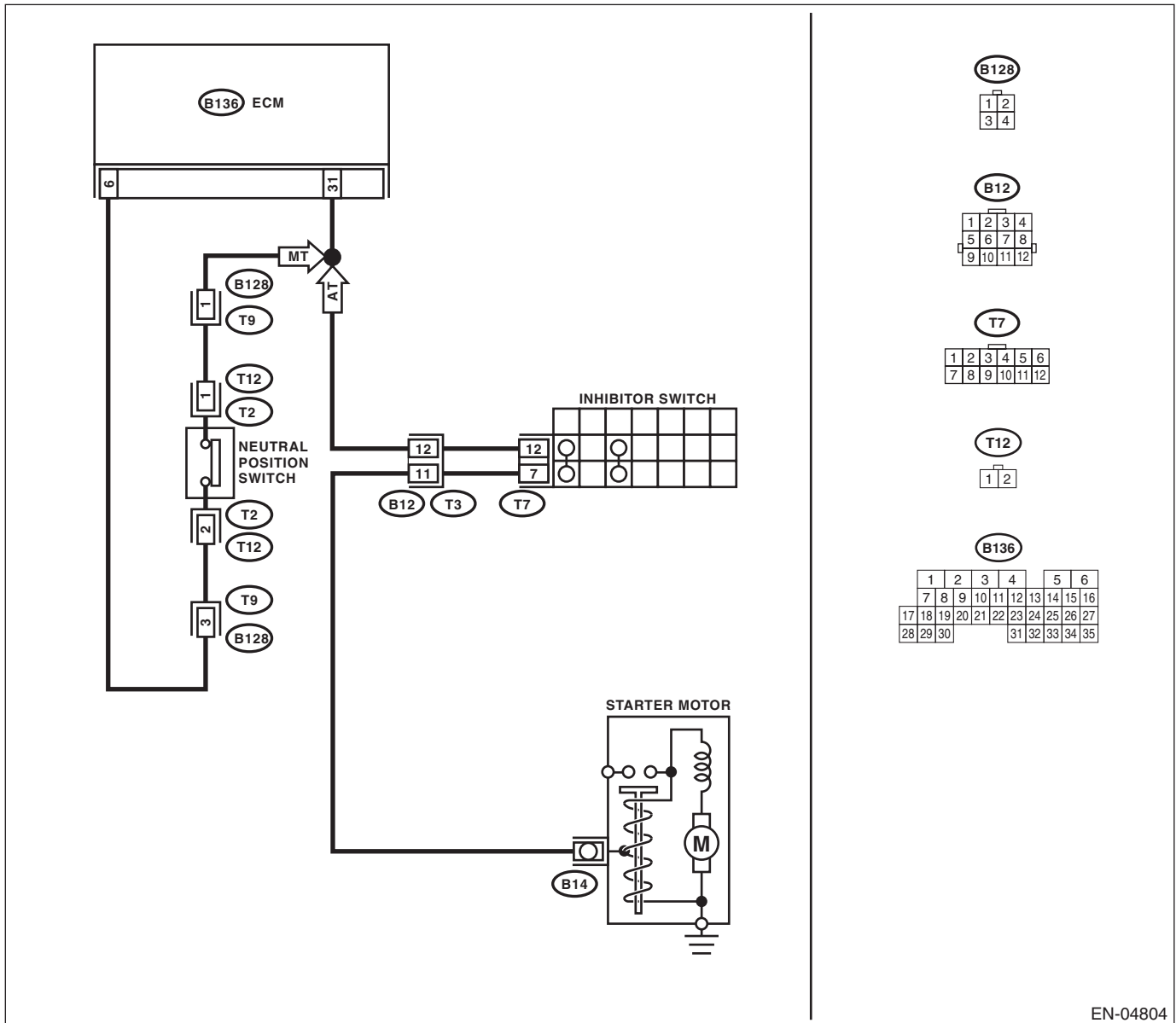
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04804

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Place the shift lever except in neutral position. 3) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 31 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 2.	Go to step 4.
2 CHECK INPUT SIGNAL OF ECM. 1) Place the shift lever in neutral position. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 31 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Repair the poor contact in ECM connector.	Go to step 3.
3 CHECK INPUT SIGNAL OF ECM. 1) Disconnect the connectors from ECM. 2) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 31 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the short circuit to power supply in the harness between the ECM and transmission harness connector.	Go to step 4.
4 CHECK HARNESS BETWEEN ECM AND TRANSMISSION HARNESS CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and transmission harness connector (T9). 3) Measure the resistance of harness between ECM and neutral switch connector. Connector & terminal (B136) No. 31 — (B128) No. 1:	Is the resistance less than 1 Ω ?	Go to step 5.	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open circuit of harness between ECM and transmission harness connector • Poor contact in transmission harness connector. • Poor contact in ECM connector
5 CHECK NEUTRAL POSITION SWITCH GROUND LINE. Measure the resistance of the harness between the ECM and transmission harness connector. Connector & terminal (B128) No. 3 — (B136) No. 6:	Is the resistance less than 5 Ω ?	Go to step 6.	Repair the open circuit in the neutral position switch ground line.
6 CHECK NEUTRAL POSITION SWITCH. 1) Place the shift lever in neutral position. 2) Measure the resistance between transmission harness connector socket terminals. Terminals No. 1 — No. 3:	Is the resistance less than 1 Ω ?	Repair the poor contact of transmission harness connector.	Replace the neutral position switch.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CS:DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1)

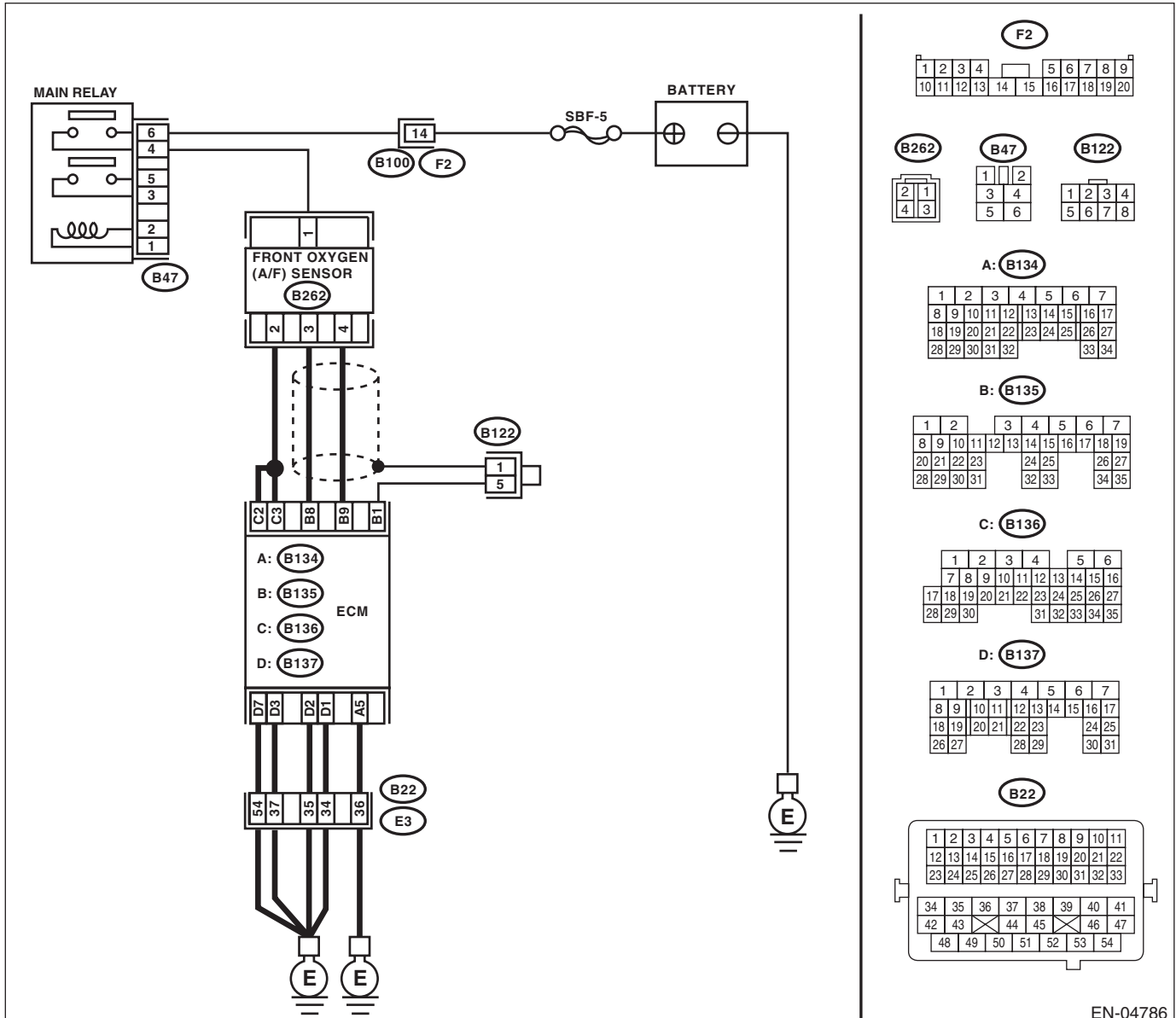
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-196, DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04786

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.	Does water enter the connector?	Dry the water thoroughly. Go to step 2.
2	CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. Connector & terminal (B135) No. 9 — (B262) No. 4: (B135) No. 8 — (B262) No. 3:	Is the resistance less than 1 Ω?	Go to step 3. Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
3	CHECK POOR CONTACT. Check poor contact of front oxygen (A/F) sensor connector.	Is there poor contact in front oxygen (A/F) sensor connector?	Repair the poor contact in front oxygen (A/F) sensor connector. Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-36, Front Oxygen (A/F) Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CT:DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1)

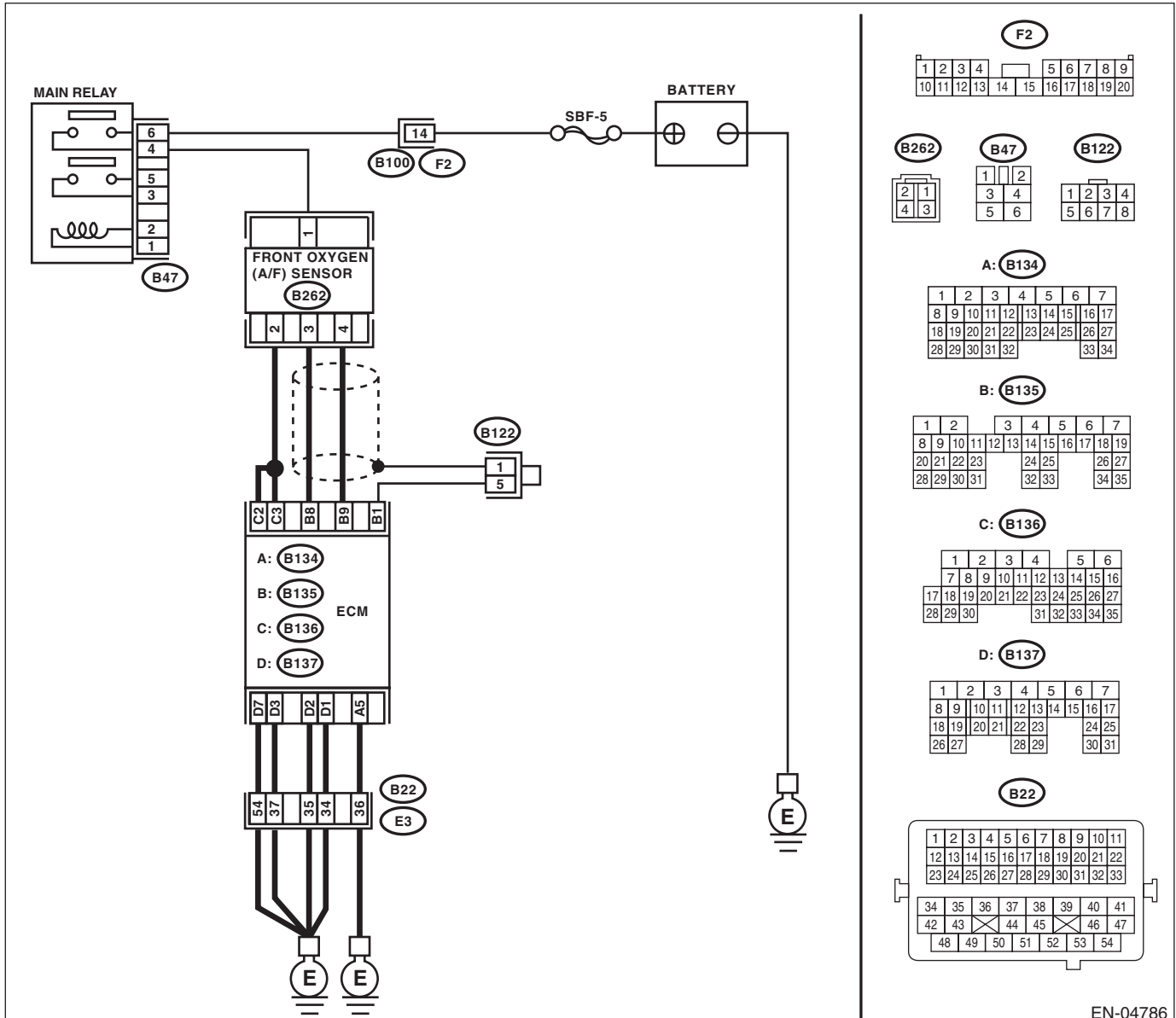
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-198, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04786

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No	
1	CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.	Does water enter the connector?	Dry the water thoroughly.	Go to step 2.
2	CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B135) No. 8 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 3.	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.
3	CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B135) No. 9 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 4.	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.
4	CHECK OUTPUT SIGNAL FOR ECM. 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 8 (+) — Chassis ground (-):	Is the voltage 4.5 V or more?	Go to step 5.	Go to step 6.
5	CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 8 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the short to power supply in the harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	Repair poor contact in ECM connector.
6	CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-):	Is the voltage 4.95 V or more?	Go to step 7.	Replace the front oxygen (A/F) sensor. <Ref. to FU(H4SO)-36, Front Oxygen (A/F) Sensor.>
7	CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the short to power supply in the harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	Repair poor contact in ECM connector.

CU:DTC P1160 RETURN SPRING FAILURE

NOTE:

For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC)(diag)-351, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CV:DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW

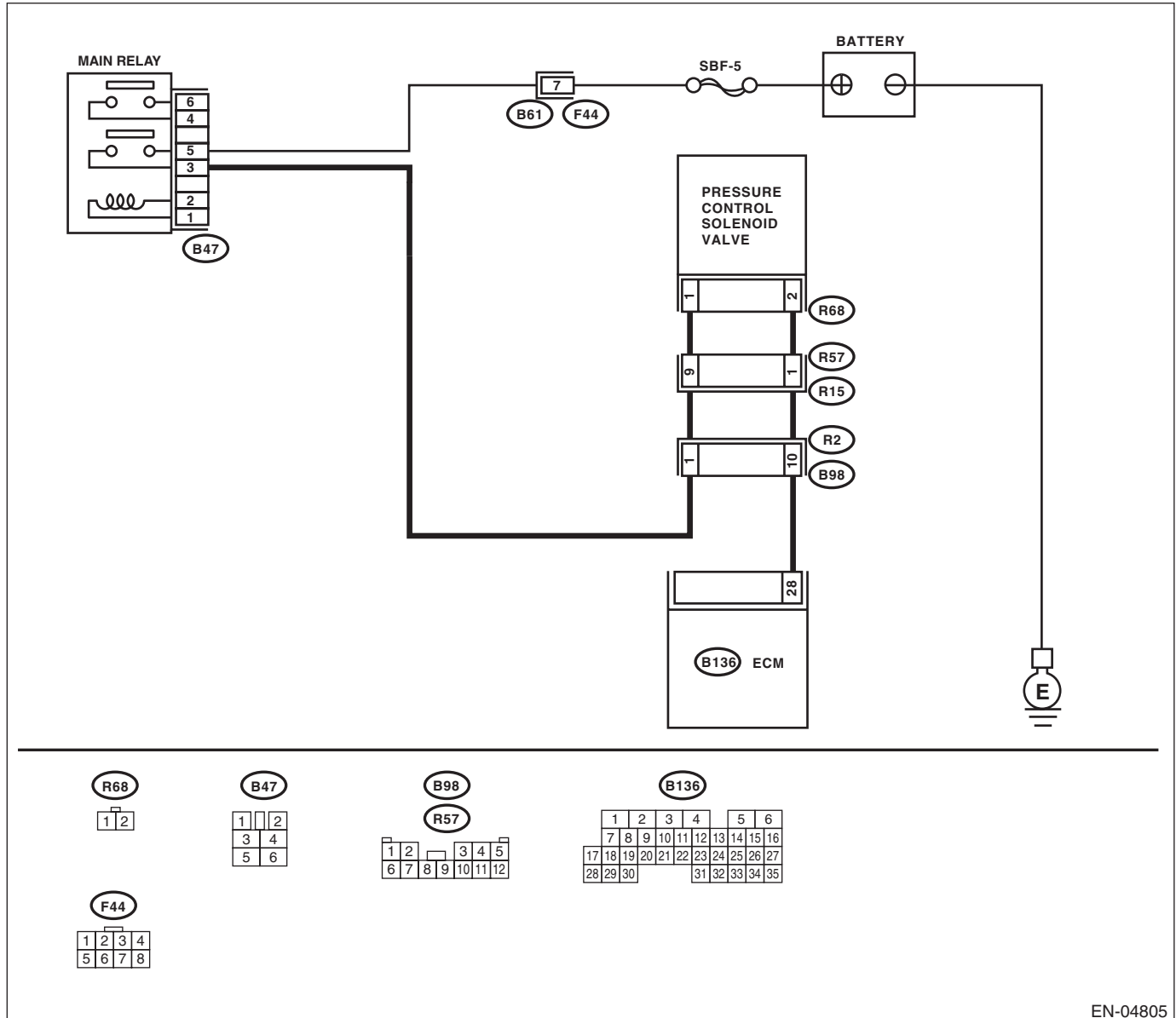
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-202, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>

WIRING DIAGRAM:



EN-04805

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK OUTPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B136) No. 28 (+) — Chassis ground (-):</i></p>	Is the voltage 10 V or more?	Repair the poor contact in ECM connector.	Go to step 2.
<p>2</p> <p>CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the pressure control solenoid valve and ECM. 3) Measure the resistance of harness between pressure control solenoid valve connector and chassis ground. <i>Connector & terminal</i> <i>(R68) No. 2 — Chassis ground:</i></p>	Is the resistance 1 M Ω or more?	Go to step 3.	Repair the ground short circuit of harness between ECM and pressure control solenoid valve connector.
<p>3</p> <p>CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR. Measure the resistance of harness between ECM and pressure control solenoid valve connector. <i>Connector & terminal</i> <i>(B136) No. 28 — (R68) No. 2:</i></p>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and pressure control solenoid valve connector • Poor contact in coupling connector
<p>4</p> <p>CHECK PRESSURE CONTROL SOLENOID VALVE. Measure the resistance between pressure control solenoid valve terminals. <i>Terminals</i> <i>No. 1 — No. 2:</i></p>	Is the resistance between 10 — 100 Ω ?	Go to step 5.	Replace the pressure control solenoid valve. <Ref. to EC (H4DOTC)-16, Pressure Control Solenoid Valve.>
<p>5</p> <p>CHECK POWER SUPPLY TO THE PRESSURE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to ON. 2) Measure the voltage between pressure control solenoid valve and chassis ground. <i>Connector & terminal</i> <i>(R68) No. 1 (+) — Chassis ground (-):</i></p>	Is the voltage 10 V or more?	Repair the poor contact of pressure control solenoid valve connector.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between main relay and pressure control solenoid valve connector • Poor contact in coupling connector • Poor contact in main relay connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CW:DTC P1410 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-204, DTC P1410 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

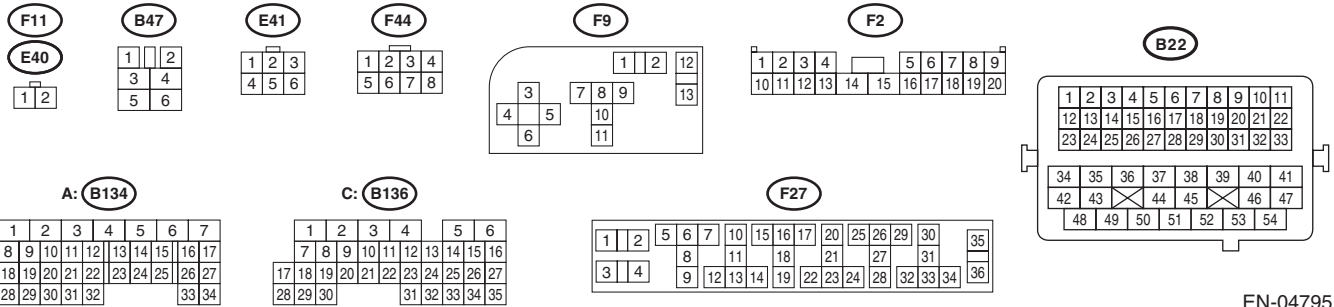
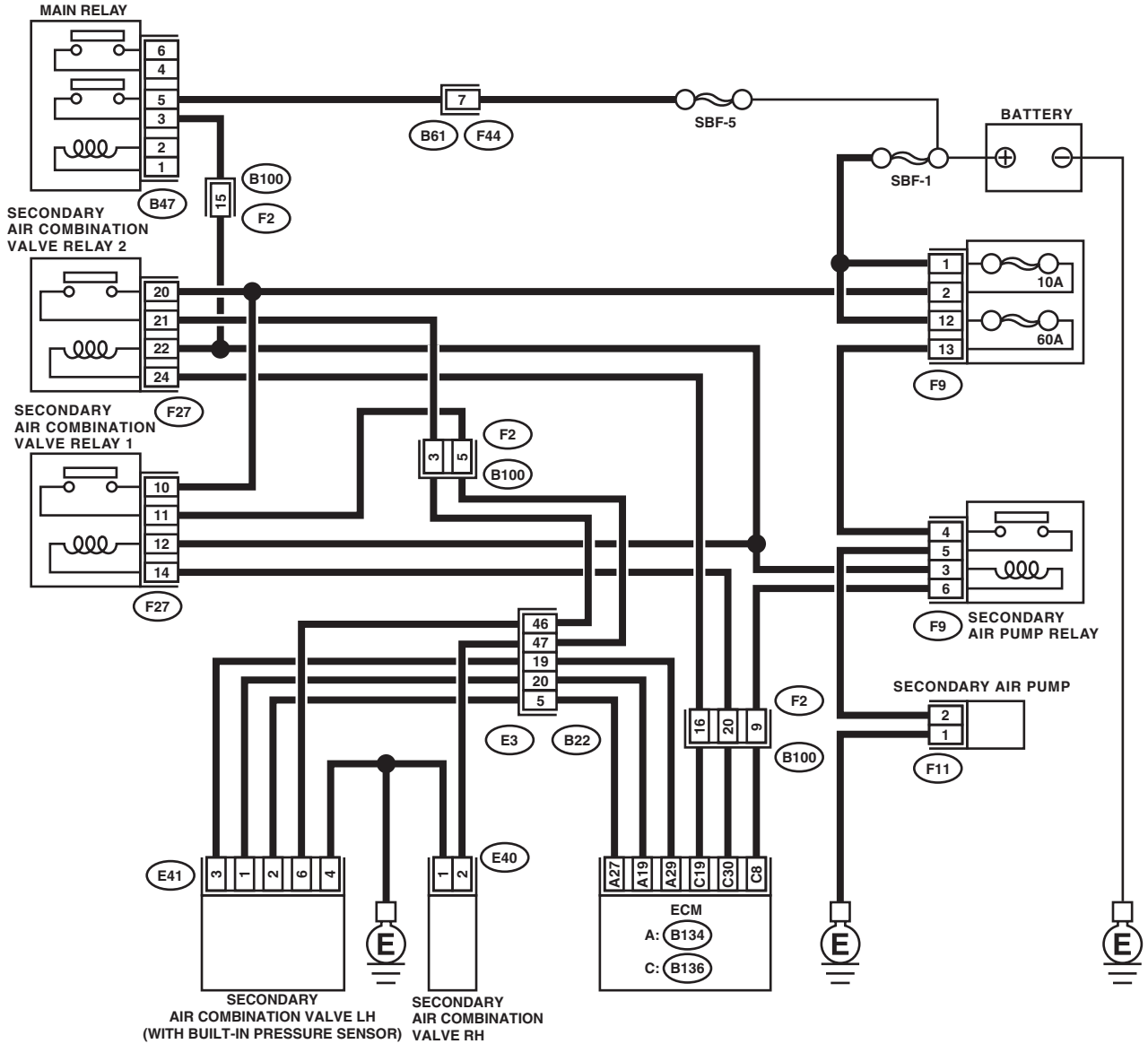
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04795

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK SECONDARY AIR COMBINATION VALVE. 1) Remove the secondary air combination valve. <Ref. to EC (H4DOTC)-10, Secondary Air Combi Valve.> 2) Blow in air from the secondary air combination valve air inlet, and check whether there are leaks at the pipe connections.	Are there air leaks from the pipe connections?	Replace the secondary air combination valve on the side with the air leak. <Ref. to EC (H4DOTC)-10, Secondary Air Combi Valve.>	Temporary poor contact occurs. Check the poor contact of connector.

CX:DTC P1418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT SHORTED

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-205, DTC P1418 SECONDARY AIR INJECTION SYSTEM CONTROL “A” CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

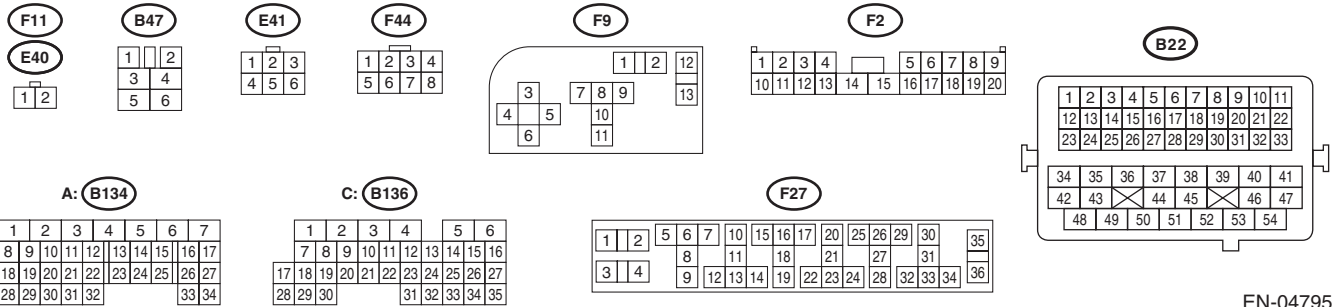
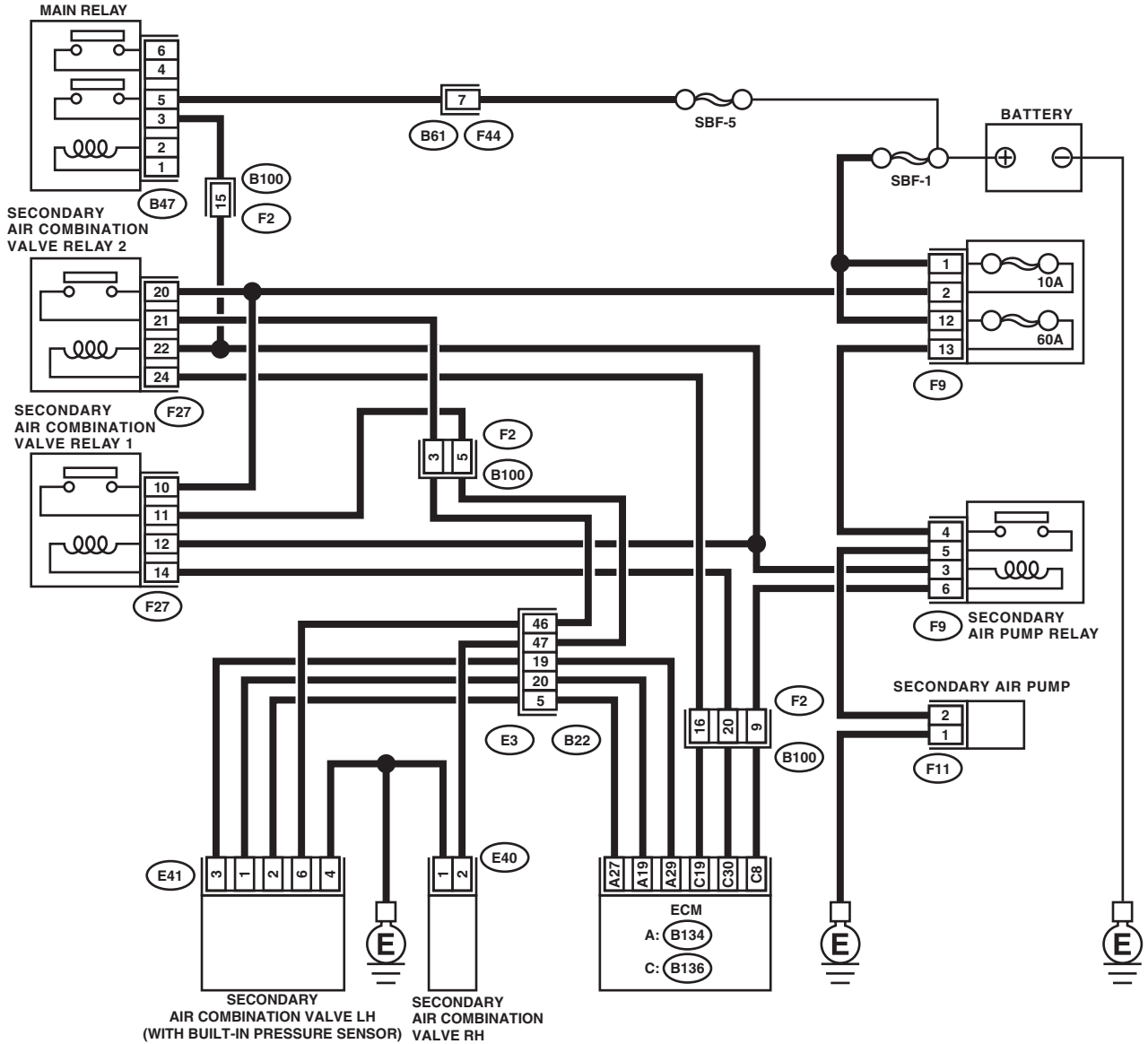
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04795

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and secondary air pump relay. 3) Measure the resistance of the harness between the ECM and secondary air pump relay terminal. Connector & terminal (B136) No. 8 — (F9) No. 6:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair open circuit of the harness between the ECM and secondary air pump relay terminal.
2	CHECK HARNESS BETWEEN ECM AND SECONDARY AIR PUMP RELAY. Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 8 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the short circuit to power supply in the harness between the ECM and secondary air pump relay terminal.	Temporary poor contact occurs. Check the poor contact of connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CY:DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH

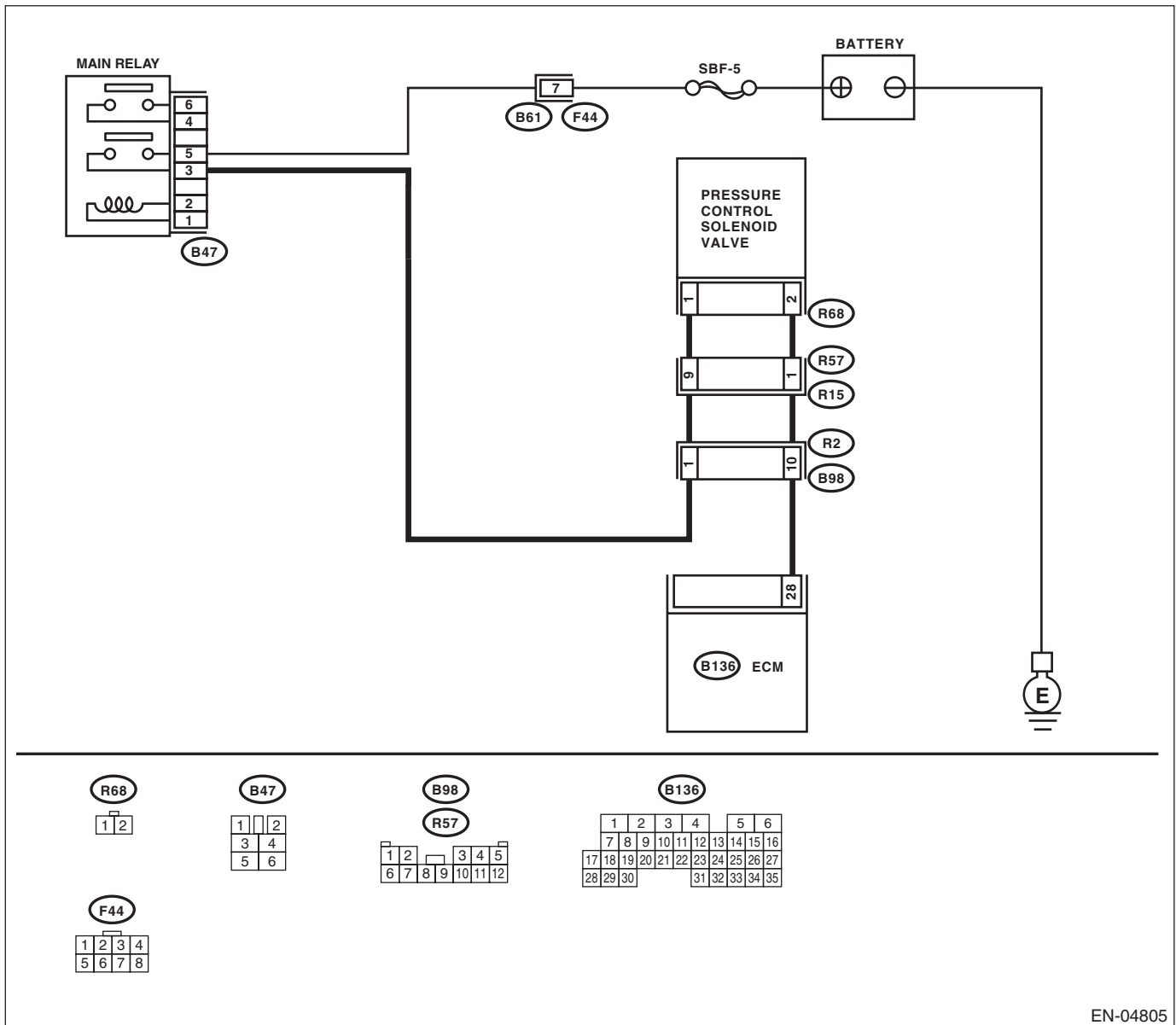
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-206, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04805

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK INPUT SIGNAL OF ECM. 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground while operating the pressure control solenoid valve.</p> <p>NOTE: The pressure control solenoid valve operation can be executed using the Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.></p> <p>Connector & terminal (B136) No. 28 (+) — Chassis ground (-):</p>	Does the voltage change between 0 — 10 V?	Go to step 2.	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. In this case, repair the poor contact in ECM connector.
2	<p>CHECK INPUT SIGNAL OF ECM. 1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground.</p> <p>Connector & terminal (B136) No. 28 (+) — Chassis ground (-):</p>	Is the voltage 10 V or more?	Go to step 4.	Go to step 3.
3	<p>CHECK POOR CONTACT. Check poor contact of ECM connector.</p>	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>
4	<p>CHECK HARNESS BETWEEN PRESSURE CONTROL SOLENOID VALVE AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the pressure control solenoid valve. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground.</p> <p>Connector & terminal (B136) No. 28 (+) — Chassis ground (-):</p>	Is the voltage 10 V or more?	Repair the short circuit to power supply in the harness between the ECM and pressure control solenoid valve connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	Go to step 5.
5	<p>CHECK PRESSURE CONTROL SOLENOID VALVE. 1) Turn the ignition switch to OFF. 2) Measure the resistance between pressure control solenoid valve terminals.</p> <p>Terminals No. 1 — No. 2:</p>	Is the resistance less than 1 Ω ?	Replace the purge control solenoid valve <Ref. to EC (H4DOTC)-16, Pressure Control Solenoid Valve.>and ECM <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	Go to step 6.
6	<p>CHECK POOR CONTACT. Check poor contact of ECM connector.</p>	Is there poor contact in ECM connector?	Repair poor contact in ECM connector.	Replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

CZ:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-208, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

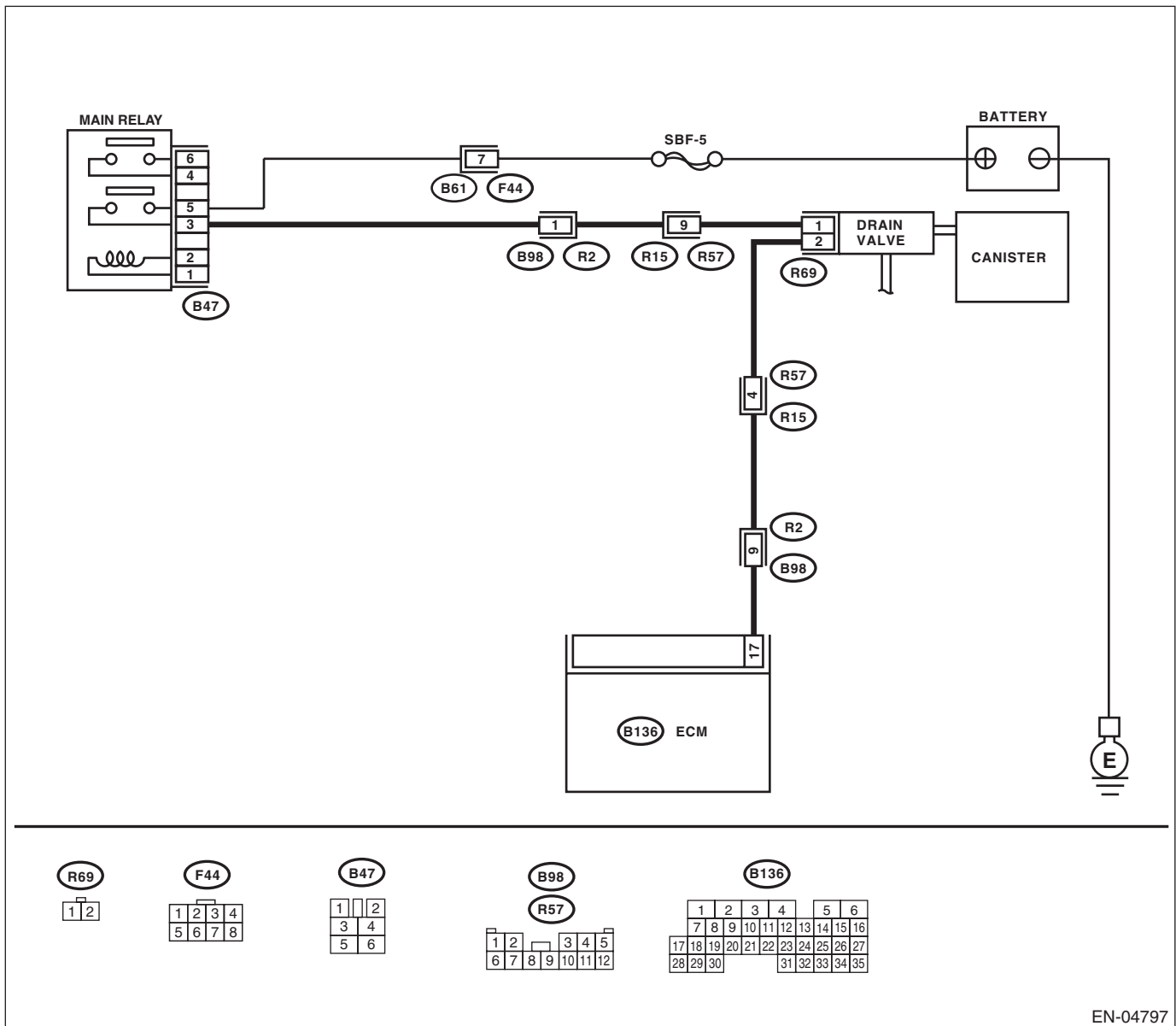
TROUBLE SYMPTOM:

Improper fuel supply

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04797

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK DRAIN VALVE OPERATION. 1) Turn the ignition switch to OFF. 2) Connect the test mode connector at the lower portion of instrument panel (on the driver's side). 3) Turn the ignition switch to ON. 4) Operate the drain valve. NOTE: Drain valve operation can be executed using Subaru Select Monitor. Regarding the procedures, refer to "Compulsory Valve Operation Check Mode". <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.>	Does the drain valve operate?	Repair the poor contact in ECM connector.	Replace the drain valve. <Ref. to EC(H4DOTC)-21, Drain Valve.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DA:DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-210, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

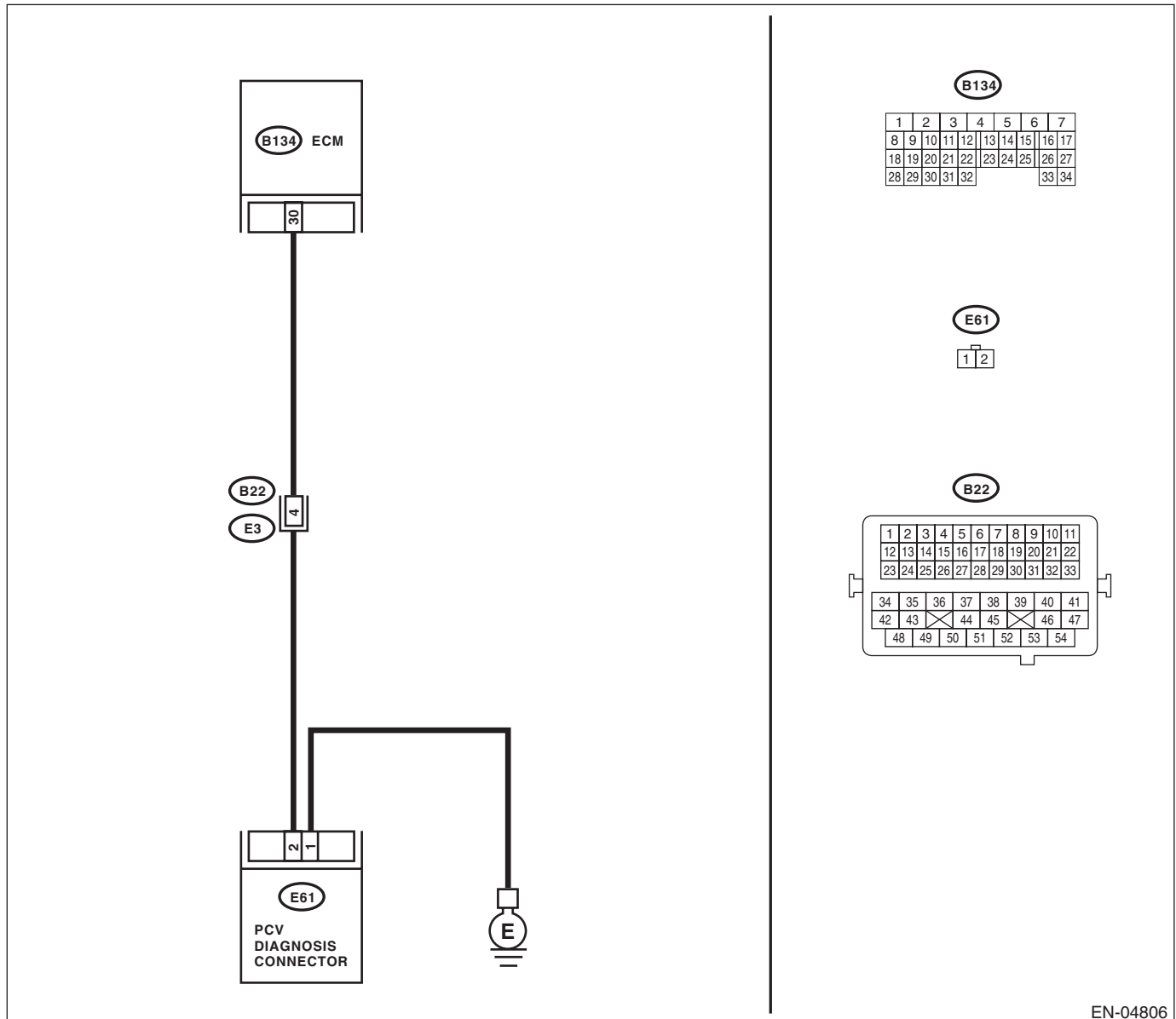
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04806

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK BLOW-BY HOSE. Check the condition of the blow-by hose.	Is there any disconnection or crack in blow-by hose?	Replace or repair the blow-by hose.	Go to step 2.
2 CHECK HARNESS BETWEEN PCV DIAGNOSIS CONNECTOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the PCV diagnosis connector and ECM. 3) Measure the resistance of harness between PCV diagnosis connector and ECM connector. <i>Connector & terminal</i> <i>(B134) No. 30 — (E61) No. 2:</i>	Is the resistance less than 1 Ω?	Go to step 3.	Repair the open circuit of harness between PCV diagnosis connector and ECM connector.
3 CHECK HARNESS BETWEEN PCV DIAGNOSIS CONNECTOR AND ECM CONNECTOR. Measure the resistance of harness between PCV diagnosis connector and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 30 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 4.	Repair the ground short circuit of harness between PCV diagnosis connector and ECM connector.
4 CHECK GROUND CIRCUIT OF PCV DIAGNOSIS CONNECTOR. Measure the resistance of harness between PCV diagnosis connector and engine ground. <i>Connector & terminal</i> <i>(E61) No. 1 — Engine ground:</i>	Is the resistance less than 5 Ω?	Go to step 5.	Repair the ground circuit of PCV diagnosis connector.
5 CHECK PCV DIAGNOSIS CONNECTOR. Measure the resistance between PCV diagnosis connector terminals. <i>Terminals</i> <i>No. 1 — No. 2:</i>	Is the resistance less than 1 Ω?	Repair poor contact of the ECM and PCV diagnosis connector.	Replace the PCV diagnosis connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DB:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-212, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

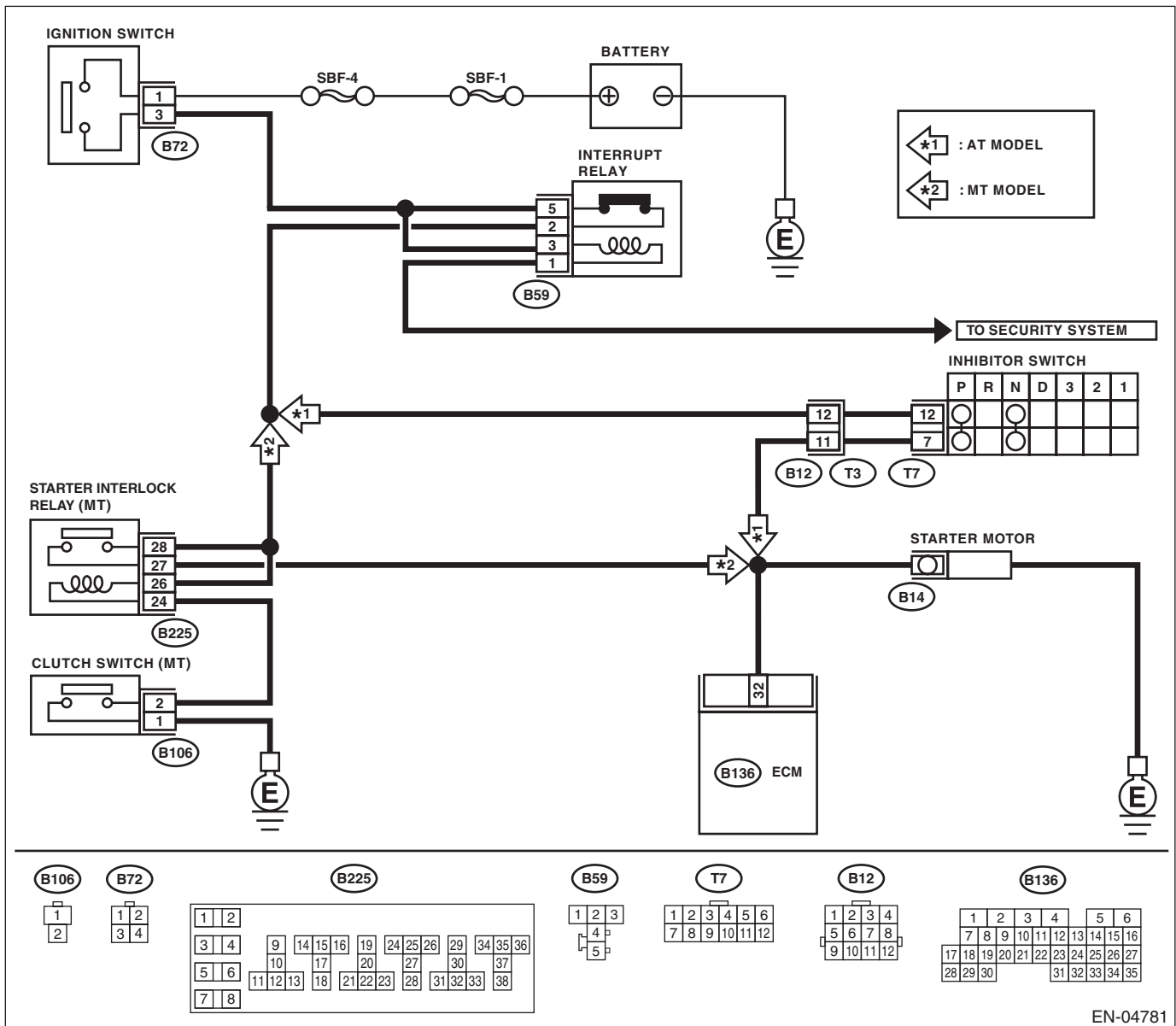
TROUBLE SYMPTOM:

Failure of engine to start

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04781

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OPERATION OF STARTER MOTOR.	Does the starter motor operate when ignition switch is turned to START?	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none">• Open or ground short circuit of harness between ECM and starter motor connector• Poor contact in ECM connector	Check the starter motor circuit. <Ref. to EN(H4DOTC)(diag)-59, STARTER MOTOR CIRCUIT, Diagnostics for Engine Starting Failure.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DC:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

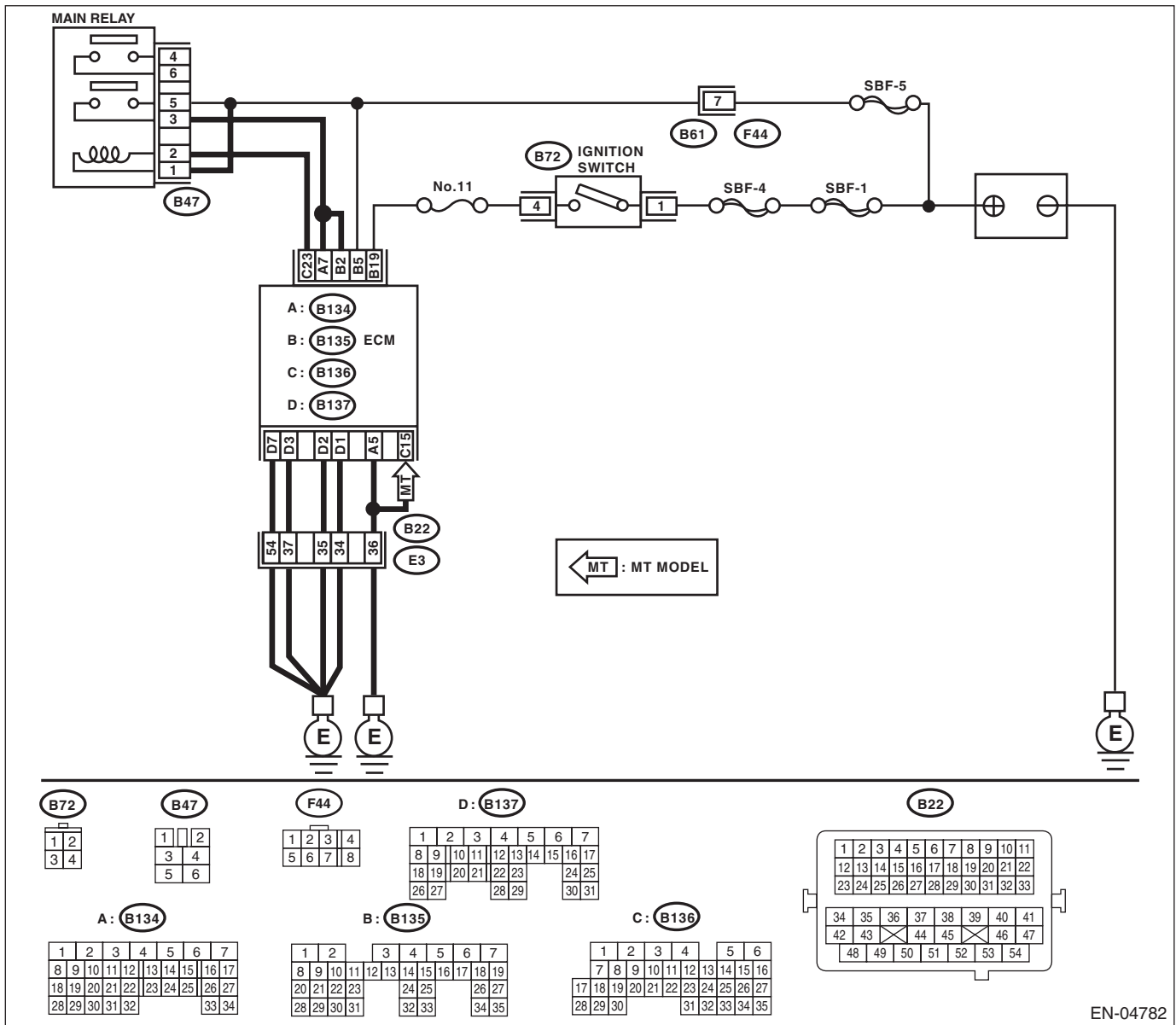
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-213, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04782

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT SIGNAL OF ECM. 1) Turn the ignition switch to OFF. 2) Measure the voltage between ECM and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 5 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Repair poor contact in ECM connector.	Go to step 2.
2 CHECK HARNESS BETWEEN ECM AND MAIN FUSE BOX CONNECTOR. 1) Disconnect the connectors from ECM. 2) Measure the resistance of harness between ECM and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 5 — Chassis ground:</i>	Is the resistance less than 10 Ω?	Repair the ground short circuit of harness between ECM connector and battery terminal.	Go to step 3.
3 CHECK FUSE SBF-5.	Is the fuse blown out?	Replace the fuse.	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open circuit in harness between ECM and battery • Poor contact in ECM connector • Poor contact in battery terminal

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DD:DTC P1602 CONTROL MODULE PROGRAMMING ERROR

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-215, DTC P1602 CONTROL MODULE PROGRAMMING ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>

TROUBLE SYMPTOM:

- Engine keeps running at higher speed than specified idle speed.
- Engine keeps running at lower speed than specified idle speed.
- Engine stalls.

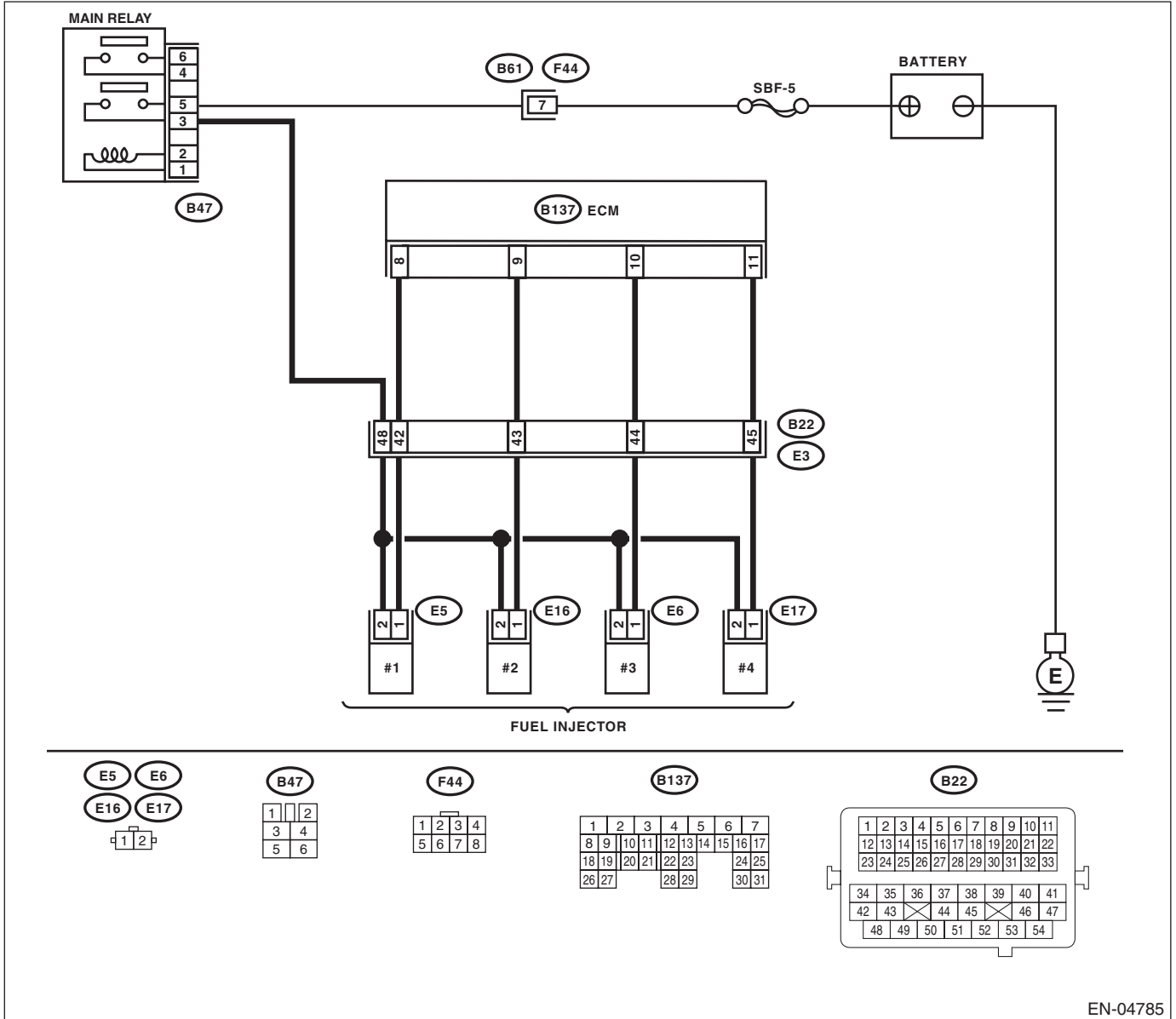
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

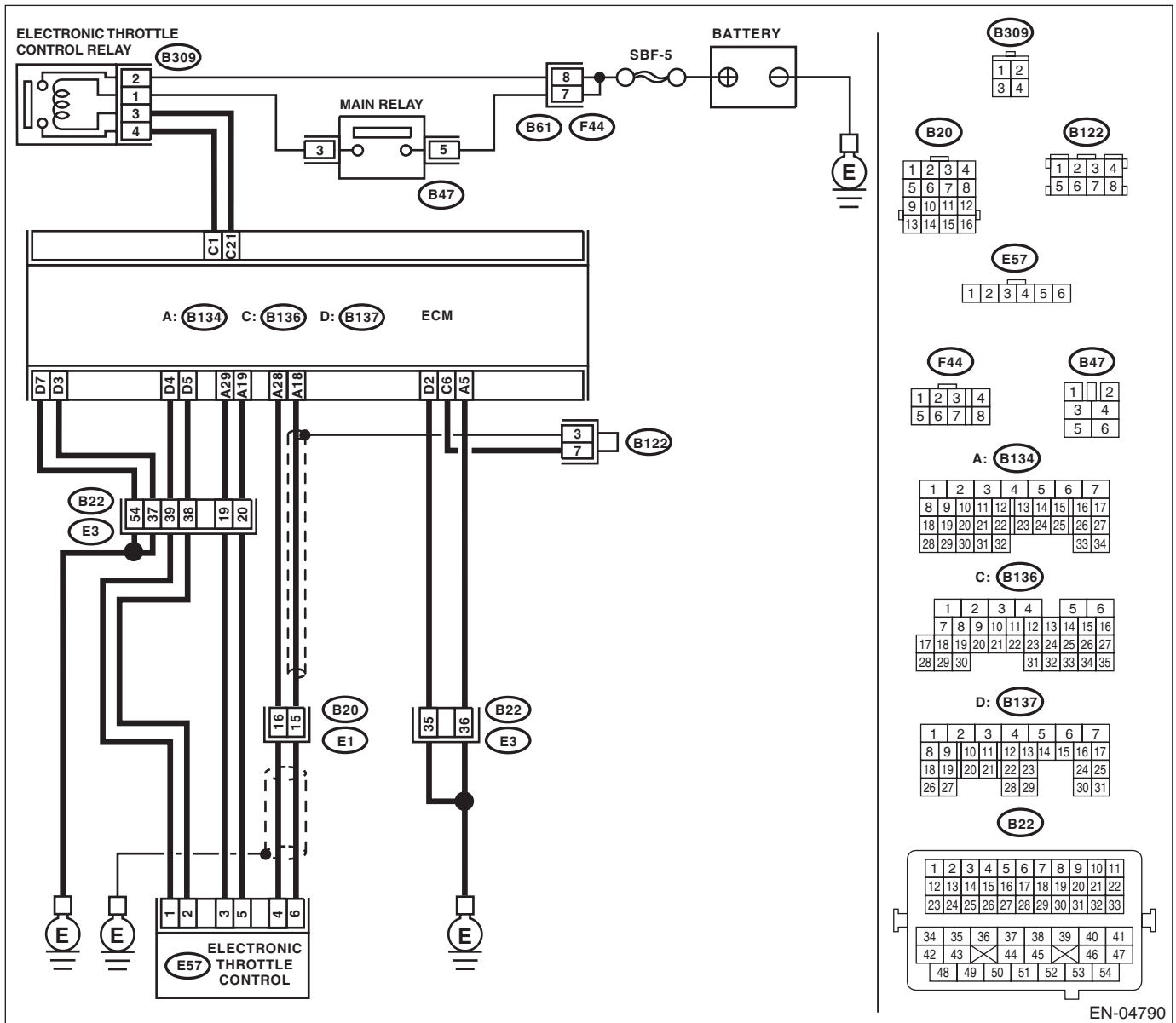
WIRING DIAGRAM:



EN-04785

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)



EN-04790

Step	Check	Yes	No	
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK ENGINE OIL.	Is the engine oil filled to the specified amount?	Go to step 3.	Replace the engine oil. <Ref. to LU (H4SO)-10, REPLACEMENT, Engine Oil.>
3	CHECK EXHAUST SYSTEM.	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step 4.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
4 CHECK AIR INTAKE SYSTEM.	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step 5.
5 CHECK FUEL PRESSURE. WARNING: • Place “NO FIRE” signs near the working area. • Be careful not to spill fuel. Measure the fuel pressure. <Ref. to ME(H4DOTC)-27, INSPECTION, Fuel Pressure.> WARNING: Release fuel pressure before removing the fuel pressure gauge.	Is the fuel pressure 339.5 — 360.5 kPa (3.5 — 3.7 kgf/cm ² , 49 — 52 psi)?	Go to step 6.	Repair the following item. Fuel pressure is too high: • Clogged fuel line or bent hose Fuel pressure is too low: • Improper fuel pump discharge • Clogged fuel line
6 CHECK ENGINE COOLANT TEMPERATURE SENSOR. 1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the “General Scan Tool Instruction Manual”.	Is the engine coolant temperature 60°C (140°F) or more?	Go to step 7.	Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-26, Engine Coolant Temperature Sensor.>
7 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR. 1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the select lever in “N” or “P” position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool. NOTE: • Subaru Select Monitor For detailed operation procedures, refer to “READ CURRENT DATA FOR ENGINE”. <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the “General Scan Tool Instruction Manual”.	Is the measured value 2.1 — 3.4 g/s (0.28 — 0.45 lb/m)?	Go to step 8.	Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-30, Mass Air Flow and Intake Air Temperature Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>8 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.</p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F).</p> <p>2) Place the shift lever in neutral position.</p> <p>3) Turn the A/C switch to OFF.</p> <p>4) Turn all the accessory switches to OFF.</p> <p>5) Open the front hood.</p> <p>6) Measure the ambient temperature.</p> <p>7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • Subaru Select Monitor <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • General scan tool <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Subtract the ambient temperature from intake air temperature. Is the obtained value -10 — 50°C (-18 — 90°F)?</p>	Go to step 9.	Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-30, Mass Air Flow and Intake Air Temperature Sensor.>
<p>9 CHECK OUTPUT SIGNAL OF ECM.</p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between ECM connector and chassis ground.</p> <p>Connector & terminal</p> <p>#1 (B137) No. 8 (+) — Chassis ground (-):</p> <p>#2 (B137) No. 9 (+) — Chassis ground (-):</p> <p>#3 (B137) No. 10 (+) — Chassis ground (-):</p> <p>#4 (B137) No. 11 (+) — Chassis ground (-):</p>	Is the voltage 10 V or more?	Go to step 14.	Go to step 10.
<p>10 CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from fuel injector on faulty cylinders.</p> <p>3) Measure the resistance between ECM connector and engine ground on faulty cylinders.</p> <p>Connector & terminal</p> <p>#1 (E5) No. 1 — Engine ground:</p> <p>#2 (E16) No. 1 — Engine ground:</p> <p>#3 (E6) No. 1 — Engine ground:</p> <p>#4 (E17) No. 1 — Engine ground:</p>	Is the resistance 1 MΩ or more?	Go to step 11.	Repair the ground short circuit of harness between fuel injector and ECM connector.
<p>11 CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR.</p> <p>Measure the resistance of harness connector between ECM connector and fuel injector on faulty cylinders.</p> <p>Connector & terminal</p> <p>#1 (B137) No. 8 — (E5) No. 1:</p> <p>#2 (B137) No. 9 — (E16) No. 1:</p> <p>#3 (B137) No. 10 — (E6) No. 1:</p> <p>#4 (B137) No. 11 — (E17) No. 1:</p>	Is the resistance less than 1 Ω?	Go to step 12.	Repair the harness and connector. NOTE: In this case, repair the following item: • Open circuit in harness between ECM and fuel injector connector • Poor contact in coupling connector
<p>12 CHECK FUEL INJECTOR.</p> <p>Measure the resistance between fuel injector terminals on faulty cylinder.</p> <p>Terminals</p> <p>No. 1 — No. 2:</p>	Is the resistance between 5 — 20 Ω?	Go to step 13.	Replace the faulty fuel injector. <Ref. to FU(H4DOTC)-32, Fuel Injector.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
13 CHECK POWER SUPPLY LINE. 1) Turn the ignition switch to ON. 2) Measure the voltage between fuel injector and engine ground on faulty cylinders. Connector & terminal <i>#1 (E5) No. 2 (+) — Engine ground (-):</i> <i>#2 (E16) No. 2 (+) — Engine ground (-):</i> <i>#3 (E6) No. 2 (+) — Engine ground (-):</i> <i>#4 (E17) No. 2 (+) — Engine ground (-):</i>	Is the voltage 10 V or more?	Repair the poor contact of all connectors in fuel injector circuit.	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open circuit in harness between main relay and fuel injector connector on faulty cylinders • Poor contact in coupling connector • Poor contact in main relay connector • Poor contact in fuel injector connector on faulty cylinders
14 CHECK HARNESS BETWEEN FUEL INJECTOR AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from fuel injector on faulty cylinders. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground on faulty cylinders. Connector & terminal <i>#1 (B137) No. 8 (+) — Chassis ground (-):</i> <i>#2 (B137) No. 9 (+) — Chassis ground (-):</i> <i>#3 (B137) No. 10 (+) — Chassis ground (-):</i> <i>#4 (B137) No. 11 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Repair the short circuit to power supply in the harness between the ECM connector and fuel injector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	Go to step 15.
15 CHECK FUEL INJECTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between fuel injector terminals on faulty cylinder. Terminals <i>No. 1 — No. 2:</i>	Is the resistance less than 1 Ω?	Replace the faulty fuel injector <Ref. to FU(H4DOTC)-32, Fuel Injector.> and ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	Go to step 16.
16 CHECK INSTALLATION OF CAMSHAFT POSITION SENSOR/CRANKSHAFT POSITION SENSOR.	Is the camshaft position sensor or crankshaft position sensor loosely installed?	Tighten the camshaft position sensor or crankshaft position sensor.	Go to step 17.
17 CHECK CRANKSHAFT SPROCKET. Remove the timing belt cover.	Is the crank sprocket rusted or does it have broken teeth?	Replace the crank sprocket. <Ref. to ME(H4DOTC)-53, Crank Sprocket.>	Go to step 18.
18 CHECK INSTALLATION CONDITION OF TIMING BELT. Turn the crankshaft, and align alignment mark on crank sprocket with alignment mark on cylinder block.	Is the timing belt dislocated from its proper position?	Repair the installation condition of the timing belt. <Ref. to ME(H4DOTC)-44, Timing Belt.>	Go to step 19.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
19 CHECK ELECTRONIC THROTTLE CONTROL RELAY. 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Connect the battery to terminals No. 1 and No. 3 of electronic throttle control relay. 4) Measure the resistance between electronic throttle control relay terminals. <i>Terminals</i> <i>No. 2 — No. 4:</i>	Is the resistance less than 1 Ω ?	Go to step 20.	Replace the electronic throttle control relay.
20 CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL RELAY. Measure the voltage between electronic throttle control relay connector and chassis ground. <i>Connector & terminal</i> <i>(B309) No. 1 (+) — Chassis ground (-):</i> <i>(B309) No. 2 (+) — Chassis ground (-):</i>	Is the voltage 5 V or more?	Go to step 21.	Repair the open or ground short circuit of power supply circuit.
21 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY. 1) Disconnect the connectors from ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control relay connector and chassis ground. <i>Connector & terminal</i> <i>(B309) No. 3 (+) — Chassis ground (-):</i>	Is the voltage less than 5 V?	Go to step 22.	Repair the power supply short circuit of harness between ECM and electronic throttle control.
22 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY. 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control relay connector and chassis ground. <i>Connector & terminal</i> <i>(B309) No. 3 — Chassis ground:</i> <i>(B309) No. 4 — Chassis ground:</i>	Is the resistance 1 M Ω or more?	Go to step 23.	Repair the ground short circuit of harness between ECM and electronic throttle control relay.
23 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY. Measure the resistance between ECM connector and electronic throttle control relay connector. <i>Connector & terminal</i> <i>(B136) No. 21 — (B309) No. 3:</i> <i>(B136) No. 1 — (B309) No. 4:</i>	Is the resistance less than 1 Ω ?	Go to step 24.	Repair the open circuit of harness between ECM and electronic throttle control relay.
24 CHECK SENSOR OUTPUT. 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.>	Is the voltage 0.4 V or more?	Go to step 25.	Go to step 27.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
25 CHECK SENSOR OUTPUT. 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.>	Is the voltage 0.8 V or more?	Go to step 26 .	Go to step 27 .
26 CHECK POOR CONTACT. Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Go to step 31 .
27 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. <i>Connector & terminal</i> <i>(B134) No. 18 — (E57) No. 6:</i> <i>(B134) No. 28 — (E57) No. 4:</i> <i>(B134) No. 19 — (E57) No. 5:</i>	Is the resistance less than 1 Ω?	Go to step 28 .	Repair the open circuit of harness connector.
28 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. Measure the resistance between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 18 — Chassis ground:</i> <i>(B134) No. 19 — Chassis ground:</i> <i>(B134) No. 28 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 29 .	Repair the ground short circuit of harness.
29 CHECK SENSOR POWER SUPPLY. 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. <i>Connector & terminal</i> <i>(E57) No. 5 (+) — Engine ground (-):</i>	Is the voltage 4.5 — 5.5 V?	Go to step 30 .	Repair poor contact in ECM connector.
30 CHECK SHORT CIRCUIT IN ECM. 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. <i>Connector & terminal</i> <i>(E57) No. 6 — Engine ground:</i> <i>(E57) No. 4 — Engine ground:</i>	Is the resistance 10 Ω or more?	Go to step 31 .	Repair poor contact in ECM connector.
31 CHECK SENSOR OUTPUT. 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.>	Is the voltage less than 4.63 V?	Go to step 32 .	Go to step 34 .

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
32 CHECK SENSOR OUTPUT. Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.>	Is the voltage less than 4.73 V?	Go to step 33.	Go to step 34.
33 CHECK POOR CONTACT. Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Go to step 39.
34 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. <i>Connector & terminal</i> <i>(B134) No. 29 — (E57) No. 3:</i> <i>(B134) No. 18 — (E57) No. 6:</i> <i>(B134) No. 28 — (E57) No. 4:</i>	Is the resistance less than 1 Ω?	Go to step 35.	Repair the open circuit of harness connector.
35 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM connector. 2) Measure the resistance between electronic throttle control connector and engine ground. <i>Connector & terminal</i> <i>(E57) No. 3 — Engine ground:</i>	Is the resistance less than 5 Ω?	Go to step 36.	Repair poor contact in ECM connector.
36 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control connector and engine ground. <i>Connector & terminal</i> <i>(E57) No. 5 (+) — Engine ground (-):</i>	Is the voltage 10 V or more?	Go to step 37.	Repair the short circuit to power supply in the harness between the ECM connector and electronic throttle control connector.
37 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. Measure the voltage between electronic throttle control connector and engine ground. <i>Connector & terminal</i> <i>(E57) No. 6 (+) — Engine ground (-):</i> <i>(E57) No. 4 (+) — Engine ground (-):</i>	Is the voltage less than 10 V?	Go to step 38.	Repair the short circuit of harness between ECM connector and electronic throttle control connector.
38 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Remove the ECM. 3) Measure the resistance between ECM connectors. <i>Connector & terminal</i> <i>(B134) No. 18 — (B134) No. 19:</i> <i>(B134) No. 28 — (B134) No. 19:</i>	Is the resistance 1 MΩ or more?	Go to step 39.	Repair the short circuit to sensor power supply.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
39 CHECK SENSOR OUTPUT. 1) Turn the ignition switch to OFF. 2) Connect the connectors except for electric throttle control relay. 3) Turn the ignition switch to ON. 4) Read the data of main throttle sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.>	Is the voltage 0.81 — 0.87 V?	Go to step 40.	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective.
40 CHECK SENSOR OUTPUT. Read the data of sub throttle sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.>	Is the voltage 1.64 — 1.70 V?	Go to step 41.	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective.
41 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. Connector & terminal (B137) No. 5 — (E57) No. 2: (B137) No. 4 — (E57) No. 1:	Is the resistance less than 1 Ω?	Go to step 42.	Repair the open circuit of harness connector.
42 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR. 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 2 (+) — Engine ground (-): (E57) No. 1 (+) — Engine ground (-):	Is the voltage less than 5 V?	Go to step 43.	Repair the power supply short circuit of harness between ECM and electronic throttle control.
43 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 2 — Engine ground: (E57) No. 1 — Engine ground:	Is the resistance 1 MΩ or more?	Go to step 44.	Repair the short circuit of harness.
44 CHECK ELECTRONIC THROTTLE CONTROL MOTOR HARNESS. Measure the resistance between electronic throttle control connector terminals. Connector & terminal (E57) No. 2 — (E57) No. 1:	Is the resistance 1 MΩ or more?	Go to step 45.	Repair the short circuit of harness.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
45 CHECK ELECTRONIC THROTTLE CONTROL GROUND CIRCUIT. Measure the resistance between ECM connector and chassis ground. <i>Connector & terminal</i> (B134) No. 5 — Chassis ground: (B137) No. 1 — Chassis ground: (B137) No. 2 — Chassis ground: (B137) No. 3 — Chassis ground: (B137) No. 7 — Chassis ground:	Is the resistance less than 10 Ω?	Go to step 46.	Repair the open circuit of harness.
46 CHECK ELECTRONIC THROTTLE CONTROL. Measure the resistance between electronic throttle control terminals. <i>Terminals</i> No. 1 — No. 2:	Is the resistance 50 Ω or less?	Go to step 47.	Replace the electronic throttle control.
47 CHECK ELECTRONIC THROTTLE CONTROL. Move the throttle valve to the fully opened and fully closed positions with fingers. Check that the valve returns to the specified position when releasing fingers.	Does the valve return to the specified position? Standard value: 3 mm (0.12 in) from fully closed position	Repair poor contact in ECM connector.	Replace the electronic throttle control.

DE:DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-217, DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the **Clear Memory Mode** <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and **Inspection Mode** <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK TUMBLE GENERATOR VALVE RH. 1) Remove the tumble generator valve assembly. 2) Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign matter is clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-36, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DF:DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-218, DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the **Clear Memory Mode** <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and **Inspection Mode** <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK TUMBLE GENERATOR VALVE LH. 1) Remove the tumble generator valve assembly. 2) Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign matter is clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-36, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

DG:DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-219, DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the **Clear Memory Mode** <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and **Inspection Mode** <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2 CHECK TUMBLE GENERATOR VALVE RH. 1) Remove the tumble generator valve assembly. 2) Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign matter is clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-36, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DH:DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-220, DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the appropriate DTC using the "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).>	Go to step 2.
2	CHECK TUMBLE GENERATOR VALVE LH. 1) Remove the tumble generator valve assembly. 2) Check the tumble generator valve body.	Does the tumble generator valve move smoothly? (No dirt or foreign matter is clogged)	Replace the tumble generator valve assembly. <Ref. to FU(H4DOTC)-36, Tumble Generator Valve Assembly.>	Clean the tumble generator valve.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DI: DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1)

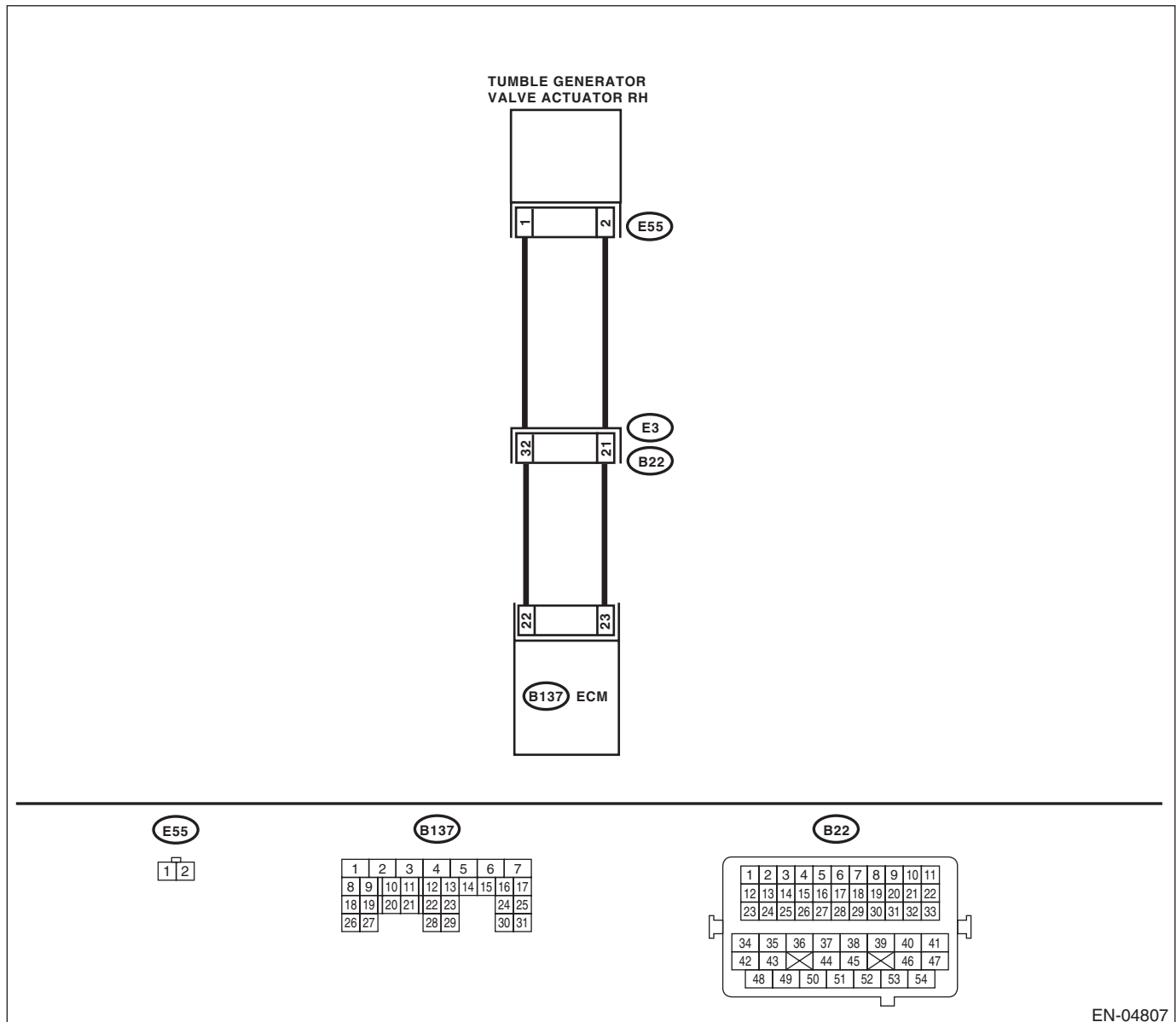
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-221, DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve and ECM connector. 3) Measure the resistance between tumble generator valve actuator and ECM connector.</p> <p>Connector & terminal (E55) No. 1 — (B137) No. 22: (E55) No. 2 — (B137) No. 23:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 2.</p>	<p>Repair the open circuit between ECM and tumble generator valve connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit of harness between ECM and tumble generator valve actuator connector • Poor contact in coupling connector
<p>2</p> <p>CHECK POOR CONTACT. Check poor contact in tumble generator valve actuator connector.</p>	<p>Is there poor contact in tumble generator valve actuator connector?</p>	<p>Repair the poor contact of tumble generator valve actuator connector.</p>	<p>Replace the tumble generator valve actuator. <Ref. to FU(H4DOTC)-37, Tumble Generator Valve Actuator.></p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DJ:DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1)

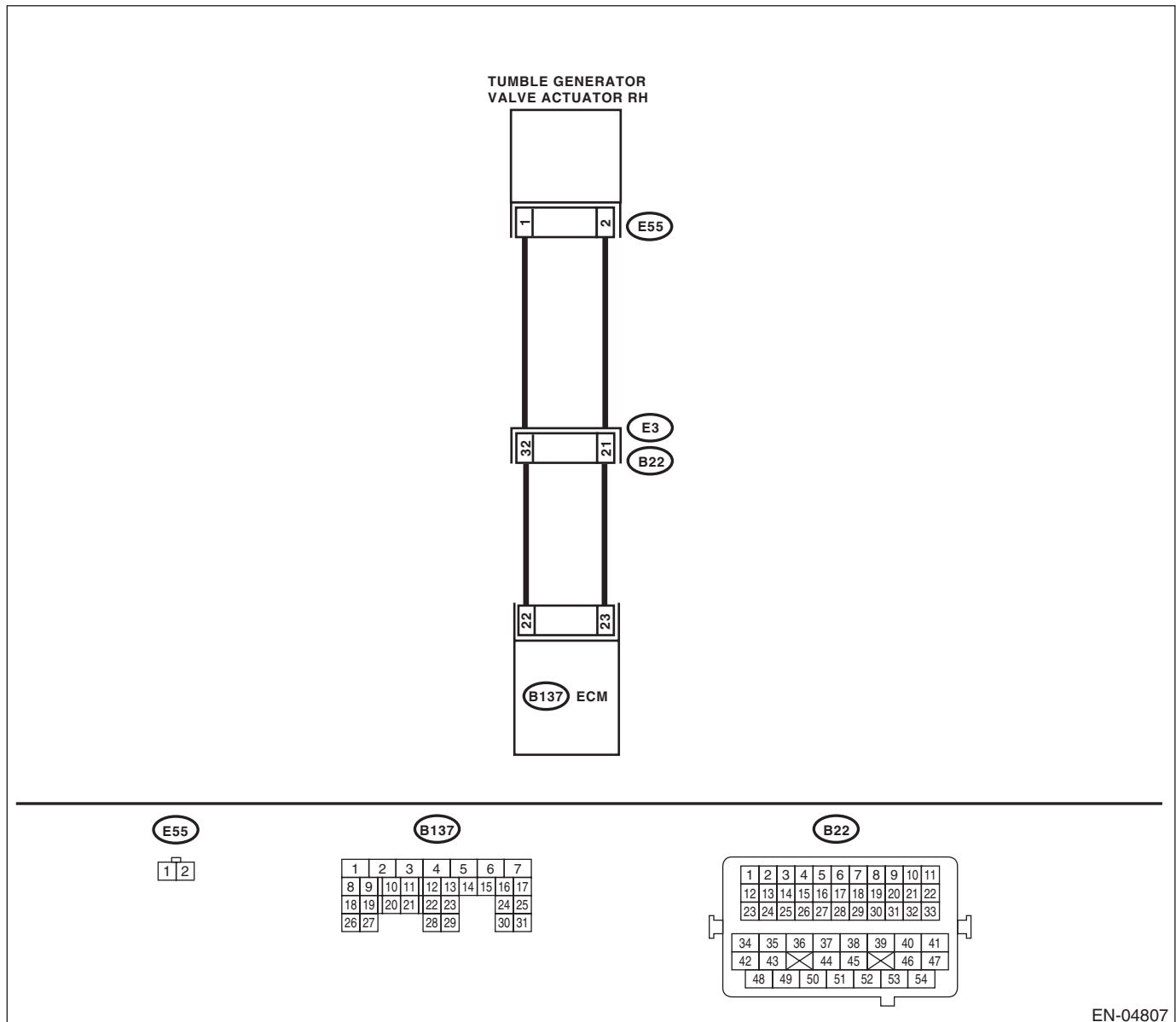
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-223, DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1 CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve connector. 3) Measure the voltage between tumble generator valve actuator and chassis ground.</p> <p>Connector & terminal (E55) No. 1 (+) — Chassis ground (-): (E55) No. 2 (+) — Chassis ground (-):</p>	Is the voltage less than 5 V?	Replace the tumble generator valve actuator. <Ref. to FU(H4DOTC)-37, Tumble Generator Valve Actuator.>	Repair the short circuit to power supply between the ECM and tumble generator valve actuator.

DK:DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2)

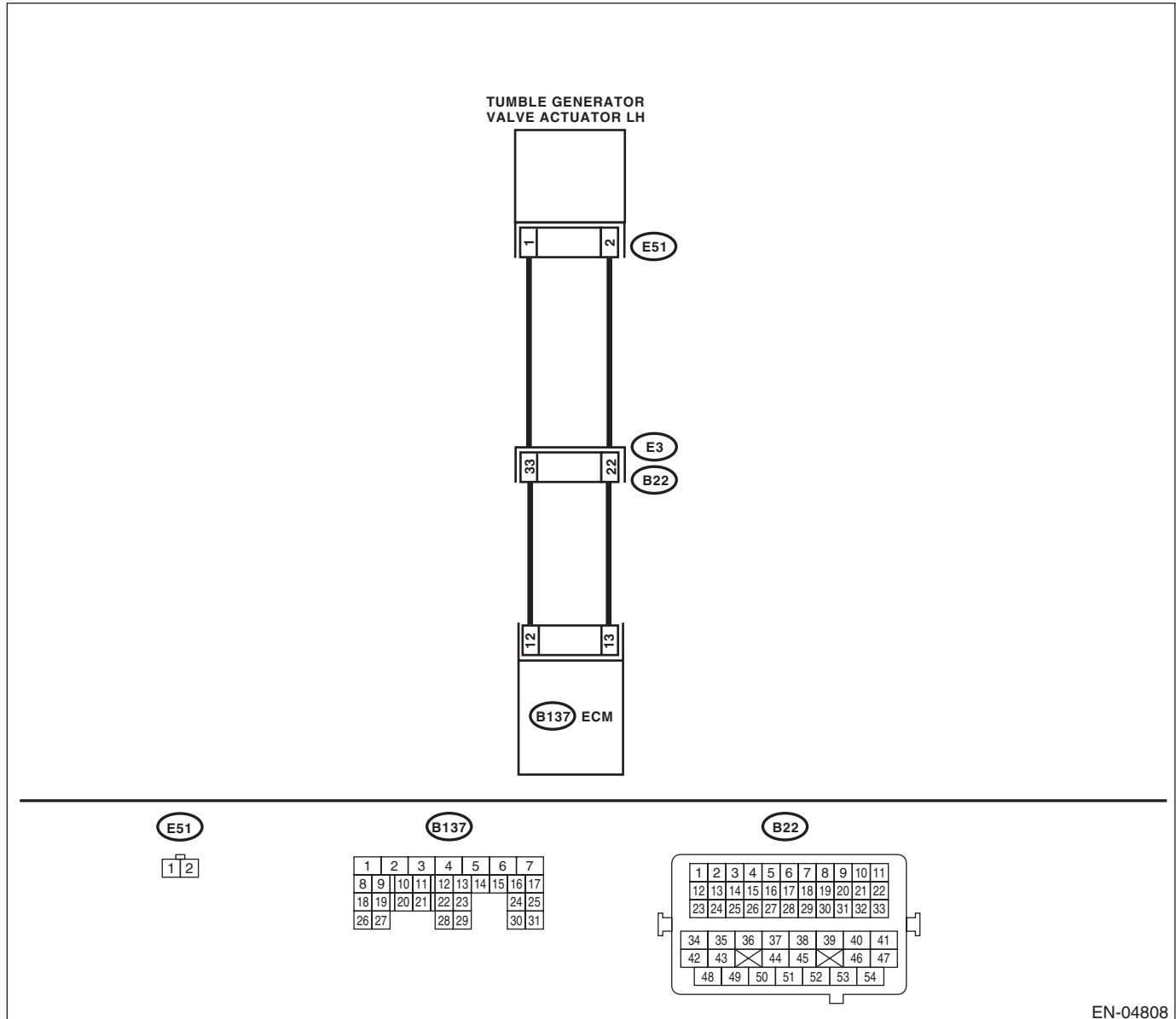
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-225, DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04808

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve and ECM connector. 3) Measure the resistance between tumble generator valve actuator and ECM connector.</p> <p>Connector & terminal (E51) No. 1 — (B137) No. 12: (E51) No. 2 — (B137) No. 13:</p>	Is the resistance less than 1 Ω?	Go to step 2.	<p>Repair the open circuit between ECM and tumble generator valve connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit of harness between ECM and tumble generator valve actuator connector • Poor contact in coupling connector
2	<p>CHECK POOR CONTACT.</p> <p>Check poor contact in tumble generator valve actuator connector.</p>	Is there poor contact in tumble generator valve actuator connector?	Repair the poor contact of tumble generator valve actuator connector.	Replace the tumble generator valve actuator. <Ref. to FU(H4DOTC)-37, Tumble Generator Valve Actuator.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DL:DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2)

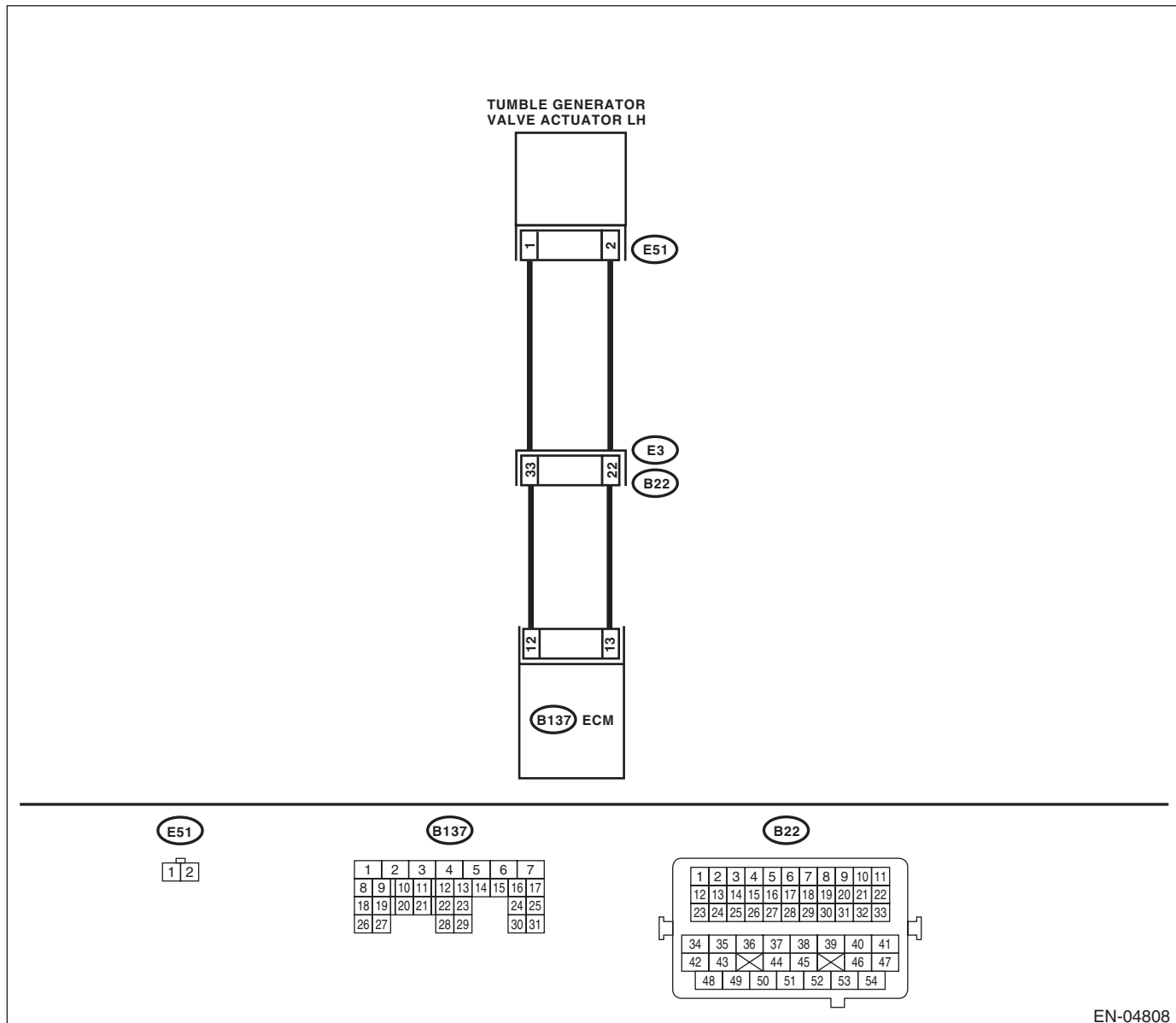
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-227, DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04808

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE ACTUATOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve connector. 3) Measure the voltage between tumble generator valve actuator and chassis ground.</p> <p>Connector & terminal (E51) No. 1 (+) — Chassis ground (-): (E51) No. 2 (+) — Chassis ground (-):</p>	Is the voltage less than 5 V?	Replace the tumble generator valve actuator. <Ref. to FU(H4DOTC)-37, Tumble Generator Valve Actuator.>	Repair the short circuit to power supply between the ECM and tumble generator valve actuator.

DM:DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-229, DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

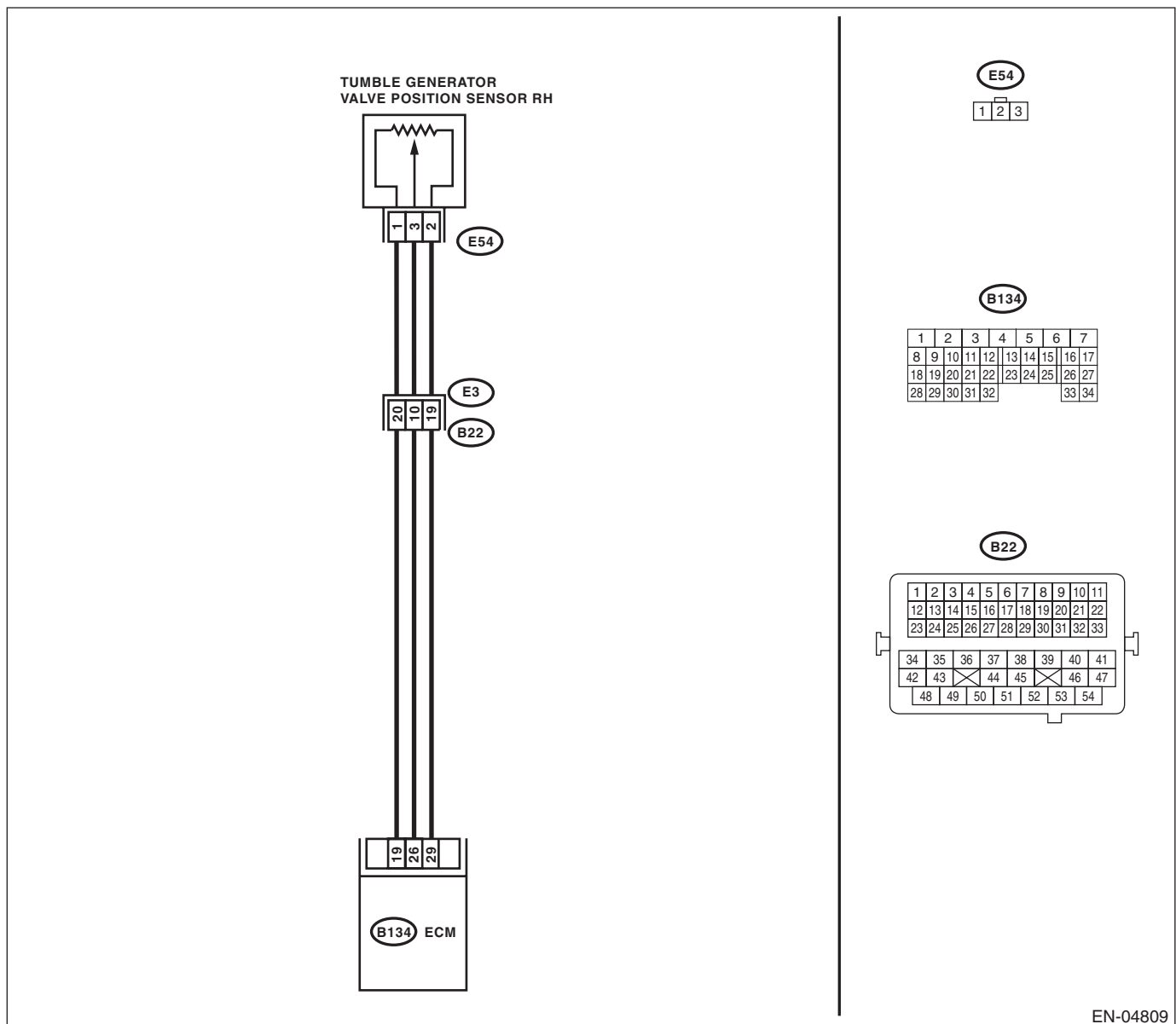
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04809

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK CURRENT DATA. 1) Start the engine. 2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	Is the voltage less than 0.1 V?	Go to step 2.	<p>Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.</p> <p>NOTE: In this case, repair the following item: • Poor contact of tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector</p>
<p>2</p> <p>CHECK INPUT SIGNAL OF ECM. Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 19 (+) — Chassis ground (-):</i></p>	Is the voltage 4.5 V or more?	Go to step 3.	Repair the poor contact in ECM connector.
<p>3</p> <p>CHECK INPUT SIGNAL OF ECM. Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 26 (+) — Chassis ground (-):</i></p>	Is the voltage less than 0.1 V?	Go to step 4.	Repair the poor contact in ECM connector.
<p>4</p> <p>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from tumble generator valve position sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between the tumble generator valve position sensor connector and engine ground. <i>Connector & terminal</i> <i>(E54) No. 1 (+) — Engine ground (-):</i></p>	Is the voltage 4.5 V or more?	Go to step 5.	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following item: • Open circuit of harness between tumble generator valve position sensor and ECM connector • Poor contact of tumble generator valve position sensor connector • Poor contact in ECM connector • Poor contact in coupling connector • Poor contact in joint connector</p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>5</p> <p>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM connector and tumble generator valve position sensor connector.</p> <p>Connector & terminal (B134) No. 26 — (E54) No. 3:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 6.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit of harness between tumble generator valve position sensor and ECM connector • Poor contact in ECM connector • Poor contact of tumble generator valve position sensor connector • Poor contact in coupling connector
<p>6</p> <p>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.</p> <p>Measure the resistance of the harness between the tumble generator valve position sensor connector and engine ground.</p> <p>Connector & terminal (E54) No. 3 — Engine ground:</p>	<p>Is the resistance 1 MΩ or more?</p>	<p>Go to step 7.</p>	<p>Repair the ground short circuit of the harness between the tumble generator valve position sensor and ECM connector.</p>
<p>7</p> <p>CHECK POOR CONTACT.</p> <p>Check for poor contact in the tumble generator valve position sensor connector.</p>	<p>Is there poor contact in the tumble generator valve position sensor connector?</p>	<p>Repair poor contact of the tumble generator valve position sensor connector.</p>	<p>Replace the tumble generator valve position sensor. <Ref. to FU(H4DOTC)-38, Tumble Generator Valve Position Sensor.></p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DN:DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-231, DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

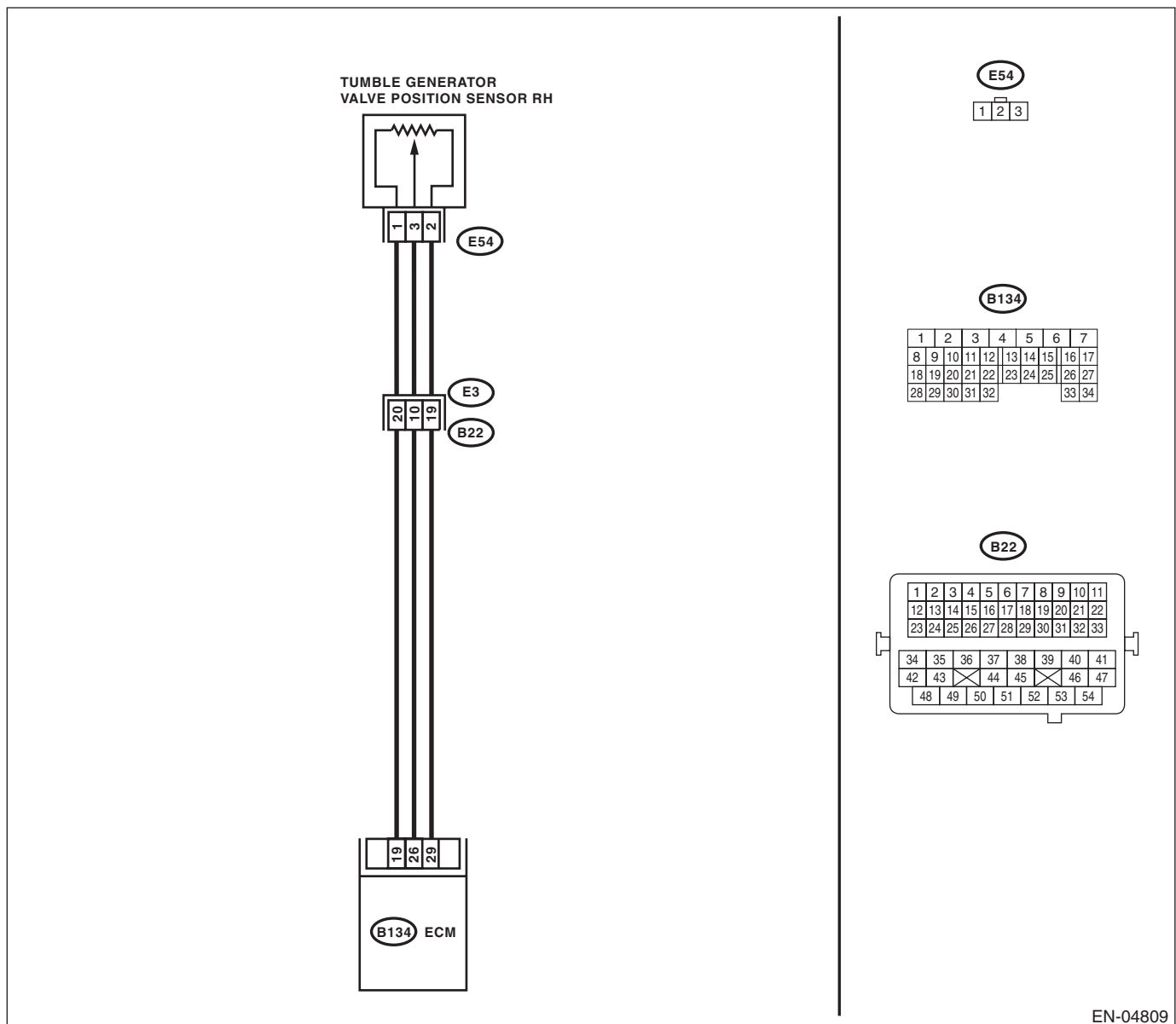
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04809

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK CURRENT DATA.</p> <p>1) Start the engine.</p> <p>2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> Subaru Select Monitor <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.></p> <ul style="list-style-type: none"> General scan tool <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	Is the voltage 4.9 V or more?	Go to step 2.	<p>Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.</p> <p>NOTE:</p> <p>In this case, repair the following item:</p> <ul style="list-style-type: none"> Poor contact of tumble generator valve position sensor connector Poor contact in ECM connector Poor contact in coupling connector
2	<p>CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from tumble generator valve position sensor.</p> <p>3) Measure the resistance of the harness between the tumble generator valve position sensor connector and engine ground.</p> <p>Connector & terminal (E54) No. 2 — Engine ground:</p>	Is the resistance less than 5 Ω?	Go to step 3.	<p>Repair the harness and connector.</p> <p>NOTE:</p> <p>In this case, repair the following item:</p> <ul style="list-style-type: none"> Open circuit of harness between tumble generator valve position sensor and ECM connector Poor contact in coupling connector Poor contact in joint connector
3	<p>CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between the tumble generator valve position sensor connector and engine ground.</p> <p>Connector & terminal (E54) No. 3 (+) — Engine ground (-):</p>	Is the voltage 4.9 V or more?	Repair the short circuit to power supply in the harness between the tumble generator valve position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	<p>Replace the tumble generator valve position sensor. <Ref. to FU(H4DOTC)-38, Tumble Generator Valve Position Sensor.></p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DO:DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-233, DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

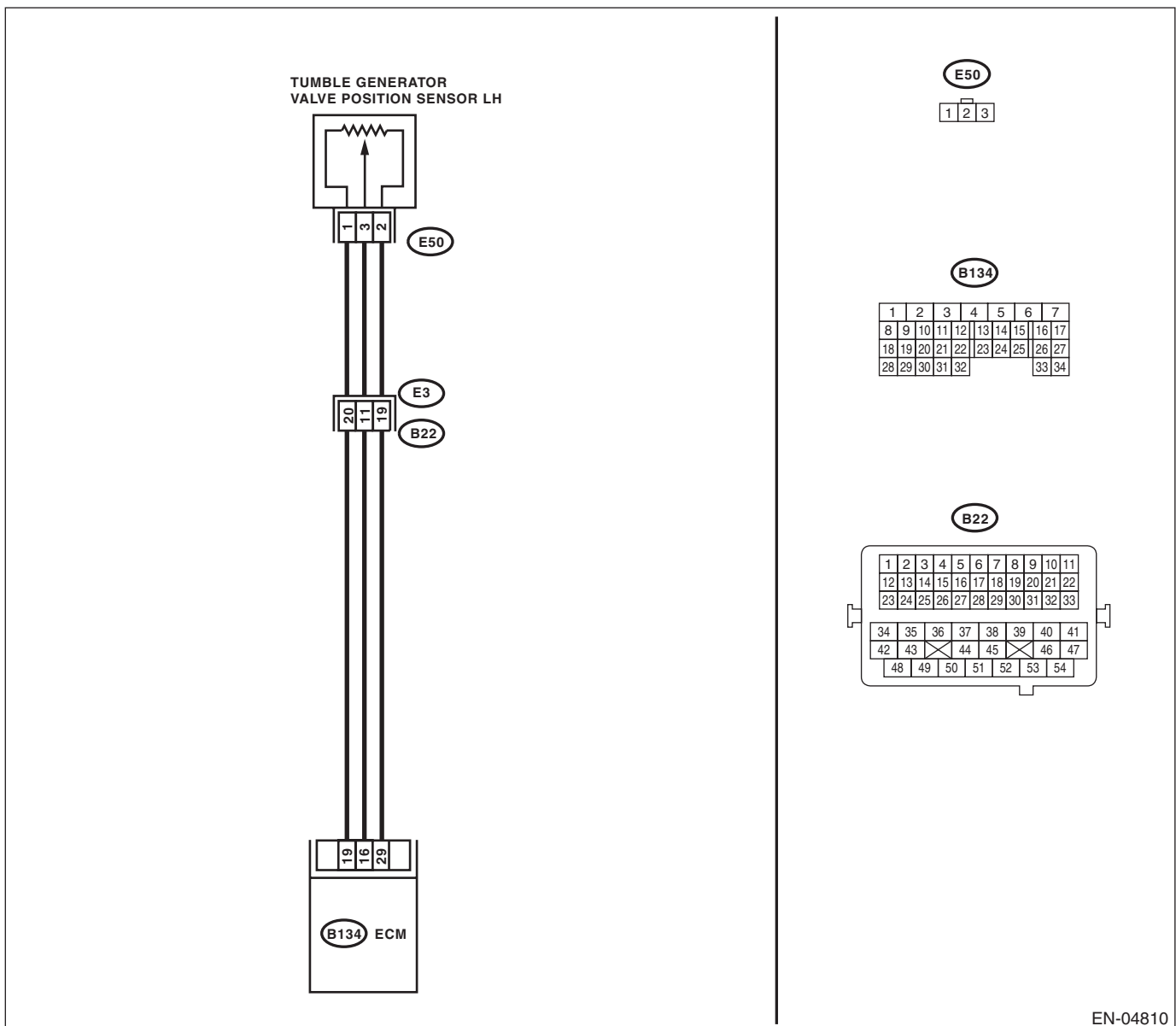
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04810

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK CURRENT DATA.</p> <p>1) Start the engine.</p> <p>2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> Subaru Select Monitor <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.></p> <ul style="list-style-type: none"> General scan tool <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	Is the voltage less than 0.1 V?	Go to step 2.	<p>Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.</p> <p>NOTE:</p> <p>In this case, repair the following item:</p> <ul style="list-style-type: none"> Poor contact of tumble generator valve position sensor connector Poor contact in ECM connector Poor contact in coupling connector
2	<p>CHECK INPUT SIGNAL OF ECM.</p> <p>Measure the voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B134) No. 19 (+) — Chassis ground (-):</p>	Is the voltage 4.5 V or more?	Go to step 3.	Repair the poor contact in ECM connector.
3	<p>CHECK INPUT SIGNAL OF ECM.</p> <p>Measure the voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B134) No. 16 (+) — Chassis ground (-):</p>	Is the voltage less than 0.1 V?	Go to step 4.	Repair the poor contact in ECM connector.
4	<p>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from tumble generator valve position sensor.</p> <p>3) Turn the ignition switch to ON.</p> <p>4) Measure the voltage between the tumble generator valve position sensor connector and engine ground.</p> <p>Connector & terminal (E50) No. 1 (+) — Engine ground (-):</p>	Is the voltage 4.5 V or more?	Go to step 5.	<p>Repair the harness and connector.</p> <p>NOTE:</p> <p>In this case, repair the following item:</p> <ul style="list-style-type: none"> Open circuit of harness between tumble generator valve position sensor and ECM connector Poor contact of tumble generator valve position sensor connector Poor contact in ECM connector Poor contact in coupling connector Poor contact in joint connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>5</p> <p>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between ECM connector and tumble generator valve position sensor connector.</p> <p>Connector & terminal (B134) No. 16 — (E50) No. 3:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 6.</p>	<p>Repair the harness and connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit of harness between tumble generator valve position sensor and ECM connector • Poor contact in ECM connector • Poor contact of tumble generator valve position sensor connector • Poor contact in coupling connector
<p>6</p> <p>CHECK HARNESS BETWEEN ECM AND TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR.</p> <p>Measure the resistance of the harness between the tumble generator valve position sensor connector and engine ground.</p> <p>Connector & terminal (E50) No. 3 — Engine ground:</p>	<p>Is the resistance 1 MΩ or more?</p>	<p>Go to step 7.</p>	<p>Repair the ground short circuit of the harness between the tumble generator valve position sensor and ECM connector.</p>
<p>7</p> <p>CHECK POOR CONTACT.</p> <p>Check for poor contact in the tumble generator valve position sensor connector.</p>	<p>Is there poor contact in the tumble generator valve position sensor connector?</p>	<p>Repair poor contact of the tumble generator valve position sensor connector.</p>	<p>Replace the tumble generator valve position sensor. <Ref. to FU(H4DOTC)-38, Tumble Generator Valve Position Sensor.></p>

DP:DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2)

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-235, DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

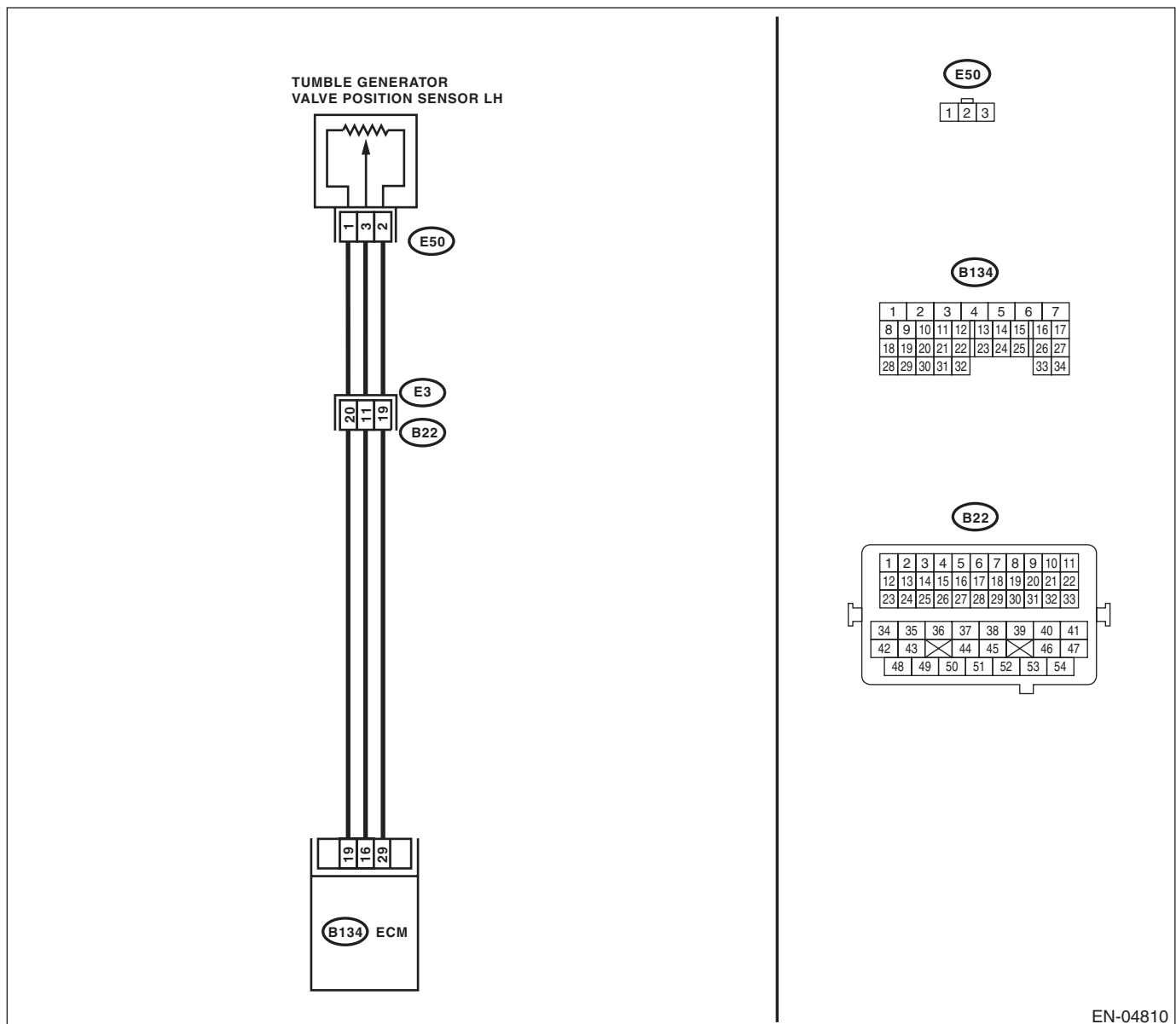
TROUBLE SYMPTOM:

- Improper idling
- Engine stalls.
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04810

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK CURRENT DATA.</p> <p>1) Start the engine.</p> <p>2) Read the data of tumble generator valve position sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> Subaru Select Monitor <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.></p> <ul style="list-style-type: none"> General scan tool <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	Is the voltage 4.9 V or more?	Go to step 2.	<p>Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time. A temporary poor contact of the connector may be the cause.</p> <p>NOTE:</p> <p>In this case, repair the following item:</p> <ul style="list-style-type: none"> Poor contact of tumble generator valve position sensor connector Poor contact in ECM connector Poor contact in coupling connector
2	<p>CHECK HARNESS BETWEEN TUMBLE GENERATOR VALVE POSITION SENSOR CONNECTOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from tumble generator valve position sensor.</p> <p>3) Measure the resistance of the harness between the tumble generator valve position sensor connector and engine ground.</p> <p>Connector & terminal (E50) No. 2 — Engine ground:</p>	Is the resistance less than 5 Ω?	Go to step 3.	<p>Repair the harness and connector.</p> <p>NOTE:</p> <p>In this case, repair the following item:</p> <ul style="list-style-type: none"> Open circuit of harness between tumble generator valve position sensor and ECM connector Poor contact in coupling connector Poor contact in joint connector
3	<p>CHECK HARNESS BETWEEN ECM CONNECTOR AND TUMBLE GENERATOR VALVE POSITION SENSOR.</p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between the tumble generator valve position sensor connector and engine ground.</p> <p>Connector & terminal (E50) No. 3 (+) — Engine ground (-):</p>	Is the voltage 4.9 V or more?	Repair the short circuit to power supply in the harness between the tumble generator valve position sensor and ECM connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	<p>Replace the tumble generator valve position sensor.</p> <p><Ref. to FU(H4DOTC)-38, Tumble Generator Valve Position Sensor.></p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DQ:DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-237, DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

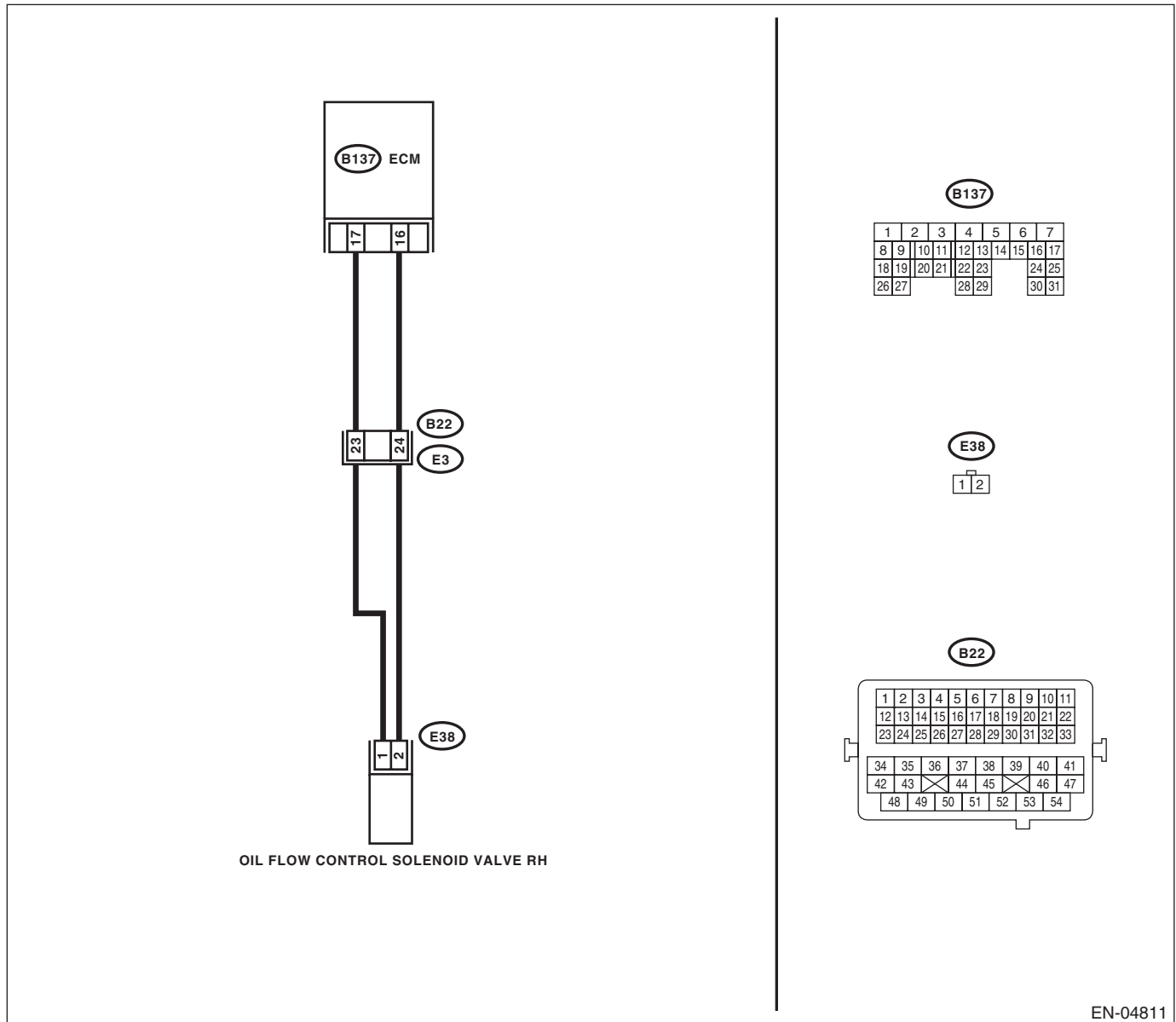
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve.</p> <p>Connector & terminal (B137) No. 17 — (E38) No. 1: (B137) No. 16 — (E38) No. 2:</p>	Is the resistance less than 1 Ω?	Go to step 2.	<p>Repair the open circuit of harness between ECM and oil flow control solenoid valve connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit of harness between ECM and oil flow control solenoid valve connector • Poor contact of the coupling connector
2	<p>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</p> <p>Measure the resistance between ECM and oil flow control solenoid valve.</p> <p>Connector & terminal (E38) No. 1 — Engine ground: (E38) No. 2 — Engine ground:</p>	Is the resistance 1 MΩ or more?	Go to step 3.	Repair the short circuit between ECM and oil flow control solenoid valve connector.
3	<p>CHECK OIL FLOW CONTROL SOLENOID VALVE.</p> <p>1) Remove the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals.</p> <p>Terminals No. 1 — No. 2:</p>	Is the resistance between 6 — 12 Ω?	Repair the poor contact of ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-54, Camshaft.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DR:DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-239, DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

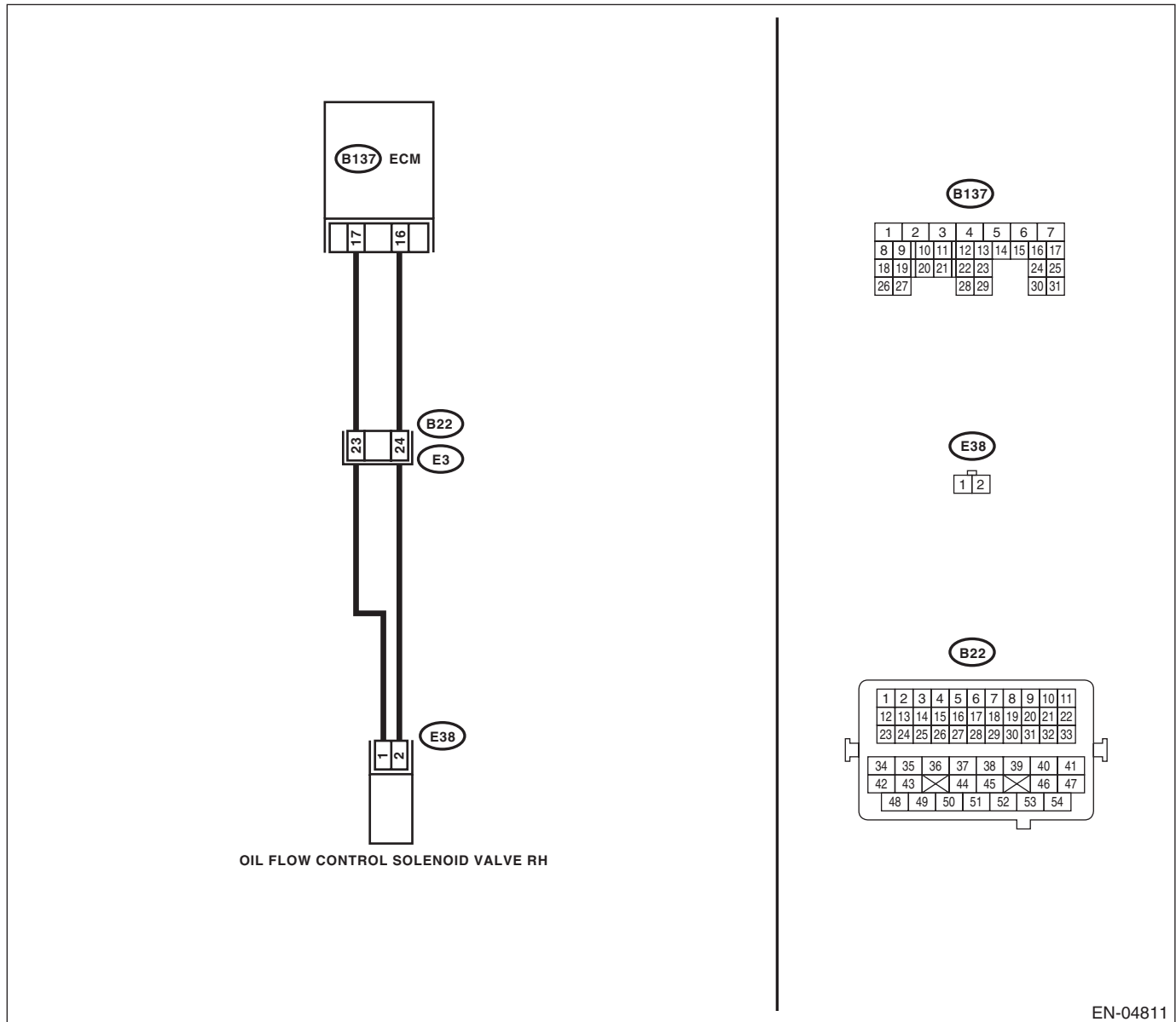
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve.</p> <p>Connector & terminal (B137) No. 17 — (E38) No. 1: (B137) No. 16 — (E38) No. 2:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 2.</p>	<p>Repair the open circuit of harness between ECM and oil flow control solenoid valve connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit of harness between ECM and oil flow control solenoid valve connector • Poor contact of the coupling connector
<p>2</p> <p>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve.</p> <p>Connector & terminal (E38) No. 1 — Engine ground: (E38) No. 2 — Engine ground:</p>	<p>Is the resistance 1 MΩ or more?</p>	<p>Go to step 3.</p>	<p>Repair the short circuit between ECM and oil flow control solenoid valve connector.</p>
<p>3</p> <p>CHECK OIL FLOW CONTROL SOLENOID VALVE.</p> <p>1) Remove the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals.</p> <p>Terminals No. 1 — No. 2:</p>	<p>Is the resistance between 6 — 12 Ω?</p>	<p>Repair the poor contact of ECM and oil flow control solenoid valve.</p>	<p>Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-54, Camshaft.></p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DS:DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-241, DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

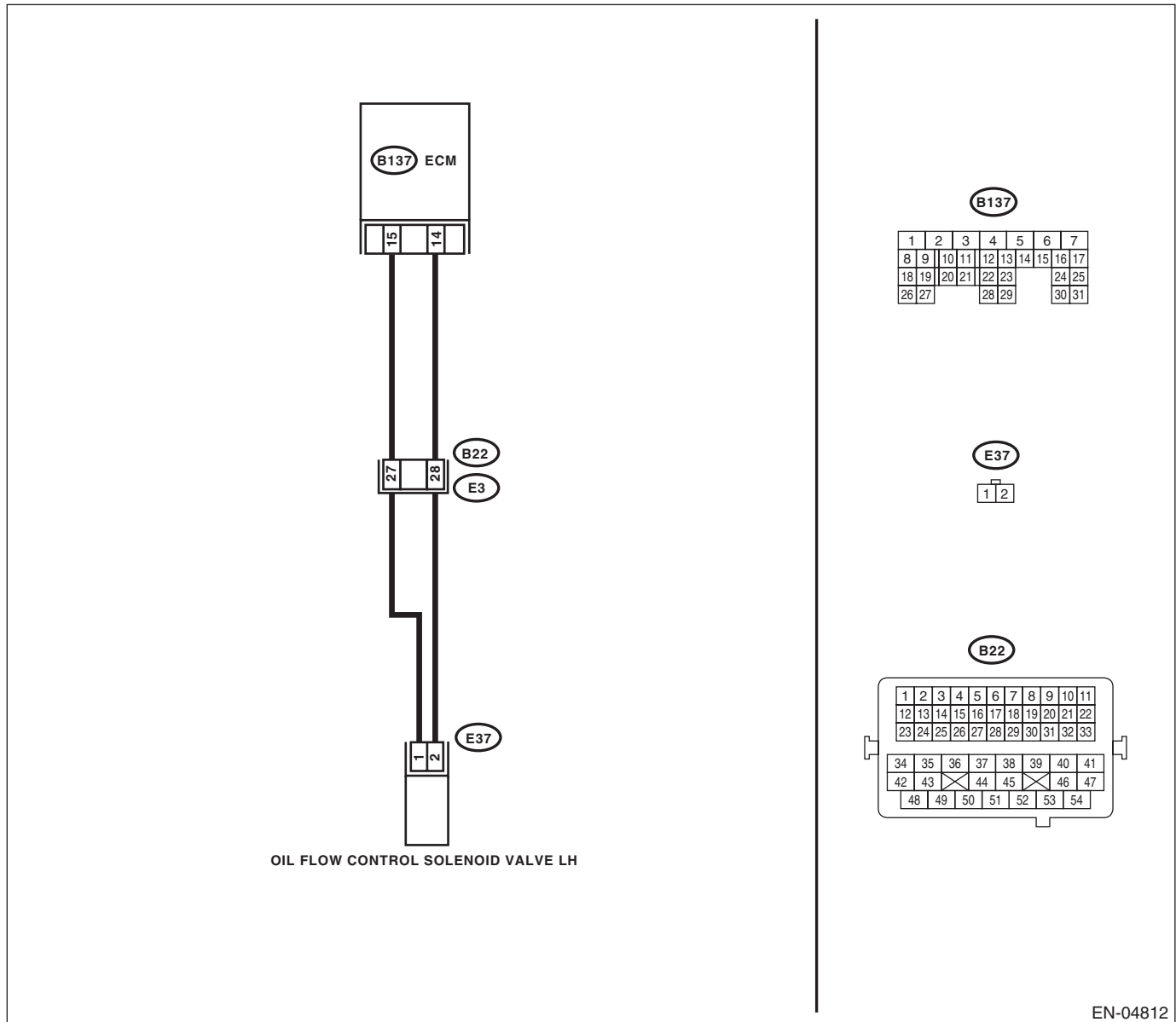
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04812

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve.</p> <p>Connector & terminal (B137) No. 15 — (E37) No. 1: (B137) No. 14 — (E37) No. 2:</p>	Is the resistance less than 1 Ω?	Go to step 2.	<p>Repair the open circuit of harness between ECM and oil flow control solenoid valve connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit of harness between ECM and oil flow control solenoid valve connector • Poor contact of the coupling connector
2	<p>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</p> <p>Measure the resistance between ECM and oil flow control solenoid valve.</p> <p>Connector & terminal (E37) No. 1 — Engine ground: (E37) No. 2 — Engine ground:</p>	Is the resistance 1 MΩ or more?	Go to step 3.	Repair the short circuit between ECM and oil flow control solenoid valve connector.
3	<p>CHECK OIL FLOW CONTROL SOLENOID VALVE.</p> <p>1) Remove the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals.</p> <p>Terminals No. 1 — No. 2:</p>	Is the resistance between 6 — 12 Ω?	Repair the poor contact of ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-54, Camshaft.>

DT:DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-243, DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

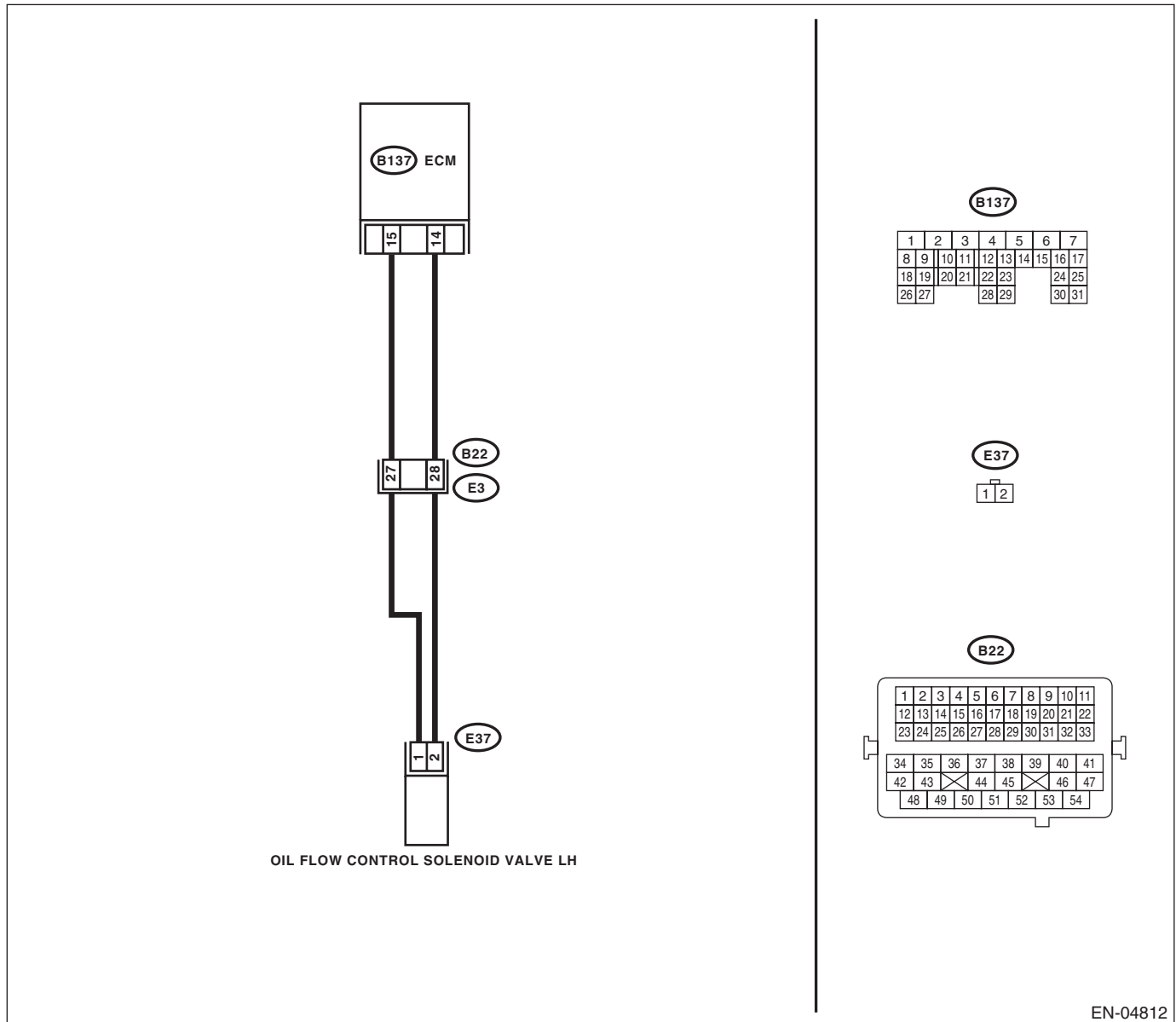
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04812

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve.</p> <p>Connector & terminal (B137) No. 15 — (E37) No. 1: (B137) No. 14 — (E37) No. 2:</p>	Is the resistance less than 1 Ω?	Go to step 2.	<p>Repair the open circuit of harness between ECM and oil flow control solenoid valve connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit of harness between ECM and oil flow control solenoid valve connector • Poor contact of the coupling connector
2	<p>CHECK HARNESS BETWEEN ECM AND OIL FLOW CONTROL SOLENOID VALVE.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM and oil flow control solenoid valve. 3) Measure the resistance between ECM and oil flow control solenoid valve.</p> <p>Connector & terminal (E37) No. 1 — Engine ground: (E37) No. 2 — Engine ground:</p>	Is the resistance 1 MΩ or more?	Go to step 3.	Repair the short circuit between ECM and oil flow control solenoid valve connector.
3	<p>CHECK OIL FLOW CONTROL SOLENOID VALVE.</p> <p>1) Remove the oil flow control solenoid valve connector. 2) Measure the resistance between oil flow control solenoid valve terminals.</p> <p>Terminals No. 1 — No. 2:</p>	Is the resistance between 6 — 12 Ω?	Repair the poor contact of ECM and oil flow control solenoid valve.	Replace the oil flow control solenoid valve. <Ref. to ME(H4DOTC)-54, Camshaft.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DU:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1

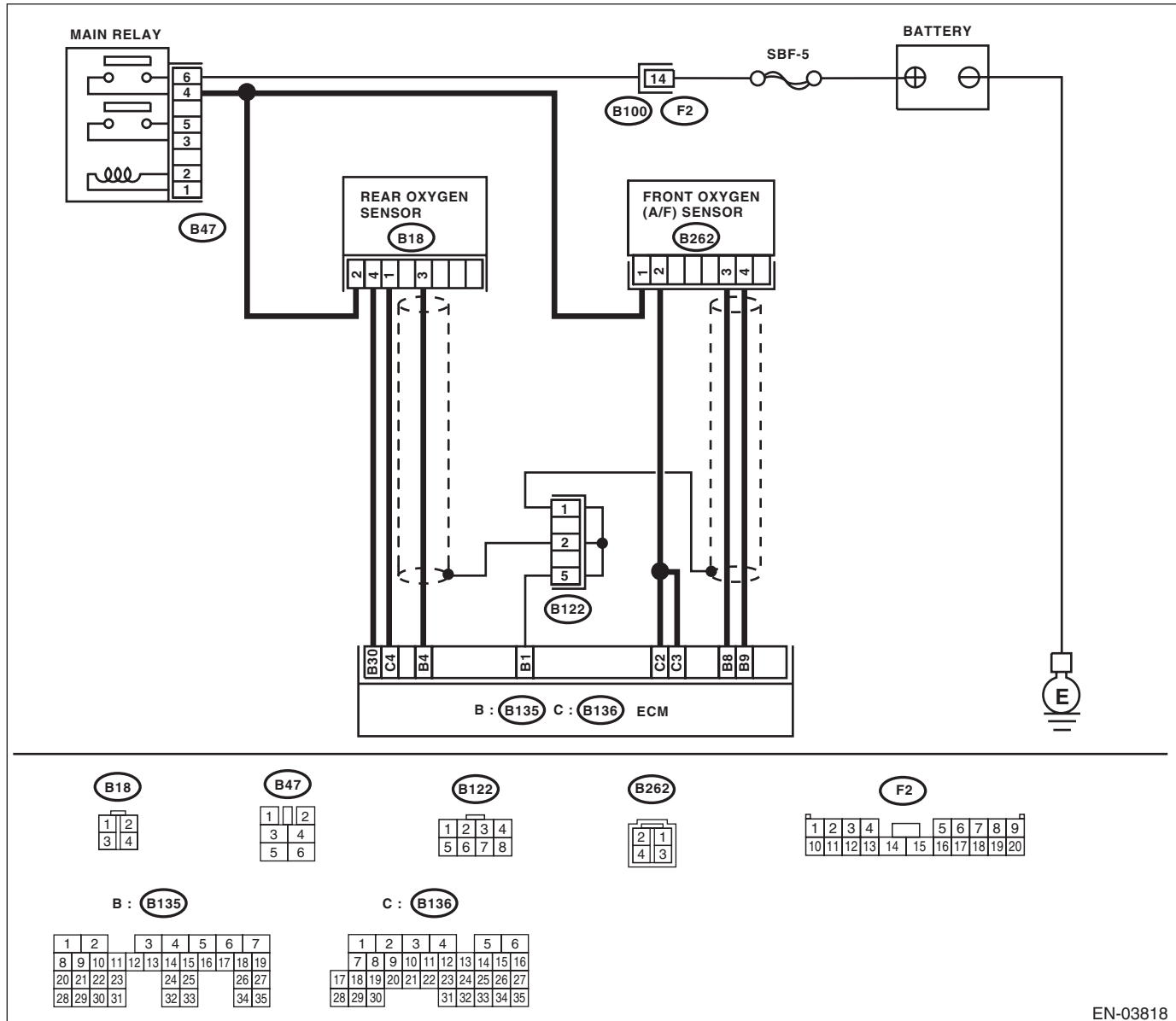
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-245, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03818

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P2096.	Go to step 2.
2 CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.	Does water enter the connector?	Dry the water thoroughly.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. Connector & terminal (B135) No. 8 — (B262) No. 3: (B135) No. 9 — (B262) No. 4:	Is the resistance less than 1 Ω?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
4 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B135) No. 8 — Chassis ground: (B135) No. 9 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 5.	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.
5 CHECK OUTPUT SIGNAL FOR ECM. 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 8 (+) — Chassis ground (-):	Is the voltage 4.5 V or more?	Go to step 6.	Go to step 7.
6 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 8 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the short to power supply in the harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	Repair poor contact in ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-):	Is the voltage 4.95 V or more?	Go to step 8.	Go to step 9.
8 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the short to power supply in the harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	Repair poor contact in ECM connector.
9 CHECK EXHAUST SYSTEM.	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step 10.
10 CHECK AIR INTAKE SYSTEM.	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step 11.
11 CHECK FUEL PRESSURE. WARNING: <ul style="list-style-type: none"> Place “NO FIRE” signs near the working area. Be careful not to spill fuel. Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. <Ref. to ME(H4DOTC)-27, INSPECTION, Fuel Pressure.> WARNING: Release fuel pressure before removing the fuel pressure gauge. NOTE: If fuel pressure does not increase, squeeze the fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value 284 — 314 kPa (2.9 — 3.2 kgf/cm ² , 41 — 46 psi)?	Go to step 12.	Repair the following item. Fuel pressure is too high: <ul style="list-style-type: none"> Clogged fuel return line or bent hose Fuel pressure is too low: <ul style="list-style-type: none"> Improper fuel pump discharge Clogged fuel supply line
12 CHECK FUEL PRESSURE. After connecting the pressure regulator vacuum hose, measure fuel pressure. <Ref. to ME(H4DOTC)-27, INSPECTION, Fuel Pressure.> WARNING: Release fuel pressure before removing the fuel pressure gauge. NOTE: <ul style="list-style-type: none"> If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. If the measured value at this step is out of specification, check or replace pressure regulator and pressure regulator vacuum hose. 	Is the measured value 230 — 260 kPa (2.35 — 2.65 kgf/cm ² , 33 — 38 psi)?	Go to step 13.	Repair the following item. Fuel pressure is too high: <ul style="list-style-type: none"> Faulty pressure regulator Clogged fuel return line or bent hose Fuel pressure is too low: <ul style="list-style-type: none"> Faulty pressure regulator Improper fuel pump discharge Clogged fuel supply line

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>13 CHECK ENGINE COOLANT TEMPERATURE SENSOR.</p> <p>1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Is the temperature 60°C (140°F) or more?</p>	<p>Go to step 14.</p>	<p>Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-26, Engine Coolant Temperature Sensor.></p>
<p>14 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.</p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Is the measured value 2.7 — 4.7 g/s (0.36 — 0.62 lb/m)?</p>	<p>Go to step 15.</p>	<p>Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-30, Mass Air Flow and Intake Air Temperature Sensor.></p>
<p>15 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.</p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Subtract the ambient temperature from intake air temperature. Is the obtained value -10 — 50°C (-18 — 90°F)?</p>	<p>Go to step 16.</p>	<p>Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-30, Mass Air Flow and Intake Air Temperature Sensor.></p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>16 CHECK REAR OXYGEN SENSOR DATA.</p> <p>1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (Max. 2 minutes)</p> <p>2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • For MT vehicles, depress the clutch pedal. • Subaru Select Monitor <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • General scan tool <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	Is the voltage 490 mV or more?	Go to step 20.	Go to step 17.
<p>17 CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.</p>	Does water enter the connector?	Dry the water thoroughly.	Go to step 18.
<p>18 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from ECM and rear oxygen sensor.</p> <p>3) Measure the resistance of harness between ECM and rear oxygen sensor connector.</p> <p>Connector & terminal (B135) No. 4 — (B18) No. 3: (B135) No. 30 — (B18) No. 4:</p>	Is the resistance 3 Ω or more?	Repair the open circuit of harness between ECM and rear oxygen sensor connector.	Go to step 19.
<p>19 CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from the rear oxygen sensor.</p> <p>3) Turn the ignition switch to ON.</p> <p>4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground.</p> <p>Connector & terminal (B18) No. 3 (+) — Engine ground (-):</p>	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-42, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open circuit in the harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>20 CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE: • For MT vehicles, depress the clutch pedal. • Subaru Select Monitor</p> <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.></p> <p>• General scan tool</p> <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Is the voltage 250 mV or less?</p>	<p>Go to step 21.</p>	<p>Go to step 17.</p>
<p>21 CHECK FRONT OXYGEN (A/F) SENSOR AND REAR OXYGEN SENSOR. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and leave it unattended for five minutes in idling state. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE: • Subaru Select Monitor</p> <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.></p> <p>• General scan tool</p> <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Does voltage keep to be 0.8 V or more for more than five minutes?</p>	<p>Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-40, Front Oxygen (A/F) Sensor.></p>	<p>Go to step 18.</p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DV:DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1

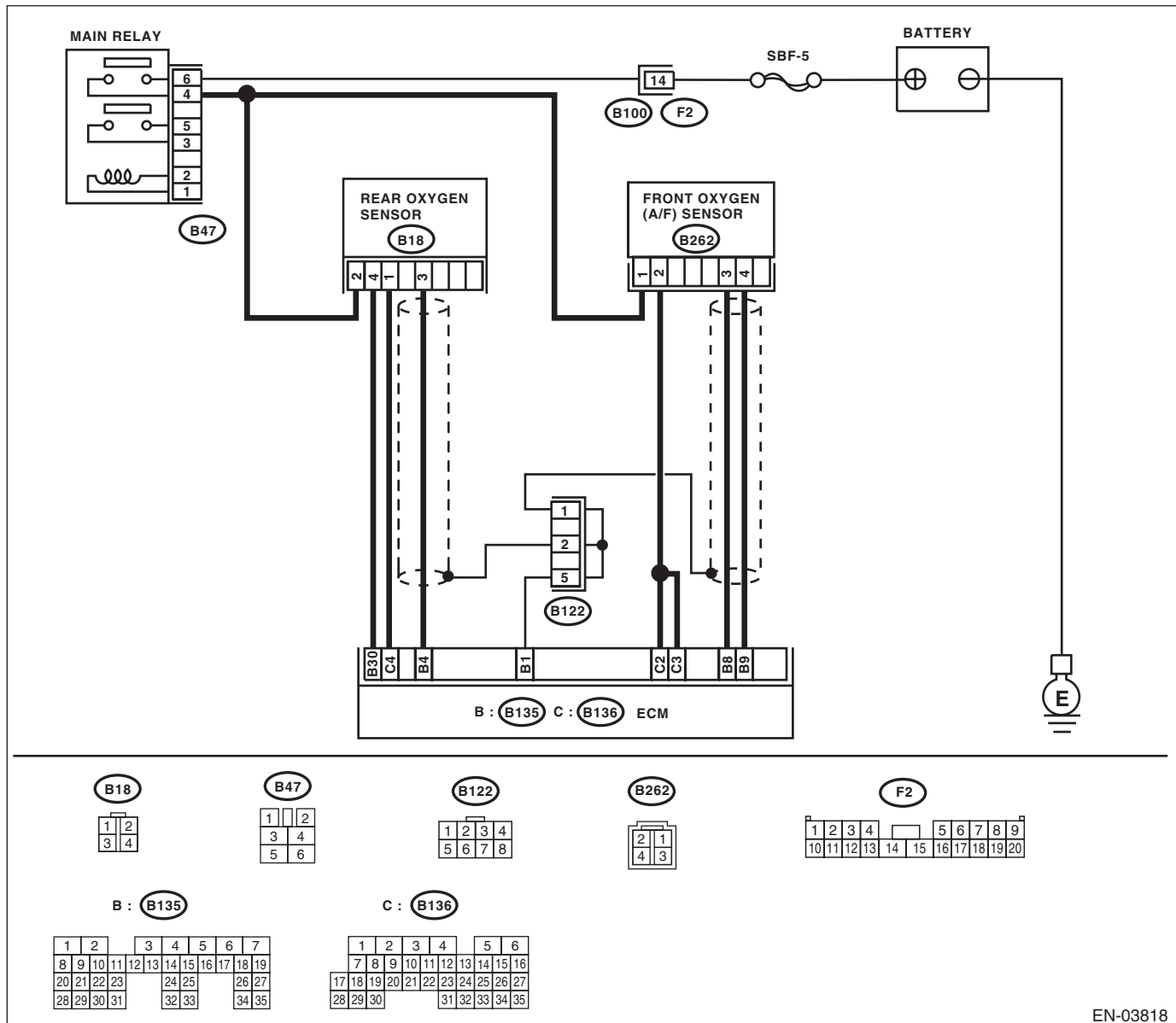
DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-247, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-03818

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).> NOTE: In this case, it is not necessary to inspect DTC P2097.	Go to step 2.
2 CHECK FRONT OXYGEN (A/F) SENSOR CONNECTOR AND COUPLING CONNECTOR.	Does water enter the connector?	Dry the water thoroughly.	Go to step 3.
3 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ECM and front oxygen (A/F) sensor connector. 3) Measure the resistance of harness between ECM and front oxygen (A/F) sensor connector. Connector & terminal (B135) No. 8 — (B262) No. 3: (B135) No. 9 — (B262) No. 4:	Is the resistance less than 1 Ω?	Go to step 4.	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open circuit in harness between ECM and front oxygen (A/F) sensor connector • Poor contact in front oxygen (A/F) sensor connector • Poor contact in ECM connector
4 CHECK HARNESS BETWEEN ECM AND FRONT OXYGEN (A/F) SENSOR CONNECTOR. Measure the resistance of harness between ECM connector and chassis ground. Connector & terminal (B135) No. 8 — Chassis ground: (B135) No. 9 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 5.	Repair the ground short circuit of harness between ECM and front oxygen (A/F) sensor connector.
5 CHECK OUTPUT SIGNAL FOR ECM. 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 8 (+) — Chassis ground (-):	Is the voltage 4.5 V or more?	Go to step 6.	Go to step 7.
6 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 8 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the short to power supply in the harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	Repair poor contact in ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-):	Is the voltage 4.95 V or more?	Go to step 8.	Go to step 9.
8 CHECK OUTPUT SIGNAL FOR ECM. Measure the voltage between ECM connector and chassis ground. Connector & terminal (B135) No. 9 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the short to power supply in the harness between ECM and front oxygen (A/F) sensor connector. After repair, replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	Repair poor contact in ECM connector.
9 CHECK EXHAUST SYSTEM.	Are there holes or loose bolts on exhaust system?	Repair the exhaust system.	Go to step 10.
10 CHECK AIR INTAKE SYSTEM.	Are there holes, loose bolts or disconnection of hose on air intake system?	Repair the air intake system.	Go to step 11.
11 CHECK FUEL PRESSURE. WARNING: <ul style="list-style-type: none"> Place “NO FIRE” signs near the working area. Be careful not to spill fuel. Measure the fuel pressure while disconnecting pressure regulator vacuum hose from intake manifold. <Ref. to ME(H4DOTC)-27, INSPECTION, Fuel Pressure.> WARNING: Release fuel pressure before removing the fuel pressure gauge. NOTE: If fuel pressure does not increase, squeeze the fuel return hose 2 to 3 times, then measure fuel pressure again.	Is the measured value 284 — 314 kPa (2.9 — 3.2 kgf/cm ² , 41 — 46 psi)?	Go to step 12.	Repair the following item. Fuel pressure is too high: <ul style="list-style-type: none"> Clogged fuel return line or bent hose Fuel pressure is too low: <ul style="list-style-type: none"> Improper fuel pump discharge Clogged fuel supply line
12 CHECK FUEL PRESSURE. After connecting the pressure regulator vacuum hose, measure fuel pressure. <Ref. to ME(H4DOTC)-27, INSPECTION, Fuel Pressure.> WARNING: Release fuel pressure before removing the fuel pressure gauge. NOTE: <ul style="list-style-type: none"> If fuel pressure does not increase, squeeze fuel return hose 2 to 3 times, then measure fuel pressure again. If the measured value at this step is out of specification, check or replace pressure regulator and pressure regulator vacuum hose. 	Is the measured value 230 — 260 kPa (2.35 — 2.65 kgf/cm ² , 33 — 38 psi)?	Go to step 13.	Repair the following item. Fuel pressure is too high: <ul style="list-style-type: none"> Faulty pressure regulator Clogged fuel return line or bent hose Fuel pressure is too low: <ul style="list-style-type: none"> Faulty pressure regulator Improper fuel pump discharge Clogged fuel supply line

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>13 CHECK ENGINE COOLANT TEMPERATURE SENSOR.</p> <p>1) Start the engine and warm-up completely. 2) Read the data of engine coolant temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Is the temperature 60°C (140°F) or more?</p>	<p>Go to step 14.</p>	<p>Replace the engine coolant temperature sensor. <Ref. to FU(H4DOTC)-26, Engine Coolant Temperature Sensor.></p>
<p>14 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.</p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Is the measured value 2.7 — 4.7 g/s (0.36 — 0.62 lb/m)</p>	<p>Go to step 15.</p>	<p>Replace the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-30, Mass Air Flow and Intake Air Temperature Sensor.></p>
<p>15 CHECK MASS AIR FLOW AND INTAKE AIR TEMPERATURE SENSOR.</p> <p>1) Start the engine and warm-up engine until coolant temperature is greater than 60°C (140°F). 2) Place the shift lever in neutral position. 3) Turn the A/C switch to OFF. 4) Turn all the accessory switches to OFF. 5) Open the front hood. 6) Measure the ambient temperature. 7) Read the data of mass air flow and intake air temperature sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE: • Subaru Select Monitor For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.> • General scan tool For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Subtract the ambient temperature from intake air temperature. Is the obtained value -10 — 50°C (-18 — 90°F)?</p>	<p>Go to step 16.</p>	<p>Check the mass air flow and intake air temperature sensor. <Ref. to FU(H4DOTC)-30, Mass Air Flow and Intake Air Temperature Sensor.></p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>16 CHECK REAR OXYGEN SENSOR DATA.</p> <p>1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and keep the engine speed at 3,000 rpm. (Max. 2 minutes)</p> <p>2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE:</p> <ul style="list-style-type: none"> • For MT vehicles, depress the clutch pedal. • Subaru Select Monitor <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.></p> <ul style="list-style-type: none"> • General scan tool <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	Is the voltage 490 mV or more?	Go to step 20.	Go to step 17.
<p>17 CHECK REAR OXYGEN SENSOR CONNECTOR AND COUPLING CONNECTOR.</p>	Does water enter the connector?	Dry the water thoroughly.	Go to step 18.
<p>18 CHECK HARNESS BETWEEN ECM AND REAR OXYGEN SENSOR CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from ECM and rear oxygen sensor.</p> <p>3) Measure the resistance of harness between ECM and rear oxygen sensor connector.</p> <p>Connector & terminal (B135) No. 4 — (B18) No. 3: (B135) No. 30 — (B18) No. 4:</p>	Is the resistance 3 Ω or more?	Repair the open circuit of harness between ECM and rear oxygen sensor connector.	Go to step 19.
<p>19 CHECK HARNESS BETWEEN REAR OXYGEN SENSOR AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from the rear oxygen sensor.</p> <p>3) Turn the ignition switch to ON.</p> <p>4) Measure the voltage between rear oxygen sensor harness connector and engine ground or chassis ground.</p> <p>Connector & terminal (B18) No. 3 (+) — Engine ground (-):</p>	Is the voltage 0.2 — 0.5 V?	Replace the rear oxygen sensor. <Ref. to FU(H4DOTC)-42, Rear Oxygen Sensor.>	Repair the harness and connector. NOTE: In this case, repair the following item: <ul style="list-style-type: none"> • Open circuit in harness between rear oxygen sensor and ECM connector • Poor contact in rear oxygen sensor connector • Poor contact in ECM connector

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>20 CHECK REAR OXYGEN SENSOR DATA. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and rapidly reduce the engine speed from 3,000 rpm. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE: • For MT vehicles, depress the clutch pedal. • Subaru Select Monitor</p> <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.></p> <p>• General scan tool</p> <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Is the voltage 250 mV or less?</p>	<p>Go to step 21.</p>	<p>Go to step 17.</p>
<p>21 CHECK FRONT OXYGEN (A/F) SENSOR AND REAR OXYGEN SENSOR. 1) Warm-up the engine until engine coolant temperature is above 70°C (158°F), and leave it unattended for five minutes in idling state. 2) Read the data of rear oxygen sensor signal using Subaru Select Monitor or general scan tool.</p> <p>NOTE: • Subaru Select Monitor</p> <p>For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.></p> <p>• General scan tool</p> <p>For detailed operation procedures, refer to the "General Scan Tool Instruction Manual".</p>	<p>Does voltage keep to be 0.8 V or more for more than five minutes?</p>	<p>Replace the front oxygen (A/F) sensor. <Ref. to FU(H4DOTC)-40, Front Oxygen (A/F) Sensor.></p>	<p>Go to step 18.</p>

DW:DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/ PERFORMANCE

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-186, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.> <Ref. to GD(H4DOTC)-200, DTC P1160 RETURN SPRING FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.> or <Ref. to GD(H4DOTC)-249, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

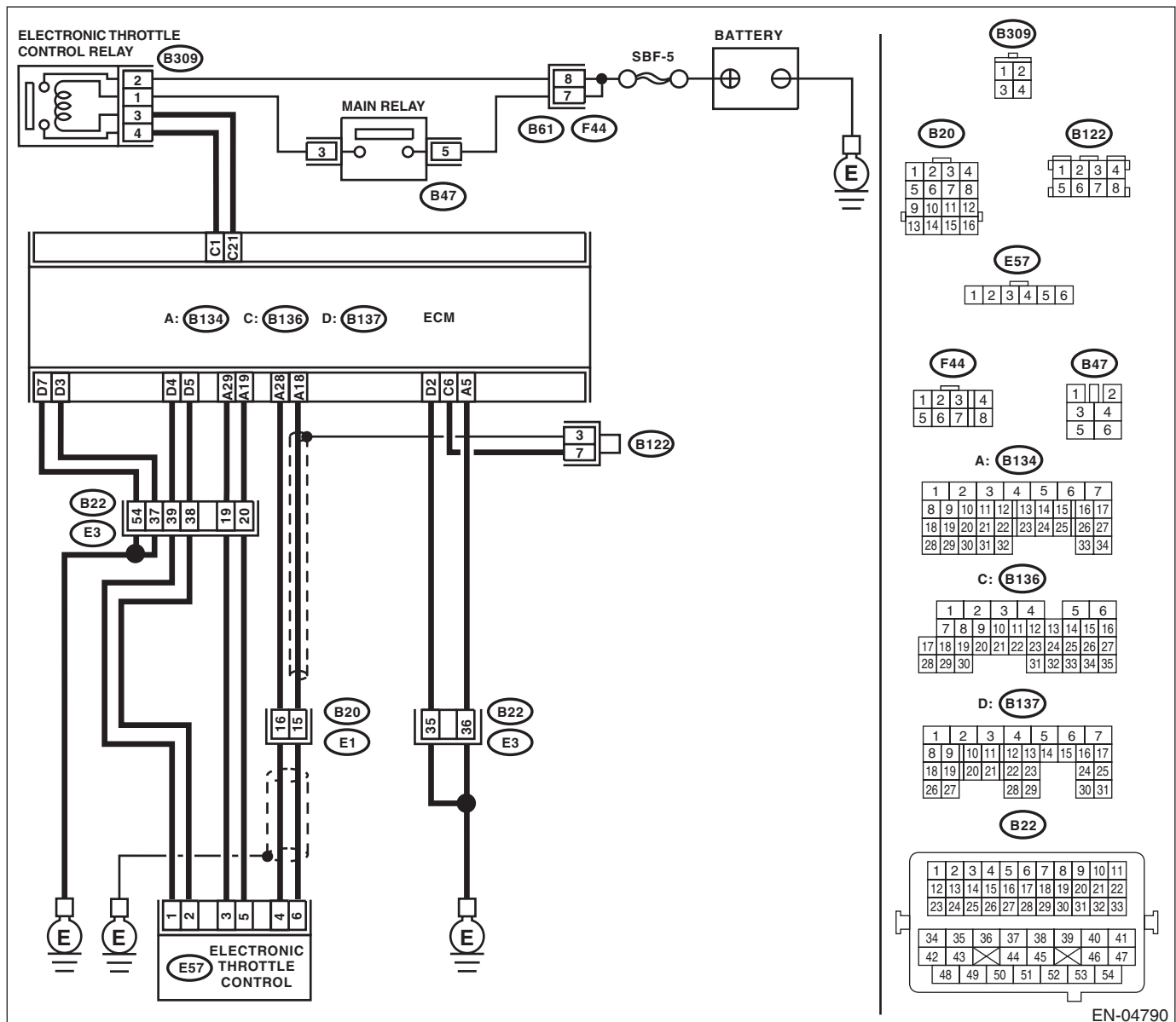
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1 CHECK ELECTRONIC THROTTLE CONTROL RELAY.</p> <p>1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Connect the battery to terminals No. 1 and No. 3 of electronic throttle control relay. 4) Measure the resistance between electronic throttle control relay terminals.</p> <p>Terminals No. 2 — No. 4:</p>	Is the resistance less than 1 Ω ?	Go to step 2.	Replace the electronic throttle control relay.
<p>2 CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL RELAY.</p> <p>Measure the voltage between the electronic throttle control relay connector and engine ground.</p> <p>Connector & terminal (B309) No. 1 (+) — Engine ground (-): (B309) No. 2 (+) — Engine ground (-):</p>	Is the voltage 5 V or more?	Go to step 3.	Repair the open or ground short circuit of power supply circuit.
<p>3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.</p> <p>1) Disconnect the connectors from ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between the electronic throttle control relay connector and engine ground.</p> <p>Connector & terminal (B309) No. 3 (+) — Engine ground (-):</p>	Is the voltage less than 5 V?	Go to step 4.	Repair the power supply short circuit of harness between ECM and electronic throttle control.
<p>4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.</p> <p>1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control relay connector and chassis ground.</p> <p>Connector & terminal (B309) No. 3 — Engine ground: (B309) No. 4 — Engine ground:</p>	Is the resistance 1 M Ω or more?	Go to step 5.	Repair the ground short circuit of harness between ECM and electronic throttle control relay.
<p>5 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY.</p> <p>1) Turn the ignition switch to OFF. 2) Measure the resistance between ECM connector and electronic throttle control relay connector.</p> <p>Connector & terminal (B136) No. 21 — (B309) No. 3: (B136) No. 1 — (B309) No. 4:</p>	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the open circuit of harness between ECM and electronic throttle control relay.
<p>6 CHECK SENSOR OUTPUT.</p> <p>1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector terminals.</p> <p>Connector & terminal (B134) No. 18 (+) — (B134) No. 29 (-):</p> <p>4) Check the voltage change while shaking the ECM harness and connector, engine harness connector, and electronic throttle control connector harness.</p>	Is the voltage 0.4 V or more?	Go to step 7.	Go to step 9.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK SENSOR OUTPUT. 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between ECM connector terminals. <i>Connector & terminal</i> <i>(B134) No. 28 (+) — (B134) No. 29 (-):</i> 4) Check the voltage change while shaking the ECM harness and connector, engine harness connector, and electronic throttle control connector harness.	Is the voltage 0.8 V or more?	Go to step 8.	Go to step 9.
8 CHECK POOR CONTACT. Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Go to step 13.
9 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. <i>Connector & terminal</i> <i>(B134) No. 19 — (E57) No. 5:</i>	Is the resistance less than 1 Ω ?	Go to step 10.	Repair the open circuit of harness connector.
10 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. Measure the resistance between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B134) No. 19 — Chassis ground:</i> <i>(B134) No. 18 — Chassis ground:</i> <i>(B134) No. 28 — Chassis ground:</i>	Is the resistance 1 M Ω or more?	Go to step 11.	Repair the ground short circuit of harness.
11 CHECK SENSOR POWER SUPPLY. 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. <i>Connector & terminal</i> <i>(E57) No. 5 (+) — Engine ground (-):</i> 4) Check the voltage change by shaking the harness and connector of ECM and engine harness connector while monitoring the value with voltage meter.	Is the voltage 4.5 — 5.5 V?	Go to step 12.	Repair poor contact in ECM connector.
12 CHECK SHORT CIRCUIT IN ECM. 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control connector and engine ground. <i>Connector & terminal</i> <i>(E57) No. 4 — Engine ground:</i> <i>(E57) No. 6 — Engine ground:</i>	Is the resistance 10 Ω or more?	Go to step 13.	Repair poor contact in ECM connector.
13 CHECK SENSOR OUTPUT. 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal using Subaru Select Monitor. 4) Check the voltage change while shaking the ECM harness and connector, engine harness connector, and electronic throttle control connector harness.	Is the voltage 4.63 V?	Go to step 14.	Go to step 16.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
14 CHECK SENSOR OUTPUT. 1) Read the data of sub throttle sensor signal using Subaru Select Monitor. 2) Check the voltage change while shaking the ECM harness and connector, engine harness connector, and electronic throttle control connector harness.	Is the voltage 4.73 V?	Go to step 15.	Go to step 16.
15 CHECK POOR CONTACT. Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Go to step 21.
16 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. <i>Connector & terminal</i> <i>(B134) No. 18 — (E57) No. 6:</i> <i>(B134) No. 28 — (E57) No. 4:</i> <i>(B134) No. 29 — (E57) No. 3:</i>	Is the resistance less than 1 Ω?	Go to step 17.	Repair the open circuit of harness connector.
17 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM connector. 2) Measure the resistance between electronic throttle control connector and engine ground. <i>Connector & terminal</i> <i>(E57) No. 3 — Engine ground:</i>	Is the resistance less than 5 Ω?	Go to step 18.	Repair poor contact in ECM connector.
18 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to ON. 2) Measure the voltage between electronic throttle control connector and engine ground. <i>Connector & terminal</i> <i>(E57) No. 5 (+) — Engine ground (-):</i> 3) Check the voltage change by shaking the harness and connector of ECM and engine harness connector while monitoring the value with voltage meter.	Is the voltage 10 V or more?	Go to step 19.	Repair the short circuit to power supply in the harness between the ECM connector and electronic throttle control connector.
19 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Measure the voltage between electronic throttle control connector and engine ground. <i>Connector & terminal</i> <i>(E57) No. 4 (+) — Engine ground (-):</i> <i>(E57) No. 6 (+) — Engine ground (-):</i> 2) Check the voltage change by shaking the harness and connector of ECM and engine harness connector while monitoring the value with voltage meter.	Is the voltage less than 10 V?	Go to step 20.	Repair the short circuit of harness between ECM connector and electronic throttle control connector.
20 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Remove the ECM. 3) Measure the resistance between ECM connectors. <i>Connector & terminal</i> <i>(B134) No. 18 — (B134) No. 29:</i> <i>(B134) No. 28 — (B134) No. 29:</i>	Is the resistance 1 MΩ or more?	Go to step 21.	Repair the short circuit to sensor power supply.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
21 CHECK SENSOR OUTPUT. 1) Turn the ignition switch to OFF. 2) Connect the connectors except for electric throttle control relay. 3) Turn the ignition switch to ON. 4) Read the data of main throttle sensor signal using Subaru Select Monitor.	Is the voltage 0.81 — 0.87 V?	Go to step 22.	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective.
22 CHECK SENSOR OUTPUT. Read the data of sub throttle sensor signal using Subaru Select Monitor.	Is the voltage 1.64 — 1.70 V?	Go to step 23.	Repair the poor contact of electronic throttle control connector. Replace the electronic throttle control if defective.
23 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. Connector & terminal (B137) No. 4 — (E57) No. 1: (B137) No. 5 — (E57) No. 2:	Is the resistance less than 1 Ω ?	Go to step 24.	Repair the open circuit of harness connector.
24 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR. 1) Connect the connector to ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 1 (+) — Engine ground (-): (E57) No. 2 (+) — Engine ground (-):	Is the voltage less than 5 V?	Go to step 25.	Repair the power supply short circuit of harness between ECM and electronic throttle control.
25 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL MOTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between electronic throttle control connector and engine ground. Connector & terminal (E57) No. 1 — Engine ground: (E57) No. 2 — Engine ground:	Is the resistance 1 M Ω or more?	Go to step 26.	Repair the short circuit of harness.
26 CHECK ELECTRONIC THROTTLE CONTROL MOTOR HARNESS. Measure the resistance between electronic throttle control connector terminals. Connector & terminal (E57) No. 2 — (E57) No. 1:	Is the resistance 1 M Ω or more?	Go to step 27.	Repair the short circuit of harness.
27 CHECK ELECTRONIC THROTTLE CONTROL GROUND CIRCUIT. Measure the resistance between ECM connector and engine ground. Connector & terminal (B137) No. 3 — Engine ground: (B137) No. 7 — Engine ground:	Is the resistance less than 10 Ω ?	Go to step 28.	Repair the open circuit of harness.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
28	CHECK ELECTRONIC THROTTLE CONTROL. Measure the resistance between electronic throttle control terminals. Terminals No. 1 — No. 2:	Is the resistance 50 Ω or less?	Go to step 29.	Replace the electronic throttle control.
29	CHECK ELECTRONIC THROTTLE CONTROL. Move the throttle valve to the fully opened and fully closed positions with fingers. Check that the valve returns to the specified position when releasing fingers.	Does the valve return to the specified position? Standard value: 3 mm (0.12 in) from fully closed position	Repair poor contact in ECM connector.	Replace the electronic throttle control.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DX:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-251, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

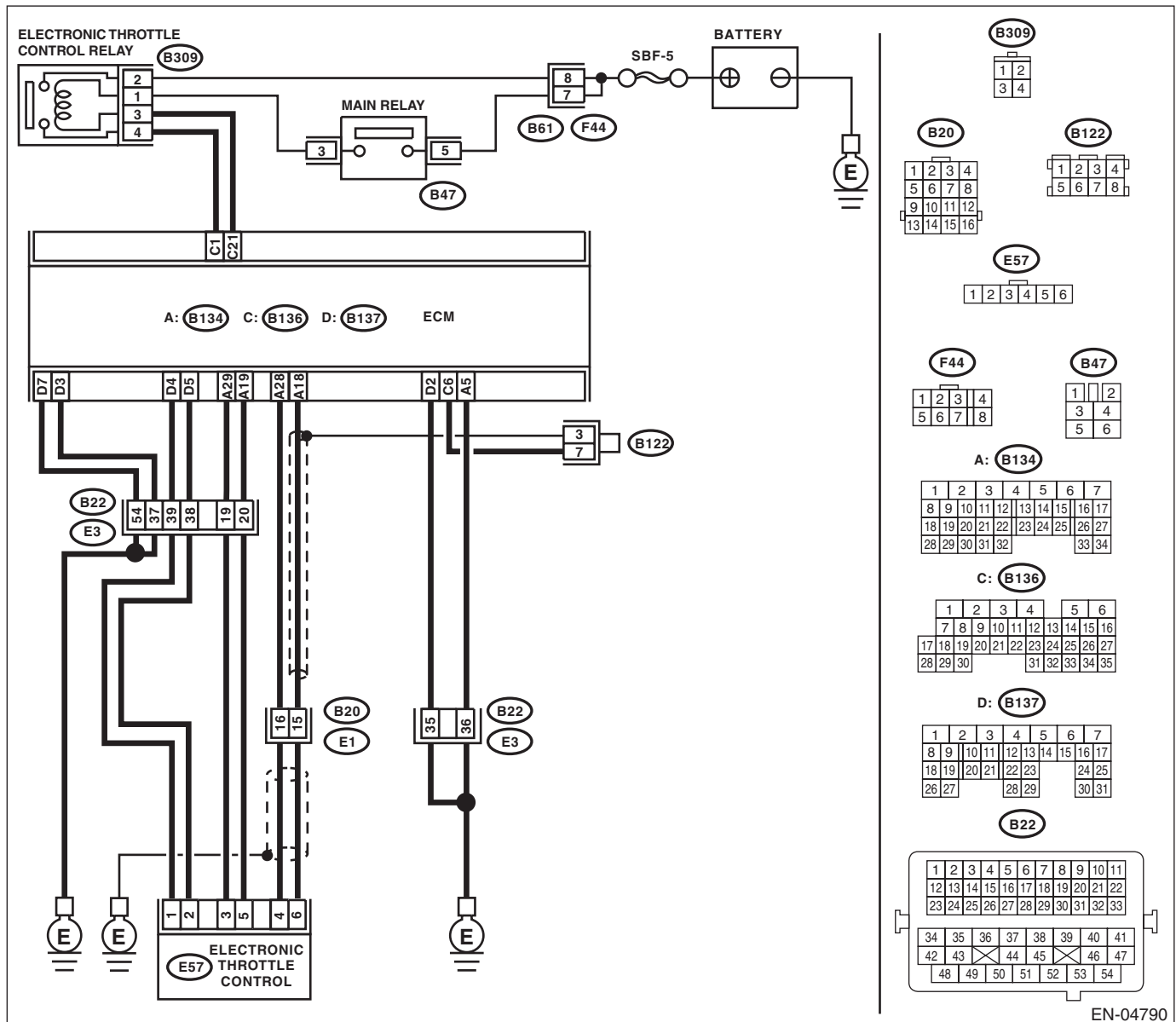
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance
- Engine stalls.

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ELECTRONIC THROTTLE CONTROL RELAY. 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Connect the battery to terminals No. 1 and No. 3 of electronic throttle control relay. 4) Measure the resistance between electronic throttle control terminals. <i>Terminals</i> <i>(B309) No. 2 — (B309) No. 4:</i>	Is the resistance less than 1 Ω?	Go to step 2.	Replace the electronic throttle control relay.
2 CHECK POWER SUPPLY OF ELECTRONIC THROTTLE CONTROL RELAY. Measure the voltage between the electronic throttle control relay connector and engine ground. <i>Connector & terminal</i> <i>(B309) No. 1 (+) — Engine ground (-):</i> <i>(B309) No. 2 (+) — Engine ground (-):</i>	Is the voltage 5 V or more?	Go to step 3.	Repair the open or ground short circuit of power supply circuit.
3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY. 1) Disconnect the connectors from ECM. 2) Turn the ignition switch to ON. 3) Measure the voltage between the electronic throttle control relay connector and engine ground. <i>Connector & terminal</i> <i>(B309) No. 3 (+) — Engine ground (-):</i>	Is the voltage less than 5 V?	Go to step 4.	Repair the power supply short circuit of harness between ECM and electronic throttle control relay.
4 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY. 1) Turn the ignition switch to OFF. 2) Measure the resistance between electronic throttle control relay connector and chassis ground. <i>Connector & terminal</i> <i>(B309) No. 3 — Engine ground:</i> <i>(B309) No. 4 — Engine ground:</i>	Is the resistance 1 MΩ or more?	Go to step 5.	Repair the ground short circuit of harness between ECM and electronic throttle control relay.
5 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY. Measure the resistance between ECM connector and electronic throttle control relay connector. <i>Connector & terminal</i> <i>(B136) No. 21 — (B309) No. 3:</i> <i>(B136) No. 1 — (B309) No. 4:</i>	Is the resistance less than 1 Ω?	Repair poor contact in ECM connector.	Repair the open circuit of harness between ECM and electronic throttle control relay.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

DY:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

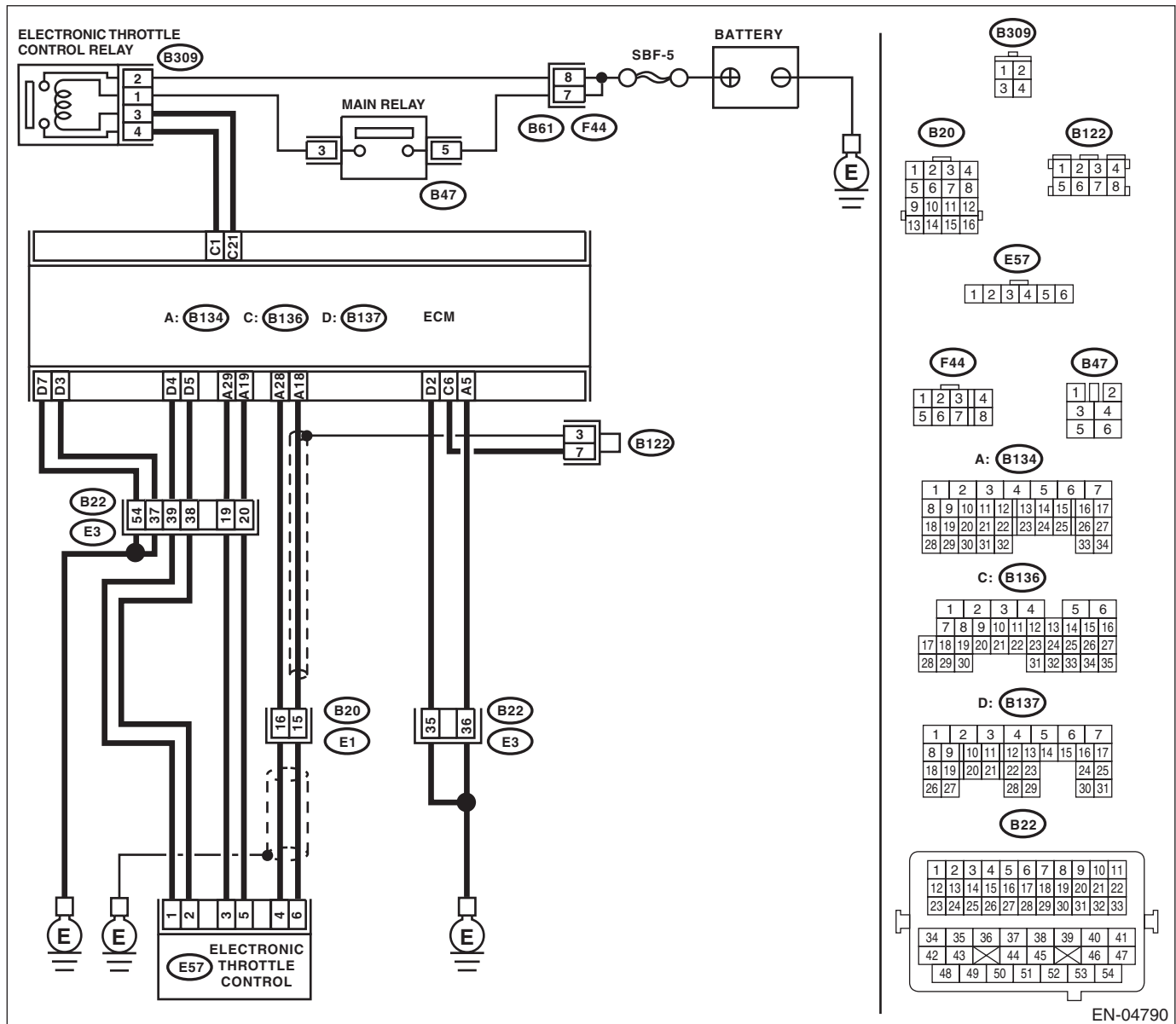
DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-253, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04790

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ELECTRONIC THROTTLE CONTROL RELAY. 1) Turn the ignition switch to OFF. 2) Remove the electronic throttle control relay. 3) Measure the resistance between electronic throttle control relay terminals. <i>Terminals</i> <i>No. 2 — No. 4:</i>	Is the resistance 1 MΩ or more?	Go to step 2.	Replace the electronic throttle control relay.
2 CHECK SHORT CIRCUIT OF ELECTRONIC THROTTLE CONTROL RELAY POWER SUPPLY. 1) Turn the ignition switch to ON. 2) Measure the voltage between the electronic throttle control relay connector and engine ground. <i>Connector & terminal</i> <i>(B309) No. 4 (+) — Engine ground (-):</i>	Is the voltage less than 5 V?	Go to step 3.	Repair the power supply short circuit of harness between ECM and electronic throttle control relay.
3 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL RELAY. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Measure the resistance between ECM connector and engine ground. <i>Connector & terminal</i> <i>(B136) No. 21 — Engine ground:</i>	Is the resistance 1 MΩ or more?	Repair poor contact in ECM connector.	Repair the ground short circuit of harness between ECM and electronic throttle control relay.

DZ:DTC P2109 THROTTLE/PEDAL POSITION SENSOR “A” MINIMUM STOP PERFORMANCE

NOTE:

For the diagnostic procedure, refer to DTC P2101. <Ref. to EN(H4DOTC)(diag)-351, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

EA:DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-257, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

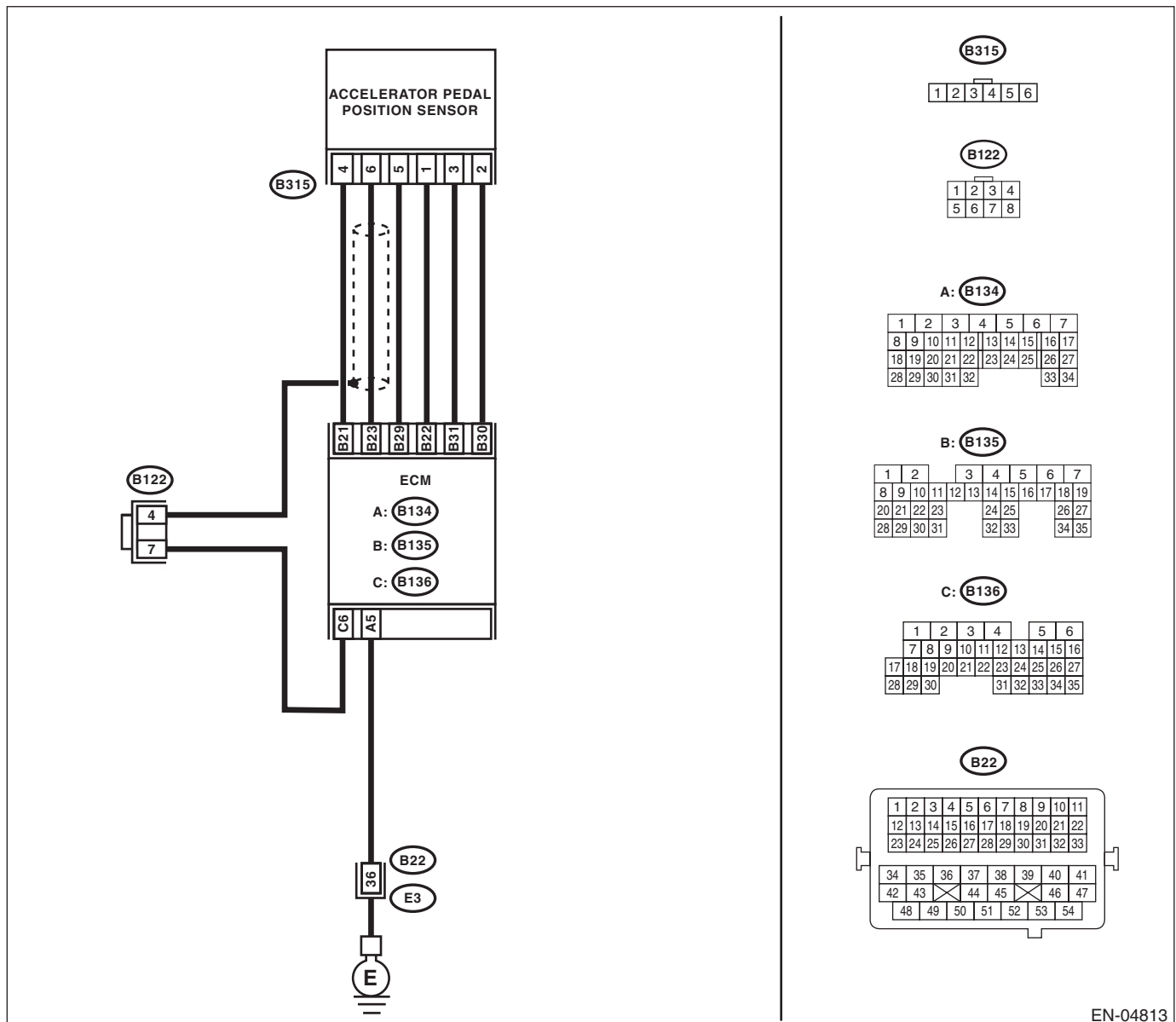
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>

WIRING DIAGRAM:



EN-04813

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT. 1) Turn the ignition switch to ON. 2) Read the data of main accelerator pedal position sensor signal using Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.>	Is the voltage 0.4 V or more?	Go to step 2.	Go to step 3.
2	CHECK POOR CONTACT. Check poor contact of connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3	CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance of ECM connector and accelerator pedal position sensor connector. Connector & terminal (B135) No. 21 — (B315) No. 4: (B135) No. 23 — (B315) No. 6:	Is the resistance less than 1 Ω?	Go to step 4.	Repair the open circuit of harness connector.
4	CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. Measure the resistance between ECM connector and chassis ground. Connector & terminal (B135) No. 21 — Chassis ground: (B135) No. 23 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 5.	Repair the chassis short circuit of harness.
5	CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Connect the ECM connector. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. Connector & terminal (B315) No. 5 — Chassis ground:	Is the resistance less than 5 Ω?	Go to step 6.	Repair poor contact in ECM connector.
6	CHECK POWER SUPPLY OF ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between accelerator pedal position sensor connector and chassis ground. Connector & terminal (B315) No. 4 (+) — Chassis ground (-):	Is the voltage 4.5 — 5.5 V?	Replace the accelerator pedal position sensor. <Ref. to SP (H4SO)-3, Accelerator Pedal.>	Repair poor contact in ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

EB:DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-259, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

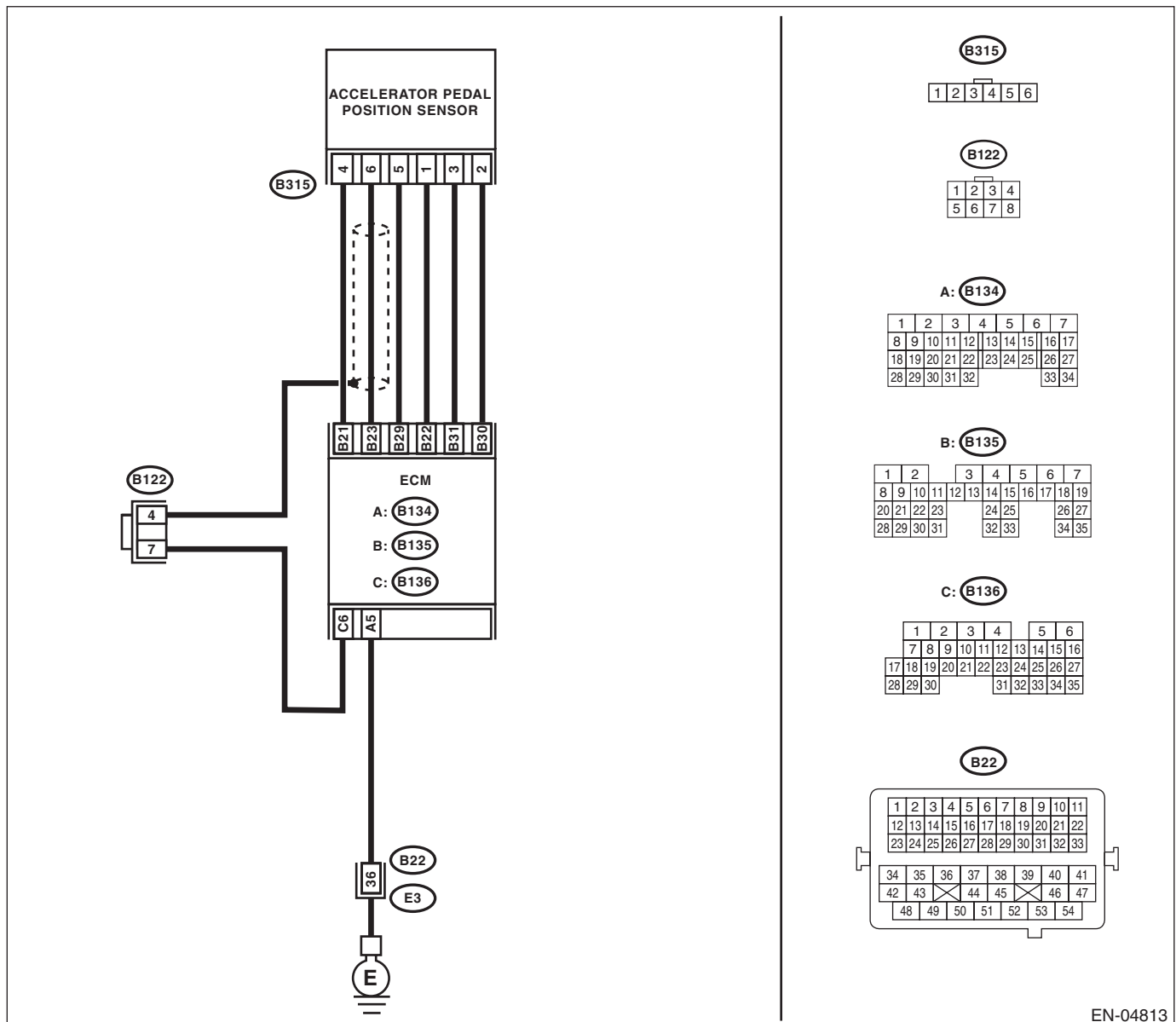
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>

WIRING DIAGRAM:



EN-04813

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT. 1) Turn the ignition switch to ON. 2) Read the data of main accelerator pedal position sensor signal using Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.>	Is the voltage less than 4.8 V?	Go to step 2.	Go to step 3.
2 CHECK POOR CONTACT. Check poor contact of connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. <i>Connector & terminal</i> (B135) No. 21 — (B315) No. 4: (B135) No. 29 — (B315) No. 5: (B135) No. 23 — (B315) No. 6:	Is the resistance less than 1 Ω?	Go to step 4.	Repair the open circuit of harness connector.
4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Connect the ECM connector. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. <i>Connector & terminal</i> (B315) No. 5 — Chassis ground:	Is the resistance less than 5 Ω?	Go to step 5.	Repair poor contact in ECM connector.
5 CHECK POWER SUPPLY OF ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between accelerator pedal position sensor connector and chassis ground. <i>Connector & terminal</i> (B315) No. 4 (+) — Chassis ground (-):	Is the voltage 4.5 — 5.5 V or more?	Go to step 6.	Repair the short circuit of harness between ECM connector and accelerator pedal position sensor connector.
6 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Connect the accelerator pedal position sensor connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> (B135) No. 23 (+) — Chassis ground (-):	Is the voltage less than 4.8 V?	Repair poor contact in ECM connector.	Repair the poor contact of accelerator pedal position sensor connector. Replace the accelerator pedal position sensor if defective. <Ref. to SP (H4SO)-3, Accelerator Pedal.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

EC:DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-261, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

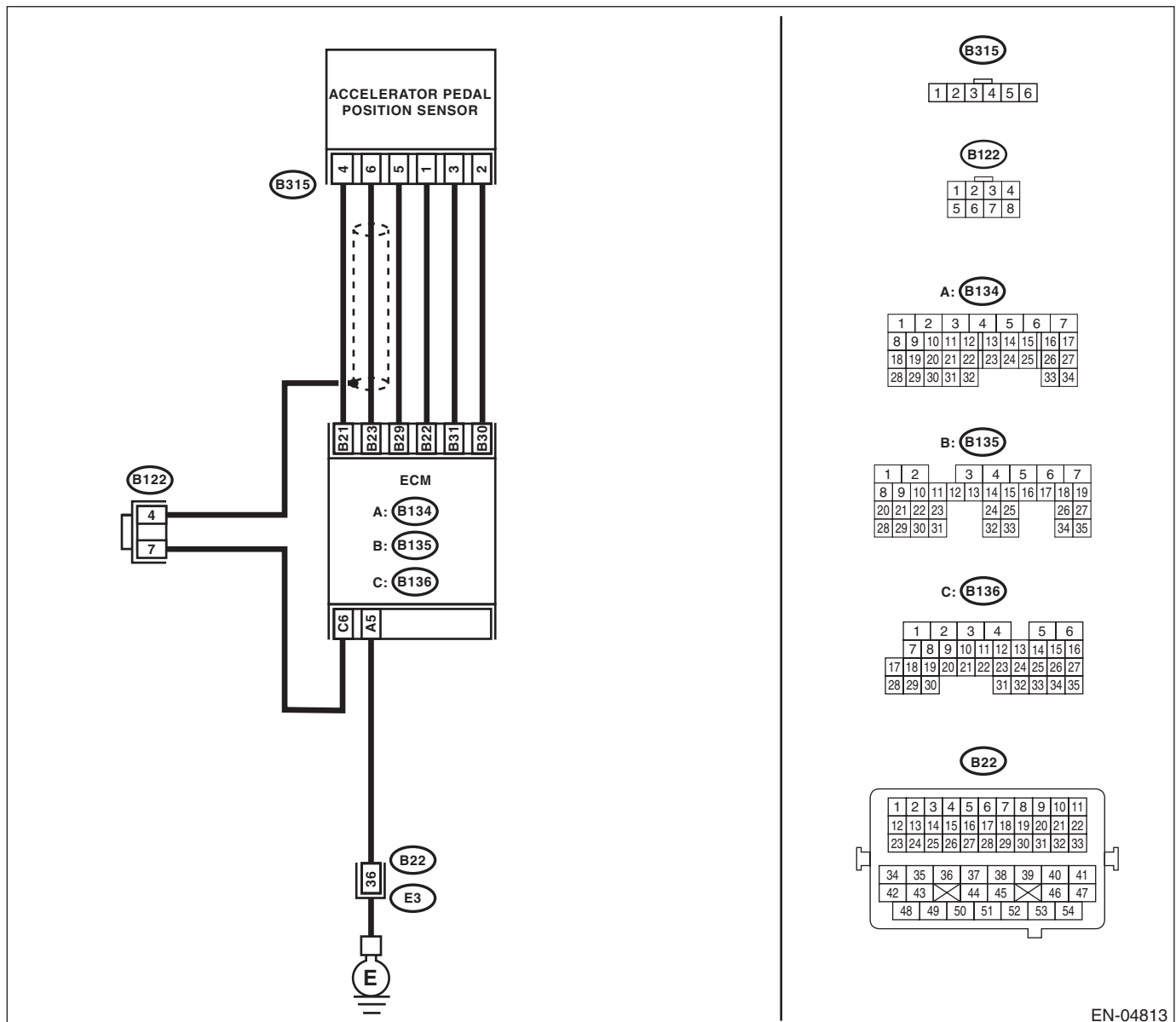
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04813

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT. 1) Turn the ignition switch to ON. 2) Read the data of sub accelerator pedal position sensor signal using Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.>	Is the voltage 0.4 V or more?	Go to step 2.	Go to step 3.
2 CHECK POOR CONTACT. Check poor contact of connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. <i>Connector & terminal</i> <i>(B135) No. 22 — (B315) No. 1:</i> <i>(B135) No. 31 — (B315) No. 3:</i>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit of harness connector.
4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. Measure the resistance between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 22 — Chassis ground:</i> <i>(B135) No. 31 — Chassis ground:</i>	Is the resistance 1 M Ω or more?	Go to step 5.	Repair the chassis short circuit of harness.
5 CHECK HARNESS BETWEEN ECM CONNECTOR AND ACCELERATOR PEDAL POSITION SENSOR. 1) Connect the ECM connector. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. <i>Connector & terminal</i> <i>(B315) No. 2 — Chassis ground:</i>	Is the resistance less than 5 Ω ?	Go to step 6.	Repair poor contact in ECM connector.
6 CHECK POWER SUPPLY OF ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between accelerator pedal position sensor connector and chassis ground. <i>Connector & terminal</i> <i>(B315) No. 1 (+) — Chassis ground (-):</i>	Is the voltage 4.5 — 5.5 V?	Replace the accelerator pedal position sensor. <Ref. to SP (H4SO)-3, Accelerator Pedal.>	Repair poor contact in ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

ED:DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-263, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>

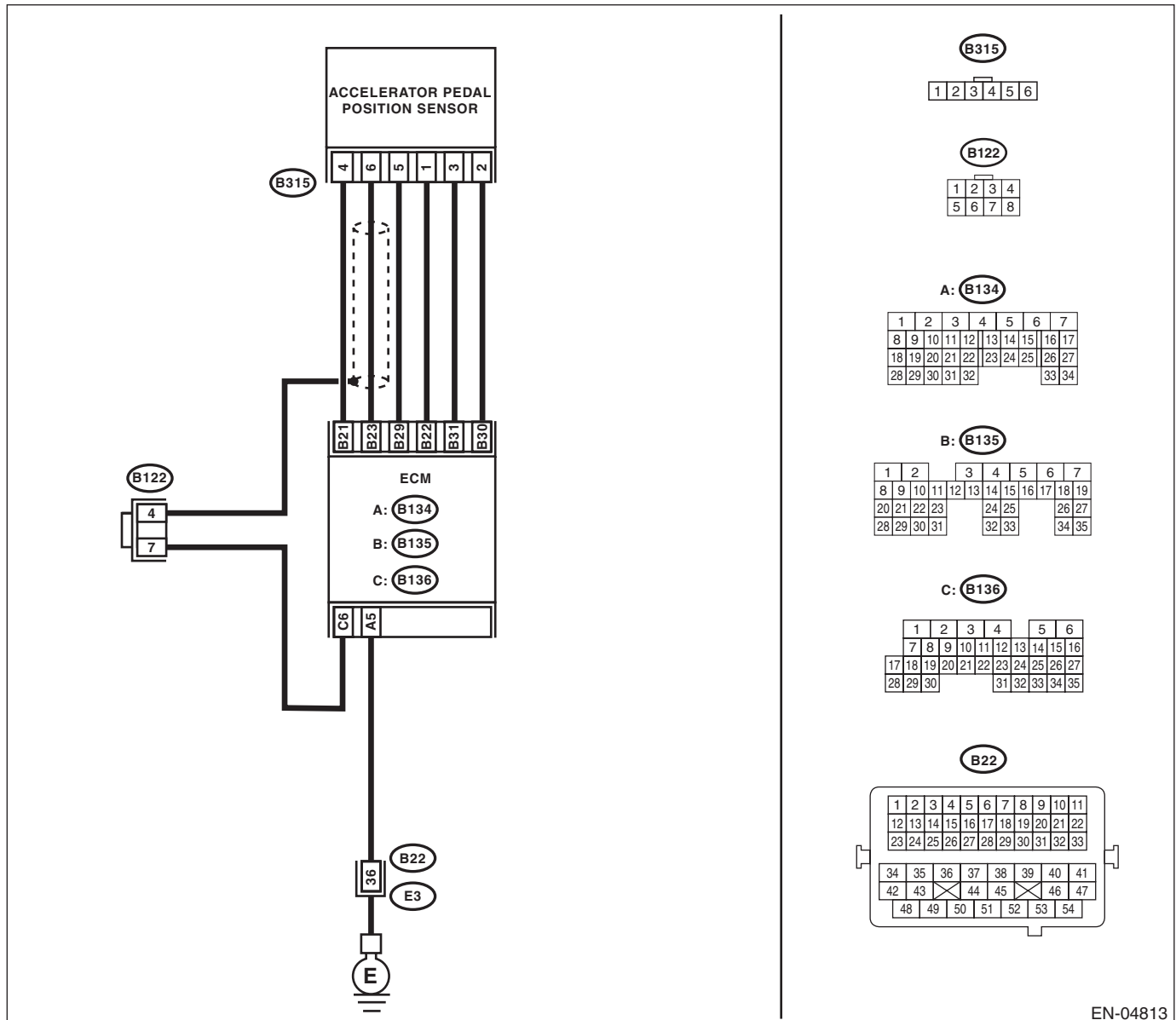
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04813

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT. 1) Turn the ignition switch to ON. 2) Read the data of sub accelerator pedal position sensor signal using Subaru Select Monitor. <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.>	Is the voltage less than 4.8 V?	Go to step 2.	Go to step 3.
2 CHECK POOR CONTACT. Check poor contact of connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
3 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. <i>Connector & terminal</i> <i>(B135) No. 22 — (B315) No. 1:</i> <i>(B135) No. 30 — (B315) No. 2:</i> <i>(B135) No. 31 — (B315) No. 3:</i>	Is the resistance less than 1 Ω?	Go to step 4.	Repair the open circuit of harness connector.
4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Connect the ECM connector. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground. <i>Connector & terminal</i> <i>(B315) No. 2 — Chassis ground:</i>	Is the resistance less than 5 Ω?	Go to step 5.	Repair poor contact in ECM connector.
5 CHECK POWER SUPPLY OF ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between accelerator pedal position sensor connector and chassis ground. <i>Connector & terminal</i> <i>(B315) No. 1 (+) — Chassis ground (-):</i>	Is the voltage 4.5 — 5.5 V?	Go to step 6.	Repair the short circuit of harness between ECM connector and accelerator pedal position sensor connector.
6 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Connect the accelerator pedal position sensor connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground. <i>Connector & terminal</i> <i>(B135) No. 31 (+) — Chassis ground (-):</i>	Is the voltage less than 4.8 V?	Repair poor contact in ECM connector.	Repair the poor contact of accelerator pedal position sensor connector. Replace the accelerator pedal position sensor if defective. <Ref. to SP (H4SO)-3, Accelerator Pedal.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

EE:DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A"/"B" VOLTAGE CORRELATION

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-265, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A"/"B" VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

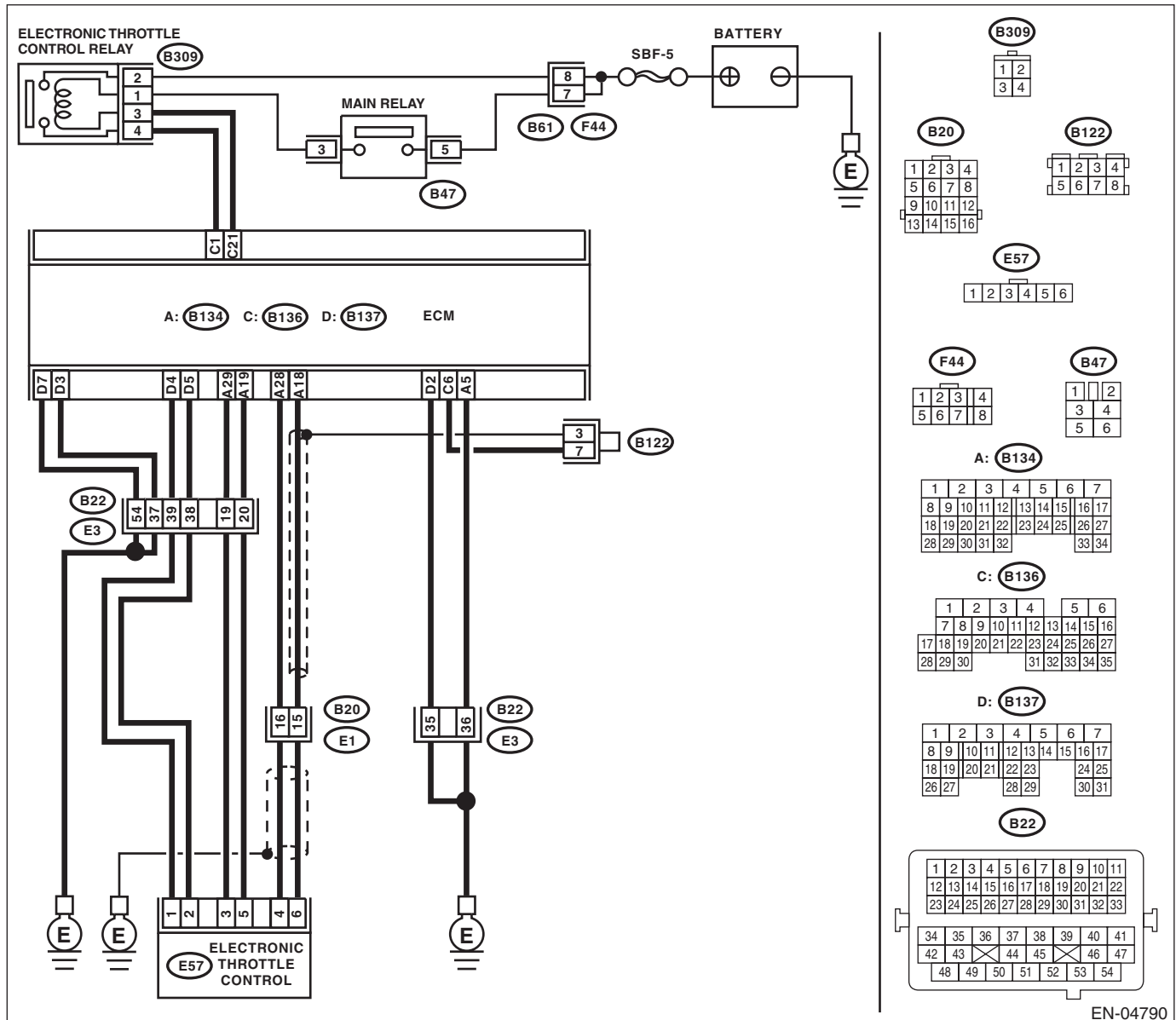
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK SENSOR OUTPUT.</p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between ECM connector terminals.</p> <p>Connector & terminal (B134) No. 18 (+) — (B134) No. 29 (-):</p> <p>3) Check the voltage change while shaking the ECM harness and connector, engine harness connector, and electronic throttle control connector harness.</p>	Is the voltage 0.4 V or more?	Go to step 2.	Go to step 4.
2	<p>CHECK SENSOR OUTPUT.</p> <p>1) Measure the voltage between ECM connector terminals.</p> <p>Connector & terminal (B134) No. 28 (+) — (B134) No. 29 (-):</p> <p>2) Check the voltage change while shaking the ECM harness and connector, engine harness connector, and electronic throttle control connector harness.</p>	Is the voltage 0.8 V or more?	Go to step 3.	Go to step 4.
3	<p>CHECK POOR CONTACT.</p> <p>Check poor contact in connector between ECM and electronic throttle control.</p>	Is there poor contact?	Repair the poor contact.	Go to step 14.
4	<p>CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connectors from ECM.</p> <p>3) Disconnect the connectors from electronic throttle control.</p> <p>4) Measure the resistance between ECM connector and electronic throttle control connector.</p> <p>Connector & terminal (B134) No. 19 — (E57) No. 5:</p>	Is the resistance less than 1 Ω ?	Go to step 5.	Repair the open circuit of harness connector.
5	<p>CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL.</p> <p>Measure the resistance between ECM connector and chassis ground.</p> <p>Connector & terminal (B134) No. 19 — Chassis ground: (B134) No. 18 — Chassis ground: (B134) No. 28 — Chassis ground:</p>	Is the resistance 1 M Ω or more?	Go to step 6.	Repair the ground short circuit of harness.
6	<p>CHECK SENSOR POWER SUPPLY.</p> <p>1) Connect the ECM connector.</p> <p>2) Turn the ignition switch to ON.</p> <p>3) Measure the voltage between electronic throttle control connector and engine ground.</p> <p>Connector & terminal (E57) No. 5 (+) — Engine ground (-):</p> <p>4) Check the voltage change by shaking the harness and connector of ECM and engine harness connector while monitoring the value with voltage meter.</p>	Is the voltage 4.5 — 5.5 V?	Go to step 7.	Repair poor contact in ECM connector.
7	<p>CHECK SHORT CIRCUIT IN ECM.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Measure the resistance between electronic throttle control connector and engine ground.</p> <p>Connector & terminal (E57) No. 4 — Engine ground: (E57) No. 6 — Engine ground:</p>	Is the resistance 10 Ω or more?	Go to step 8.	Repair poor contact in ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK SENSOR OUTPUT. 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Read the data of main throttle sensor signal using Subaru Select Monitor. 4) Check the voltage change while shaking the ECM harness and connector, engine harness connector, and electronic throttle control connector harness.	Is the voltage less than 4.63 V?	Go to step 9.	Go to step 11.
9 CHECK SENSOR OUTPUT. 1) Read the data of sub throttle sensor signal using Subaru Select Monitor. 2) Check the voltage change while shaking the ECM harness and connector, engine harness connector, and electronic throttle control connector harness.	Is the voltage less than 4.73 V?	Go to step 10.	Go to step 11.
10 CHECK POOR CONTACT. Check poor contact in connector between ECM and electronic throttle control.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
11 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from electronic throttle control. 4) Measure the resistance between ECM connector and electronic throttle control connector. <i>Connector & terminal</i> (B134) No. 18 — (E57) No. 6: (B134) No. 28 — (E57) No. 4: (B134) No. 29 — (E57) No. 3:	Is the resistance less than 1 Ω?	Go to step 12.	Repair the open circuit of harness connector.
12 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM connector. 2) Measure the resistance between electronic throttle control connector and engine ground. <i>Connector & terminal</i> (E57) No. 3 — Engine ground:	Is the resistance less than 5 Ω?	Go to step 13.	Repair poor contact in ECM connector.
13 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Connect the ECM connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between electronic throttle control connector and engine ground. <i>Connector & terminal</i> (E57) No. 5 (+) — Engine ground (-): 4) Check the voltage change by shaking the harness and connector of ECM and engine harness connector while monitoring the value with voltage meter.	Is the voltage 10 V or more?	Go to step 14.	Repair the short circuit to power supply in the harness between the ECM connector and electronic throttle control connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
14 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Measure the voltage between electronic throttle control connector and engine ground. <i>Connector & terminal</i> <i>(E57) No. 4 (+) — Engine ground (-):</i> <i>(E57) No. 6 (+) — Engine ground (-):</i> 2) Check the voltage change by shaking the harness and connector of ECM and engine harness connector while monitoring the value with voltage meter.	Is the voltage less than 10 V?	Go to step 15.	Repair the short circuit of harness between ECM connector and electronic throttle control connector.
15 CHECK HARNESS BETWEEN ECM AND ELECTRONIC THROTTLE CONTROL. 1) Turn the ignition switch to OFF. 2) Disconnect the ECM connector. 3) Measure the resistance between ECM connectors. <i>Connector & terminal</i> <i>(B134) No. 18 — (B134) No. 29:</i> <i>(B134) No. 28 — (B134) No. 29:</i>	Is the resistance 1 MΩ or more?	Go to step 16.	Repair the short circuit to sensor power supply.
16 CHECK ELECTRONIC THROTTLE CONTROL HARNESS. 1) Disconnect the connectors from ECM. 2) Disconnect the connectors from electronic throttle control. 3) Measure the resistance between electronic throttle control connector terminals. <i>Connector & terminal</i> <i>(E57) No. 6 — (E57) No. 4:</i>	Is the resistance 1 MΩ or more?	Repair poor contact in ECM connector.	Repair the short circuit of harness.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

EF:DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-267, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>

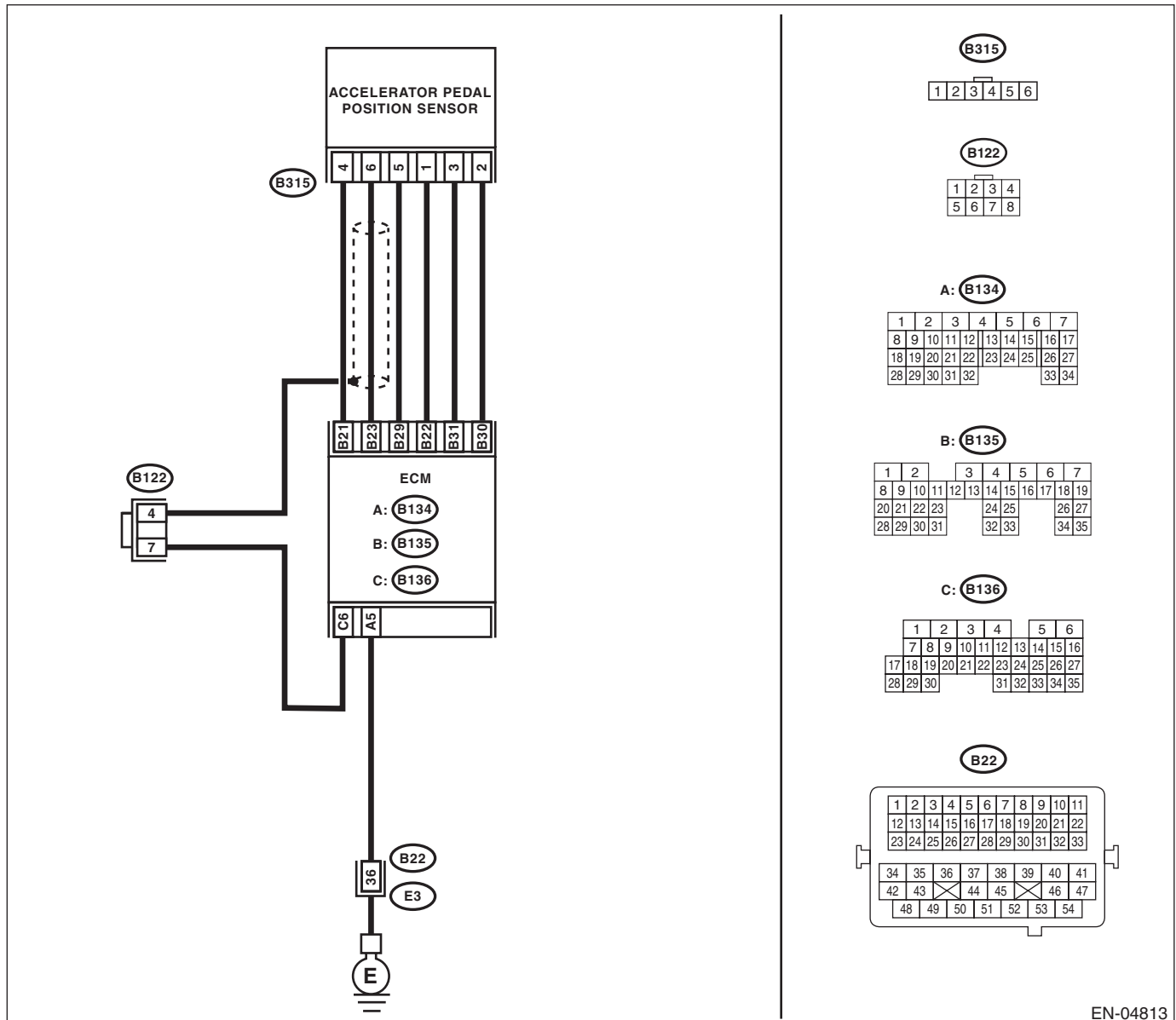
TROUBLE SYMPTOM:

- Improper idling
- Poor driving performance

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04813

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT. 1) Turn the ignition switch to ON. 2) Read the data of main accelerator pedal position sensor signal and sub accelerator pedal position sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.>	Is the voltage 0.4 V or more?	Go to step 2.	Go to step 4.
2 CHECK ACCELERATOR PEDAL POSITION SENSOR OUTPUT. 1) Turn the ignition switch to ON. 2) Read the data of main accelerator pedal position sensor signal and sub accelerator pedal position sensor signal using Subaru Select Monitor. NOTE: For detailed operation procedures, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.>	Is the voltage less than 4.8 V?	Go to step 3.	Go to step 4.
3 CHECK POOR CONTACT. Check poor contact of connector between ECM and accelerator pedal position sensor.	Is there poor contact?	Repair the poor contact.	Temporary poor contact occurred, but it is normal at present.
4 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between ECM connector and accelerator pedal position sensor connector. Connector & terminal (B135) No. 22 — (B315) No. 1: (B135) No. 30 — (B315) No. 2: (B135) No. 31 — (B315) No. 3: (B135) No. 21 — (B315) No. 4: (B135) No. 29 — (B315) No. 5: (B135) No. 23 — (B315) No. 6:	Is the resistance less than 1 Ω?	Go to step 5.	Repair the open circuit of harness connector.
5 CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR. Measure the resistance between ECM connector and chassis ground. Connector & terminal (B135) No. 23 — Chassis ground: (B135) No. 21 — Chassis ground: (B135) No. 31 — Chassis ground: (B135) No. 22 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 6.	Repair the chassis short circuit of harness.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>6</p> <p>CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</p> <p>1) Connect the ECM connector. 2) Measure the resistance between accelerator pedal position sensor connector and chassis ground.</p> <p>Connector & terminal (B315) No. 2 — Chassis ground: (B315) No. 5 — Chassis ground:</p>	Is the resistance less than 5 Ω?	Go to step 7.	Repair poor contact in ECM connector.
<p>7</p> <p>CHECK POWER SUPPLY OF ACCELERATOR PEDAL POSITION SENSOR.</p> <p>1) Turn the ignition switch to ON. 2) Measure the voltage between accelerator pedal position sensor connector and chassis ground.</p> <p>Connector & terminal (B315) No. 1 (+) — Chassis ground (-): (B315) No. 4 (+) — Chassis ground (-):</p>	Is the voltage 4.5 — 5.5 V?	Go to step 8.	Repair poor contact in ECM connector.
<p>8</p> <p>CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</p> <p>1) Turn the ignition switch to OFF. 2) Connect the accelerator pedal position sensor connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM connector and chassis ground.</p> <p>Connector & terminal (B135) No. 31 (+) — Chassis ground (-): (B135) No. 23 (+) — Chassis ground (-):</p>	Is the voltage less than 4.8 V?	Go to step 9.	Repair the poor contact of accelerator pedal position sensor connector. Replace the accelerator pedal position sensor if defective. <Ref. to SP (H4SO)-3, Accelerator Pedal.>
<p>9</p> <p>CHECK HARNESS BETWEEN ECM AND ACCELERATOR PEDAL POSITION SENSOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from ECM. 3) Disconnect the connectors from accelerator pedal position sensor. 4) Measure the resistance between connector terminals of accelerator pedal position sensor.</p> <p>Connector & terminal (B315) No. 6 — (B315) No. 3:</p>	Is the resistance 1 MΩ or more?	Repair poor contact in ECM connector.	Repair the short circuit of harness between ECM connector and accelerator pedal position sensor connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

EG:DTC P2419 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT LOW

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-269, DTC P2419 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

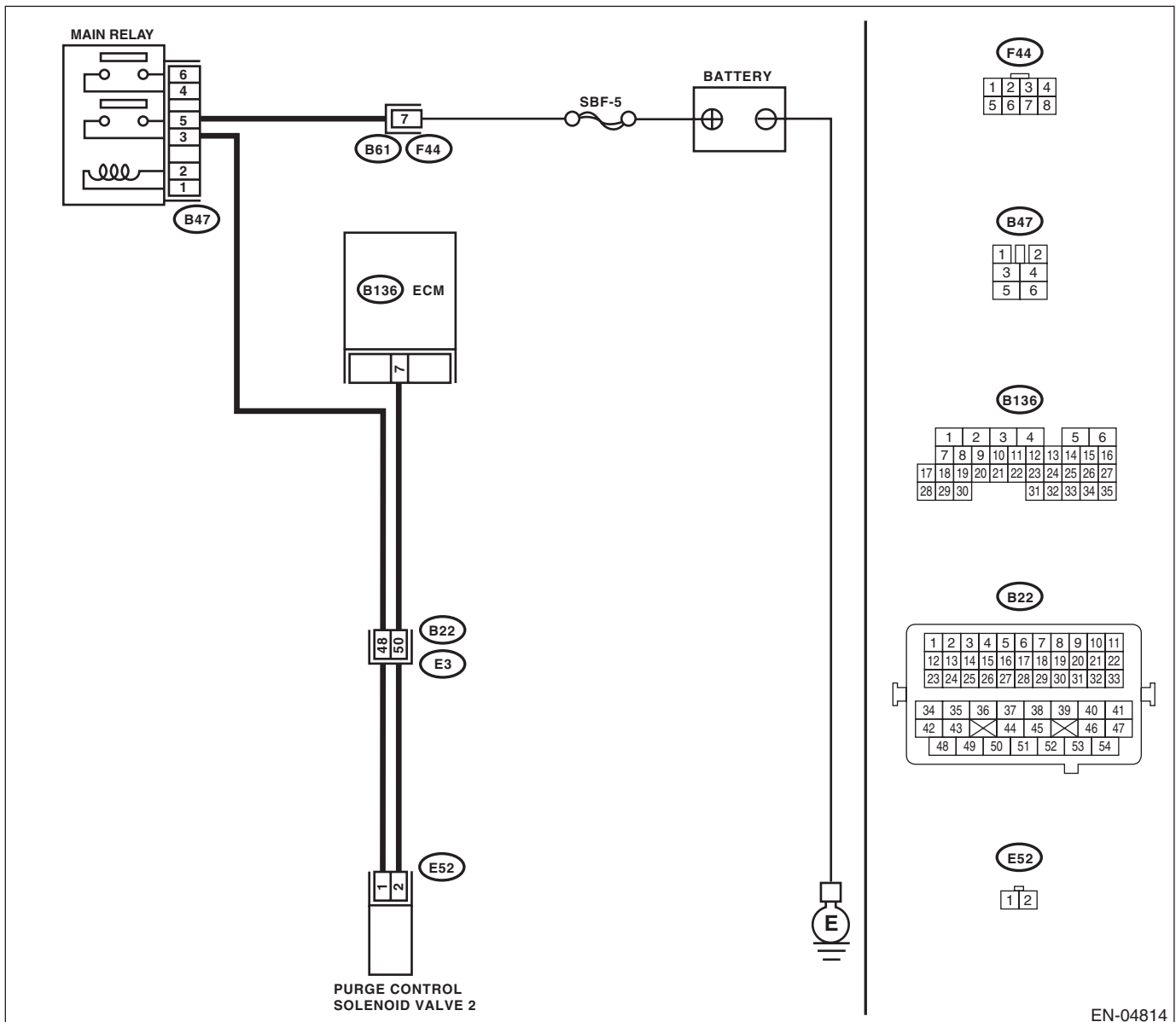
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04814

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK OUTPUT SIGNAL OF ECM.</p> <p>1) Turn the ignition switch to ON. 2) Measure the voltage between ECM and chassis ground.</p> <p>Connector & terminal (B136) No. 7 (+) — Chassis ground (-):</p>	Is the voltage 10 V or more?	Even if the malfunction indicator light illuminates, the circuit has returned to a normal condition at this time.	Go to step 2.
2	<p>CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE 2 AND ECM CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from purge control solenoid valve 2 and ECM. 3) Measure the resistance of harness between purge control solenoid valve 2 connector and engine ground.</p> <p>Connector & terminal (E52) No. 2 — Engine ground:</p>	Is the resistance 1 M Ω or more?	Go to step 3.	Repair the ground short circuit of harness between ECM and purge control solenoid valve 2 connector.
3	<p>CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE 2 AND ECM CONNECTOR.</p> <p>Measure the resistance of harness between ECM and purge control solenoid valve 2.</p> <p>Connector & terminal (B136) No. 7 — (E52) No. 2:</p>	Is the resistance less than 1 Ω ?	Go to step 4.	<p>Repair the open circuit of harness between ECM and purge control solenoid valve 2 connector.</p> <p>NOTE: In this case, repair the following item:</p> <ul style="list-style-type: none"> • Open circuit in harness between ECM and purge control solenoid valve 2 connector • Poor contact in coupling connector
4	<p>CHECK PURGE CONTROL SOLENOID VALVE 2.</p> <p>1) Remove the purge control solenoid valve 2. 2) Measure the resistance between purge control solenoid valve 2 terminals.</p> <p>Terminals No. 1 — No. 2:</p>	Is the resistance between 10 — 100 Ω ?	Go to step 5.	Replace the purge control solenoid valve 2. <Ref. to EC (H4DOTC)-8, Purge Control Solenoid Valve.>
5	<p>CHECK POWER SUPPLY TO PURGE CONTROL SOLENOID VALVE 2.</p> <p>1) Turn the ignition switch to ON. 2) Measure the voltage between purge control solenoid valve 2 and engine ground.</p> <p>Connector & terminal (E52) No. 1 (+) — Engine ground (-):</p>	Is the voltage 10 V or more?	Repair the poor contact of purge control solenoid valve 2 connector.	Repair the open circuit of harness between main relay and purge control solenoid valve 2 connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

EH:DTC P2420 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT HIGH

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-270, DTC P2420 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

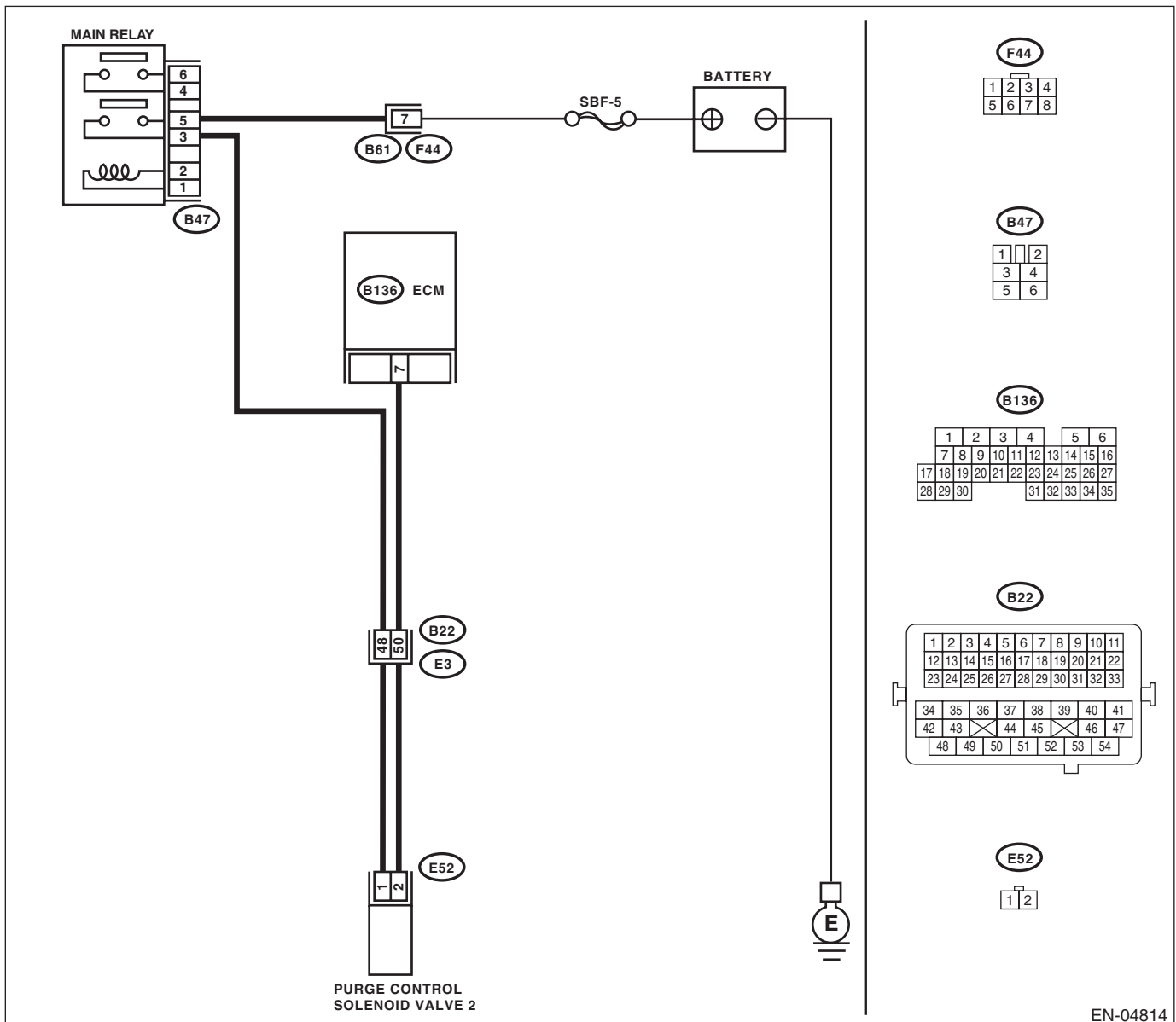
TROUBLE SYMPTOM:

Improper idling

CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

WIRING DIAGRAM:



EN-04814

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK HARNESS BETWEEN PURGE CONTROL SOLENOID VALVE 2 AND ECM CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from purge control solenoid valve 2 and ECM. 3) Turn the ignition switch to ON. 4) Measure the voltage between ECM and chassis ground. Connector & terminal (B136) No. 7 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Repair the short circuit to power supply in the harness between the ECM and purge control solenoid valve 2 connector.	Go to step 2.
2	CHECK PURGE CONTROL SOLENOID VALVE 2. 1) Turn the ignition switch to OFF. 2) Measure the resistance between purge control solenoid valve 2 terminals. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Replace the purge control solenoid valve 2. <Ref. to EC (H4DOTC)-8, Purge Control Solenoid Valve.>	Repair the poor contact in ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

EI: DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW/PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-271, DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

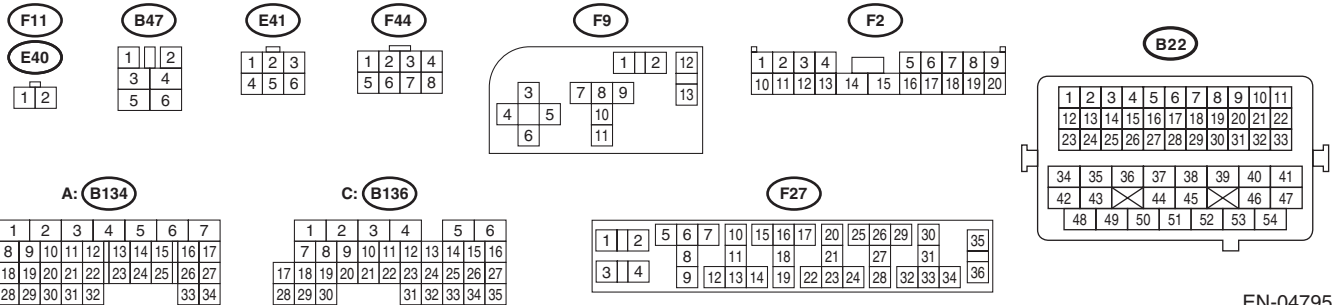
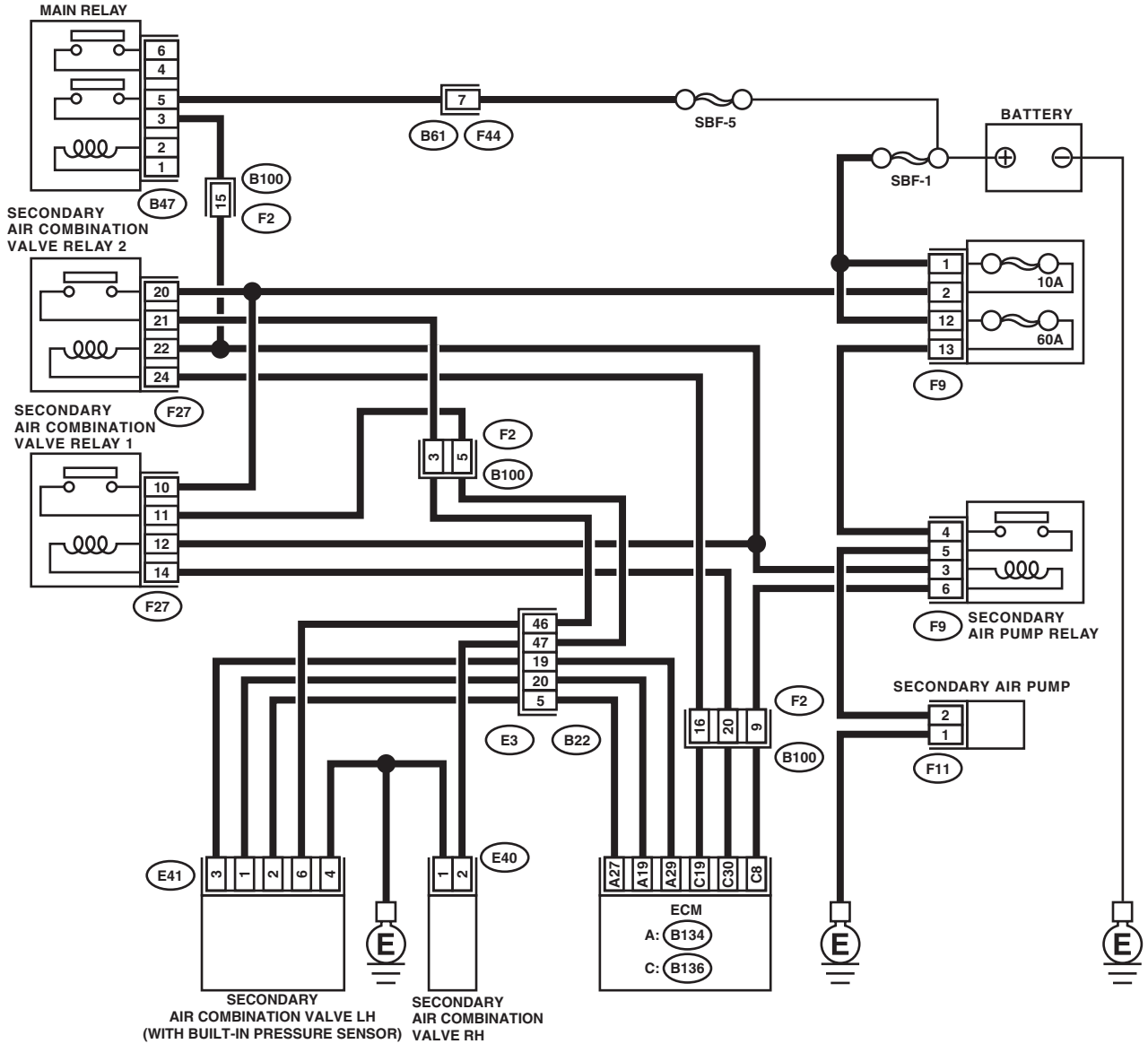
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04795

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check the relative DTC.	Go to step 2.
2	CHECK CURRENT DATA. 1) Turn the ignition switch to ON (engine OFF). 2) Using the Subaru Select Monitor, read secondary air piping pressure, intake manifold absolute pressure and atmospheric pressure data, and compare with the actual atmospheric pressure. NOTE: For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.>	Is the difference with the actual atmospheric pressure 200 mmHg (27 kPa, 8 inHg or 3.9 psig) or more?	Replace the secondary air combination valve (LH). <Ref. to EC (H4DOTC)-10, Secondary Air Combi Valve.> NOTE: The secondary air pressure sensor is a one piece combined part with the secondary air combination valve (LH).	Temporary poor contact occurs. Check the poor contact of connector.

EJ:DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW/PRESSURE SENSOR CIRCUIT LOW

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-272, DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>

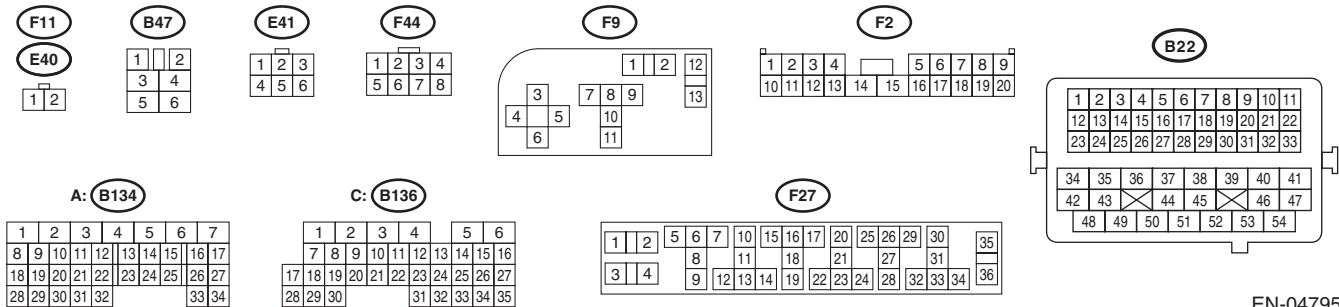
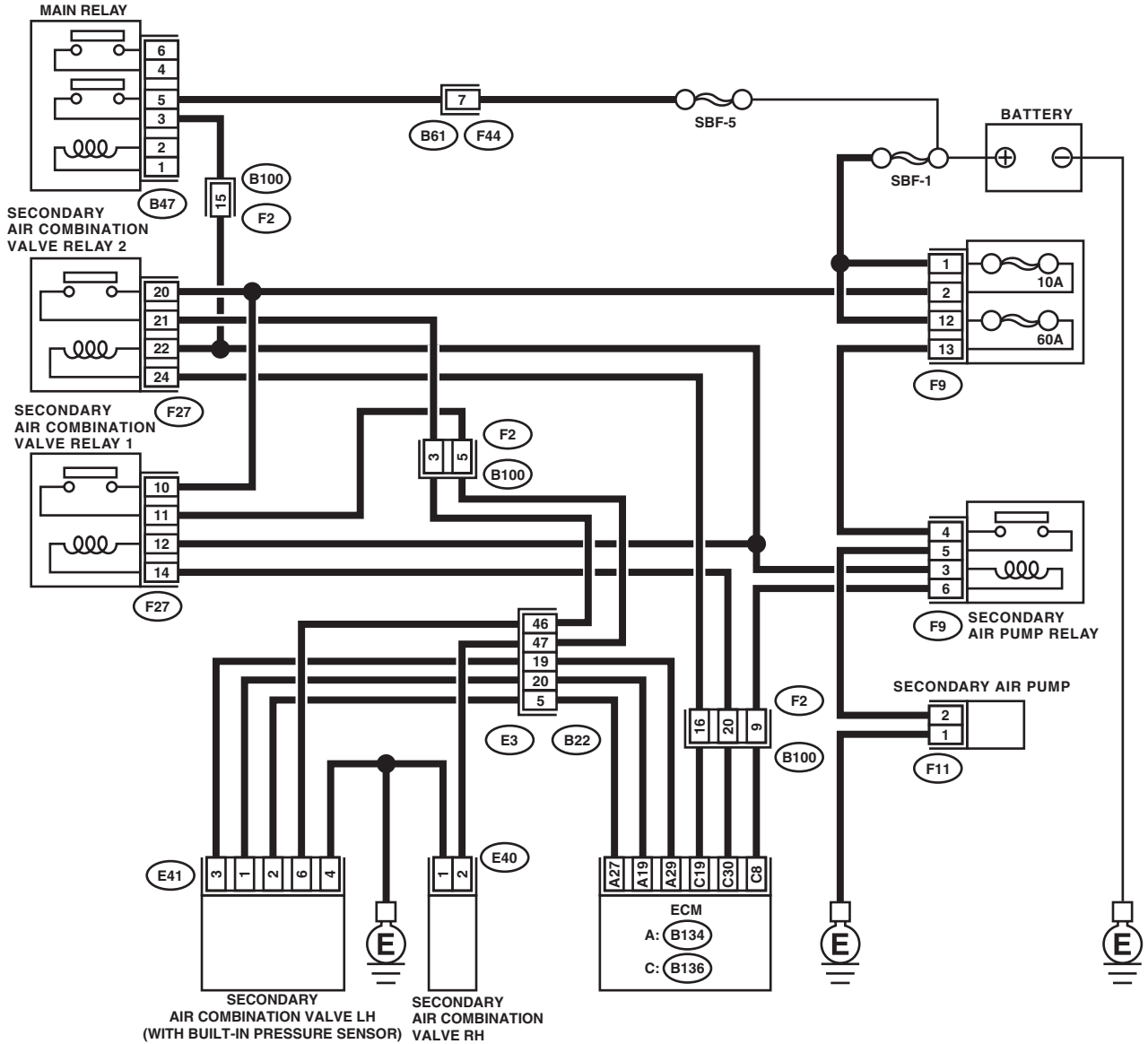
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04795

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE LH CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and secondary air combination valve LH. 3) Measure the resistance of the harness between the ECM and secondary air combination valve relay LH connector terminal.</p> <p>Connector & terminal (B134) No. 27 — (E41) No. 2: (B134) No. 19 — (E41) No. 1: (B134) No. 29 — (E41) No. 3:</p>	Is the resistance less than 1 Ω?	Go to step 2.	Repair open circuit of the harness between the ECM and secondary air combination valve relay LH connector terminal.
2	<p>CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE LH CONNECTOR.</p> <p>Measure the resistance of harness between ECM and chassis ground.</p> <p>Connector & terminal (B134) No. 27 — Chassis ground:</p>	Is the resistance 1 MΩ or more?	Temporary poor contact occurs. Check the poor contact of connector.	Repair the ground short of the harness between the ECM and secondary air combination valve relay LH connector terminal.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

EK:DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT HIGH

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-273, DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

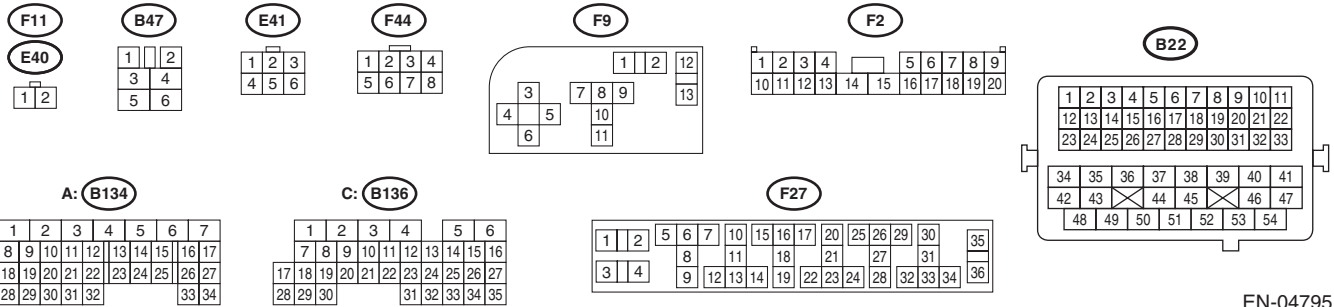
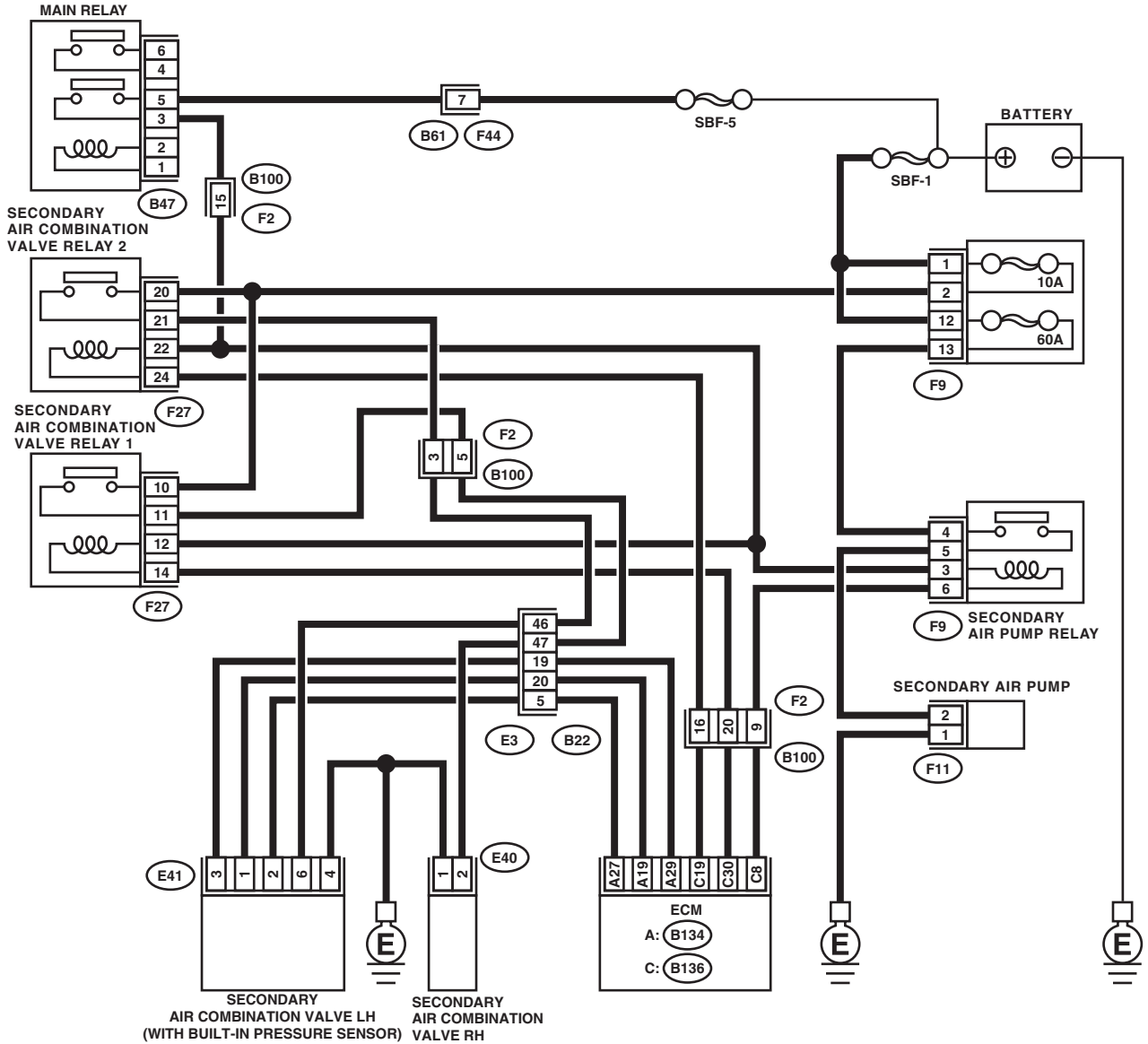
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04795

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE LH CONNECTOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ECM and secondary air combination valve LH. 3) Measure the resistance of the harness between the ECM and secondary air combination valve relay LH connector terminal.</p> <p>Connector & terminal (B134) No. 27 — (E41) No. 2: (B134) No. 19 — (E41) No. 1: (B134) No. 29 — (E41) No. 3:</p>	Is the resistance less than 1 Ω ?	Go to step 2.	Repair open circuit of the harness between the ECM and secondary air combination valve relay LH connector terminal.
2	<p>CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE LH CONNECTOR.</p> <p>Measure the voltage between ECM and chassis ground.</p> <p>Connector & terminal (B134) No. 27 (+) — Chassis ground (-):</p>	Is the voltage 5 V or more?	Repair the short circuit to power supply in the harness between the ECM and secondary air combination valve LH connector terminal.	Temporary poor contact occurs. Check the poor contact of connector.

EL:DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 1)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-274, DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

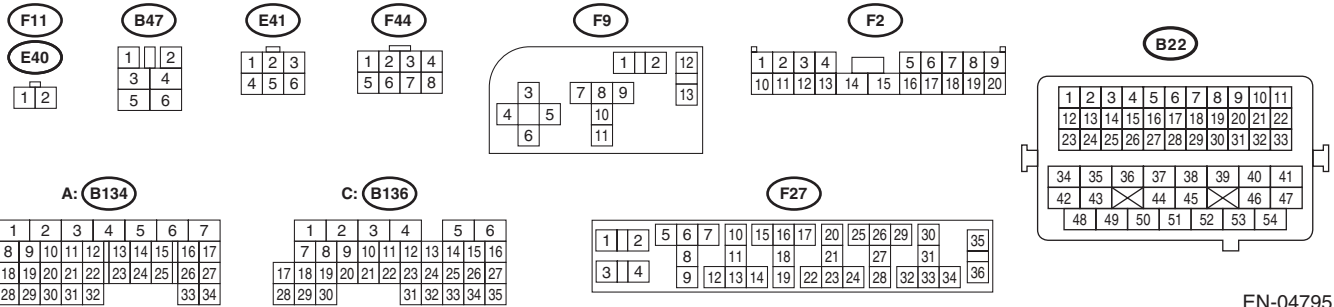
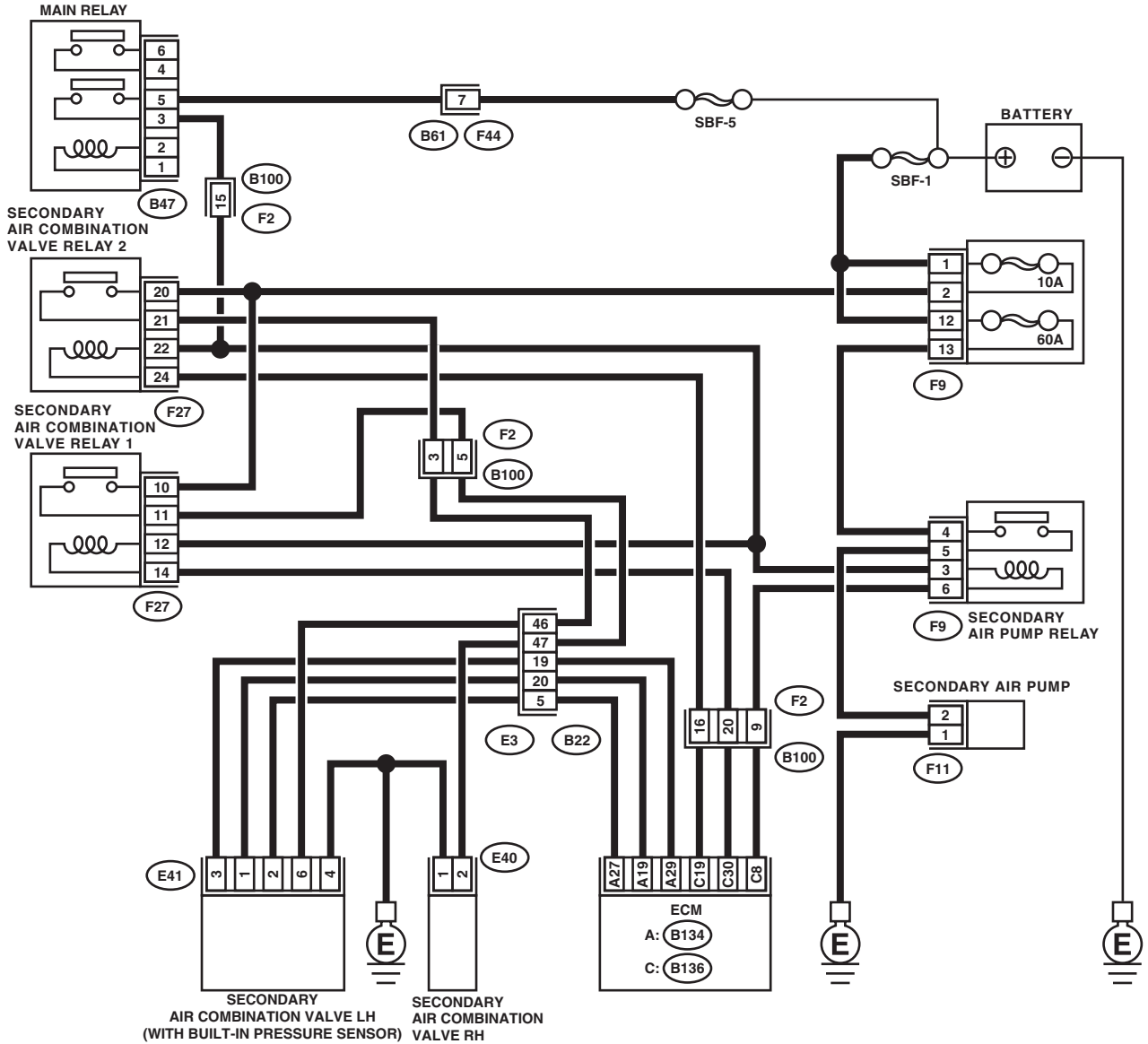
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04795

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK SECONDARY AIR COMBINATION VALVE OPERATION.</p> <p>1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Perform operation check for the secondary air combination valve using the Subaru Select Monitor.</p> <p>NOTE: Refer to "Compulsory Valve Operation Check Mode" for more operation procedure. <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.></p>	Does the secondary air combination valve operate properly?	Go to step 2.	Go to step 4.
2	<p>CHECK DUCT BETWEEN SECONDARY AIR PUMP AND SECONDARY AIR COMBINATION VALVE.</p> <p>Inspection of the duct between the secondary air pump and secondary air combination valve.</p>	Is there damage or disconnection of the duct?	Replace or connect the duct.	Go to step 3.
3	<p>CHECK PIPE BETWEEN SECONDARY AIR COMBINATION VALVE AND CYLINDER HEAD.</p> <p>Inspection of the pipe between the secondary air combination valve and cylinder head.</p>	Is there damage or disconnection of the pipe?	Replace or connect the pipe.	Temporary poor contact occurs. Check the poor contact of connector.
4	<p>CHECK POWER SUPPLY TO SECONDARY AIR COMBINATION VALVE.</p> <p>In the condition of step 1, measure the voltage between the secondary air combination valve and the chassis ground.</p> <p>Connector & terminal (E40) No. 2 (+) — Chassis ground (-):</p>	Is the voltage 10 V or more?	Replace the secondary air combination valve.	Go to step 5.
5	<p>CHECK HARNESS BETWEEN SECONDARY AIR COMBINATION VALVE RELAY AND SECONDARY AIR COMBINATION VALVE CONNECTOR TERMINAL.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from the secondary air combination valve relay and secondary air combination valve. 3) Measure resistance between the secondary air combination valve relay and secondary air combination valve connector terminal.</p> <p>Connector & terminal (F27) No. 11 — (E40) No. 2:</p>	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the open circuit between the secondary air combination valve relay and secondary air combination valve connector terminal.
6	<p>CHECK SECONDARY AIR COMBINATION VALVE RELAY.</p> <p>1) Turn the ignition switch to OFF. 2) Remove the secondary air pump relay from the relay box. 3) Connect the battery to the secondary air combination valve relay terminals No. 12 and No. 14. 4) Measure the resistance between the secondary air combination valve relay terminals.</p> <p>Terminals No. 10 — No. 11:</p>	Is the resistance less than 1 Ω ?	Go to step 7.	Replace the secondary air combination valve relay.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK SECONDARY AIR COMBINATION VALVE RELAY POWER SOURCE. 1) Turn the ignition switch to ON. 2) Measure the voltage between the secondary air combination valve relay connector and chassis ground. <i>Connector & terminal</i> <i>(F27) No. 10 (+) — Chassis ground (-):</i> <i>(F27) No. 12 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Go to step 8.	Repair the open or ground short circuit of power supply circuit.
8 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector of ECM. 3) Measure the resistance of the harness between the ECM and secondary air combination valve relay connector terminal. <i>Connector & terminal</i> <i>(B136) No. 30 — (F27) No. 14:</i>	Is the resistance less than 1 Ω ?	Replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	Repair open circuit of the harness between the ECM and secondary air pump relay connector terminal.

EM:DTC P2441 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK 1)

NOTE:

For the diagnostic procedure, refer to DTC P2440. <Ref. to EN(H4DOTC)(diag)-389, DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 1), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

EN:DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 2)

DTC DETECTING CONDITION:

- Two consecutive driving cycles with fault
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-274, DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

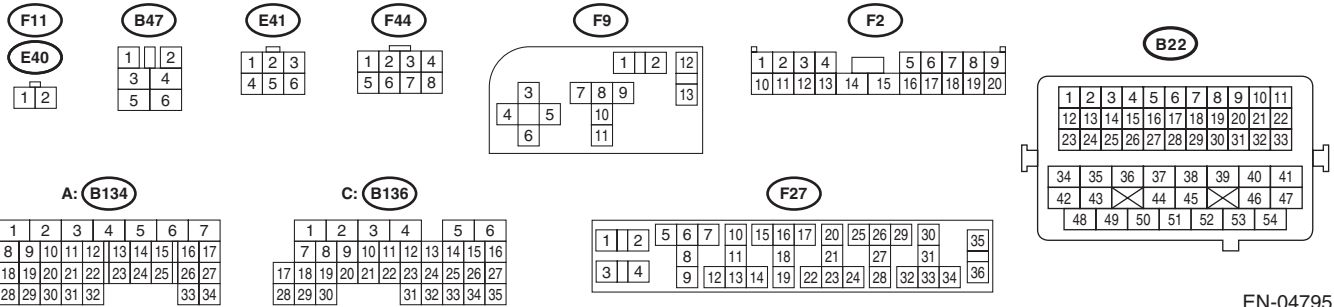
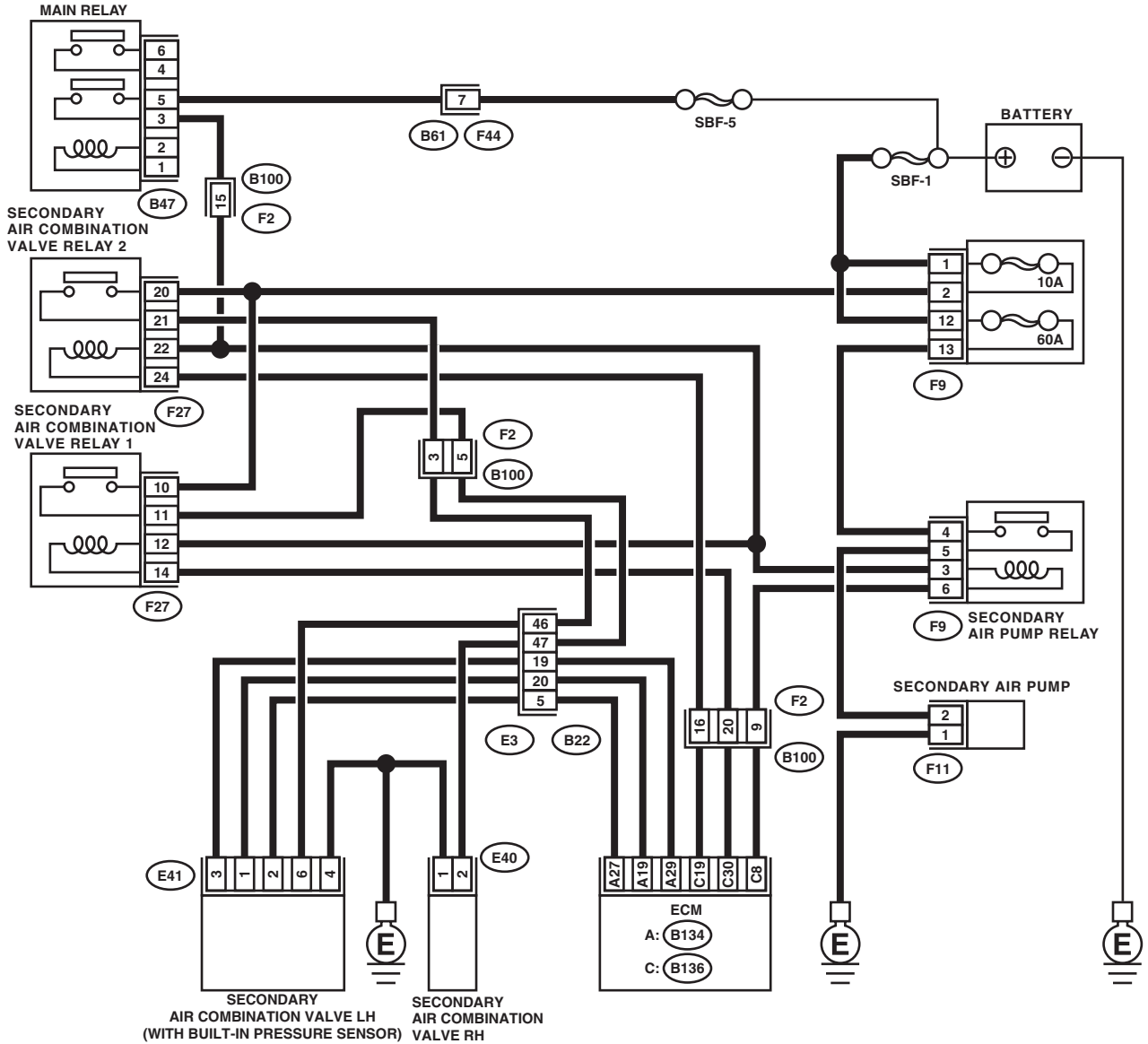
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04795

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
<p>1 CHECK SECONDARY AIR COMBINATION VALVE OPERATION.</p> <p>1) Connect the test mode connector. 2) Turn the ignition switch to ON. 3) Perform operation check for the secondary air combination valve using the Subaru Select Monitor.</p> <p>NOTE: Refer to "Compulsory Valve Operation Check Mode" for more operation procedure. <Ref. to EN(H4DOTC)(diag)-51, Compulsory Valve Operation Check Mode.></p>	Does the secondary air combination valve operate properly?	Go to step 2.	Go to step 4.
<p>2 CHECK DUCT BETWEEN SECONDARY AIR PUMP AND SECONDARY AIR COMBINATION VALVE.</p> <p>Inspection of the duct between the secondary air pump and secondary air combination valve.</p>	Is there damage or disconnection of the duct?	Replace or connect the duct.	Go to step 3.
<p>3 CHECK PIPE BETWEEN SECONDARY AIR COMBINATION VALVE AND CYLINDER HEAD.</p> <p>Inspection of the pipe between the secondary air combination valve and cylinder head.</p>	Is there damage or disconnection of the pipe?	Replace or connect the pipe.	Temporary poor contact occurs. Check the poor contact of connector.
<p>4 CHECK POWER SUPPLY TO SECONDARY AIR COMBINATION VALVE.</p> <p>In the condition of step 1, measure the voltage between the secondary air combination valve and the chassis ground.</p> <p>Connector & terminal (E41) No. 6 (+) — Chassis ground (-):</p>	Is the voltage 10 V or more?	Replace the secondary air combination valve.	Go to step 5.
<p>5 CHECK HARNESS BETWEEN SECONDARY AIR COMBINATION VALVE RELAY AND SECONDARY AIR COMBINATION VALVE CONNECTOR TERMINAL.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from the secondary air combination valve relay and secondary air combination valve. 3) Measure resistance between the secondary air combination valve relay and secondary air combination valve connector terminal.</p> <p>Connector & terminal (F27) No. 21 — (E41) No. 6:</p>	Is the resistance less than 1 Ω?	Go to step 6.	Repair the open circuit between the secondary air combination valve relay and secondary air combination valve connector terminal.
<p>6 CHECK SECONDARY AIR COMBINATION VALVE RELAY.</p> <p>1) Turn the ignition switch to OFF. 2) Remove the secondary air pump relay from the relay box. 3) Connect the battery to the secondary air combination valve relay terminals No. 22 and No. 24. 4) Measure the resistance between the secondary air combination valve relay terminals.</p> <p>Terminals No. 20 — No. 21:</p>	Is the resistance less than 1 Ω?	Go to step 7.	Replace the secondary air combination valve relay.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK SECONDARY AIR COMBINATION VALVE RELAY POWER SOURCE. 1) Turn the ignition switch to ON. 2) Measure the voltage between the secondary air combination valve relay connector and chassis ground. Connector & terminal (F27) No. 20 (+) — Chassis ground (-): (F27) No. 22 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 8.	Repair the open or ground short circuit of power supply circuit.
8 CHECK HARNESS BETWEEN ECM AND SECONDARY AIR COMBINATION VALVE RELAY CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector of ECM. 3) Measure the resistance of the harness between the ECM and secondary air combination valve relay connector terminal. Connector & terminal (B136) No. 19 — (F27) No. 24:	Is the resistance less than 1 Ω ?	Replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	Repair open circuit of the harness between the ECM and secondary air pump relay connector terminal.

EO:DTC P2443 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK 2)

NOTE:

For the diagnostic procedure, refer to DTC P2442. <Ref. to EN(H4DOTC)(diag)-393, DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 2), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

EP:DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON

DTC DETECTING CONDITION:

- Immediately at fault recognition
- GENERAL DESCRIPTION <Ref. to GD(H4DOTC)-275, DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON, Diagnostic Trouble Code (DTC) Detecting Criteria.>

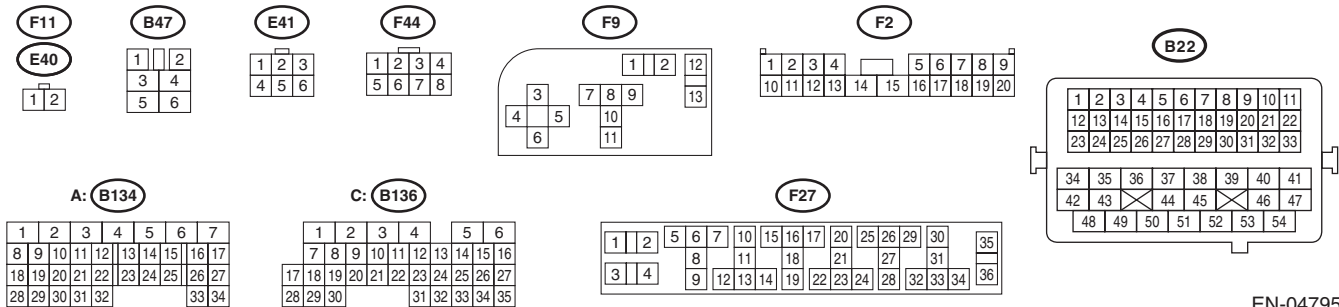
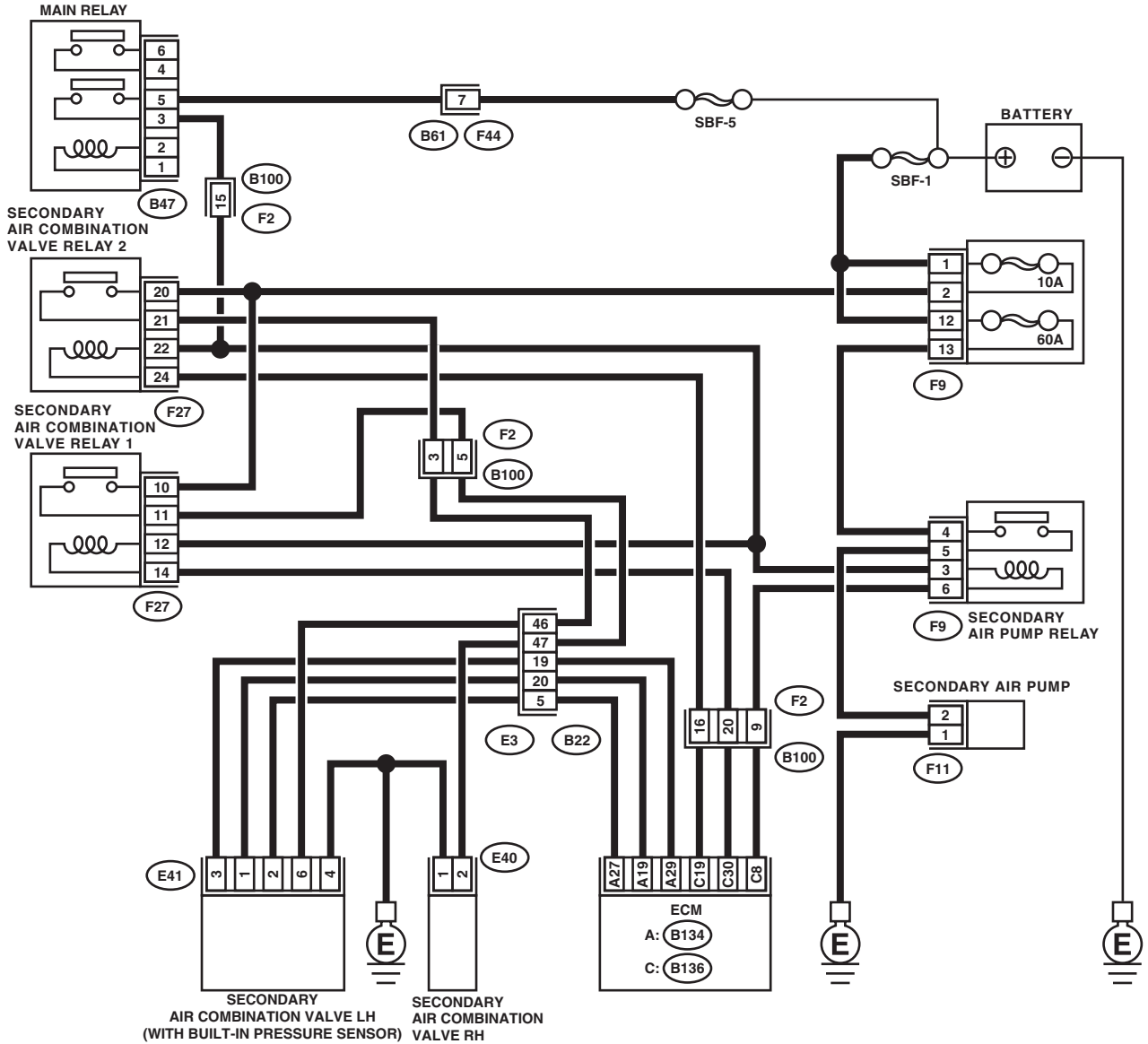
CAUTION:

After repairing or replacing the defective part, perform the Clear Memory Mode <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.> and Inspection Mode <Ref. to EN(H4DOTC)(diag)-38, PROCEDURE, Inspection Mode.>.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

WIRING DIAGRAM:



EN-04795

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ENGINE (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK SECONDARY AIR PIPING PRESSURE.</p> <p>1) Turn the ignition switch to ON (engine OFF). 2) Using the Subaru Select Monitor, read secondary air piping pressure data, and compare with the actual atmospheric pressure.</p> <p>NOTE: For detailed operation procedure, refer to "READ CURRENT DATA FOR ENGINE". <Ref. to EN(H4DOTC)(diag)-29, Subaru Select Monitor.></p>	<p>Is the difference with the actual atmospheric pressure 50 mmHg (6.7 kPa, 2.0 inHg or 0.97 psig) or more?</p>	<p>Replace the secondary air combination valve (LH). <Ref. to EC (H4DOTC)-10, Secondary Air Combi Valve.></p> <p>NOTE: The secondary air pressure sensor is a one piece combined part with the secondary air combination valve (LH).</p>	<p>Go to step 2.</p>
2	<p>CHECK POWER SUPPLY TO SECONDARY AIR PUMP.</p> <p>1) Turn the ignition switch to ON (engine OFF). 2) Measure the voltage between the secondary air pump and chassis ground.</p> <p>Connector & terminal (F11) No. 2 (+) — Chassis ground (-):</p>	<p>Is the voltage 10 V or more?</p>	<p>Go to step 3.</p>	<p>Temporary poor contact occurs. Check the poor contact of connector.</p>
3	<p>CHECK SECONDARY AIR PUMP RELAY.</p> <p>1) Turn the ignition switch to OFF. 2) Remove the secondary air pump relay from the relay box. 3) Measure the resistance between the secondary air pump relay terminals.</p> <p>Terminals No. 4 — No. 5:</p>	<p>Is the resistance 1 MΩ or more?</p>	<p>Repair the short circuit to power supply in the harness between the secondary air pump relay and secondary air pump connector terminal.</p>	<p>Replace the secondary air pump relay.</p>

General Diagnostic Table

ENGINE (DIAGNOSTICS)

20. General Diagnostic Table

A: INSPECTION

1. ENGINE

NOTE:

Malfunction of parts other than those listed is also possible. <Ref. to ME(H4DOTC)-93, Engine Trouble in General.>

Symptom	Problem parts
1. Engine stalls during idling.	1) Electronic throttle control 2) Manifold absolute pressure sensor 3) Mass air flow and intake air temperature sensor 4) Ignition parts (*1) 5) Engine coolant temperature sensor (*2) 6) Crankshaft position sensor (*3) 7) Camshaft position sensor (*3) 8) Fuel injection parts (*4)
2. Rough idling	1) Electronic throttle control 2) Manifold absolute pressure sensor 3) Mass air flow and intake air temperature sensor 4) Engine coolant temperature sensor (*2) 5) Ignition parts (*1) 6) Air intake system (*5) 7) Fuel injection parts (*4) 8) Crankshaft position sensor (*3) 9) Camshaft position sensor (*3) 10) Oxygen sensor 11) Fuel pump and fuel pump relay
3. Engine does not return to idle.	1) Electronic throttle control 2) Engine coolant temperature sensor 3) Manifold absolute pressure sensor 4) Mass air flow sensor
4. Poor acceleration	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Electronic throttle control 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay 6) Engine coolant temperature sensor (*2) 7) Crankshaft position sensor (*3) 8) Camshaft position sensor (*3) 9) A/C switch and A/C cut relay 10) Engine torque control signal circuit 11) Ignition parts (*1)
5. Engine stalls, hesitates, or sputters at acceleration.	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Purge control solenoid valve 7) Fuel injection parts (*4) 8) Fuel pump and fuel pump relay
6. Surging	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Engine coolant temperature sensor (*2) 4) Crankshaft position sensor (*3) 5) Camshaft position sensor (*3) 6) Fuel injection parts (*4) 7) Throttle position sensor 8) Fuel pump and fuel pump relay

General Diagnostic Table

ENGINE (DIAGNOSTICS)

Symptom	Problem parts
7. Spark knock	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Engine coolant temperature sensor 4) Knock sensor 5) Fuel injection parts (*4) 6) Fuel pump and fuel pump relay
8. After-burn in exhaust system	1) Manifold absolute pressure sensor 2) Mass air flow and intake air temperature sensor 3) Engine coolant temperature sensor (*2) 4) Fuel injection parts (*4) 5) Fuel pump and fuel pump relay

*1: Check ignition coil and ignitor assembly and spark plug.

*2: Indicate the symptom occurring only in cold temperatures.

*3: Ensure the secure installation.

*4: Check fuel injector, fuel pressure regulator and fuel filter.

*5: Inspect air leak in air intake system.

General Diagnostic Table

ENGINE (DIAGNOSTICS)

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

1. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Note
P0011	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 1)	<Ref. to GD(H4DOTC)-9, DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0016	Crankshaft Position - Camshaft Position Correlation (Bank 1)	<Ref. to GD(H4DOTC)-12, DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0018	Crankshaft Position - Camshaft Position Correlation (Bank 2)	<Ref. to GD(H4DOTC)-12, DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0021	Intake Camshaft Position - Timing Over-Advanced or System Performance (Bank 2)	<Ref. to GD(H4DOTC)-12, DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0030	HO2S Heater Control Circuit (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-13, DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0031	HO2S Heater Control Circuit Low (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-15, DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0032	HO2S Heater Control Circuit High (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-17, DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0037	HO2S Heater Control Circuit Low (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-19, DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0038	HO2S Heater Control Circuit High (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-21, DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0068	MAP/MAF - Throttle Position Correlation	<Ref. to GD(H4DOTC)-23, DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0101	Mass or Volume Air Flow Circuit Range/Performance	<Ref. to GD(H4DOTC)-25, DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0102	Mass or Volume Air Flow Circuit Low Input	<Ref. to GD(H4DOTC)-28, DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0103	Mass or Volume Air Flow Circuit High Input	<Ref. to GD(H4DOTC)-30, DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0107	Manifold Absolute Pressure/Barometric Pressure Circuit Low Input	<Ref. to GD(H4DOTC)-32, DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0108	Manifold Absolute Pressure/Barometric Pressure Circuit High Input	<Ref. to GD(H4DOTC)-34, DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0111	Intake Air Temperature Sensor 1 Circuit Range/Performance	<Ref. to GD(H4DOTC)-36, DTC P0111 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0112	Intake Air Temperature Sensor 1 Circuit Low	<Ref. to GD(H4DOTC)-38, DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0113	Intake Air Temperature Sensor 1 Circuit High	<Ref. to GD(H4DOTC)-40, DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0117	Engine Coolant Temperature Circuit Low	<Ref. to GD(H4DOTC)-42, DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0118	Engine Coolant Temperature Circuit High	<Ref. to GD(H4DOTC)-44, DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0122	Throttle/Pedal Position Sensor/Switch "A" Circuit Low	<Ref. to GD(H4DOTC)-46, DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0123	Throttle/Pedal Position Sensor/Switch "A" Circuit High	<Ref. to GD(H4DOTC)-48, DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A" CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Item	Note
P0125	Insufficient Coolant Temperature for Closed Loop Fuel Control	<Ref. to GD(H4DOTC)-50, DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0126	Insufficient Engine Coolant Temperature for Stable Operation	<Ref. to GD(H4DOTC)-52, DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0128	Coolant Thermostat (Engine Coolant Temperature Below Thermostat Regulating Temperature)	<Ref. to GD(H4DOTC)-54, DTC P0128 COOLANT THERMOSTAT (ENGINE COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0131	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-56, DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0132	O2 Sensor Circuit High Voltage (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-58, DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0133	O2 Sensor Circuit Slow Response (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-60, DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0134	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-63, DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0137	O2 Sensor Circuit Low Voltage (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-65, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0138	O2 Sensor Circuit High Voltage (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-67, DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0139	O2 Sensor Circuit Slow Response (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-68, DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0140	O2 Sensor Circuit No Activity Detected (Bank 1 Sensor 2)	<Ref. to GD(H4DOTC)-73, DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0171	System Too Lean (Bank 1)	<Ref. to GD(H4DOTC)-75, DTC P0171 SYSTEM TOO LEAN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0172	System Too Rich (Bank 1)	<Ref. to GD(H4DOTC)-78, DTC P0172 SYSTEM TOO RICH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0181	Fuel Temperature Sensor "A" Circuit Range/Performance	<Ref. to GD(H4DOTC)-81, DTC P0181 FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0182	Fuel Temperature Sensor "A" Circuit Low Input	<Ref. to GD(H4DOTC)-84, DTC P0182 FUEL TEMPERATURE SENSOR "A" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0183	Fuel Temperature Sensor "A" Circuit High Input	<Ref. to GD(H4DOTC)-86, DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0222	Throttle/Pedal Position Sensor/Switch "B" Circuit Low	<Ref. to GD(H4DOTC)-88, DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0223	Throttle/Pedal Position Sensor/Switch "B" Circuit High	<Ref. to GD(H4DOTC)-90, DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0230	Fuel Pump Primary Circuit	<Ref. to GD(H4DOTC)-92, DTC P0230 FUEL PUMP PRIMARY CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0244	Turbo/Super Charger Wastegate Solenoid "A" Range/Performance	<Ref. to GD(H4DOTC)-94, DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0245	Turbo/Super Charger Wastegate Solenoid "A" Low	<Ref. to GD(H4DOTC)-96, DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0246	Turbo/Super Charger Wastegate Solenoid "A" High	<Ref. to GD(H4DOTC)-98, DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0301	Cylinder 1 Misfire Detected	<Ref. to GD(H4DOTC)-100, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Item	Note
P0302	Cylinder 2 Misfire Detected	<Ref. to GD(H4DOTC)-105, DTC P0302 CYLINDER 2 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0303	Cylinder 3 Misfire Detected	<Ref. to GD(H4DOTC)-105, DTC P0303 CYLINDER 3 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0304	Cylinder 4 Misfire Detected	<Ref. to GD(H4DOTC)-105, DTC P0304 CYLINDER 4 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0327	Knock Sensor 1 Circuit Low (Bank 1 or Single Sensor)	<Ref. to GD(H4DOTC)-106, DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0328	Knock Sensor 1 Circuit High (Bank 1 or Single Sensor)	<Ref. to GD(H4DOTC)-108, DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0335	Crankshaft Position Sensor "A" Circuit	<Ref. to GD(H4DOTC)-110, DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0336	Crankshaft Position Sensor "A" Circuit Range/Performance	<Ref. to GD(H4DOTC)-112, DTC P0336 CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0340	Camshaft Position Sensor "A" Circuit (Bank 1 or Single Sensor)	<Ref. to GD(H4DOTC)-114, DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0345	Camshaft Position Sensor "A" Circuit (Bank 2)	<Ref. to GD(H4DOTC)-115, DTC P0345 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0410	Secondary Air Injection System	<Ref. to GD(H4DOTC)-116, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0411	Secondary Air Injection System Incorrect Flow Detected	<Ref. to GD(H4DOTC)-125, DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0413	Secondary Air Injection System Switching Valve "A" Circuit Open	<Ref. to GD(H4DOTC)-126, DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "A" CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0414	Secondary Air Injection System Switching Valve "A" Circuit Shorted	<Ref. to GD(H4DOTC)-127, DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "A" CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0416	Secondary Air Injection System Switching Valve "B" Circuit Open	<Ref. to GD(H4DOTC)-128, DTC P0416 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "B" CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0417	Secondary Air Injection System Switching Valve "B" Circuit Shorted	<Ref. to GD(H4DOTC)-128, DTC P0417 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "B" CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0418	Secondary Air Injection System Control "A" Circuit Open	<Ref. to GD(H4DOTC)-129, DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL "A" CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0420	Catalyst System Efficiency Below Threshold (Bank 1)	<Ref. to GD(H4DOTC)-130, DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0441	Evaporative Emission System Incorrect Purge Flow	<Ref. to GD(H4DOTC)-131, DTC P0441 EVAPORATIVE EMISSION SYSTEM INCORRECT PURGE FLOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0442	Evaporative Emission Control System Leak Detected (Small Leak)	<Ref. to GD(H4DOTC)-132, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0447	Evaporative Emission Control System Vent Control Circuit Open	<Ref. to GD(H4DOTC)-148, DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0448	Evaporative Emission Control System Vent Control Circuit Shorted	<Ref. to GD(H4DOTC)-150, DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Item	Note
P0451	Evaporative Emission Control System Pressure Sensor	<Ref. to GD(H4DOTC)-152, DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0452	Evaporative Emission Control System Pressure Sensor Low Input	<Ref. to GD(H4DOTC)-154, DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0453	Evaporative Emission Control System Pressure Sensor High Input	<Ref. to GD(H4DOTC)-156, DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0456	Evaporative Emission Control System Leak Detected (Very Small Leak)	<Ref. to GD(H4DOTC)-157, DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0457	Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)	<Ref. to GD(H4DOTC)-157, DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0458	Evaporative Emission System Purge Control Valve Circuit Low	<Ref. to GD(H4DOTC)-158, DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0459	Evaporative Emission System Purge Control Valve Circuit High	<Ref. to GD(H4DOTC)-160, DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0461	Fuel Level Sensor "A" Circuit Range/Performance	<Ref. to GD(H4DOTC)-162, DTC P0461 FUEL LEVEL SENSOR "A" CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0462	Fuel Level Sensor "A" Circuit Low	<Ref. to GD(H4DOTC)-164, DTC P0462 FUEL LEVEL SENSOR "A" CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0463	Fuel Level Sensor "A" Circuit High	<Ref. to GD(H4DOTC)-166, DTC P0463 FUEL LEVEL SENSOR "A" CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0464	Fuel Level Sensor Circuit Intermittent	<Ref. to GD(H4DOTC)-168, DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0483	Fan Rationality Check	<Ref. to GD(H4DOTC)-171, DTC P0483 FAN RATIONALITY CHECK, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0502	Vehicle Speed Sensor "A" Circuit Low Input	<Ref. to GD(H4DOTC)-172, DTC P0502 VEHICLE SPEED SENSOR "A" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0503	Vehicle Speed Sensor "A" Intermittent/Erratic/High	<Ref. to GD(H4DOTC)-173, DTC P0503 VEHICLE SPEED SENSOR "A" INTERMITTENT/ERRATIC/HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0506	Idle Air Control System RPM Lower Than Expected	<Ref. to GD(H4DOTC)-174, DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0507	Idle Air Control System RPM Higher Than Expected	<Ref. to GD(H4DOTC)-176, DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0512	Starter Request Circuit	<Ref. to GD(H4DOTC)-178, DTC P0512 STARTER REQUEST CIRCUIT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0513	Incorrect Immobilizer Key	<Ref. to GD(H4DOTC)-179, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0519	Idle Air Control System Performance	<Ref. to GD(H4DOTC)-180, DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0600	Serial Communication Link	<Ref. to GD(H4DOTC)-181, DTC P0600 SERIAL COMMUNICATION LINK, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0604	Internal Control Module Random Access Memory (RAM) Error	<Ref. to GD(H4DOTC)-182, DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0605	Internal Control Module Read Only Memory (ROM) Error	<Ref. to GD(H4DOTC)-183, DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0607	Control Module Performance	<Ref. to GD(H4DOTC)-184, DTC P0607 CONTROL MODULE PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Item	Note
P0638	Throttle Actuator Control Range/Performance (Bank 1)	<Ref. to GD(H4DOTC)-186, DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0691	Fan 1 Control Circuit Low	<Ref. to GD(H4DOTC)-189, DTC P0691 FAN 1 CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0692	Fan 1 Control Circuit High	<Ref. to GD(H4DOTC)-190, DTC P0692 FAN 1 CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0700	Transmission Control System (MIL Request)	<Ref. to GD(H4DOTC)-191, DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0851	Park/Neutral Switch Input Circuit Low (AT Model)	<Ref. to GD(H4DOTC)-192, DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0851	Neutral Switch Input Circuit Low (MT Model)	<Ref. to GD(H4DOTC)-193, DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0852	Park/Neutral Switch Input Circuit High (AT Model)	<Ref. to GD(H4DOTC)-194, DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P0852	Neutral Switch Input Circuit High (MT Model)	<Ref. to GD(H4DOTC)-195, DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1152	O2 Sensor Circuit Range/Performance (Low) (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-196, DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1153	O2 Sensor Circuit Range/Performance (High) (Bank 1 Sensor 1)	<Ref. to GD(H4DOTC)-198, DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1160	Return Spring Failure	<Ref. to GD(H4DOTC)-200, DTC P1160 RETURN SPRING FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1400	Fuel Tank Pressure Control Solenoid Valve Circuit Low	<Ref. to GD(H4DOTC)-202, DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1410	Secondary Air Injection System Switching Valve Stuck Open	<Ref. to GD(H4DOTC)-204, DTC P1410 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1418	Secondary Air Injection System Control "A" Circuit Shorted	<Ref. to GD(H4DOTC)-205, DTC P1418 SECONDARY AIR INJECTION SYSTEM CONTROL "A" CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1420	Fuel Tank Pressure Control Sol. Valve Circuit High	<Ref. to GD(H4DOTC)-206, DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1443	Vent Control Solenoid Valve Function Problem	<Ref. to GD(H4DOTC)-208, DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1491	Positive Crankcase Ventilation (Blow-by) Function Problem	<Ref. to GD(H4DOTC)-210, DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1518	Starter Switch Circuit Low Input	<Ref. to GD(H4DOTC)-212, DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1560	Back-up Voltage Circuit Malfunction	<Ref. to GD(H4DOTC)-213, DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1570	Antenna	<Ref. to GD(H4DOTC)-214, DTC P1570 ANTENNA, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1571	Reference Code Incompatibility	<Ref. to GD(H4DOTC)-214, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1572	IMM Circuit Failure (Except Antenna Circuit)	<Ref. to GD(H4DOTC)-214, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1574	Key Communication Failure	<Ref. to GD(H4DOTC)-214, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1576	EGI Control Module EEPROM	<Ref. to GD(H4DOTC)-214, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Item	Note
P1577	IMM Control Module EEPROM	<Ref. to GD(H4DOTC)-214, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P1602	Control Module Programming Error	<Ref. to GD(H4DOTC)-215, DTC P1602 CONTROL MODULE PROGRAMMING ERROR, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2004	Intake Manifold Runner Control Stuck Open (Bank 1)	<Ref. to GD(H4DOTC)-217, DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2005	Intake Manifold Runner Control Stuck Open (Bank 2)	<Ref. to GD(H4DOTC)-218, DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2006	Intake Manifold Runner Control Stuck Closed (Bank 1)	<Ref. to GD(H4DOTC)-219, DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2007	Intake Manifold Runner Control Stuck Closed (Bank 2)	<Ref. to GD(H4DOTC)-220, DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2008	Intake Manifold Runner Control Circuit / Open (Bank 1)	<Ref. to GD(H4DOTC)-221, DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2009	Intake Manifold Runner Control Circuit Low (Bank 1)	<Ref. to GD(H4DOTC)-223, DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2011	Intake Manifold Runner Control Circuit / Open (Bank 2)	<Ref. to GD(H4DOTC)-225, DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2012	Intake Manifold Runner Control Circuit Low (Bank 2)	<Ref. to GD(H4DOTC)-227, DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2016	Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 1)	<Ref. to GD(H4DOTC)-229, DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2017	Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 1)	<Ref. to GD(H4DOTC)-231, DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2021	Intake Manifold Runner Position Sensor / Switch Circuit Low (Bank 2)	<Ref. to GD(H4DOTC)-233, DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2022	Intake Manifold Runner Position Sensor / Switch Circuit High (Bank 2)	<Ref. to GD(H4DOTC)-235, DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2088	OCV Solenoid Valve Signal A Circuit Open (Bank 1)	<Ref. to GD(H4DOTC)-237, DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2089	OCV Solenoid Valve Signal A Circuit Short (Bank 1)	<Ref. to GD(H4DOTC)-239, DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2092	OCV Solenoid Valve Signal A Circuit Open (Bank 2)	<Ref. to GD(H4DOTC)-241, DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2093	Intake Camshaft Position Actuator Control Circuit High (Bank 2)	<Ref. to GD(H4DOTC)-243, DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2096	Post Catalyst Fuel Trim System Too Lean Bank 1	<Ref. to GD(H4DOTC)-245, DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2097	Post Catalyst Fuel Trim System Too Rich Bank 1	<Ref. to GD(H4DOTC)-247, DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2101	Throttle Actuator Control Motor Circuit Range/Performance	<Ref. to GD(H4DOTC)-249, DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>

List of Diagnostic Trouble Code (DTC)

GENERAL DESCRIPTION

DTC	Item	Note
P2102	Throttle Actuator Control Motor Circuit Low	<Ref. to GD(H4DOTC)-251, DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2103	Throttle Actuator Control Motor Circuit High	<Ref. to GD(H4DOTC)-253, DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2109	Throttle/Pedal Position Sensor "A" Minimum Stop Performance	<Ref. to GD(H4DOTC)-255, DTC P2109 THROTTLE/PEDAL POSITION SENSOR "A" MINIMUM STOP PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2122	Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input	<Ref. to GD(H4DOTC)-257, DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2123	Throttle/Pedal Position Sensor/Switch "D" Circuit High Input	<Ref. to GD(H4DOTC)-259, DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2127	Throttle/Pedal Position Sensor/Switch "E" Circuit Low Input	<Ref. to GD(H4DOTC)-261, DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT LOW INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2128	Throttle/Pedal Position Sensor/Switch "E" Circuit High Input	<Ref. to GD(H4DOTC)-263, DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH "E" CIRCUIT HIGH INPUT, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2135	Throttle/Pedal Position Sensor/Switch "A"/"B" Voltage Correlation	<Ref. to GD(H4DOTC)-265, DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH "A"/"B" VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2138	Throttle/Pedal Position Sensor/Switch "D"/"E" Voltage Correlation	<Ref. to GD(H4DOTC)-267, DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH "D"/"E" VOLTAGE CORRELATION, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2419	Evaporative Emission System Switching Valve Control Circuit Low	<Ref. to GD(H4DOTC)-269, DTC P2419 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2420	Evaporative Emission System Switching Valve Control Circuit High	<Ref. to GD(H4DOTC)-270, DTC P2420 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2431	Secondary Air Injection System Air Flow /Pressure Sensor Circuit Range/Performance	<Ref. to GD(H4DOTC)-271, DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2432	Secondary Air Injection System Air Flow /Pressure Sensor Circuit Low	<Ref. to GD(H4DOTC)-272, DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT LOW, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2433	Secondary Air Injection System Air Flow /Pressure Sensor Circuit High	<Ref. to GD(H4DOTC)-273, DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT HIGH, Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2440	Secondary Air Injection System Switching Valve Stuck Open (Bank 1)	<Ref. to GD(H4DOTC)-274, DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2441	Secondary Air Injection System Switching Valve Stuck Closed (Bank 1)	<Ref. to GD(H4DOTC)-274, DTC P2441 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2442	Secondary Air Injection System Switching Valve Stuck Open (Bank 2)	<Ref. to GD(H4DOTC)-274, DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2443	Secondary Air Injection System Switching Valve Stuck Closed (Bank 2)	<Ref. to GD(H4DOTC)-274, DTC P2443 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>
P2444	Secondary Air Injection System Pump Stuck On	<Ref. to GD(H4DOTC)-275, DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON, Diagnostic Trouble Code (DTC) Detecting Criteria.>

2. Diagnostic Trouble Code (DTC) Detecting Criteria

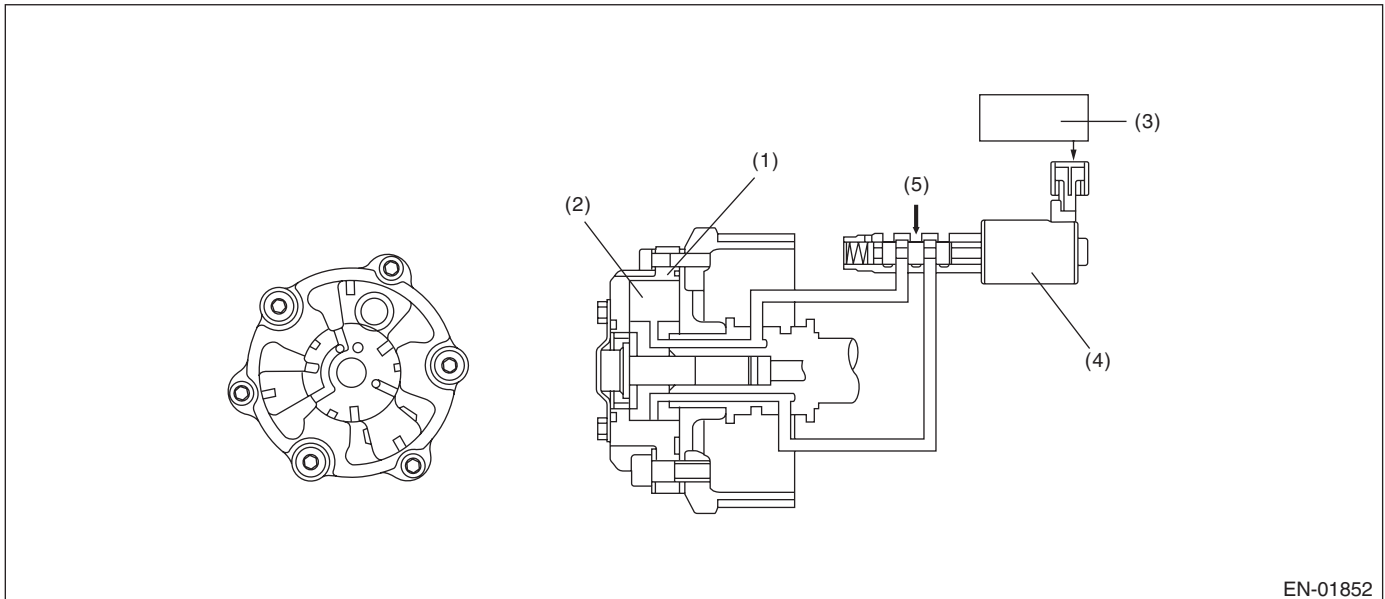
A: DTC P0011 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of AVCS system.

There are two types of diagnosis: Crankshaft cam timing diagnosis, and slow response diagnosis. Either of these is performed according to the status of the engine while running.

2. COMPONENT DESCRIPTION



- (1) AVCS timing controller
 - (2) Vane
 - (3) Engine control module (ECM)
 - (4) Oil flow control solenoid valve
 - (5) Oil pressure
- (A) Air

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

1. Crankshaft Timing Diagnosis

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Engine coolant temperature	$> 60^{\circ}\text{C}$ (140°F)
Target timing advance	$= 0^{\circ}\text{CA}$
Engine speed	$\geq 500 \text{ rpm}$
AVCS	Uncontrolled

2. Slow Response Diagnosis

Secondary Parameters	Enable Conditions
All secondary parameters are executable.	1 second or more
Battery voltage	$\geq 10.9 \text{ V}$
Engine coolant temperature	$> 60^{\circ}\text{C}$ (140°F)
Amount of AVCS target timing advance	$\neq 0^{\circ}\text{CA}$
Engine speed	$\geq 1300 \text{ rpm}$
AVCS	Controlled
Target timing advance change amount	$< 1.07^{\circ}\text{CA}$

4. GENERAL DRIVING CYCLE

1. Crankshaft Timing Diagnosis

Perform the diagnosis continuously after starting engine and while AVCS is not operating.

2. Slow Response Diagnosis

Perform the diagnosis continuously after starting engine and while AVCS is operating.

5. DIAGNOSTIC METHOD

1. Crankshaft Timing Diagnosis

Judge as NG when the timing advance is outside the normal range. Judge as OK when it within the normal range.

Judge as NG when all the following conditions are established and the continuous time is more than 20 seconds. Judge as OK and clear the NG when the following conditions are not established and the continuous time is more than one second.

Judgment Value

Malfunction Criteria	Threshold Value
Basic timing advance	$< -13^{\circ}\text{CA}$ or $> 25^{\circ}\text{CA}$

Time Needed for Diagnosis: 20 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

2. Slow Response Diagnosis

During AVCS control, calculate AVCS deviation separately for positive/negative, and when the calculated value per the set time (30 seconds) is large, this is judged as NG.

Abnormality Judgment

When all of the following conditions are established, judged as OK.

Judgment Value

Malfunction Criteria	Threshold Value
AVCS target position	$\geq 0^{\circ}\text{CA}$
AVCS positive deviation integrated value	$< 8000^{\circ}\text{CA}$ (R bank) $< 8000^{\circ}\text{CA}$ (L bank)
or	
AVCS negative deviation integrated value	$< -8000^{\circ}\text{CA}$ (R bank) $< -8000^{\circ}\text{CA}$ (L bank)

Time Needed for Diagnosis: 30 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judges OK when all of the following conditions are established, and clears the NG.

Judgment Value

Malfunction Criteria	Threshold Value
AVCS target position	$\geq 0^{\circ}\text{CA}$
AVCS positive deviation integrated value	$\leq 8000^{\circ}\text{CA}$ (R bank) $\leq 8000^{\circ}\text{CA}$ (L bank)
or	
AVCS negative deviation integrated value	$\geq -8000^{\circ}\text{CA}$ (R bank) $\geq -8000^{\circ}\text{CA}$ (L bank)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Make the oil flow control solenoid valve drive duty a predetermined value.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

B: DTC P0016 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 1)

NOTE:

For the diagnostic procedure, refer to DTC P0011. <Ref. to GD(H4DOTC)-9, DTC P0011 INTAKE CAM-SHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

C: DTC P0018 CRANKSHAFT POSITION - CAMSHAFT POSITION CORRELATION (BANK 2)

NOTE:

For the diagnostic procedure, refer to DTC P0011. <Ref. to GD(H4DOTC)-9, DTC P0011 INTAKE CAM-SHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

D: DTC P0021 INTAKE CAMSHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 2)

NOTE:

For the diagnostic procedure, refer to DTC P0011. <Ref. to GD(H4DOTC)-9, DTC P0011 INTAKE CAM-SHAFT POSITION - TIMING OVER-ADVANCED OR SYSTEM PERFORMANCE (BANK 1), Diagnostic Trouble Code (DTC) Detecting Criteria.>

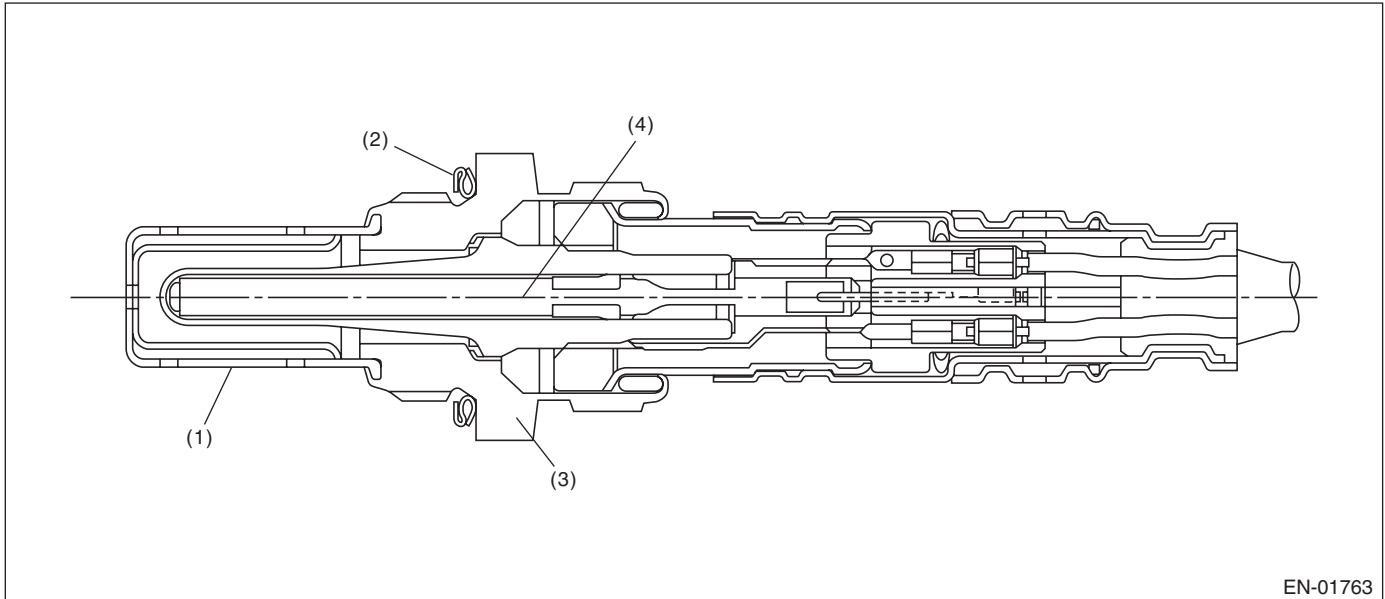
E: DTC P0030 HO2S HEATER CONTROL CIRCUIT (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect functional errors of the front oxygen (A/F) sensor heater.

Judge as NG when it is determined that the front oxygen (A/F) sensor impedance is large by referring to the engine condition such as fuel shut-off in deceleration, etc.

2. COMPONENT DESCRIPTION



EN-01763

- (1) Protection tube
- (2) Gasket
- (3) Sensor housing
- (4) Ceramic heater

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time needed for all secondary parameters to be in enable conditions	30 seconds or more
Battery voltage	> 10.9 V
After fuel cut	10 seconds or more
Front oxygen (A/F) sensor heater control duty \geq 35%	Experienced
Heater current	ON

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after 30 seconds or more have passed since the engine started.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 10 seconds. Judge as OK and clear NG when the continuous time of not completing the malfunction criteria below becomes more than 10 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Front oxygen (A/F) sensor impedance	> 50 Ω

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Front oxygen sensor (A/F) sensor main learning compensation: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

F: DTC P0031 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 1)

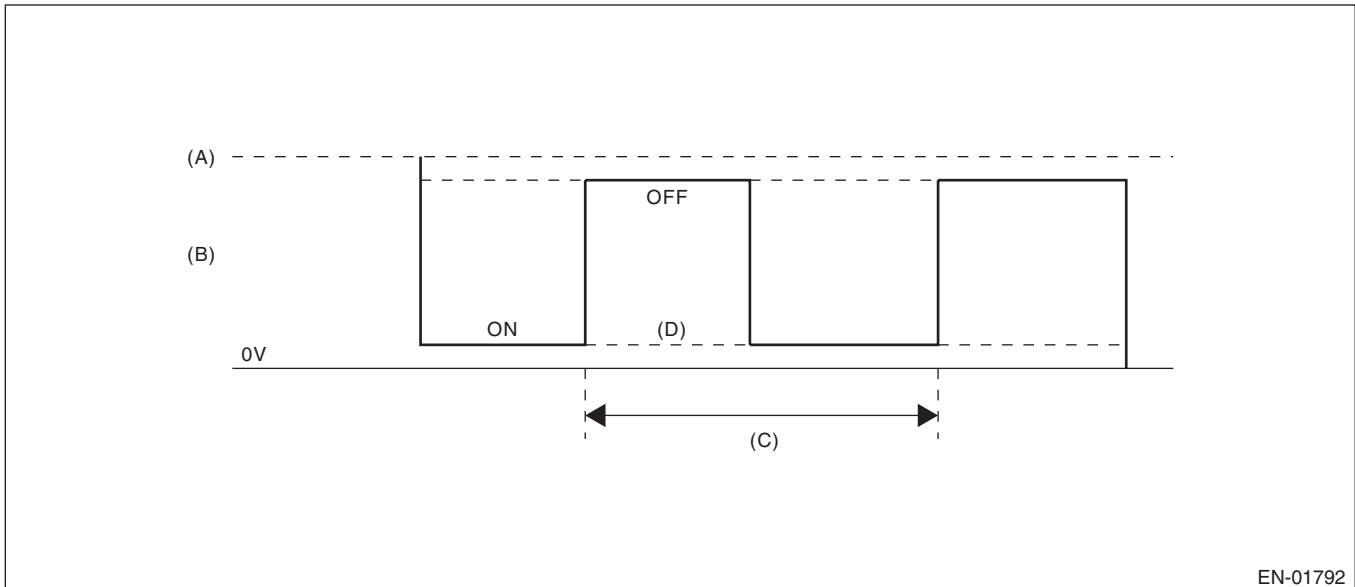
1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of heater.

The heater performs duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.

Judge NG when the terminal voltage remains Low.

2. COMPONENT DESCRIPTION



- (A) Battery voltage
- (B) Front oxygen (A/F) sensor heater output voltage
- (C) 128 milliseconds
- (D) Low error

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge NG when the continuous time of meeting the malfunction criteria below becomes more than 1 second (8 cycles).

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low
Front oxygen (A/F) sensor heater control duty	< 87.5%

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0.3 → 0, normally.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

G: DTC P0032 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 1)

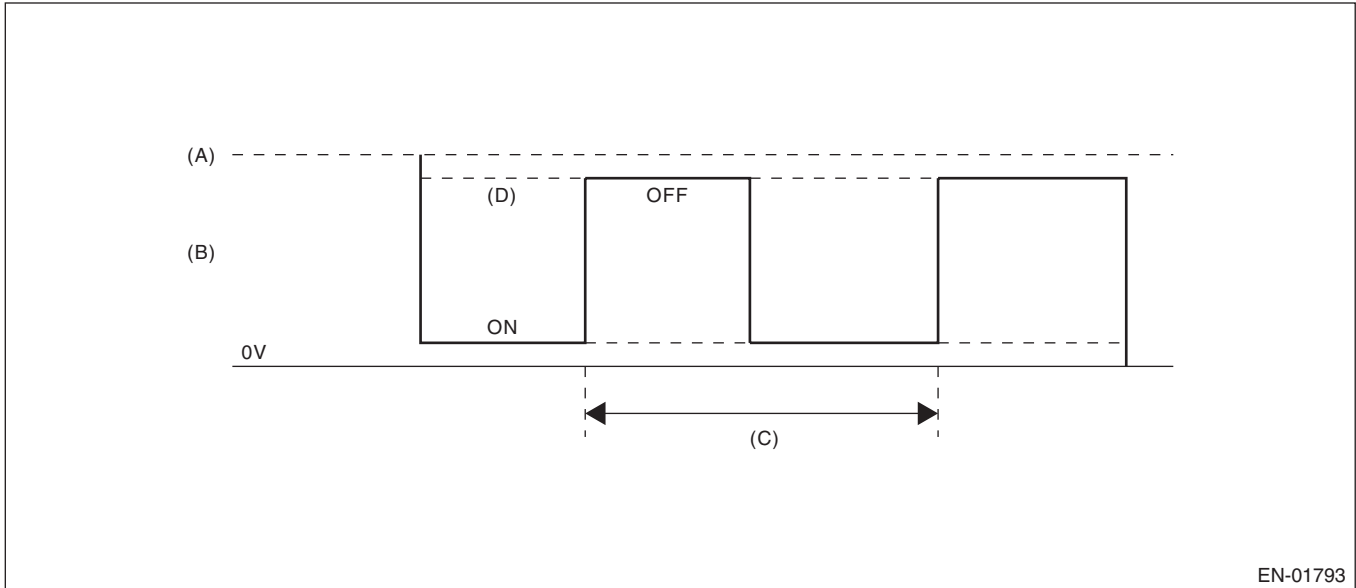
1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of heater.

The heater performs duty control, and the output terminal voltage at ON is 0 V and the output terminal voltage at OFF is the battery voltage.

Judge NG when the terminal voltage remains High.

2. COMPONENT DESCRIPTION



- (A) Battery voltage
- (B) Front oxygen (A/F) sensor heater output voltage
- (C) 128 milliseconds
- (D) High malfunction

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge NG when the continuous time of meeting the malfunction criteria below becomes more than 1 second (8 cycles).

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High
Front oxygen (A/F) sensor heater control duty	≥ 12.5%

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0.3 → 0, normally.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

H: DTC P0037 HO2S HEATER CONTROL CIRCUIT LOW (BANK 1 SENSOR 2)

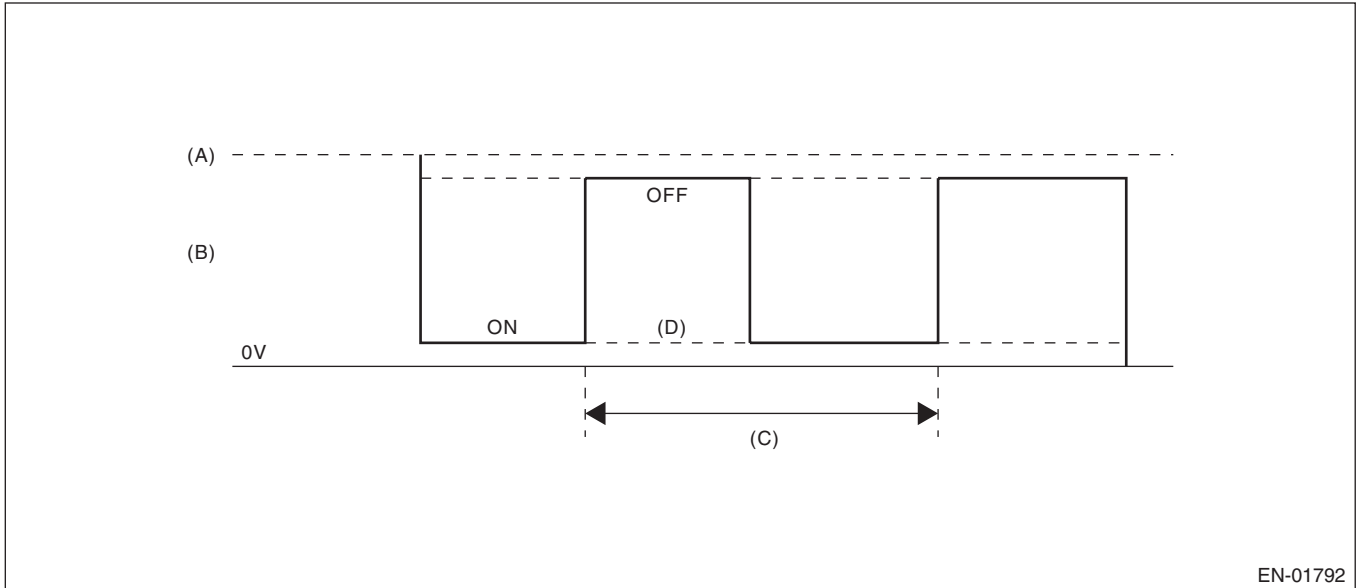
1. OUTLINE OF DIAGNOSIS

Detect the rear oxygen sensor heater open or short circuit.

The rear oxygen sensor heater performs duty control, and the output terminal voltage at ON is 0 V, and the output terminal voltage at OFF is the battery voltage.

Judge NG when the terminal voltage remains Low.

2. COMPONENT DESCRIPTION



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- (A) Battery voltage
- (B) Rear oxygen sensor heater output voltage
- (C) 256 milliseconds (cycles)
- (D) Low error

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time while meeting all of the malfunction criteria below is more than 2560 milliseconds (10 cycles).

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low
Rear oxygen sensor heater control duty	< 75%

Time Needed for Diagnosis: 2.56 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

I: DTC P0038 HO2S HEATER CONTROL CIRCUIT HIGH (BANK 1 SENSOR 2)

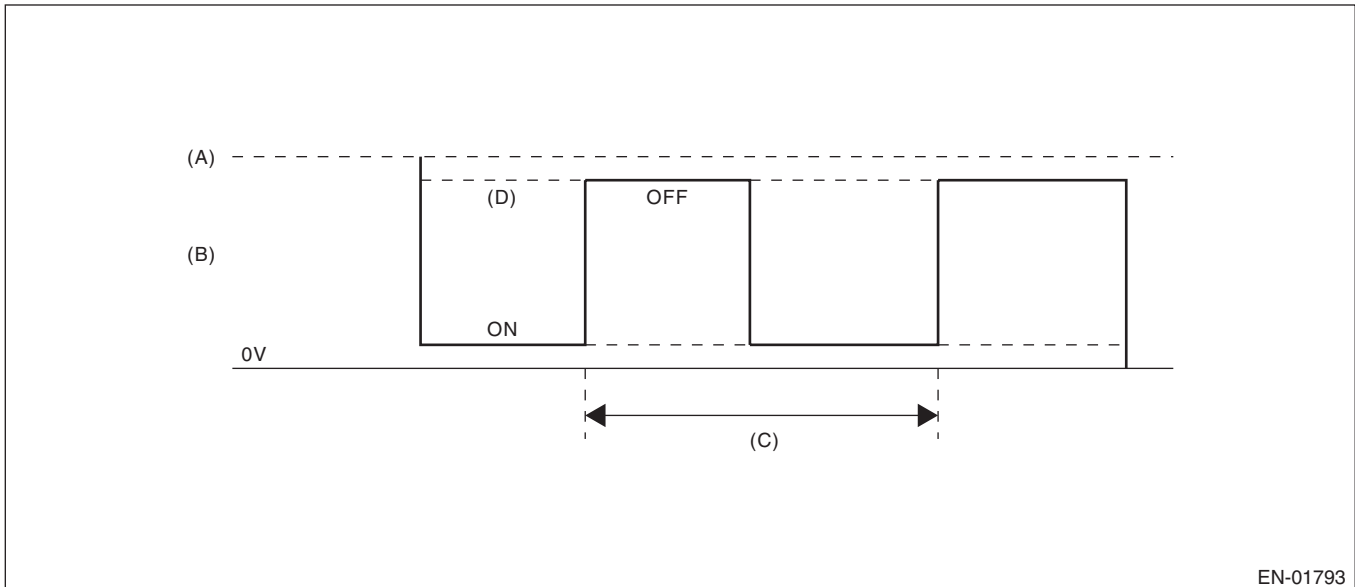
1. OUTLINE OF DIAGNOSIS

Detect the rear oxygen sensor heater open or short circuit.

The rear oxygen sensor heater performs duty control, and the output terminal voltage at ON is 0 V, and the output terminal voltage at OFF is the battery voltage.

Judge NG when the terminal voltage remains High.

2. COMPONENT DESCRIPTION



- (A) Battery voltage
- (B) Rear oxygen sensor heater output voltage
- (C) 256 milliseconds (cycles)
- (D) High malfunction

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time while meeting all of the malfunction criteria below is more than 2560 milliseconds (10 cycles).

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	High
Rear oxygen sensor heater control duty	≥ 25%

Time Needed for Diagnosis: 2.56 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage level	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Sub feedback control: Not allowed

9. ECM OPERATION AT DTC SETTING

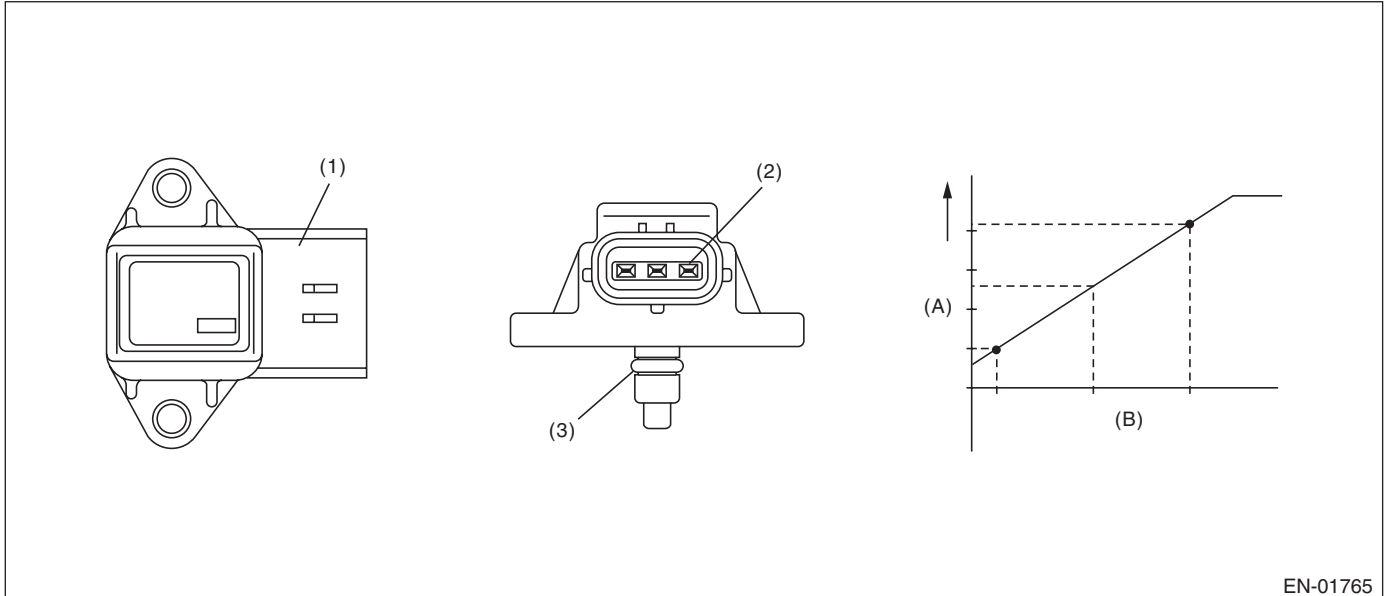
Memorize the freeze frame data. (For test mode \$02)

J: DTC P0068 MAP/MAF - THROTTLE POSITION CORRELATION

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake manifold pressure sensor output property. Judge NG when the intake air pressure AD value is Low whereas it seemed to be High from the viewpoint of engine condition, or when it is High whereas it seemed to be Low from the engine condition.

2. COMPONENT DESCRIPTION



EN-01765

(1) Connector

(2) Terminal

(3) O-ring

(A) Output voltage

(B) Absolute pressure

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge NG when either Low side or High side becomes NG.

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 3 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	< 2500 rpm
Throttle position	$\geq 10^\circ$
Intake air amount every 0.5 engine revs.	> 1.356 g/rev
Output voltage	< 1.0 V
High side	
Engine speed	600 — 900 rpm
Throttle position	< 1.3°
Intake air amount every 0.5 engine revs.	< 0.4 g/rev
Output voltage	≥ 2.36 V

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when both Low side and High side become OK.

Judge as OK when the malfunction criteria below are completed.

Judgment Value

Malfunction Criteria	Threshold Value
Low side	
Engine speed	< 2500 rpm
Throttle position	$\geq 10^\circ$
Output voltage	≥ 1.0 V
High side	
Engine speed	600 — 900 rpm
Throttle position	< 1.3°
Output voltage	< 2.36 V

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

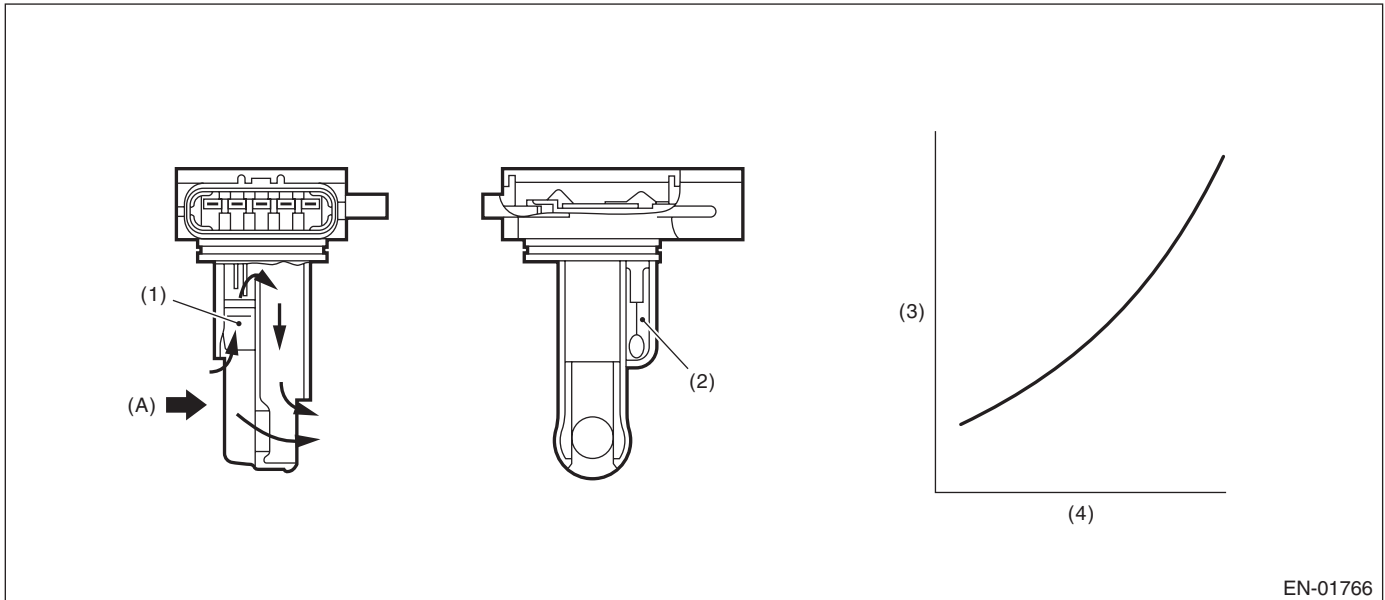
K: DTC P0101 MASS OR VOLUME AIR FLOW CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of air flow sensor output property.

Judge as a low side NG when the air flow voltage indicates a small value regardless of running in a state where the air flow voltage increases. Judge as a high side NG when the air flow voltage indicates a large value regardless of running in a state where the air flow voltage decreases. Judge air flow sensor property NG when the Low side or High side becomes NG.

2. COMPONENT DESCRIPTION



EN-01766

(1) Air flow sensor

(2) Intake air temperature sensor

(3) Voltage (V)

(4) Intake air volume (kg/s)

(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after idling.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time with the following criteria established exceeds the predetermined time.

Judgment Value

Malfunction Criteria	Threshold Value
(Low side error) Output voltage Engine speed Throttle opening angle Intake manifold pressure	< 1.5 V ≥ 2500 rpm ≥ 15° ≥ 53.3 kPa (400 mmHg, 15.7 inHg)
(High side error 1) Output voltage Engine speed Throttle opening angle Intake manifold pressure	≥ 1.95 V 600 — 900 rpm < 4.1° < 52.7 kPa (395 mmHg, 15.6 inHg)
(High side error 2) Output voltage Engine speed Throttle opening angle Intake manifold pressure Fuel system diagnosis	≥ 1.7 V 600 — 900 rpm < 4.1° < 52.7 kPa (395 mmHg, 15.6 inHg) Rich side fault

Time Needed for Diagnosis:

Low side: 3 seconds

High side: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
(Low side error) Output voltage Engine speed Throttle opening angle Intake manifold pressure	≥ 1.5 V ≥ 2500 rpm ≥ 15° ≥ 53.3 kPa (400 mmHg, 15.7 inHg)
(High side error) Output voltage Engine speed Throttle opening angle Intake manifold pressure	< 1.95 V 600 — 900 rpm < 4.1° < 52.7 kPa (395 mmHg, 15.6 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
 - Knock compensation final advance/delay angle value = knock compensation value + whole learning compensation value + portional learning compensation value
 - When normal: Knock compensation value = Fixed at 0°CA
 - Failure: Knock compensation value ≠ Fixed at 0°CA. (When knock: Max. 12°CA retard)
 - Whole learning compensation coefficient update not allowed.
 - Portional learning zone compensation value calculation not allowed.
- ISC control: Open loop compensation is set to (1 g/s). Stop calculation of throttle sensor temperature compensation. (Hold the previous value.)
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

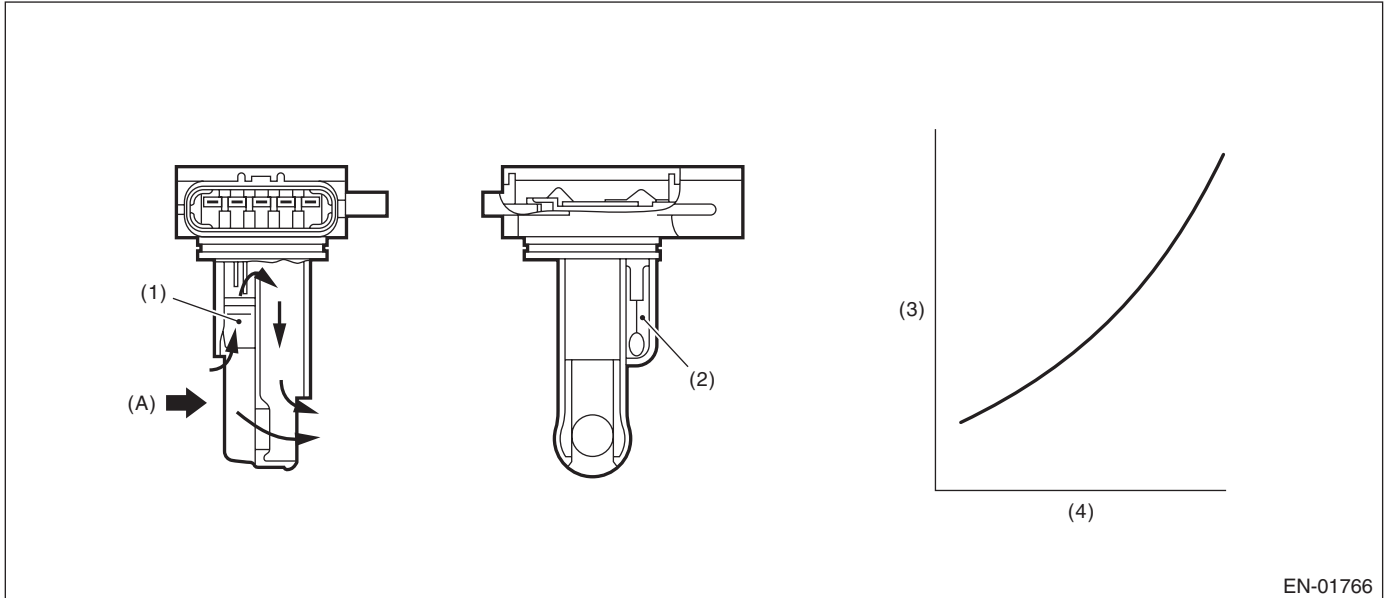
GENERAL DESCRIPTION

L: DTC P0102 MASS OR VOLUME AIR FLOW CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect open or short circuits of the air flow sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



- (1) Air flow sensor
 - (2) Intake air temperature sensor
 - (3) Voltage (V)
 - (4) Intake air volume (kg/s)
- (A) Air

EN-01766

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≤ 0.2 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
 - Knock compensation final advance/delay angle value = knock compensation value + whole learning compensation value + portional learning compensation value
 - When normal: Knock compensation value = Fixed at 0°C.A.
 - Failure: Knock compensation value ≠ Fixed at 0°C.A. (When knock: Max. 12°C.A retard)
 - Whole learning compensation coefficient update not allowed.
 - Portional learning zone compensation value calculation not allowed.
- ISC control: Open loop compensation is set to (1 g/s). Stop calculation of throttle sensor temperature compensation. (Hold the previous value.)
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

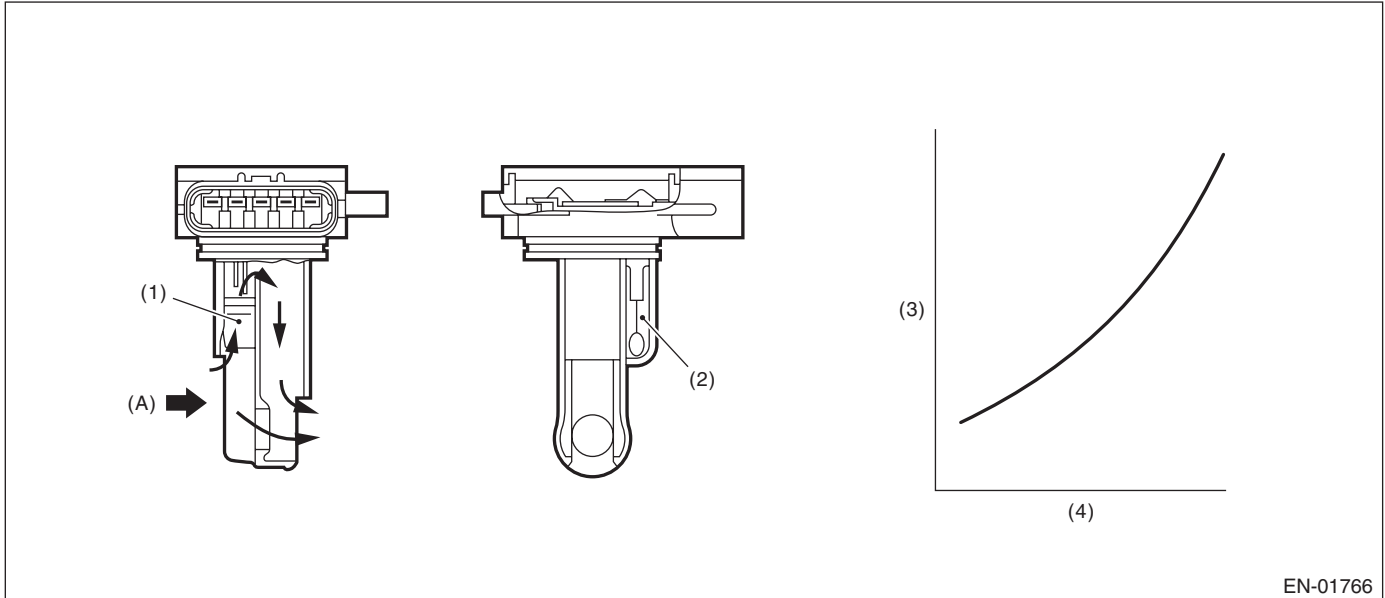
GENERAL DESCRIPTION

M: DTC P0103 MASS OR VOLUME AIR FLOW CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect open or short circuits of the air flow sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Air flow sensor

(2) Intake air temperature sensor

(3) Voltage (V)

(4) Intake air volume (kg/s)

(A) Air

EN-01766

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of the following base value is higher than 0.5 seconds. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.985 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Air flow meter: Engine load is normally calculated by manifold pressure and engine speed; however, calculated only by manifold pressure.
- EVAP conc. learning (fuel): Not allowed to learn.
- Knock compensation:
 - Knock compensation final advance/delay angle value = knock compensation value + whole learning compensation value + portional learning compensation value
 - When normal: Knock compensation value = Fixed at 0°C.A.
 - Failure: Knock compensation value ≠ Fixed at 0°C.A. (When knock: Max. 12°C.A retard)
 - Whole learning compensation coefficient update not allowed.
 - Portional learning zone compensation value calculation not allowed.
- ISC control: Open loop compensation is set to (1 g/s). Stop calculation of throttle sensor temperature compensation. (Hold the previous value.)
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

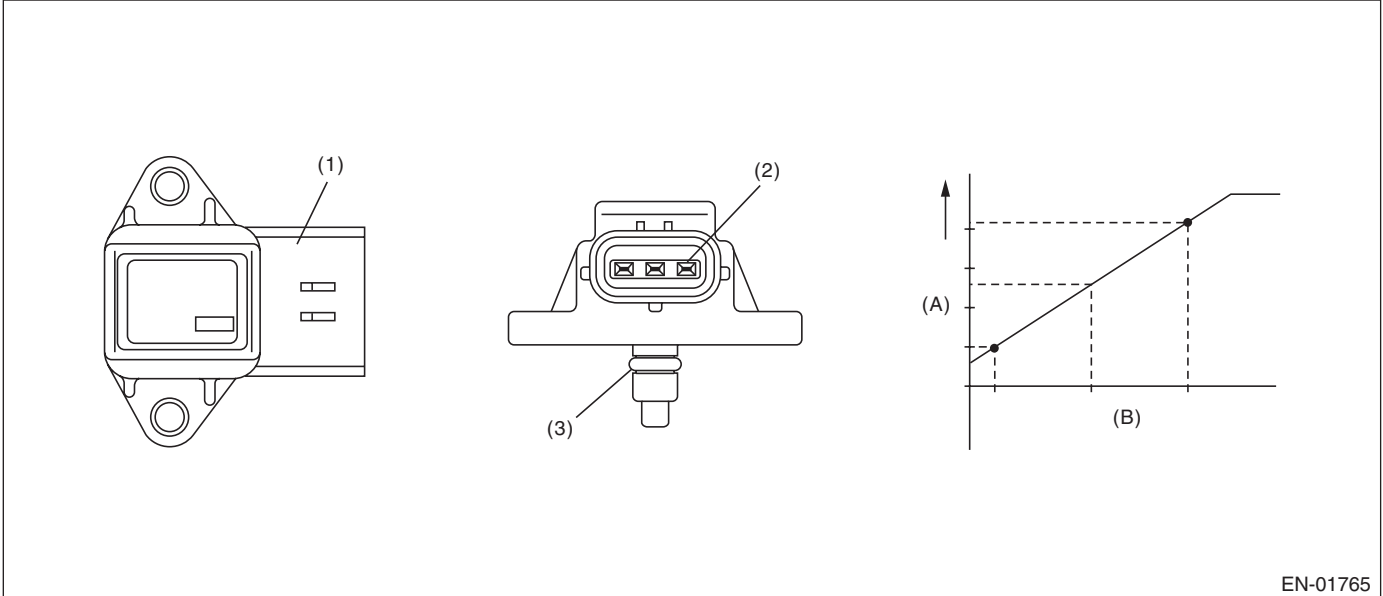
N: DTC P0107 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor.

Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



- (1) Connector
- (2) Terminal
- (3) O-ring

- (A) Output voltage
- (B) Absolute pressure

EN-01765

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$< 0.568 \text{ V}$

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

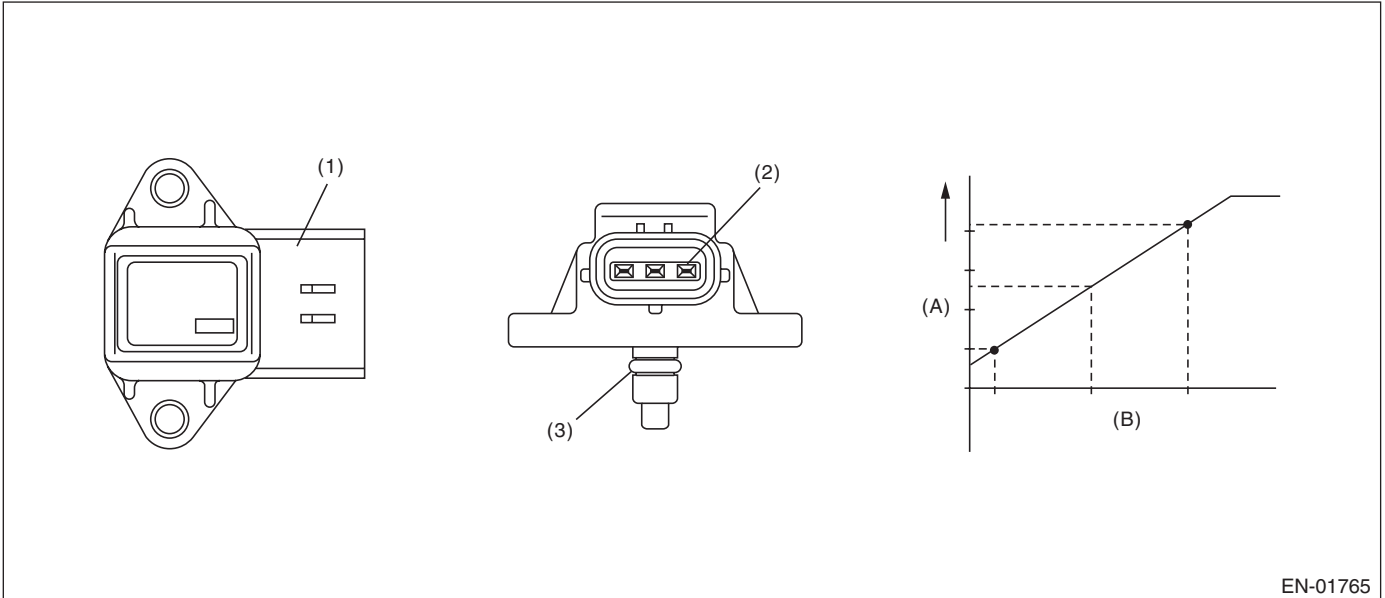
O: DTC P0108 MANIFOLD ABSOLUTE PRESSURE/BAROMETRIC PRESSURE CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of intake manifold pressure sensor.

Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



- (1) Connector
- (2) Terminal
- (3) O-ring

- (A) Output voltage
- (B) Absolute pressure

EN-01765

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\geq 4.93 \text{ V}$

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Intake manifold pressure sensor process: Estimate the pressure from engine load.
- ISC feedback: Not allowed to calculate the amount of feedback.
- Heavy fuel judgment: Not allowed to carry out the heavy judgment.
- Fuel cut control: Not allowed to cut the over pressure charged fuel.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

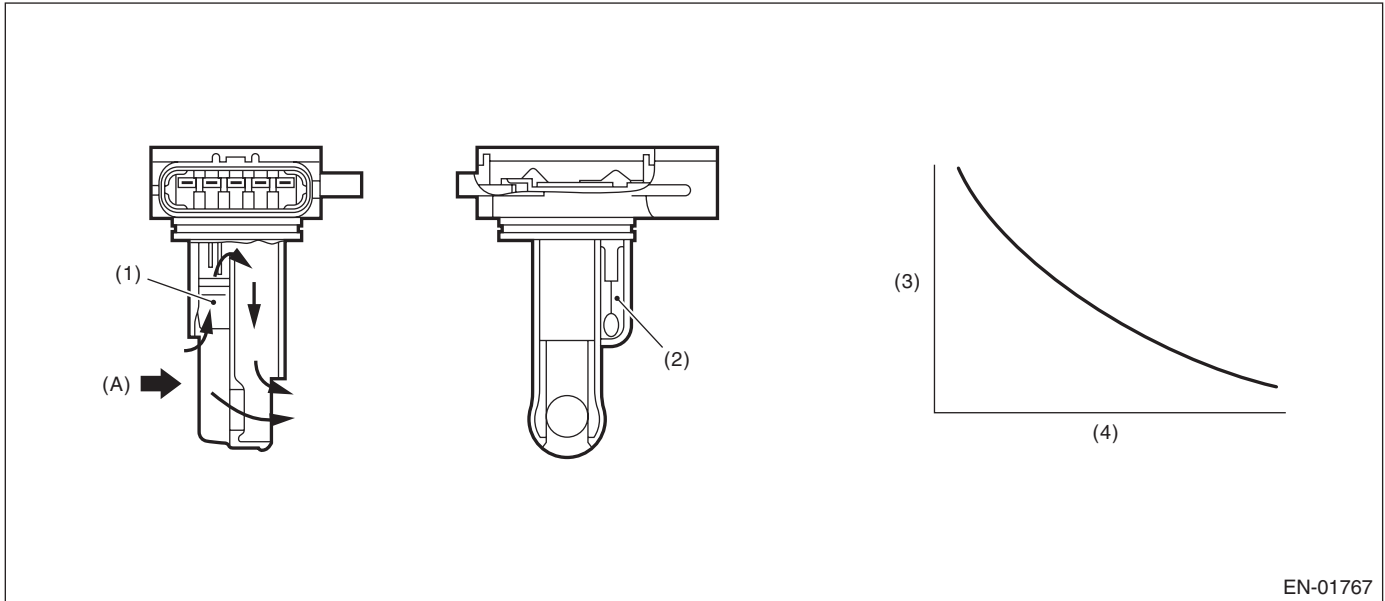
P: DTC P0111 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT RANGE/ PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of intake air temperature sensor output property.

Judge as NG when the intake air temperature is not varied whereas it seemed to be varied from the viewpoint of engine condition.

2. COMPONENT DESCRIPTION



EN-01767

(1) Air flow sensor

(2) Intake air temperature sensor

(3) Resistance value (Ω)

(4) Intake air temperature °C (°F)

(A) Air

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Coolant temp. before engine start	< 30°C (86°F)
Engine coolant temperature	> 95°C (203°F)
Battery voltage	≥ 10.9 V
Continuous time when the vehicle speed is less than 50 km/h (31 MPH)	600 seconds or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis when the vehicle speed condition is completed after idling from starting the cooled engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 1 second or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	< 20 mV (Equivalent to approximately 0.5°C (33°F) near 25°C)

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage difference between Max. and Min.	≥ 20 mV

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

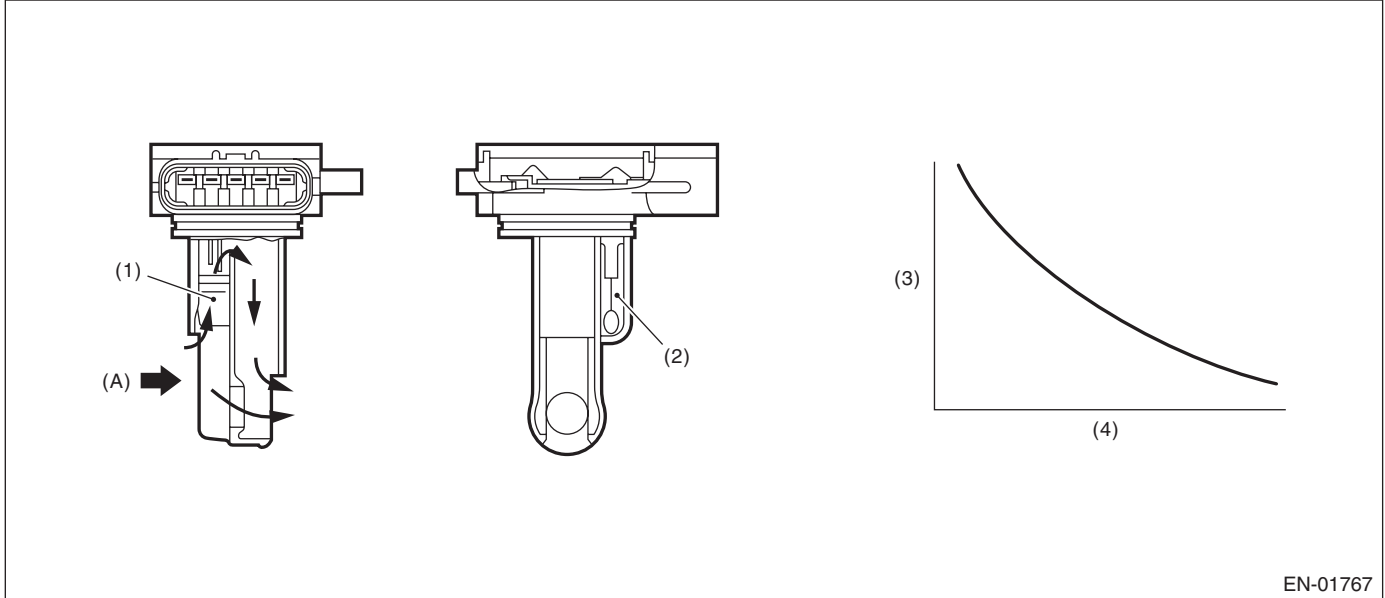
GENERAL DESCRIPTION

Q: DTC P0112 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the intake air temperature sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Air flow sensor

(2) Intake air temperature sensor

(3) Resistance value (Ω)

(4) Intake air temperature °C (°F)

(A) Air

EN-01767

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.165 V
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.165 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

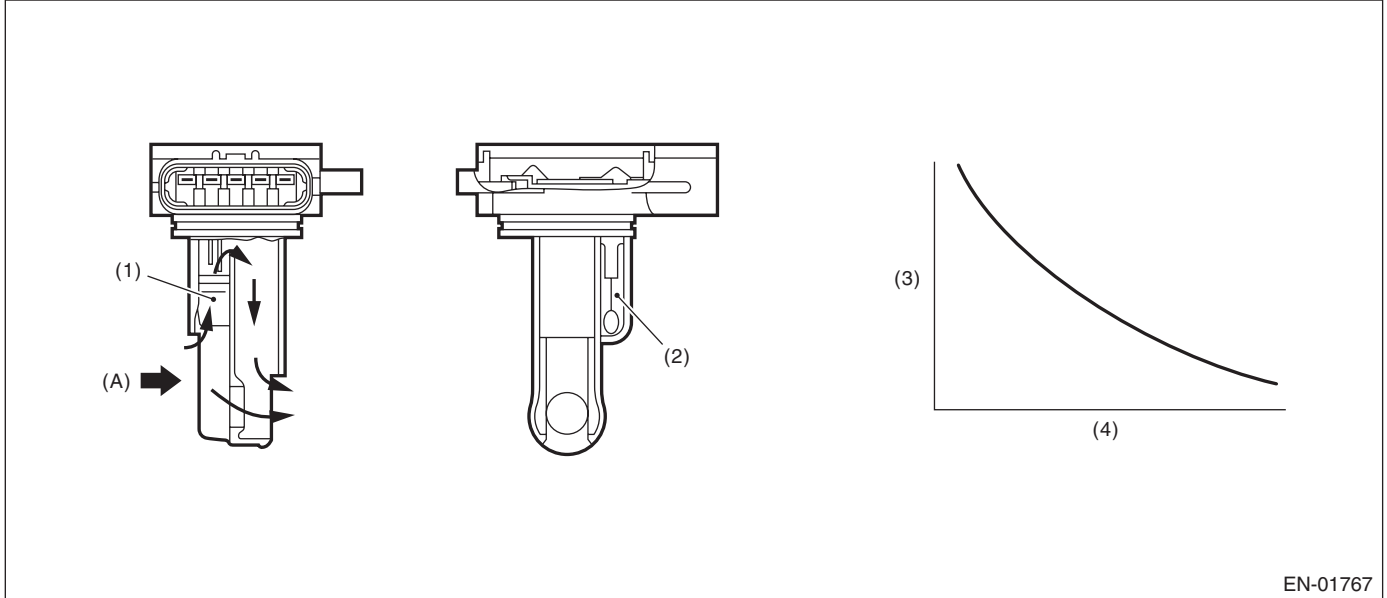
GENERAL DESCRIPTION

R: DTC P0113 INTAKE AIR TEMPERATURE SENSOR 1 CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the intake air temperature sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(1) Air flow sensor

(2) Intake air temperature sensor

(3) Resistance value (Ω)

(4) Intake air temperature °C (°F)

(A) Air

EN-01767

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.72 V
Ignition switch	ON

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.23 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Intake air temperature sensor process: Intake air temperature is fixed at 20°C (68°F).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

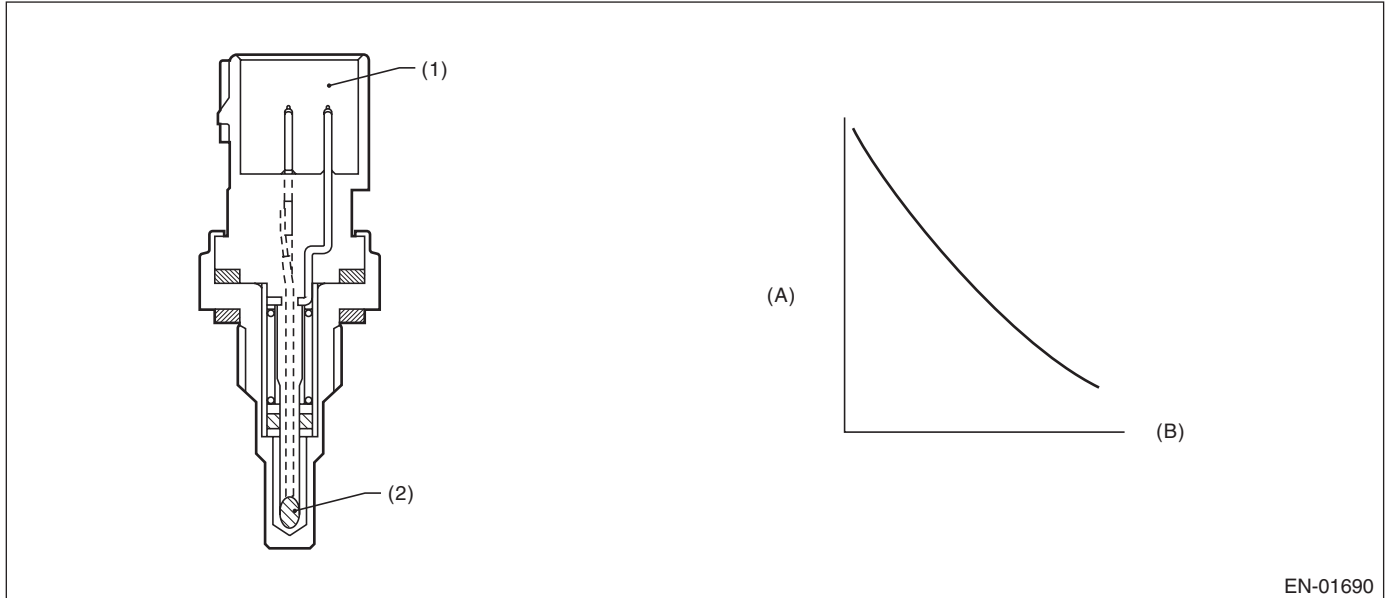
GENERAL DESCRIPTION

S: DTC P0117 ENGINE COOLANT TEMPERATURE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the engine coolant temperature sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



- (1) Connector
- (2) Thermistor element

- (A) Resistance value (k Ω)
- (B) Temperature °C (°F)

EN-01690

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.165 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Engine coolant temperature sensor process: Engine coolant temperature is fixed at 70°C (158°F)
- ISC Feedback: Calculate target engine speed as engine coolant temperature 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- High water temperature expansion compensation coefficient: Normally, mass expands with high water temperature and other conditions, but this ignores water temperature conditions and expands when other conditions are established.
- AVCS Control: Oil flow control solenoid valve drive output duty = 0 %.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

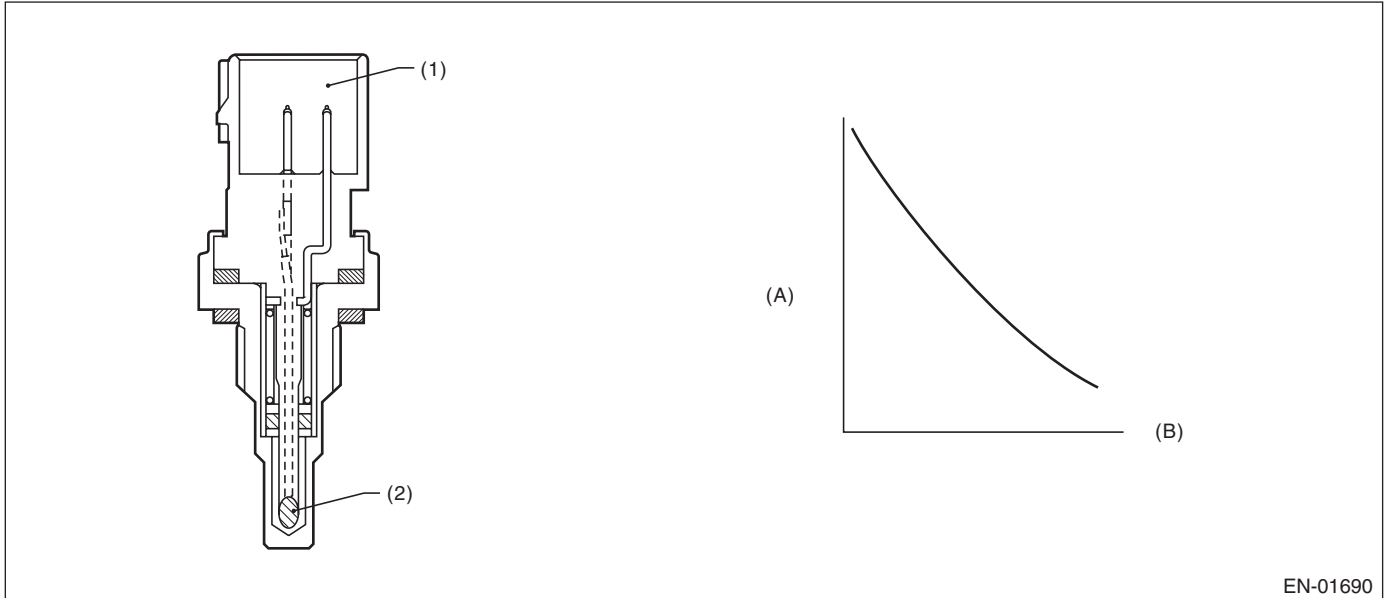
GENERAL DESCRIPTION

T: DTC P0118 ENGINE COOLANT TEMPERATURE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the engine coolant temperature sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



- (1) Connector
(2) Thermistor element

- (A) Resistance value (k Ω)
(B) Temperature °C (°F)

EN-01690

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.72 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Engine coolant temperature sensor process: Engine coolant temperature is fixed at 70°C (158°F)
- ISC Feedback: Calculate target engine speed as engine coolant temperature 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- High water temperature expansion compensation coefficient: Normally, mass expands with high water temperature and other conditions, but this ignores water temperature conditions and expands when other conditions are established.
- AVCS Control: Oil flow control solenoid valve drive output duty = 0 %.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

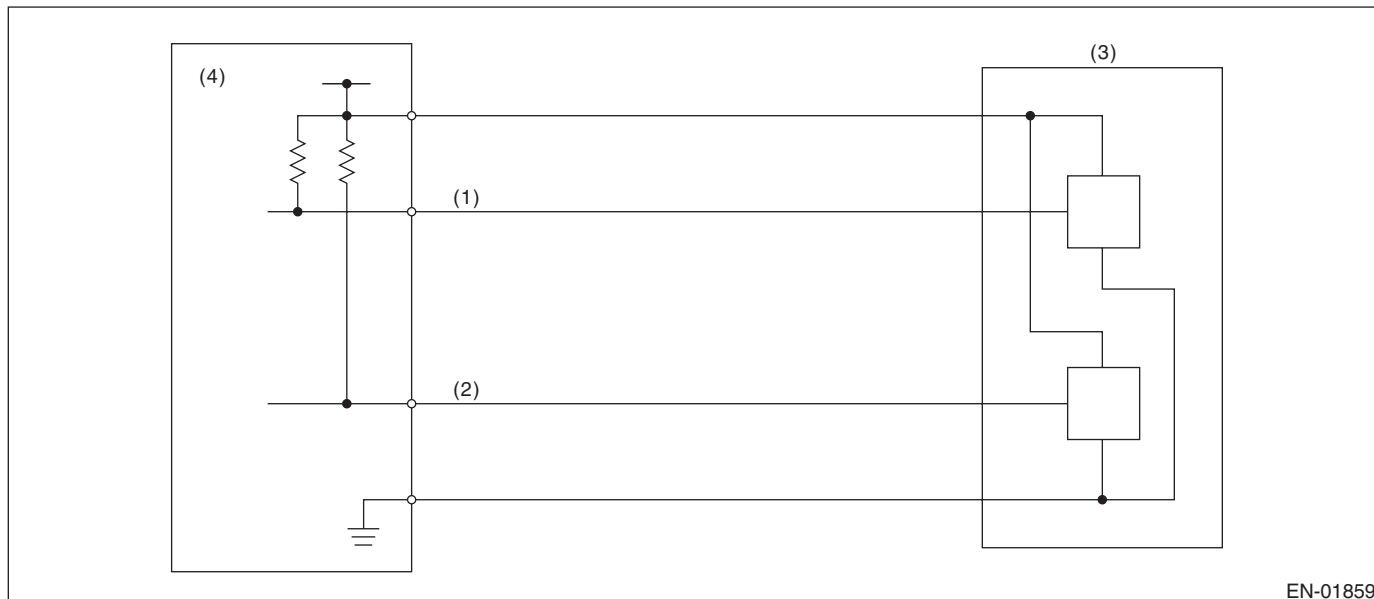
GENERAL DESCRIPTION

U: DTC P0122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



- (1) Throttle position sensor 1 signal
- (2) Throttle position sensor 2 signal
- (3) Throttle position sensor
- (4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≤ 0.224 V

Time Needed for Diagnosis: 24 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

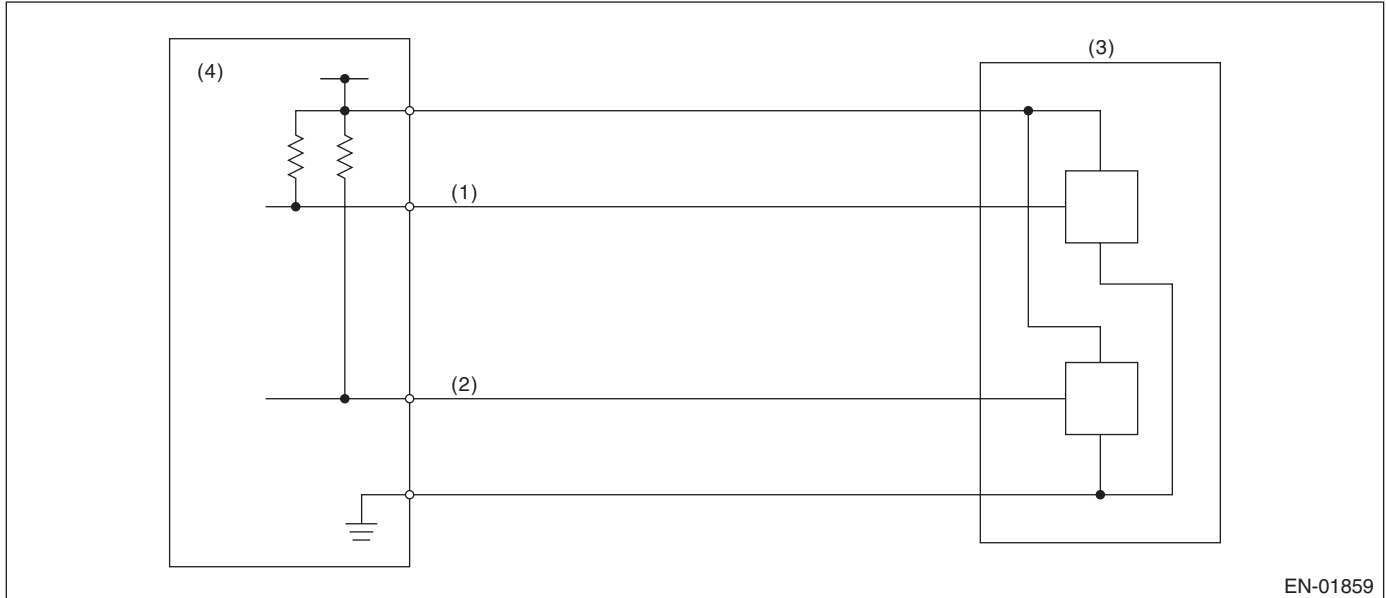
V: DTC P0123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A” CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 1.

Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



- (1) Throttle position sensor 1 signal
- (2) Throttle position sensor 2 signal
- (3) Throttle position sensor
- (4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 4.851 V

Time Needed for Diagnosis: 24 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

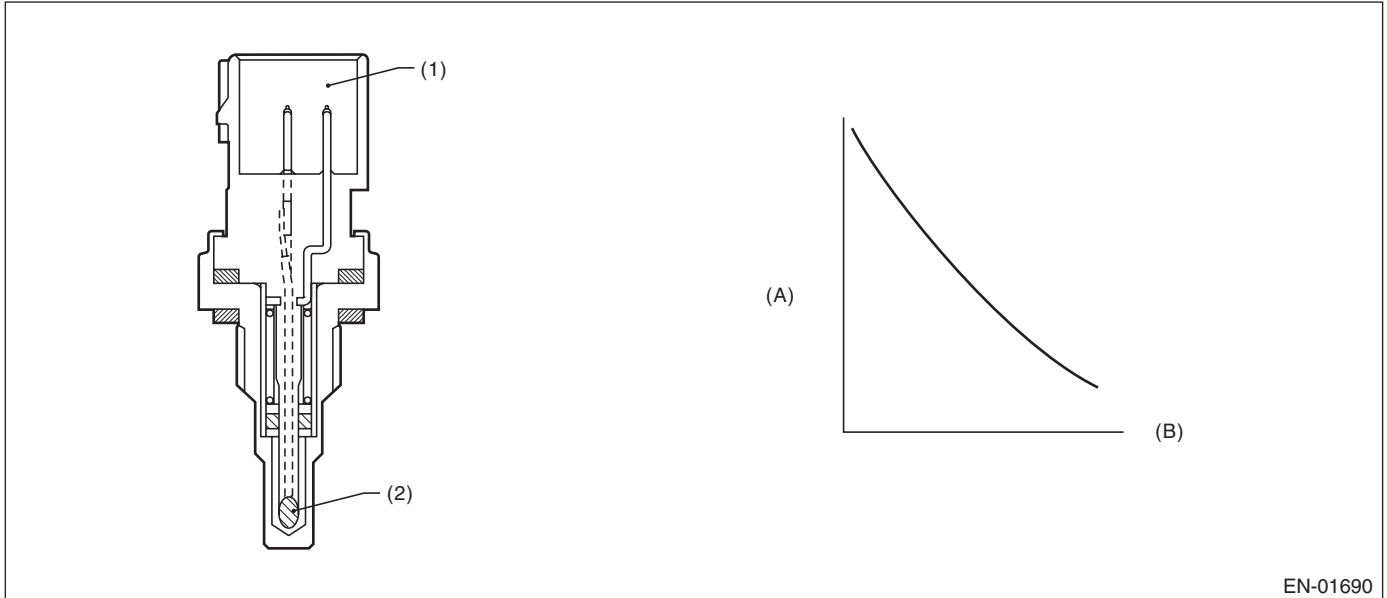
W: DTC P0125 INSUFFICIENT COOLANT TEMPERATURE FOR CLOSED LOOP FUEL CONTROL

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of engine coolant temperature output property.

Judge as NG when the engine coolant temperature does not rise in driving conditions where it should.

2. COMPONENT DESCRIPTION



- (1) Connector
- (2) Thermistor element

- (A) Resistance value (kΩ)
- (B) Temperature °C (°F)

EN-01690

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	≥ 500 rpm
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine starting.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	< 20°C (68°F)
Timer for diagnosis after engine starting	≥ Judgment value of timer after engine starting

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Timer for diagnosis after engine starting

a. Timer stop at fuel cut mode

b. During the driving conditions except a) above, timer counts up.

64 milliseconds + TWCNT milliseconds (at the time of 64 milliseconds)

TWCNT is defined as follows.

TWCNT = 0 (at idle switch ON)

TWCNT show on the following table at idle switch OFF.

Temperature °C (°F)	Vehicle speed km/h (MPH)							
	0 (0)	8 (4.97)	16 (9.94)	24 (14.9)	32 (19.9)	40 (24.9)	48 (29.8)	56 (34.8)
-20 (-4)	0 ms	37.14 ms	74.27 ms	111.41 ms	126.66 ms	141.91 ms	163.59 ms	185.26 ms
-10 (14)	0 ms	27.39 ms	54.78 ms	82.17 ms	99.65 ms	117.13 ms	135.96 ms	154.80 ms
0 (32)	0 ms	17.65 ms	35.29 ms	52.94 ms	72.64 ms	92.34 ms	108.34 ms	124.33 ms
10 (50)	0 ms	7.90 ms	15.80 ms	23.70 ms	45.63 ms	67.56 ms	80.71 ms	93.87 ms
20 (68)	0 ms	7.90 ms	15.80 ms	23.70 ms	45.63 ms	67.56 ms	80.71 ms	93.87 ms

Judgment value of timer after engine starting

$$t = 451.1 - 25.9 \times T_i$$

T_i = The lowest engine coolant temperature after starting the engine

Time Needed for Diagnosis: To be determined. (It is varied by the Min. engine coolant temperature and engine conditions such as vehicle speed and engine coolant temperature.)

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	≥ 20°C (68°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Engine coolant temperature sensor process: Engine coolant temperature is fixed at 70°C (158°F)
- ISC Feedback: Calculate target engine speed as engine coolant temperature 70°C (158°F).
- ISC learning: Not allowed to learn.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.
- Air conditioner control: Not allowed to turn the air conditioner to ON.
- Radiator fan control: Both main and sub fan are in High driving.
- High water temperature expansion compensation coefficient: Normally, mass expands with high water temperature and other conditions, but this ignores water temperature conditions and expands when other conditions are established.
- AVCS Control: Oil flow control solenoid valve drive output duty = 0 %.
- Tumble generator valve control: Open the tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

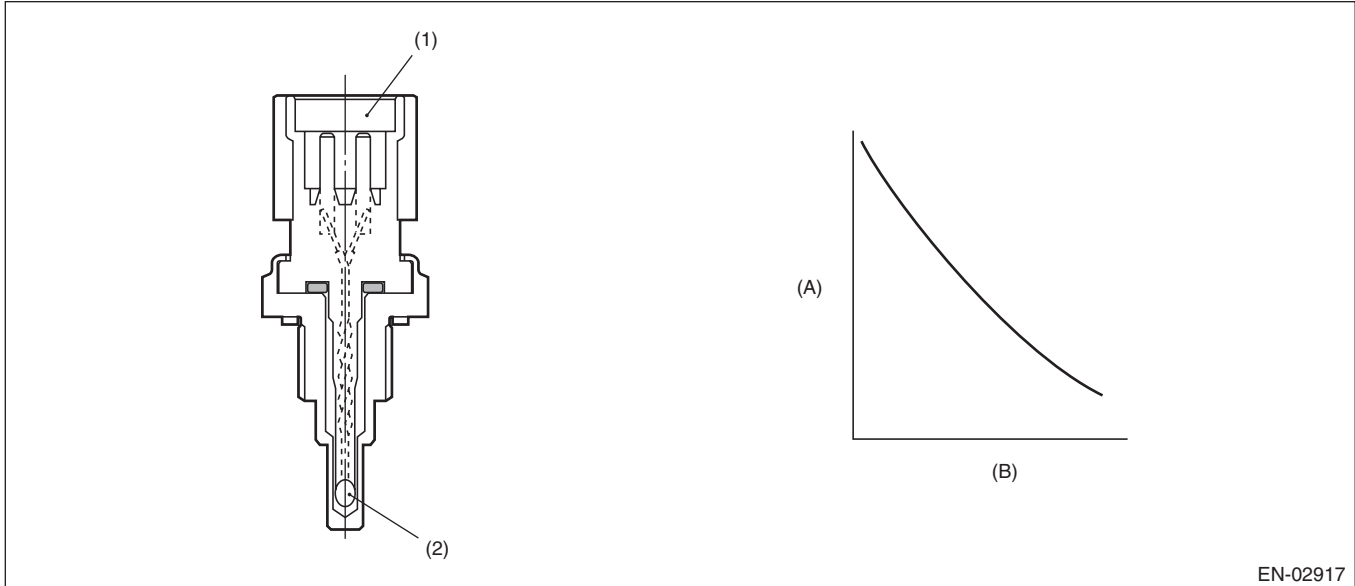
X: DTC P0126 INSUFFICIENT ENGINE COOLANT TEMPERATURE FOR STABLE OPERATION

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of the engine coolant temperature sensor characteristics.

Memorize the engine coolant temperature and fuel temperature at the last engine stop, and use them to judge as NG when the engine coolant temperature does not decrease when it should.

2. COMPONENT DESCRIPTION



EN-02917

- (1) Connector
- (2) Thermistor element

- (A) Resistance value (k Ω)
- (B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Refueling from the last engine stop till the current engine start	None
Fuel level	≥ 15 ℓ (3.96 US gal, 3.3 Imp gal)
Engine coolant temperature at the last engine stop	$\geq 70^{\circ}\text{C}$ (158°F) and $< 95^{\circ}\text{C}$ (203°F)

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the continuous time with the following conditions established is more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature at the last engine stop — Minimum engine coolant temperature after the engine start	< 2.5°C (4.5°F)
Fuel temperature at the last engine stop — fuel temperature	≥ 5°C (9°F)
Intake air temperature — fuel temperature	< 2.5°C (4.5°F)
Fuel temperature	< 35°C (95°F)

Normality Judgment

When the following conditions are established, it is OK.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature at the last engine stop — Minimum engine coolant temperature after the engine start	≥ 2.5°C (4.5°F)

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

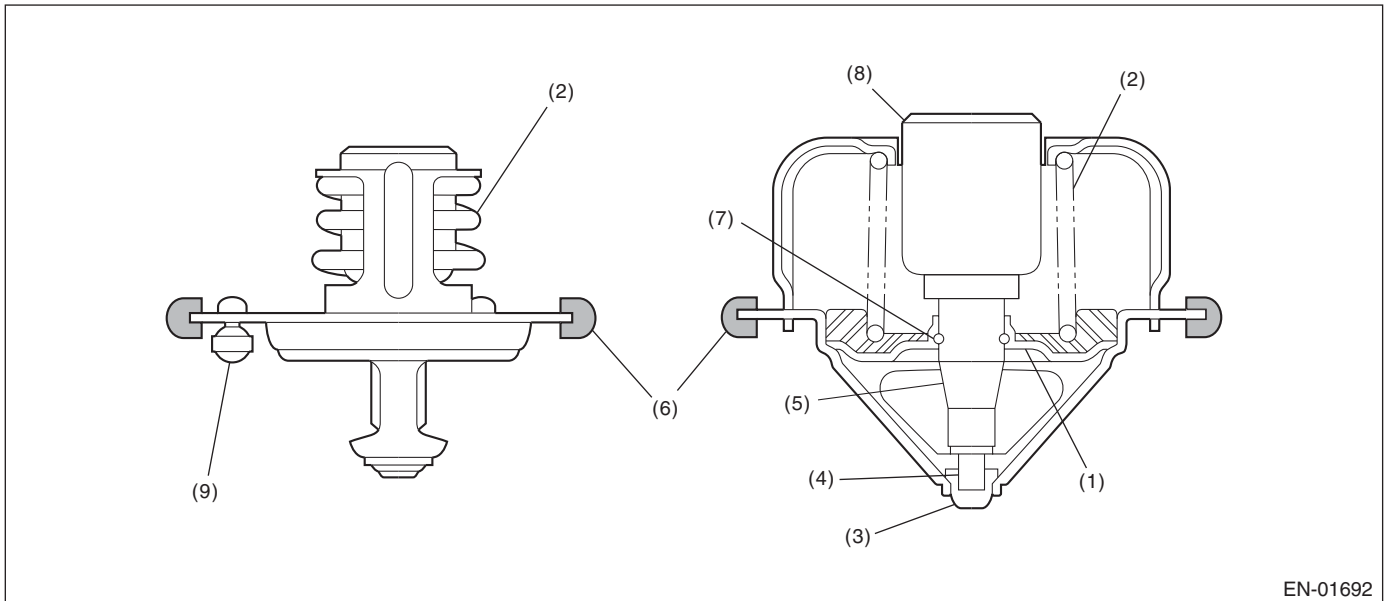
Y: DTC P0128 COOLANT THERMOSTAT (ENGINE COOLANT TEMPERATURE BELOW THERMOSTAT REGULATING TEMPERATURE)

1. OUTLINE OF DIAGNOSIS

Detect malfunctions of the thermostat function.

Judge as NG when the engine coolant temperature is lower than the estimated engine coolant temperature and the difference between them is large. Judge as OK when the engine coolant temperature becomes to 75°C (167°F), and the difference is small, before judging NG.

2. COMPONENT DESCRIPTION



- (1) Valve
- (2) Spring
- (3) Stopper
- (4) Piston
- (5) Guide

- (6) Rubber packing
- (7) Stop ring
- (8) Wax element
- (9) Jiggle valve

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 30 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Estimate ambient temperature	$\geq -7^{\circ}\text{C}$ (19.4°F)
Engine coolant temperature at engine starting	$< 55^{\circ}\text{C}$ (131°F)
Estimated coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)
Engine coolant temperature	$< 70^{\circ}\text{C}$ (158°F)
(Estimated - Measured) Engine coolant temperature	$> 30^{\circ}\text{C}$ (54°F)
Vehicle speed	≥ 30 km/h

Time Needed for Diagnosis: 30 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Estimate ambient temperature	$\geq -7^{\circ}\text{C}$ (19.4°F)
Thermostat malfunction diagnosis	Incomplete
Engine coolant temperature at engine starting	$< 55^{\circ}\text{C}$ (131°F)
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)
(Estimated - Measured) Engine coolant temperature	$\leq 30^{\circ}\text{C}$ (54°F)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

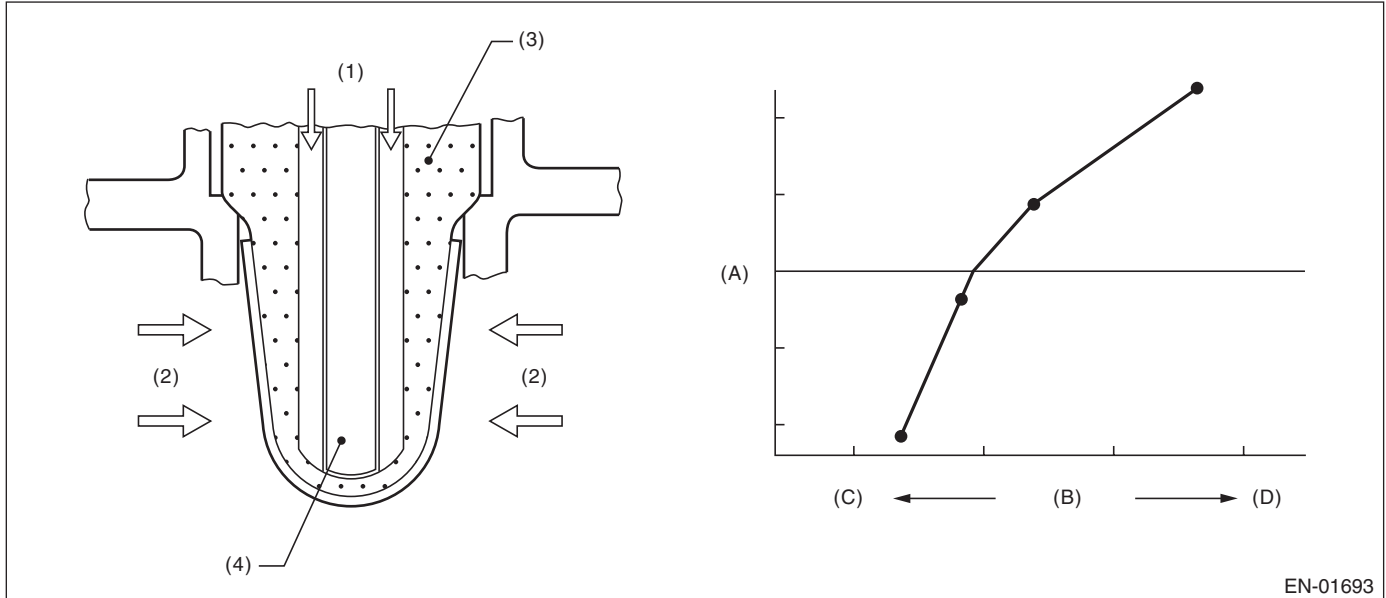
Z: DTC P0131 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.

Judge as NG when the element impressed voltage is out of range, or the element current is out of range.

2. COMPONENT DESCRIPTION



- (1) Atmosphere
- (2) Exhaust gas
- (3) ZrO₂
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting any malfunction criteria below is more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage	< 1.8 V
Input current	< -0.01 A

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0.3 → 0, normally.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

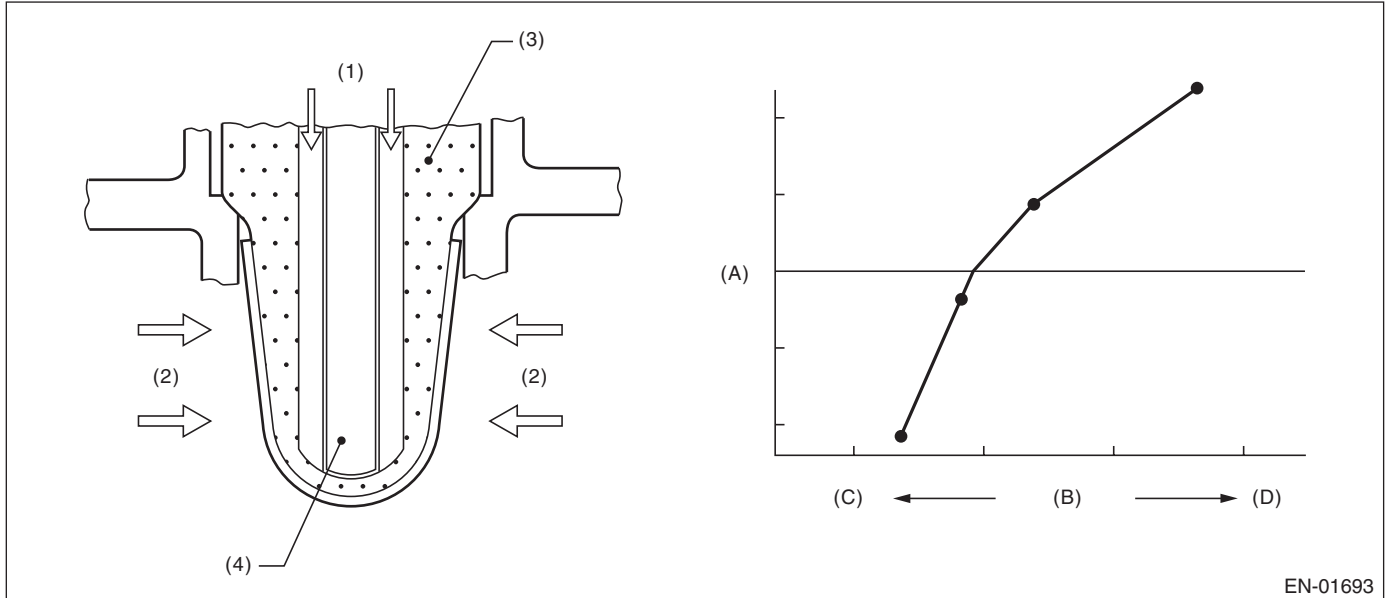
AA:DTC P0132 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of sensor.

Judge as NG when the element impressed voltage is out of range, or the element current is out of range.

2. COMPONENT DESCRIPTION



- (1) Atmosphere
- (2) Exhaust gas
- (3) ZrO₂
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting any malfunction criteria below is more than 1 second.

Judgment Value

Malfunction Criteria	Threshold Value
Input voltage	≥ 3.8 V
Input current	≥ 0.01 A

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0.3 → 0, normally.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AB:DTC P0133 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 1)

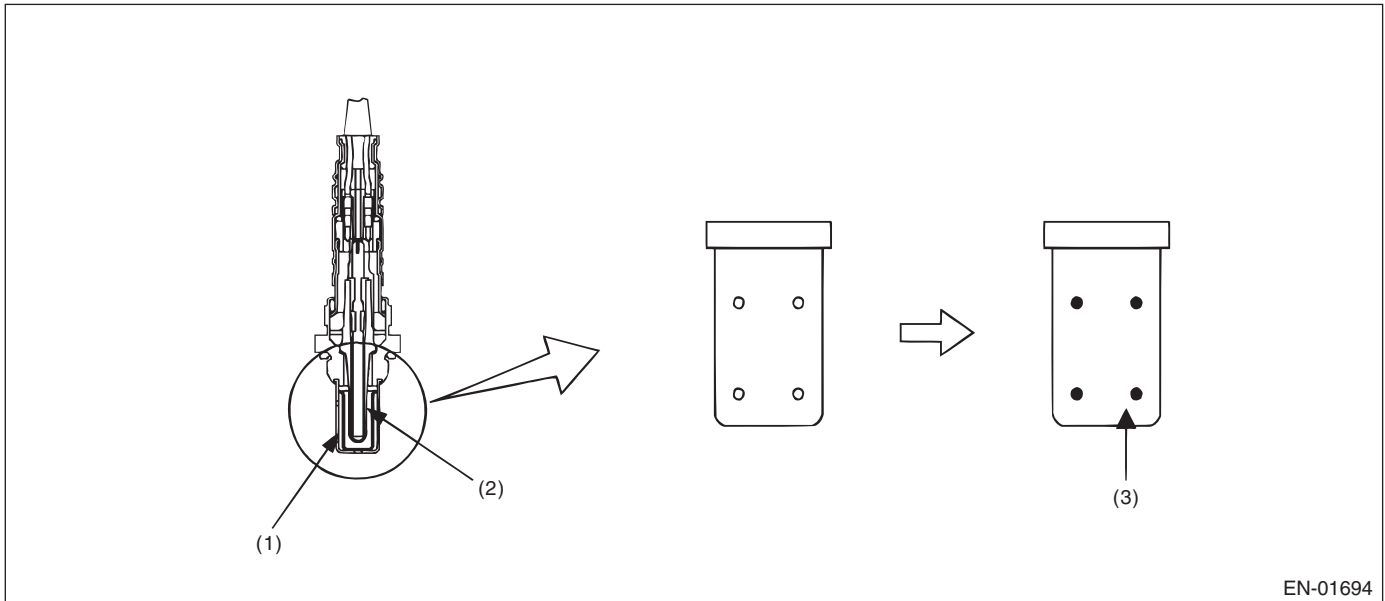
1. OUTLINE OF DIAGNOSIS

Detect the slow response of front oxygen (A/F) sensor.

Front oxygen (A/F) sensor cover has some ventilation holes for exhaust gas. Clogged ventilation holes are diagnosed.

When the holes are clogged, the A/F output variation becomes slow comparing with the actual A/F variation because oxygen which reaches the zirconia layer is insufficient. Therefore, if the sensor cover holes are clogged, the rich to lean judgment in the ECM is delayed when the change from rich to lean occurs.

Judge as NG when the actual movement in comparison to the ECM control amount is slow.



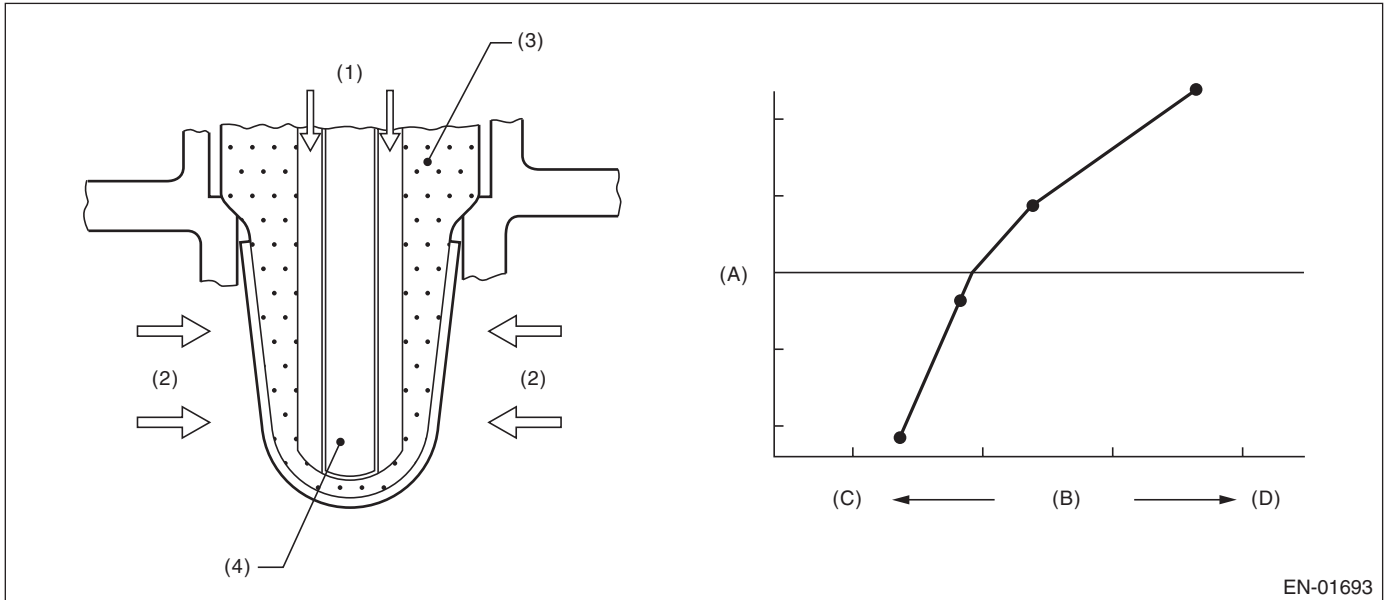
EN-01694

- (1) Cover
- (2) Zirconia
- (3) Clogging

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

2. COMPONENT DESCRIPTION



- (1) Atmosphere
- (2) Exhaust gas
- (3) ZrO₂
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters enable conditions	1 second or more
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.0 kPa (563 mmHg, 22.2 inHg)
Closed loop control with main feedback	Operating
Front oxygen (A/F) sensor impedance	0 — 50 Ω
After engine starting	120 seconds or more
Engine coolant temperature	≥ 70°C (158°F)
Engine speed	1000 — 3200 rpm
Vehicle speed	10 — 120 km/h (6.21 — 74.6 MPH)
Amount of intake air	10 — 31 g/s
Engine load change during 0.5 engine revs.	≤ 0.02 g/rev
Learning value of EVAP conc. during purge	≤ 0.2
Total time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis only once, at a constant speed of 10 — 120 km/h (6.21 — 74.6 MPH) in 120 seconds or more after warming up the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Calculate faf difference every 128 milliseconds, and the λ value difference. Calculate the diagnosis value after calculating 1640 times (210 seconds).

Judge as NG when the malfunction criteria below are completed. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
$\text{para} \text{fca} = \text{td}2 \text{faf} / \text{td}2 \text{lmd}$ where, $\text{td}2 \text{faf} (N) = \text{td}2 \text{faf} (n-1) + \text{d}2 \text{faf} (n) $ $\text{td}2 \text{lmd} (N) = \text{td}2 \text{lmd} (n-1) + \text{d}2 \text{lmd} (n) $ add up for a total of 210 seconds $\text{d}2 \text{faf} (n) = (\text{faf} (n) - \text{faf} (n-1)) - (\text{faf} (n-1) - \text{faf} (n-2))$ $\text{d}2 \text{lmd} (n) = (\text{lmd} (n) - \text{lmd} (n-1)) - (\text{lmd} (n-1) - \text{lmd} (n-2))$ faf = main feedback compensation coefficient every 128 milliseconds lmd = output lambda every 128 milliseconds	≥ 0.392

Time Needed for Diagnosis: 210 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value $0.3 \rightarrow 0$.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

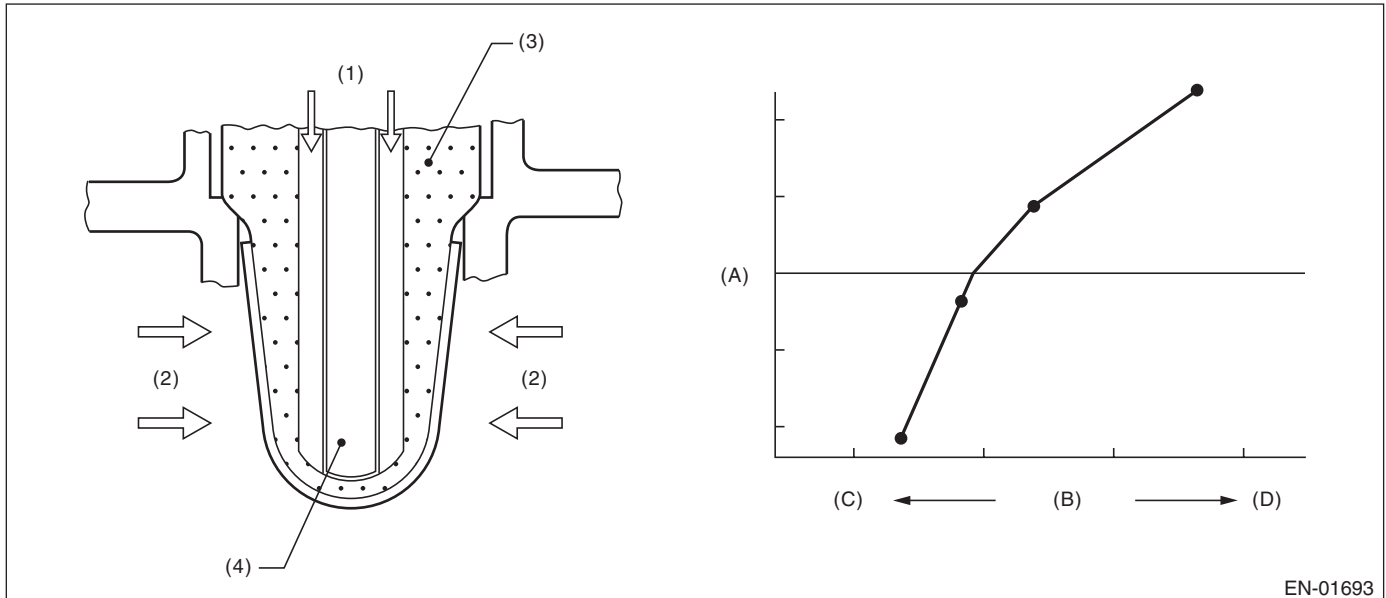
AC:DTC P0134 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect open circuits of the sensor.

Judge as NG when the impedance of the element is large.

2. COMPONENT DESCRIPTION



- (1) Atmosphere
- (2) Exhaust gas
- (3) ZrO₂
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage	≥ 10.9 V
Time after engine starting	≥ 50 sec.
Cumulative amount of the front lambda sensor heater control duty every 128 milliseconds.	≥ 28000%
Front oxygen (A/F) sensor impedance	≥ 500 Ω

Time Needed for Diagnosis: 5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor activation judgment: Front oxygen (A/F) sensor full activation is not complete, or front oxygen (A/F) sensor half activation is not complete.
- A/F main learning: Not allowed to calculate the A/F main learning compensation factor.
- Compensation when starting the engine at high temperature: Make the MIN value to be 0.3 → 0, normally.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

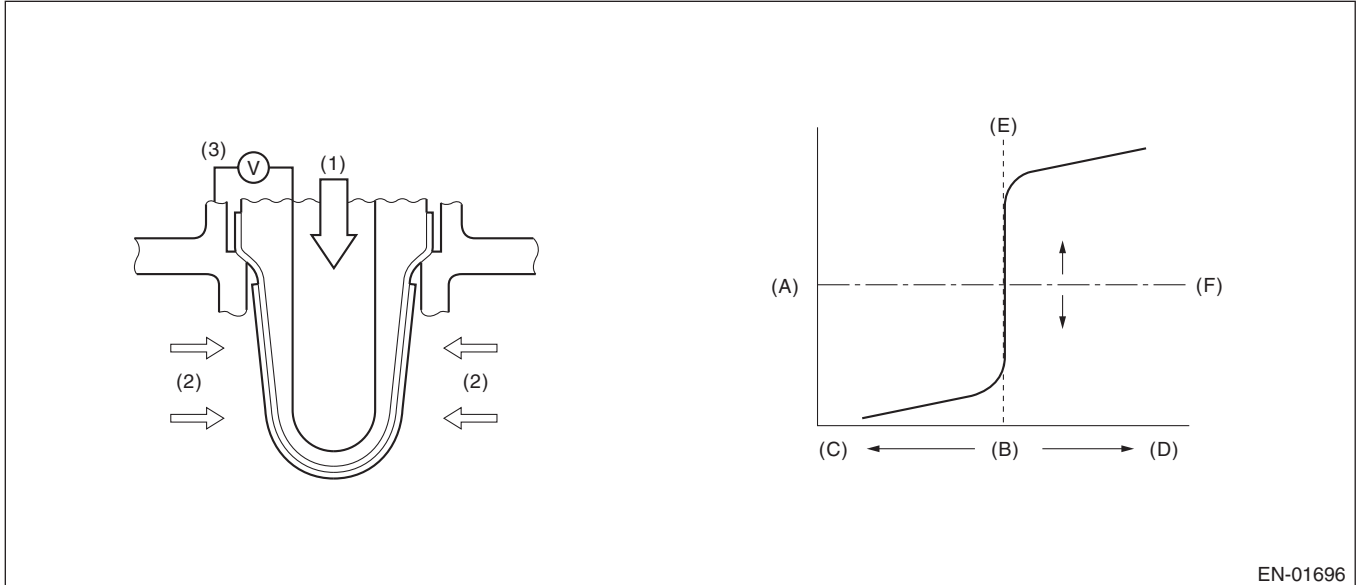
GENERAL DESCRIPTION

AD:DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect the continuity NG of oxygen sensor. If the oxygen sensor voltage reading is not within the probable range considering the operating conditions, judge as NG.

2. COMPONENT DESCRIPTION



EN-01696

(A) Electromotive force

(B) Air fuel ratio

(1) Atmosphere

(C) Rich

(D) Lean

(2) Exhaust gas

(E) Theoretical air fuel ratio

(F) Comparative voltage

(3) Electromotive force

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Used only for abnormality judgment

Secondary Parameters	Enable Conditions
High side	
Secondary air injection system	Not in operation
Closed loop control with the oxygen sensor	In operation
Misfire detection during 200 revs.	< 5 times
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	> 10.9 V
Low side 1	
Secondary air injection system	Not in operation
Closed loop control with the oxygen sensor	In operation
Misfire detection during 200 revs.	< 5 times
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	> 10.9 V
Amount of intake air	≥ 10 g (0.35 oz)/second
Low side 2	
Secondary air injection system	Not in operation
Closed loop control with the oxygen sensor	In operation
Misfire detection during 200 revs.	< 5 times
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	> 10.9 V
Amount of intake air	< 10 g (0.35 oz)/second
Current continuation time of the rear oxygen sensor heater	25 seconds or more
Low side 3	
Secondary air injection system	Not in operation
Closed loop control with the oxygen sensor	In operation
Misfire detection during 200 revs.	< 5 times
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	> 10.9 V
Amount of intake air	< 10 g (0.35 oz)/second
Current continuation time of the rear oxygen sensor heater	25 seconds or more
Fuel cut	Experienced

Used only for normality judgment

Secondary Parameters	Enable Condition
Secondary air injection system	Not in operation
Closed loop control with the oxygen sensor	In operation
Misfire detection during 200 revs.	< 5 times
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Battery voltage	> 10.9 V

4. GENERAL DRIVING CYCLE

After starting the engine, perform the diagnosis in series while the engine is in a constant operating condition.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the continuous time when the following conditions are established exceeds the predetermined time, and judge as OK if it doesn't.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
High side Maximum output voltage without continuity	≥ 1200 mV	P0138
Low side Minimum output voltage without continuity	< 30 mV	P0137

Time Needed for Diagnosis

High side: 2.5 seconds

Low side 1: 20 seconds

Low side 2: 40 seconds

Low side 3: Refer to the Map.

Map

Fuel Cut Time (Seconds)	Time Needed for Diagnosis (Seconds)
0	40
2	40
10	60

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Sub feedback control: Not allowed.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

AE:DTC P0138 O2 SENSOR CIRCUIT HIGH VOLTAGE (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

NOTE:

For the detection conditions, refer to DTC P0137. <Ref. to GD(H4DOTC)-65, DTC P0137 O2 SENSOR CIRCUIT LOW VOLTAGE (BANK 1 SENSOR 2), Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AF:DTC P0139 O2 SENSOR CIRCUIT SLOW RESPONSE (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect the slow response of the oxygen sensor.

Judge as NG if either the rich to lean response diagnosis or lean to rich response diagnosis is NG, and judge as OK if both are OK.

[Rich → lean diagnosis response]

1. Measure the response time for oxygen sensor output changes when the A/F ratio changes to rich to lean. If the measured response time is larger than the threshold value, it is NG. If it is smaller, it is OK.

2. Judge as NG when the oxygen sensor voltage is large (rich) when recovering from a deceleration fuel cut.

[Lean → rich diagnosis response]

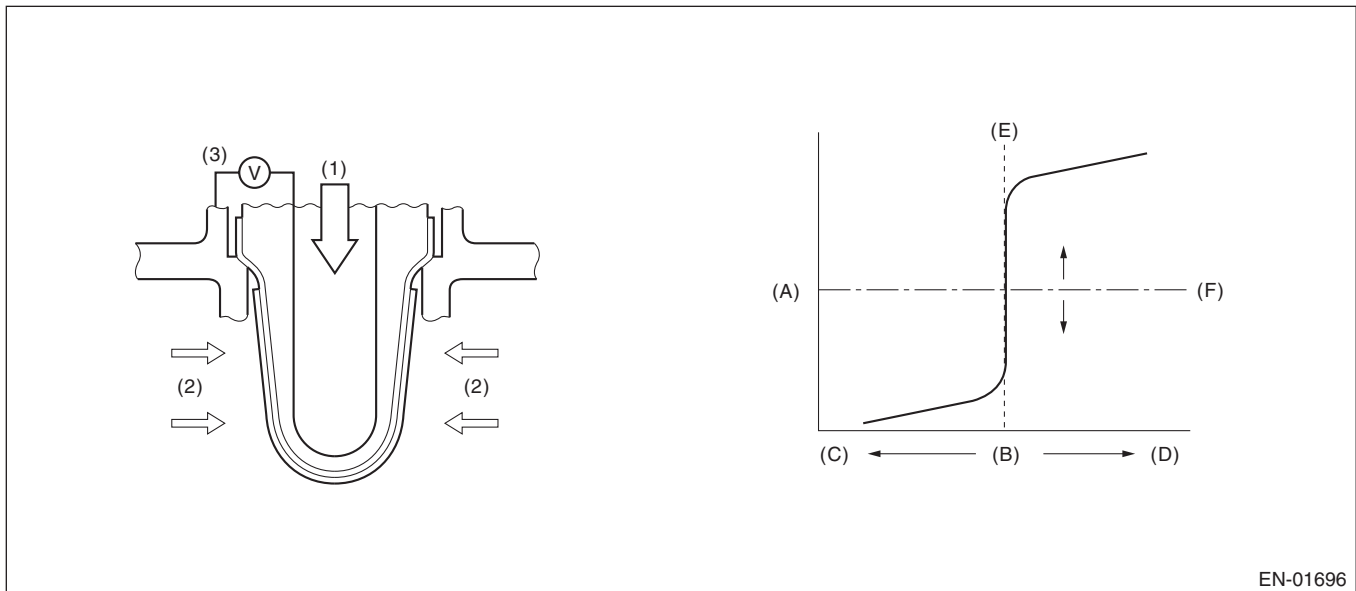
1. Measure the response time for oxygen sensor output changes when the A/F ratio changes to lean to rich. If the measured response time is larger than the threshold value, it is NG.

2. Judge as NG when the oxygen sensor voltage remains small when recovering from a deceleration fuel cut.

DIAGNOSTIC METHOD

Measure the response time of the output change of the oxygen sensor when the A/F ratio changes to rich to lean. And Judge as NG when the measured response time is larger than the threshold value.

2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust gas
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich

- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

3. ENABLE CONDITION

- Rich → lean diagnosis response

Secondary Parameters	Enable Condition
Battery voltage	> 10.9 V
A/F sub feedback control condition	Complete
Deceleration fuel cut time is 5 seconds or more.	Experienced
After fuel cut	≥ 2 sec.
Rear oxygen heater current calculation time	≥ 60 sec.
Rear oxygen heater current continuous time	≥ 30 sec.
Estimated catalyst layer temperature	≥ 400 °C (752°F)

Diagnostic Trouble Code (DTC) Detecting Criteria

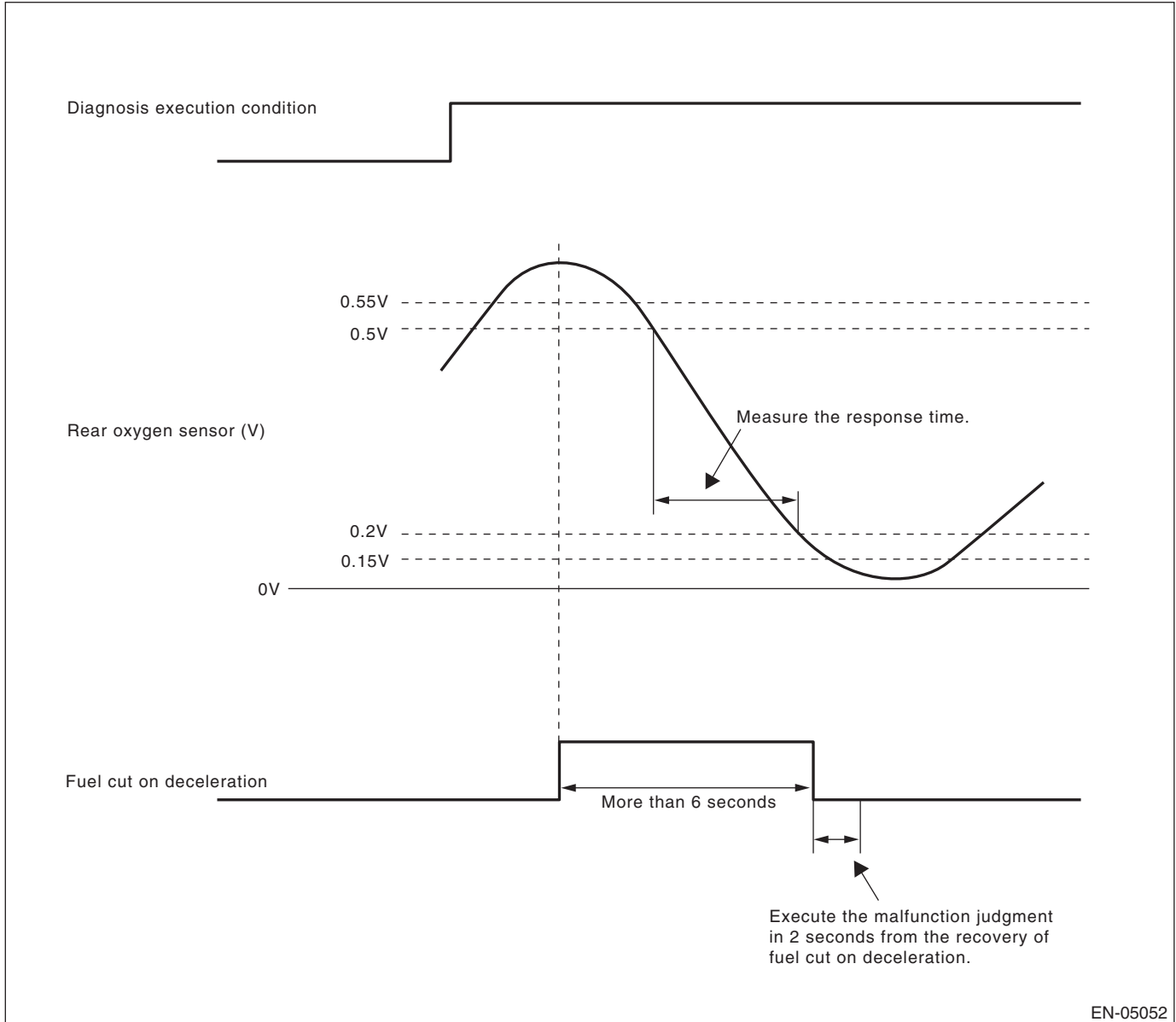
GENERAL DESCRIPTION

4. GENERAL DRIVING CYCLE

Perform the diagnosis only once when deceleration fuel cut occurs after rapid acceleration. (Pay attention to the oxygen sensor voltage to decide on the timing of the deceleration.)

5. DIAGNOSTIC METHOD

When the oxygen sensor output voltage changes from 0.55 V (rich) to 0.15 V (lean), calculate the minimum response time for output change between 0.5 V and 0.2 V for the judgment criteria.



Abnormality Judgment

1) Judge as NG when the judgment value is larger than the threshold value after deceleration fuel cut.
Response time (diagnostic value) > threshold value → abnormal

NOTE:

Variation time of rear oxygen sensor output voltage is short during fuel shut-off in deceleration. Carry out the NG judgment only after the fuel shut-off in deceleration. Even without deceleration fuel cut, judge as OK if the value is below the threshold.

When the deceleration fuel cut time is more than 6 seconds, judge as NG if the following criteria are met 2 seconds after recovering from the deceleration fuel cut.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

2) Judge as NG when the oxygen sensor voltage at recovery from a deceleration fuel cut is large. If the fuel cut time in a deceleration fuel cut is long (more than 6 s), and even after recovering from a deceleration fuel cut, the oxygen sensor voltage is high (0.55 V or more), judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from rich (0.5 V O ₂ output) to lean (0.2 V) if voltage reduces from 0.55 V to 0.15 V.	> 0.837 seconds
Time at over 0.55 V	> 2 seconds

Time Needed for Diagnosis: 1 time

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

1) Regardless of a deceleration fuel cut, if the response time (diagnostic value) when the oxygen sensor voltage has changed from rich to lean is shorter than the threshold value (judgment value), judge as a normal condition.

Response time (diagnostic value) ≤ threshold value → normal

2) Normality judgement is not to be performed.

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from rich (0.5 V O ₂ output) to lean (0.2 V) if voltage reduces from 0.55 V to 0.15 V.	≤ 0.837 sec.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Sub feedback control: Not allowed.

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

10.ENABLE CONDITION

- Lean → rich response diagnosis

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
A/F main feedback control condition	Completed
Deceleration fuel cut ≥ 5 seconds	Experienced
After fuel cut	≥ 2 sec.
Current calculation time of the rear oxygen sensor heater	≥ 60 sec.
Current continuation time of the rear oxygen sensor heater	≥ 30 sec.

Diagnostic Trouble Code (DTC) Detecting Criteria

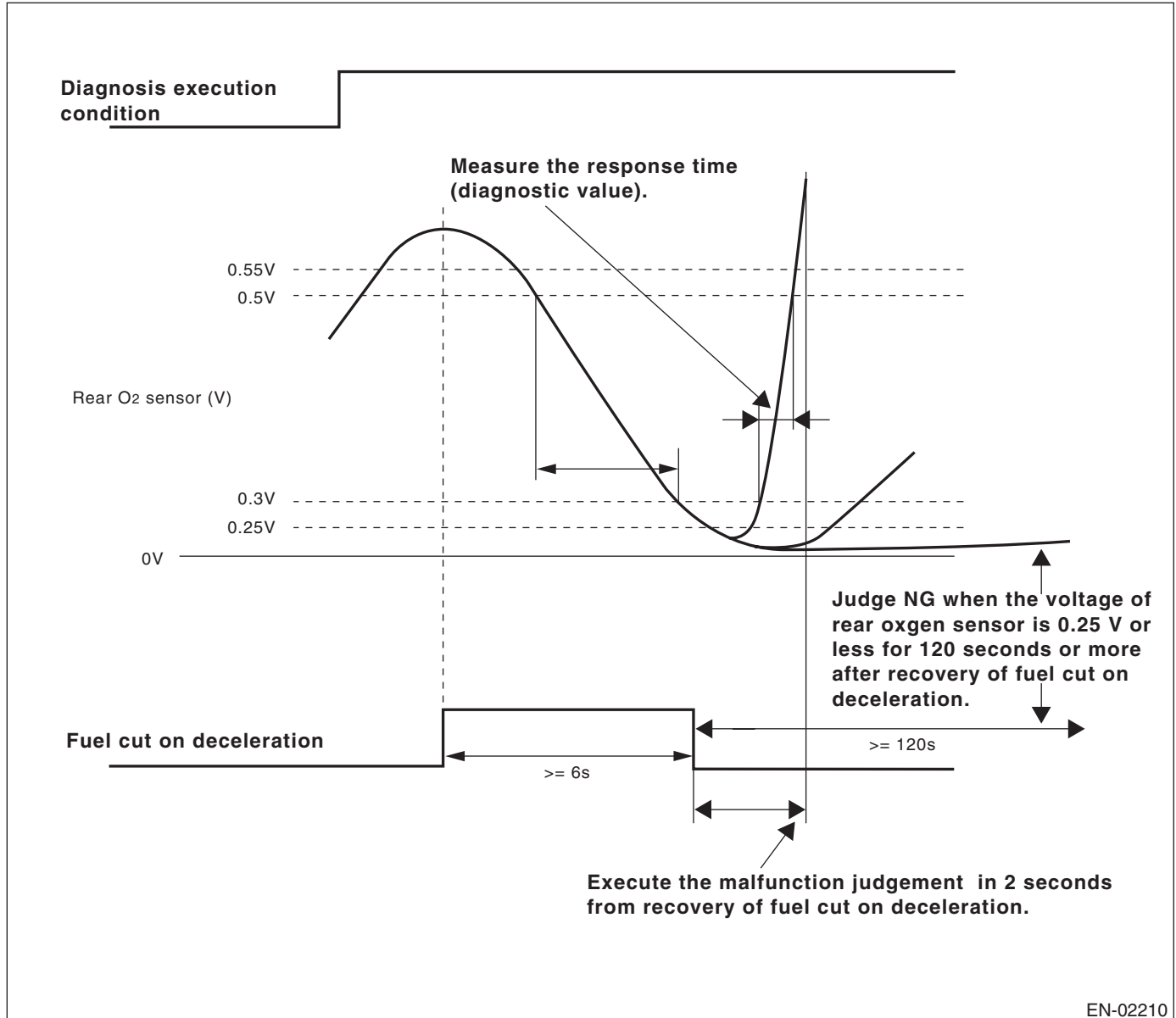
GENERAL DESCRIPTION

11.GENERAL DRIVING CYCLE

Perform the diagnosis only once when deceleration fuel cut occurs after rapid acceleration. (Pay attention to the oxygen sensor voltage for the timing of the deceleration.)

12.DIAGNOSTIC METHOD

Calculate the minimum value of 0.3 V to 0.5 V output change response time as judgment value, when the oxygen sensor output voltage changes from 0.25 V (lean) to 0.55 V (rich).



Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Abnormality Judgment

1) Judge as NG when the judgment value is larger than the threshold value after deceleration fuel cut.

Response time (diagnostic value) > threshold value → abnormal

2) If the oxygen sensor voltage is small after recovering from a deceleration fuel cut, and remains small, judge as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from lean (0.3 V O ₂ output) to rich (0.5 V) when voltage drops from 0.5 V to 0.25 V.	> 2 seconds
Time at less than 0.25 V	> 120 seconds

Time Needed for Diagnosis: 1 time

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

1) Regardless of a deceleration fuel cut, if the response time (diagnostic value) when the oxygen sensor voltage has changed from rich to lean is shorter than the threshold value (judgment value), judge as a normal condition.

Response time (diagnostic value) ≤ threshold value → normal

2) Do not judge as a normal condition.

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Shortest time change from lean (0.3 V O ₂ output) to rich (0.5 V) when voltage drops from 0.55 V to 0.25 V.	≤ 2 sec.

13.DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

14.MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

15.FAIL SAFE

Sub feedback control: Not allowed.

16.ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AG:DTC P0140 O2 SENSOR CIRCUIT NO ACTIVITY DETECTED (BANK 1 SENSOR 2)

1. OUTLINE OF DIAGNOSIS

Detect abnormalities in the rear oxygen sensor output property.

By referring to the intake air amount, engine coolant temperature, main feedback control, deceleration fuel cut and other operating conditions, if the rear oxygen sensor voltage should be moving under those conditions but is showing a low voltage, this is judged as a Low side NG. If the voltage is high, it is judged as a High side NG.

When either Low side or High side is NG, this is judged as an rear oxygen sensor property NG.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)
Target output voltage of rear oxygen sensor	$\geq 0.6\text{ V}$
Air intake amount	10 g (0.35 oz)/seconds or more
Battery voltage	$> 10.9\text{ V}$
Closed loop with the oxygen sensor	In operation
Misfire detection during 200 revs.	5 times or less
Front oxygen (A/F) sensor compensation coefficient	Not in limit value
Deceleration fuel cut of 5 seconds or more	Experienced

3. GENERAL DRIVING CYCLE

Perform the diagnosis only once after engine warm-up.

4. DIAGNOSTIC METHOD

Abnormality Judgment

When the following conditions are established, it is NG.

Judgment Value

Malfunction Criteria	Threshold Value
Maximum output voltage, low side	$< 550\text{ mV}$
Minimum output voltage, high side	$> 250\text{ mV}$

Time Needed for Diagnosis: 200 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

When the following conditions are established, it is OK.

Judgment Value

Malfunction Criteria	Threshold Value
Maximum output voltage, low side	$\geq 550\text{ mV}$
Minimum output voltage, high side	$\leq 250\text{ mV}$

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

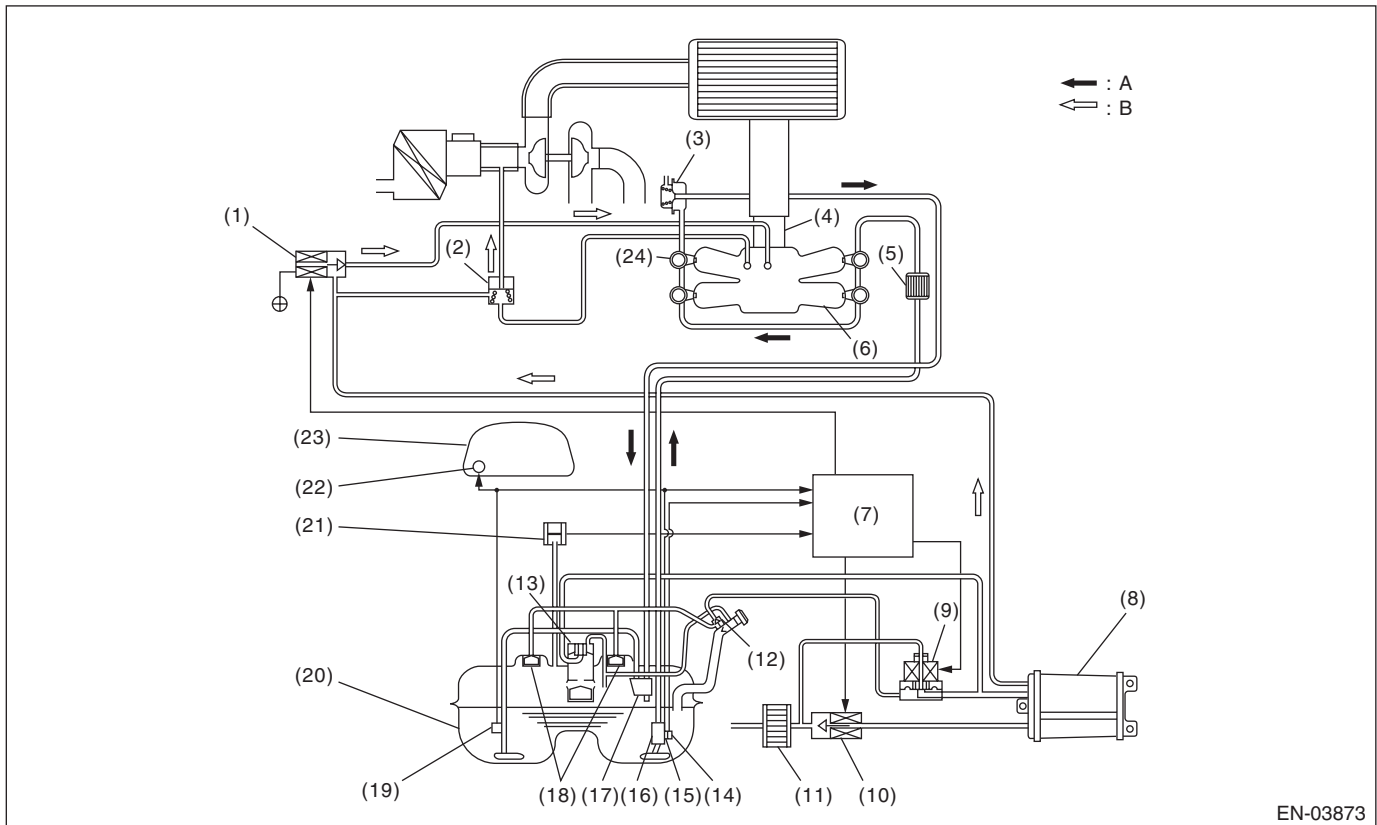
- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

AH:DTC P0171 SYSTEM TOO LEAN (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect fuel system malfunction by the amount of main feedback control.

FUEL SYSTEM DIAGNOSIS



- | | |
|-------------------------------------|--------------------------------|
| (1) Purge control solenoid valve | (14) Fuel temperature sensor |
| (2) Purge valve | (15) Fuel level sensor |
| (3) Pressure regulator | (16) Fuel pump |
| (4) Throttle body | (17) Jet pump |
| (5) Fuel filter | (18) Fuel cut valve |
| (6) Intake manifold | (19) Fuel sub level sensor |
| (7) Engine control module (ECM) | (20) Fuel tank |
| (8) Canister | (21) Fuel tank pressure sensor |
| (9) Pressure control solenoid valve | (22) Fuel gauge |
| (10) Drain valve | (23) Combination meter |
| (11) Drain filter | (24) Fuel injector |
| (12) Shut-off valve | (A) Fuel line |
| (13) Vent valve | (B) Vaporized fuel line |

Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158°F)
Engine load	\geq Value from Map 5
Intake air change during 0.5 engine revs.	≤ 0.02 g/rev

Map 5

engine speed (rpm)	idling	800	1200	1600	2000	2400	2800	3200	3600	4000	4400
Measured value (g(oz)/rev)	Non-turbo	0.228 (0.008)	0.22 (0.0078)	0.22 (0.0078)	0.22 (0.0078)	0.228 (0.008)	0.23 0.0081	0.234 (0.0083)	0.242 (0.0085)	0.250 (0.0088)	0.250 (0.0088)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling or at a constant speed after warming up the engine.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Compare the diagnosed value (fsobd) with the threshold value, and if a condition where the malfunction criteria below are met continues for more than 50 seconds, judge that there is a fault in the fuel system.

Judgment Value

Malfunction Criteria	Threshold Value
$\text{fsobd} = (\text{sglmd} - \text{tglm da}) + \text{faf} + \text{flaf}$ where, sglmd = measured lambda tglm da = target lambda faf = main feedback compensation coefficient every 64 milliseconds flaf = main feedback learning compensation coefficient	$\geq \text{fsobdL1}$ See Map 4 fsobdL1 = lean side threshold value of fsobd

Map 4 Threshold value for fuel system malfunction criteria

Amount of air (g(oz)/s)	0	2.4 (0.085)	4.7 (0.166)	7 (0.247)	9.4 (0.332)	11.7 (0.413)	14.1 (0.497)
fsobdL1 (%)	40	40	36.9	32.0	27.0	26.5	26.5

Time Needed for Diagnosis: 10 seconds \times 5 time

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK when the malfunction criteria below are completed for 10 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
$\text{fsobd} = (\text{sglmd} - \text{tglm da}) + \text{faf} + \text{flaf}$	$< 19\%$

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When similar driving conditions are repeated 3 times and the result is OK.
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

Rich side malfunction

- Purge control solenoid valve control: Not allowed to purge.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

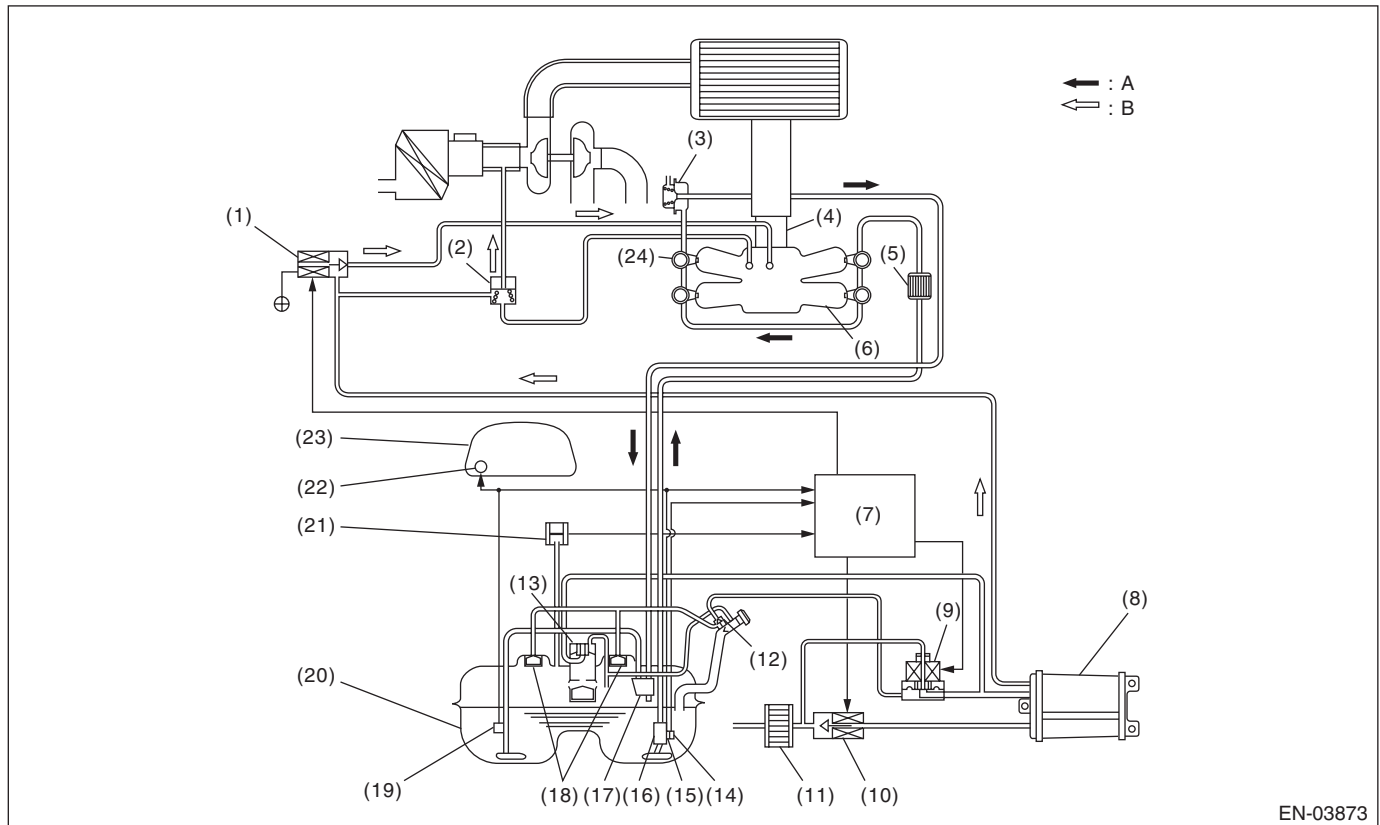
GENERAL DESCRIPTION

AI: DTC P0172 SYSTEM TOO RICH (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect fuel system malfunction by the amount of main feedback control.

FUEL SYSTEM DIAGNOSIS



EN-03873

- | | |
|-------------------------------------|--------------------------------|
| (1) Purge control solenoid valve | (14) Fuel temperature sensor |
| (2) Purge valve | (15) Fuel level sensor |
| (3) Pressure regulator | (16) Fuel pump |
| (4) Throttle body | (17) Jet pump |
| (5) Fuel filter | (18) Fuel cut valve |
| (6) Intake manifold | (19) Fuel sub level sensor |
| (7) Engine control module (ECM) | (20) Fuel tank |
| (8) Canister | (21) Fuel tank pressure sensor |
| (9) Pressure control solenoid valve | (22) Fuel gauge |
| (10) Drain valve | (23) Combination meter |
| (11) Drain filter | (24) Fuel injector |
| (12) Shut-off valve | (A) Fuel line |
| (13) Vent valve | (B) Vaporized fuel line |

Diagnostic Method

Fuel system is diagnosed by comparing the target air fuel ratio calculated by ECM with the actual air fuel ratio measured by sensor.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
A/F main learning system	In operation
Engine coolant temperature	≥ 70°C (158°F)
Engine load	≥ Value from Map 5
Intake air change during 0.5 engine revs.	≤ 0.02 g/rev
Learning value of EVAP conc. during purge	≤ 0.1
Cumulative time of canister purge after engine start	20 seconds or more
Continuous period after canister purge starting	30 seconds or more

Map 5

Engine speed (rpm)	idling	800	1200	1600	2000	2400	2800	3200	3600	4000	4400
Measured value (g(oz)/rev)	Non-turbo	0.228 (0.008)	0.22 (0.0078)	0.22 (0.0078)	0.22 (0.0078)	0.228 (0.008)	0.23 0.0081	0.234 (0.0083)	0.242 (0.0085)	0.250 (0.0088)	0.250 (0.0088)

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at idling or at a constant speed after warming up the engine.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Compare the diagnosed value (fsobd) with the threshold value, and if a condition where the malfunction criteria below are met continues for more than 50 seconds, judge that there is a fault in the fuel system.

Judgment Value

Malfunction Criteria	Threshold Value
$fsobd = (sglmd - tglmda) + faf + flaf$ where, sglmd = measured lambda tglmda = target lambda faf = Main feedback compensation coefficient (Per 64 milliseconds) flaf = main feedback learning compensation coefficient	$\leq fsobdR1$ See Map 4 fsobdR1 = rich side threshold value of fsobd

Map 4 Threshold value for fuel system malfunction criteria

Amount of air (g(oz)/s)	0	2.4(0.085)	4.7(0.166)	7(0.247)	9.4(0.332)	11.7(0.413)	14.1(0.497)
fsobdR1 (%)	-40	-40	-36.9	-32.0	-27.0	-27.0	-27.0

Time Needed for Diagnosis: 10 seconds × 5 time

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK when the malfunction criteria below continues for 10 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
$fsobd = (sglmd - tglmda) + faf + flaf$	≥ -20%

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When similar driving conditions are repeated 3 times and the result is OK.
- When “Clear Memory” is performed

7. FAIL SAFE

Rich side malfunction

- Purge control solenoid valve control: Not allowed to purge.
- Heavy fuel judgment control: Not allowed to carry out the heavy judgment.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AJ:DTC P0181 FUEL TEMPERATURE SENSOR "A" CIRCUIT RANGE/ PERFORMANCE

1. OUTLINE OF DIAGNOSIS

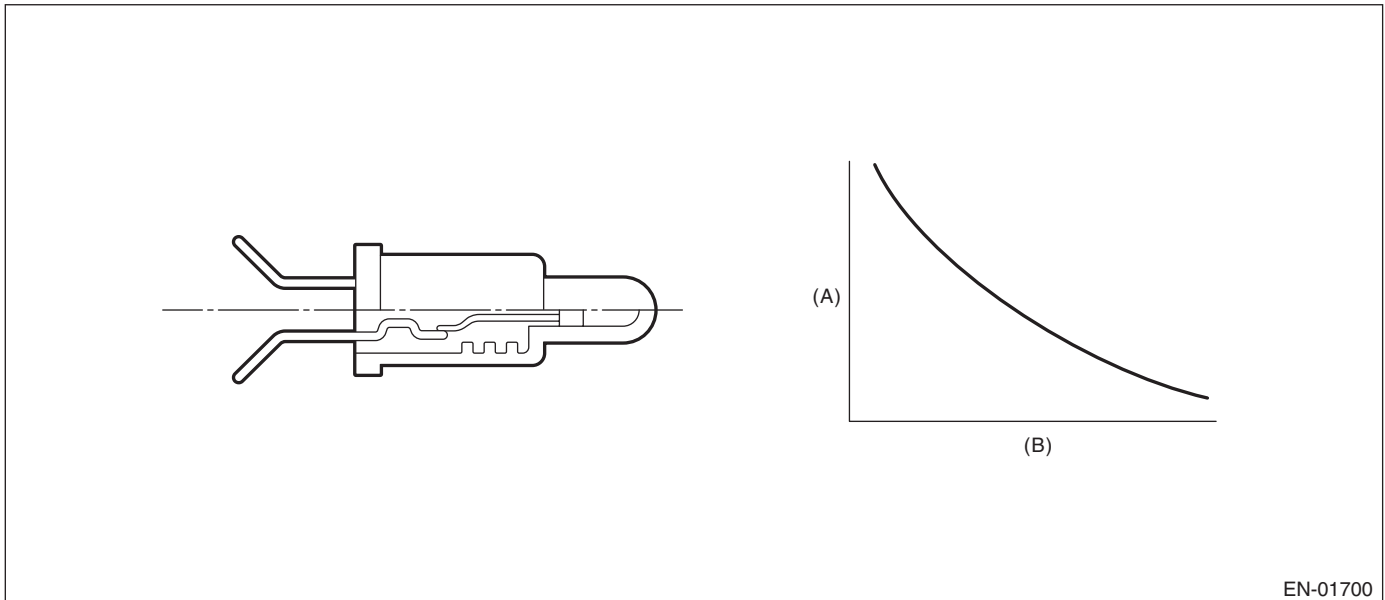
Detect faults in the fuel temperature sensor output properties.

Diagnosis is performed in two methods; drift diagnosis and stuck diagnosis. If either is NG, judge as NG. If both are OK, Judge as OK and clear the NG.

DRIFT DIAGNOSIS

Normally fuel temperature is lower than engine coolant temperature. When the fuel temperature becomes higher than the engine coolant temperature, the range is considered to be shifted, and judged as NG.

2. COMPONENT DESCRIPTION



(A) Resistance value (Ω)

(B) Temperature °C (°F)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 120 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	$\geq 9 \text{ l}$ (2.38 US gal, 1.98 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature — engine coolant temperature at engine starting	$> 10^{\circ}\text{C}$ (18°F)
Fuel temperature – Engine coolant temperature	$\geq 10^{\circ}\text{C}$ (18°F)
Battery voltage	$> 10.9 \text{ V}$

Time Needed for Diagnosis: 120 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel level	$\geq 9 \text{ l}$ (2.38 US gal, 1.98 Imp gal)
After engine starting	20 seconds or more
Engine coolant temperature — engine coolant temperature at engine starting	$> 10^{\circ}\text{C}$ (18°F)
Fuel temperature – Engine coolant temperature	$< 10^{\circ}\text{C}$ (18°F)
Battery voltage	$> 10.9 \text{ V}$
Engine coolant temperature	$< 70^{\circ}\text{C}$ (158°F)

Stuck Diagnosis

As the engine warms up (cumulative amount of intake air after starting is large), if the fuel temperature which should rise does not, determine as being stuck and NG.

6. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	20 seconds or more
Battery voltage	$> 10.9 \text{ V}$

7. GENERAL DRIVING CYCLE

Always perform diagnosis continuously after 20 seconds or more have passed since the engine started.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 550 kg (1212.8 lb)
Fuel temperature difference between Max. and Min.	< 3°C (5.4°F)

Time Needed for Diagnosis: Undetermined

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	≥ 550 kg (1212.8 lb)
Fuel temperature difference between Max. and Min.	≥ 3°C (5.4°F)

9. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

10.MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

11.FAIL SAFE

None

12.ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

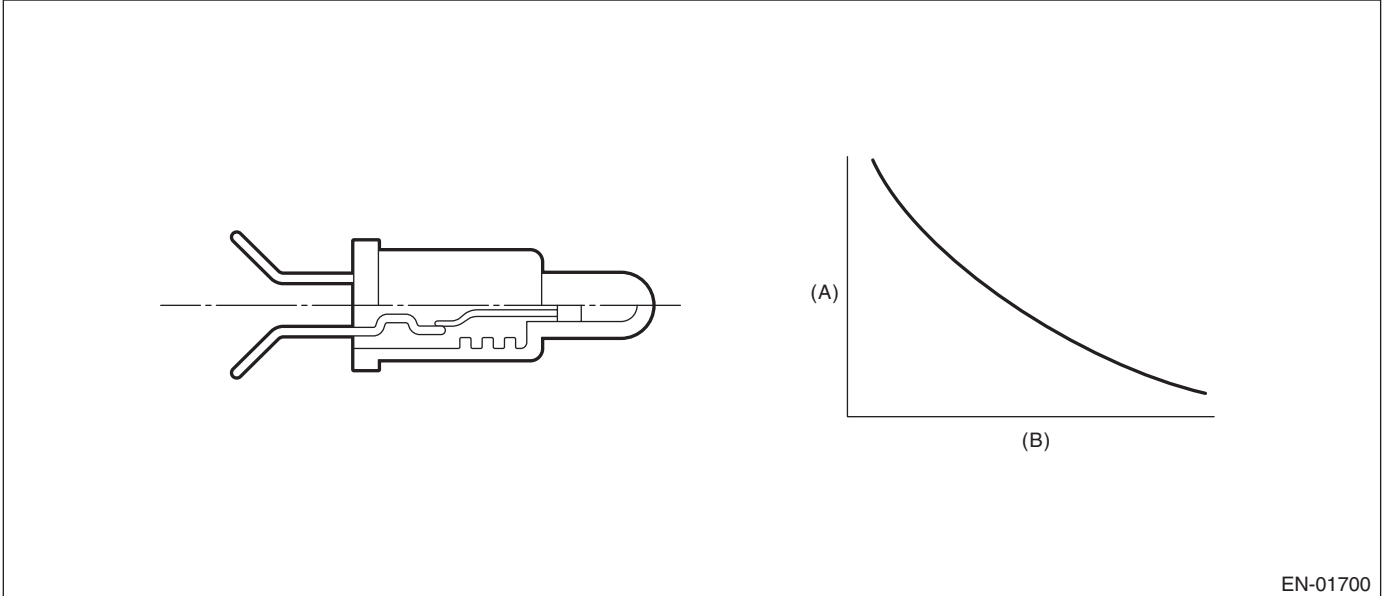
GENERAL DESCRIPTION

AK:DTC P0182 FUEL TEMPERATURE SENSOR “A” CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



(A) Resistance value (Ω)

(B) Temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$< 0.1646 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\geq 0.1646 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

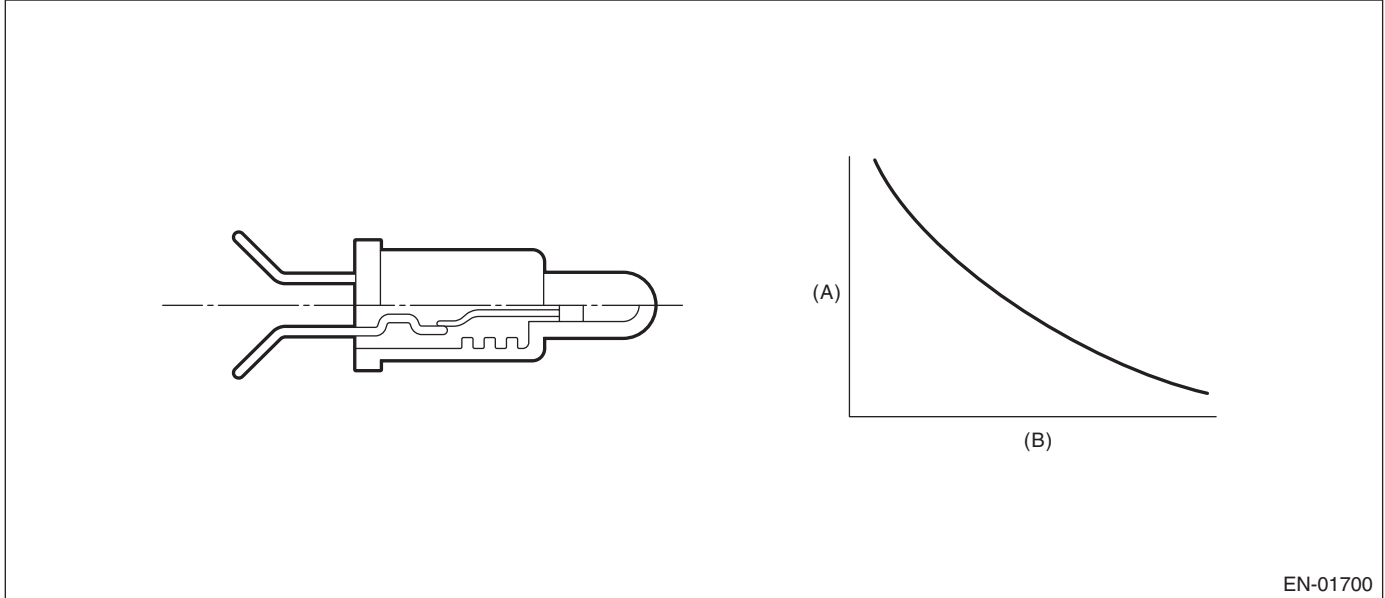
GENERAL DESCRIPTION

AL:DTC P0183 FUEL TEMPERATURE SENSOR "A" CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel temperature sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



EN-01700

(A) Resistance value (Ω)

(B) Temperature $^{\circ}\text{C}$ ($^{\circ}\text{F}$)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$\geq 4.72 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	$< 4.72 \text{ V}$
Battery voltage	$\geq 10.9 \text{ V}$

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

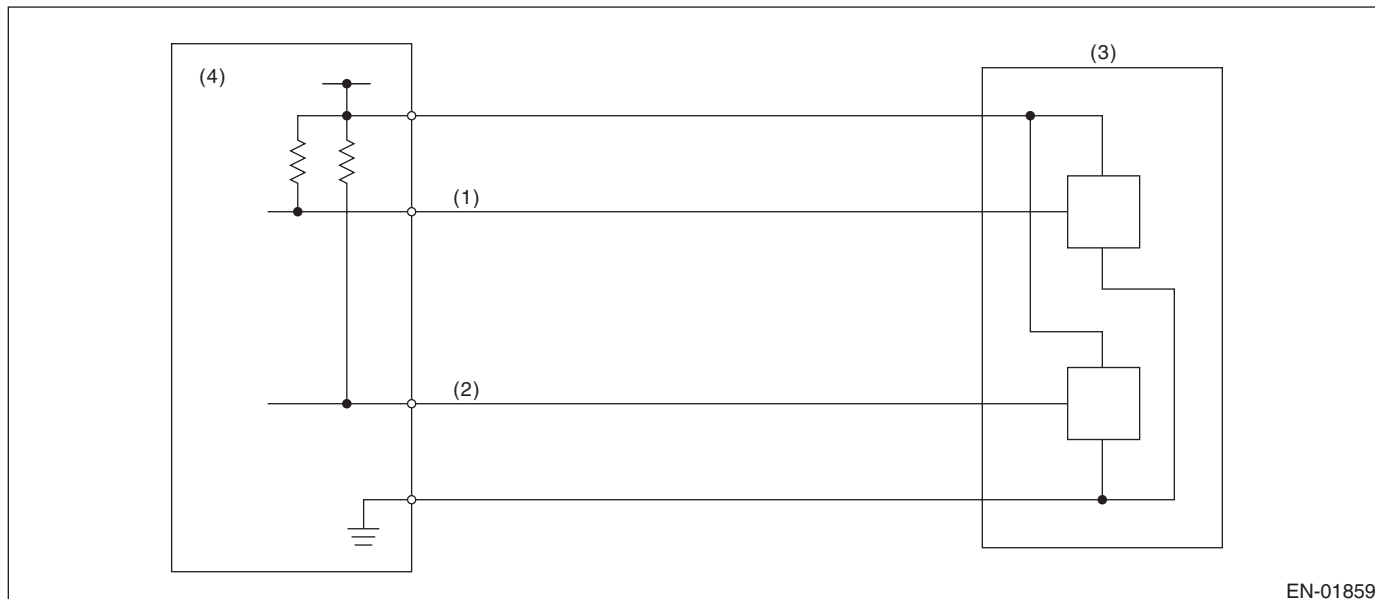
GENERAL DESCRIPTION

AM:DTC P0222 THROTTLE/PEDAL POSITION SENSOR/SWITCH “B” CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



- (1) Throttle position sensor 1 signal
- (2) Throttle position sensor 2 signal
- (3) Throttle position sensor
- (4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	> 0.224 V

Time Needed for Diagnosis: 24 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

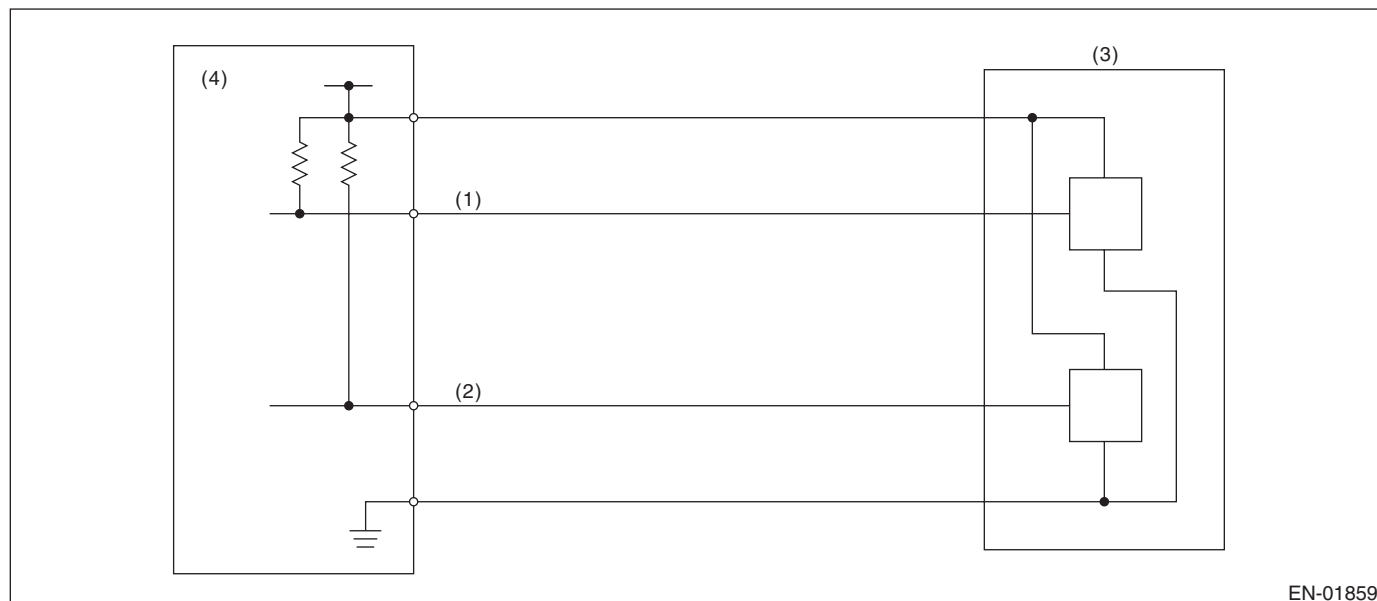
GENERAL DESCRIPTION

AN:DTC P0223 THROTTLE/PEDAL POSITION SENSOR/SWITCH "B" CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of throttle position sensor 2.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



- (1) Throttle position sensor 1 signal
- (2) Throttle position sensor 2 signal
- (3) Throttle position sensor
- (4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	< 4.851 V

Time Needed for Diagnosis: 24 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AO:DTC P0230 FUEL PUMP PRIMARY CIRCUIT

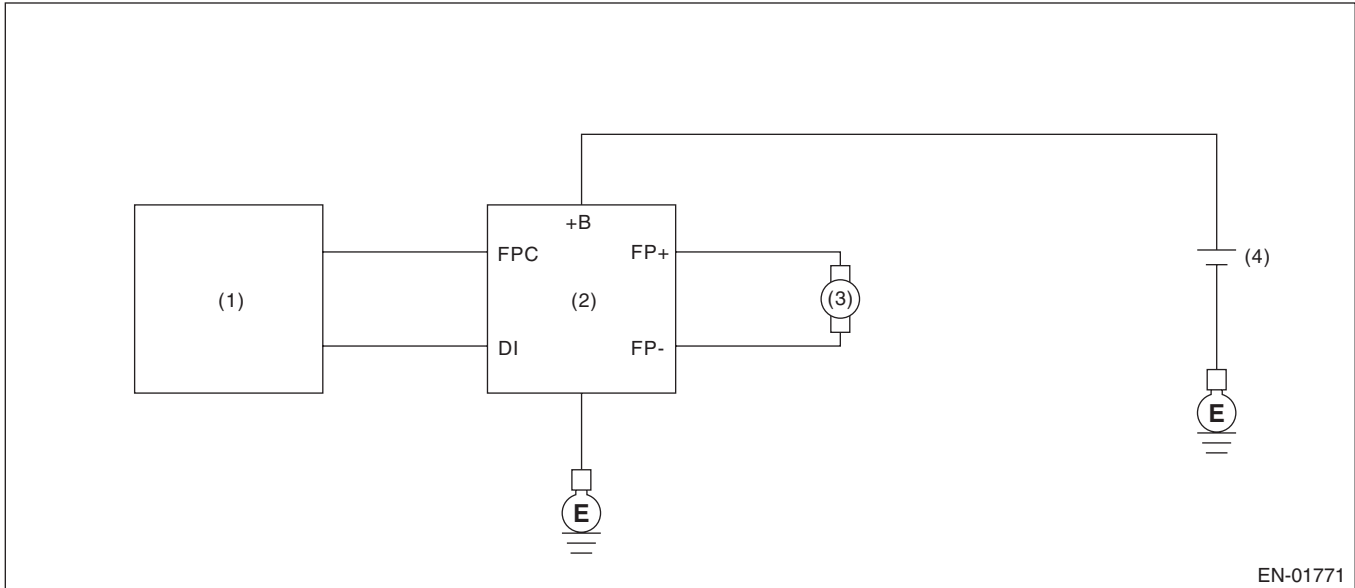
1. OUTLINE OF DIAGNOSIS

Detect the malfunction of fuel pump control unit.

Judge as NG when the NG signal is sent through a diagnostic line coming from the fuel pump control unit.

Fuel pump control unit detects the open or short circuit malfunction for each line, and then sends NG signals if one of them is found NG.

2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Fuel pump control unit
- (3) Fuel pump
- (4) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
After engine starting	30 seconds or more
Fuel pump control	ON
Fuel pump control unit output diagnosis signal	Low
Fuel level	≥ 10 ℓ (2.64 US gal, 2.2 Imp gal)

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 8 V
After engine starting	30 seconds or more
Fuel pump control	ON
Fuel pump control unit output diagnosis signal	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

OFF setting may be needed depending on the NG portion.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

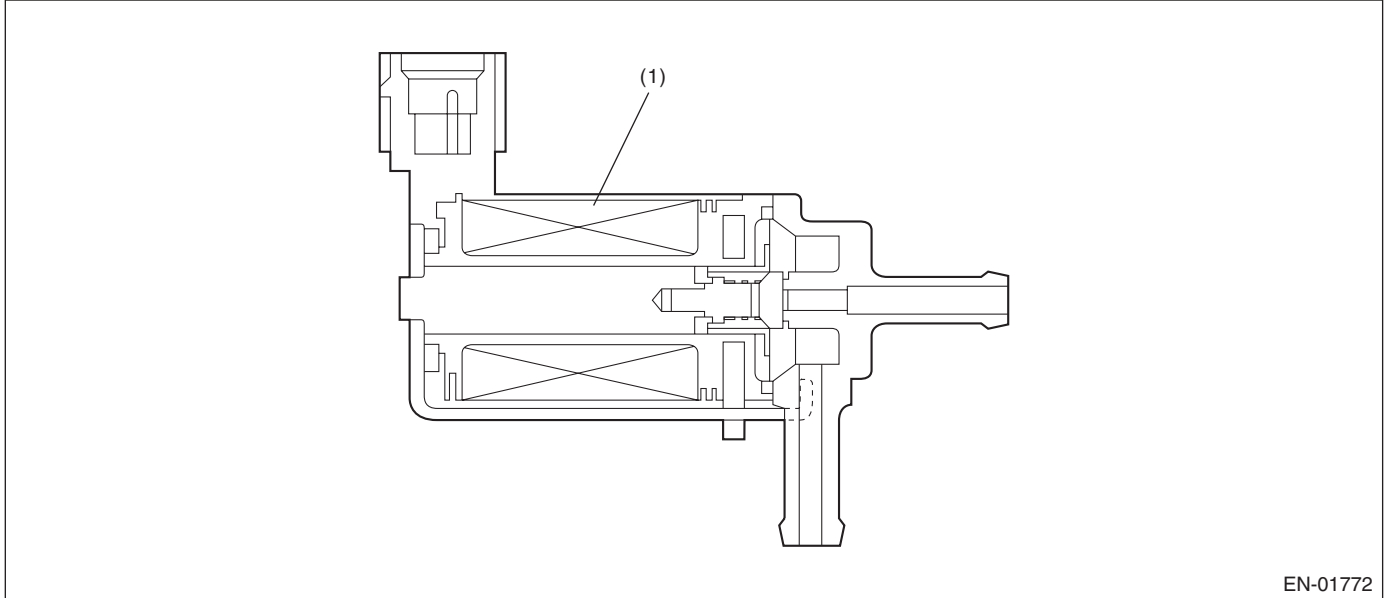
GENERAL DESCRIPTION

AP:DTC P0244 TURBO/SUPER CHARGER WASTEGATE SOLENOID “A” RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of wastegate control solenoid valve function.
Judge NG when becoming high wastegate pressure.

2. COMPONENT DESCRIPTION



(1) Coil

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 1 second or more.

Judgment Value

Malfunction Criteria	Threshold Value
Intake manifold pressure	≥ Map 10

Map 10

Atmosphere pressure (kPa (mmHg, inHg))	58.7 (440, 17.3)	67.2 (504, 19.8)	75.7 (568, 22.4)	84.2 (632, 24.9)	92.8 (696, 27.4)	101.3 (760, 29.9)
NG pressure (kPa (mmHg, inHg))	142.4 (1068, 42.1)	156.2 (1172, 46.1)	170.2 (1277, 50.3)	184.1 (1381, 54.4)	198.0 (1485, 58.5)	207.9 (1560, 61.4)
OK pressure (kPa (mmHg, inHg))	120.0 (900, 35.4)	113.8 (1004, 33.6)	147.8 (1109, 43.7)	161.7 (1213, 47.8)	175.6 (1317, 51.9)	185.6 (1392, 54.8)

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Intake manifold pressure	< Map 10

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

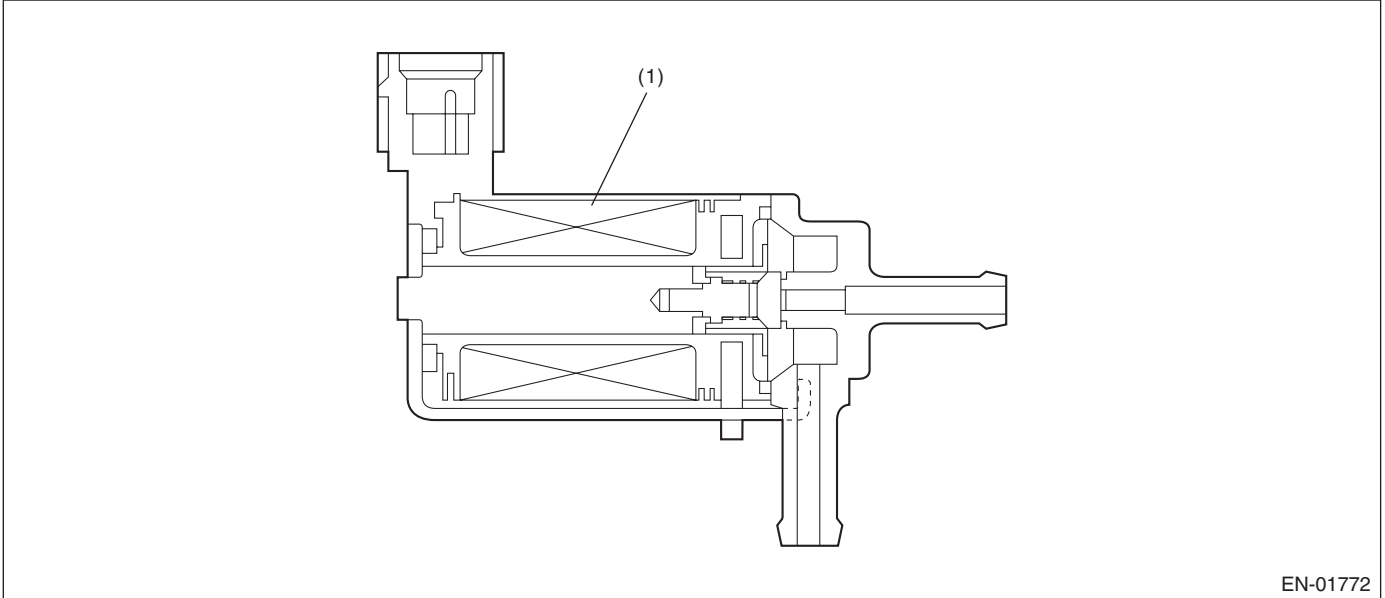
AQ:DTC P0245 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of wastegate control solenoid valve.

Judge NG when the terminal output voltage remains Low during outputting the duty signal.

2. COMPONENT DESCRIPTION



(1) Coil

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge NG when the continuous time of meeting the malfunction criteria below becomes more than 655 milliseconds.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output	Low
Duty ratio for turbocharged pressure control	< 75%

Time Needed for Diagnosis: 655 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

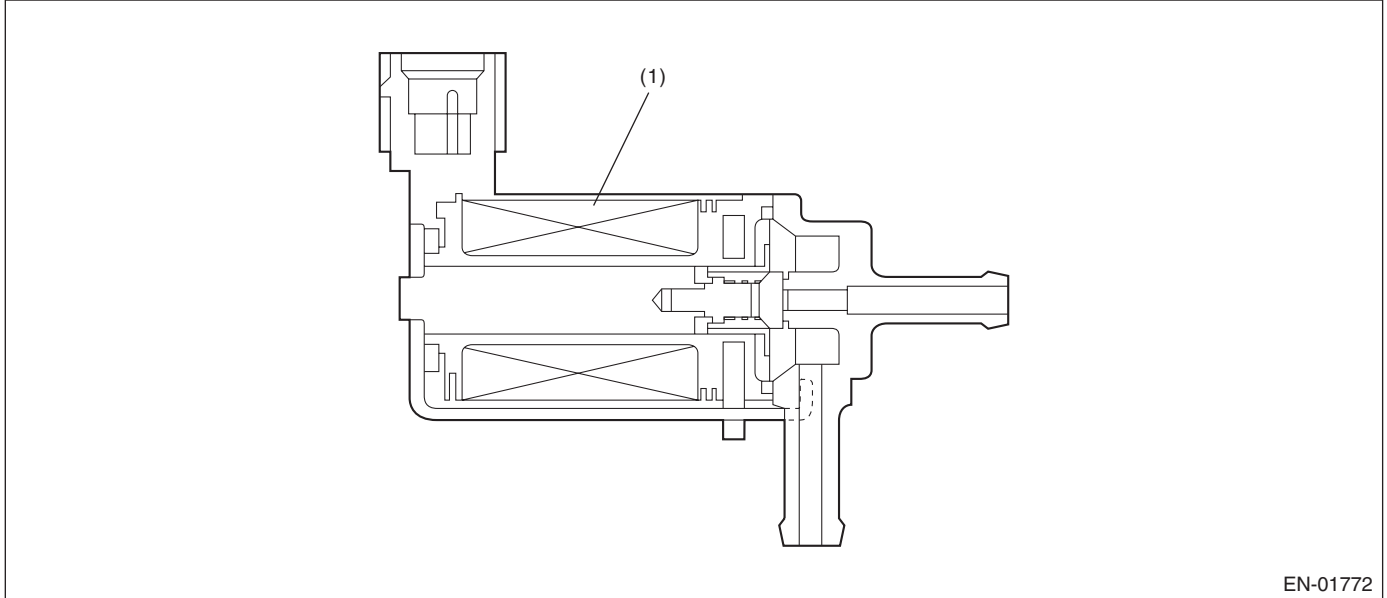
AR:DTC P0246 TURBO/SUPER CHARGER WASTEGATE SOLENOID "A" HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of wastegate control solenoid valve.

Judge NG when the terminal output voltage remains High during outputting the duty signal.

2. COMPONENT DESCRIPTION



(1) Coil

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge NG when the continuous time of meeting the malfunction criteria below becomes more than 655 milliseconds.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output	High
Duty ratio for turbocharged pressure control	> 25%

Time Needed for Diagnosis: 655 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

AS:DTC P0301 CYLINDER 1 MISFIRE DETECTED

1. OUTLINE OF DIAGNOSIS

Detect the presence of misfire occurrence. (Revolution fluctuation method)

Monitoring misfire which influences exhaust deterioration (1.5 times of FTP) and catalyst damage is made obligatory by the law. Misfire affecting these two has two patterns below.

- Intermittent misfire (The same cylinder misfires in random, or different cylinders misfire in random.): FTP 1.5 times misfire
- Every time misfire (The same cylinder misfires every time.): FTP 1.5 times misfire, Catalyst damage misfire

The following detecting methods are adopted for these detection.

1) Intermittent misfire: FTP 1.5 times misfire

- 180° Interval Difference Method (MT: 1,800 rpm or less; AT: None)
- 360° Interval Difference Method (whole range)
- 720° Interval Difference Method (3,000 rpm or more)

2) Misfire every time: FTP 1.5 times misfire, Catalyst damage misfire

- 360° Interval Difference Method

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Time for keep completing all secondary parameters	1 second or more
Intake manifold pressure change during 0.5 engine revs.	< 13.3 kPa (100 mmHg, 3.93 inHg (MT model)) < 13.3 kPa (100 mmHg, 3.93 inHg (AT model))
Engine speed change	< 1,000 rpm/32 milliseconds
Throttle position change during 16 milliseconds	< 14°
Fuel shut-off function	Not in operation
Atmosphere pressure	≥ 75.0 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9 ℓ (2.38 US gal, 1.98 Imp gal)
Evaporative system leak check	Not in operation
Engine speed	500 — 6500 rpm
Intake manifold pressure	> Value of map 3 or more
Battery voltage	≥ 8 V

Map 3

MT model

Vehicle Speed < 64.4 km/h (40 MPH)

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa	25.1	24.8	23.3	24.7	24.0	25.6	28.8	30.0	31.6	32.5	37.1	41.9	36.9	51.1
(mmHg, inHg)	(188, 7.40)	(186, 7.32)	(175, 6.89)	(185, 7.30)	(180, 7.09)	(192, 7.56)	(216, 8.51)	(225, 8.86)	(237, 9.33)	(244, 9.60)	(278, 10.96)	(314, 12.4)	(352, 10.90)	(383, 15.1)

Vehicle Speed ≥ 64.4 km/h (40 MPH)

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa	25.1	24.8	23.3	24.7	24.0	25.6	28.8	30.0	31.6	32.5	37.1	41.9	36.9	51.1
(mmHg, inHg)	(188, 7.40)	(186, 7.32)	(175, 6.89)	(185, 7.30)	(180, 7.09)	(192, 7.56)	(216, 8.51)	(225, 8.86)	(237, 9.33)	(244, 9.60)	(278, 10.96)	(314, 12.4)	(352, 10.90)	(383, 15.1)

AT model

rpm	700	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	6700
kPa	26.3	24.7	23.6	26.7	27.3	26.1	29.5	31.3	32.7	34.1	38.2	44.0	49.5	53.3
(mmHg, inHg)	(197, 7.76)	(185, 7.28)	(177, 6.97)	(200, 7.89)	(205, 8.07)	(196, 7.72)	(221.5, 8.72)	(235, 9.25)	(245.5, 9.67)	(256, 10.08)	(286.5, 11.28)	(330, 13.0)	(371.5, 14.63)	(400, 15.74)

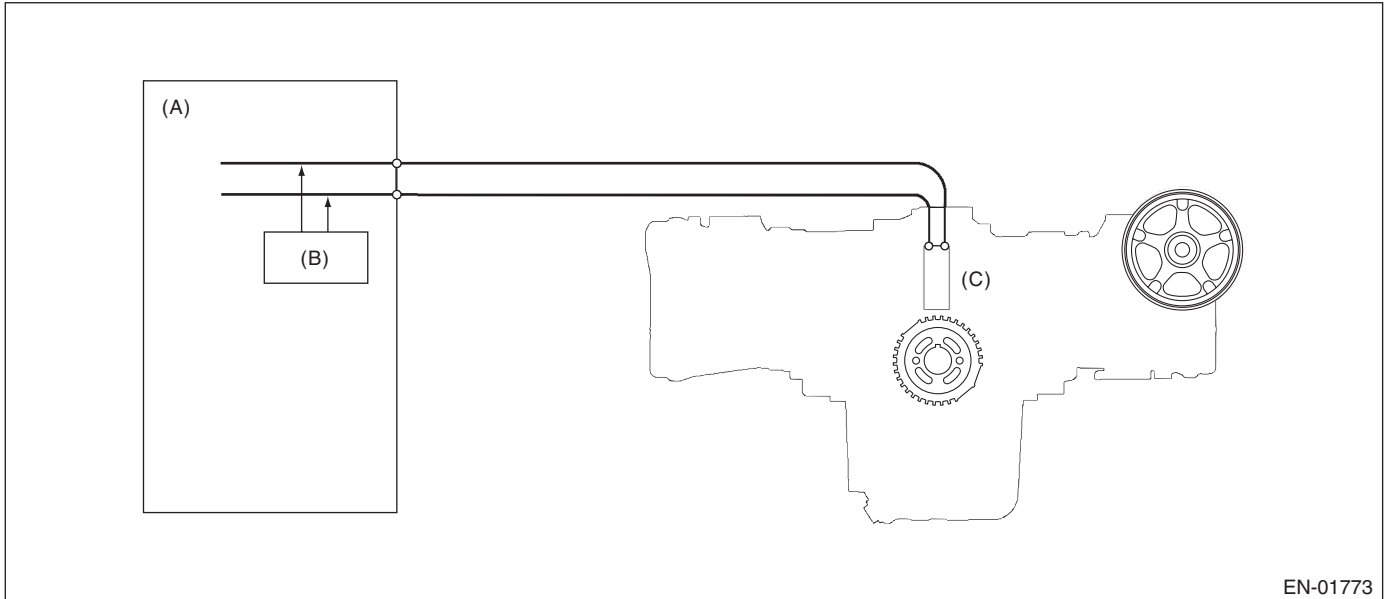
Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. GENERAL DRIVING CYCLE

- If conditions are met, detect misfire from idling to high rotation.
- Perform the diagnosis continuously.

4. DIAGNOSTIC METHOD



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- (A) Engine control module (ECM)
- (B) Diagnosis circuit
- (C) Crankshaft position sensor

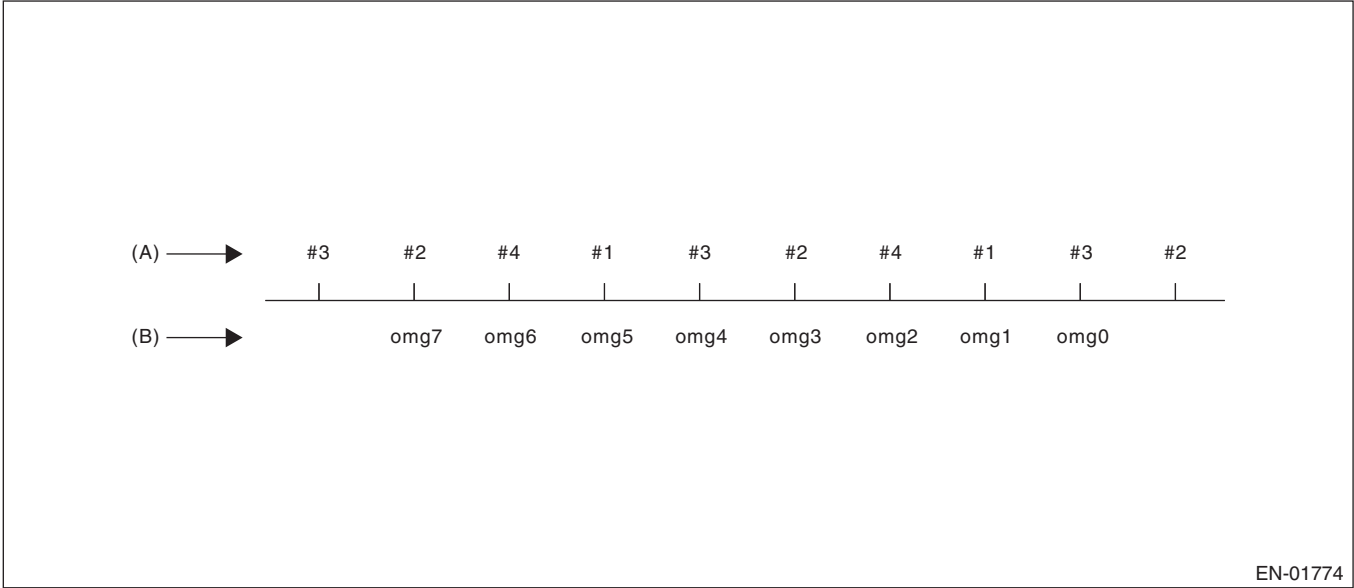
When a misfire occurs, the engine speed will decrease and the crankshaft position speed will change. Calculate the interval difference value (diagnostic value) from crankshaft position speed by the following formula, and judge whether a misfire is occurring or not comparing the calculated result with judgment value. Counting the number of misfires, if the misfire ratio is higher during 1000 rev. or 200 rev., Judge corresponding cylinders as NG.

Diagnostic value calculation (Calculate from angle speed) →	Misfire detection every single ignition (Compare diagnostic value with judgment value) →	NG judgment (Misfire occurrence judgment required by the law) (Compare number of misfire with judgment)
	<ul style="list-style-type: none"> • 180° Interval Method • 360° Interval Method • 720° Interval Method 	<ul style="list-style-type: none"> • FTP 1.5 times misfire NG judgment • Catalyst damage misfire NG judgment

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

As shown in the following figure, pick a cylinder as the standard and name it omg 0. And the former crankshaft position speed is named omg 1, the second former crankshaft position speed is named omg 2, the third is named omg 3, etc.



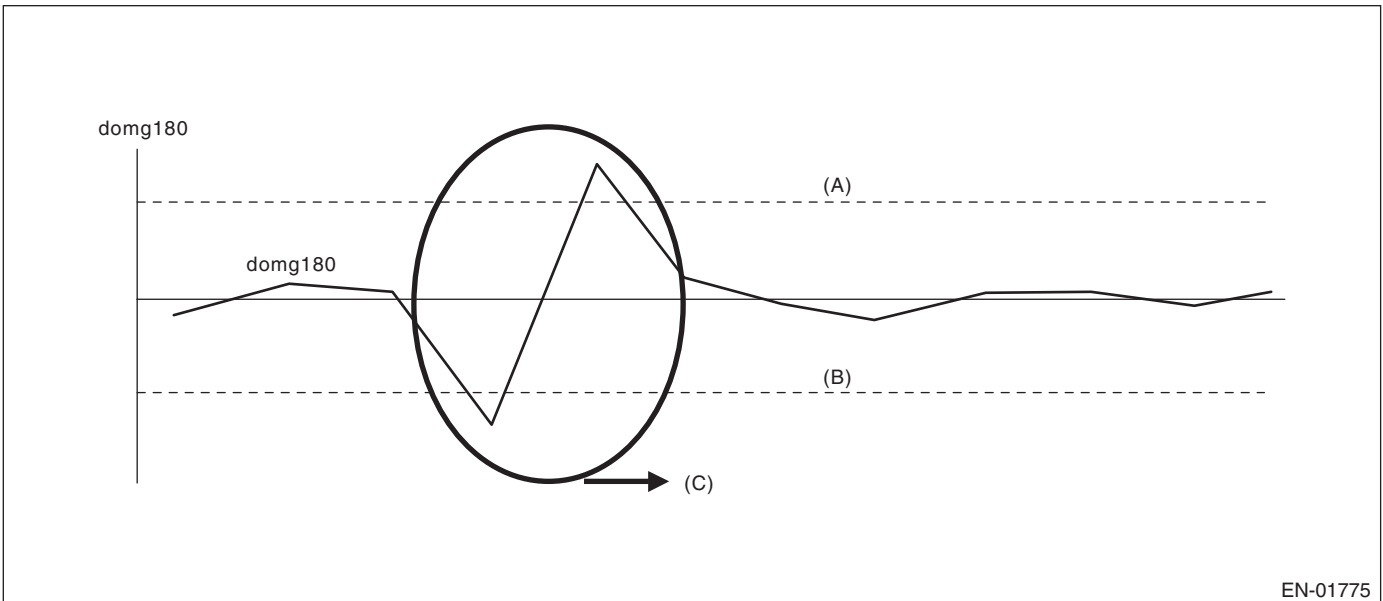
- (A) Ignition order
- (B) Crankshaft position speed

180° Interval Difference Method

$$\text{Diagnostic value } \text{domg } 180 = (\text{omg } 1 - \text{omg } 0) - (\text{omg } 7 - \text{omg } 1)/6$$

Judge as a misfire in the following cases.

- $\text{domg } 180 > \text{judgment value of positive side}$
 - $\text{domg } 180 \leq \text{judgment value of negative side}$
- (Judgment value before 180°CA)



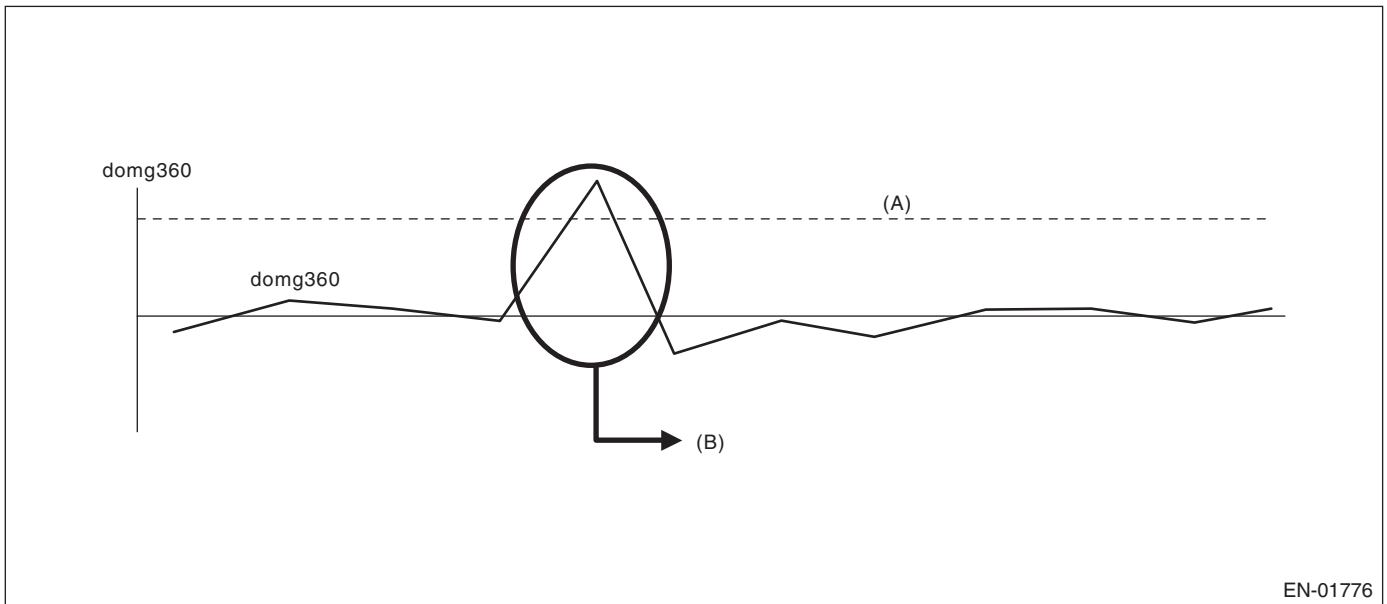
- (A) Threshold value (judgment value of the positive side)
- (B) Threshold value (judgment value of the negative side)
- (C) Judged as a misfire

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

360° Interval Difference Method

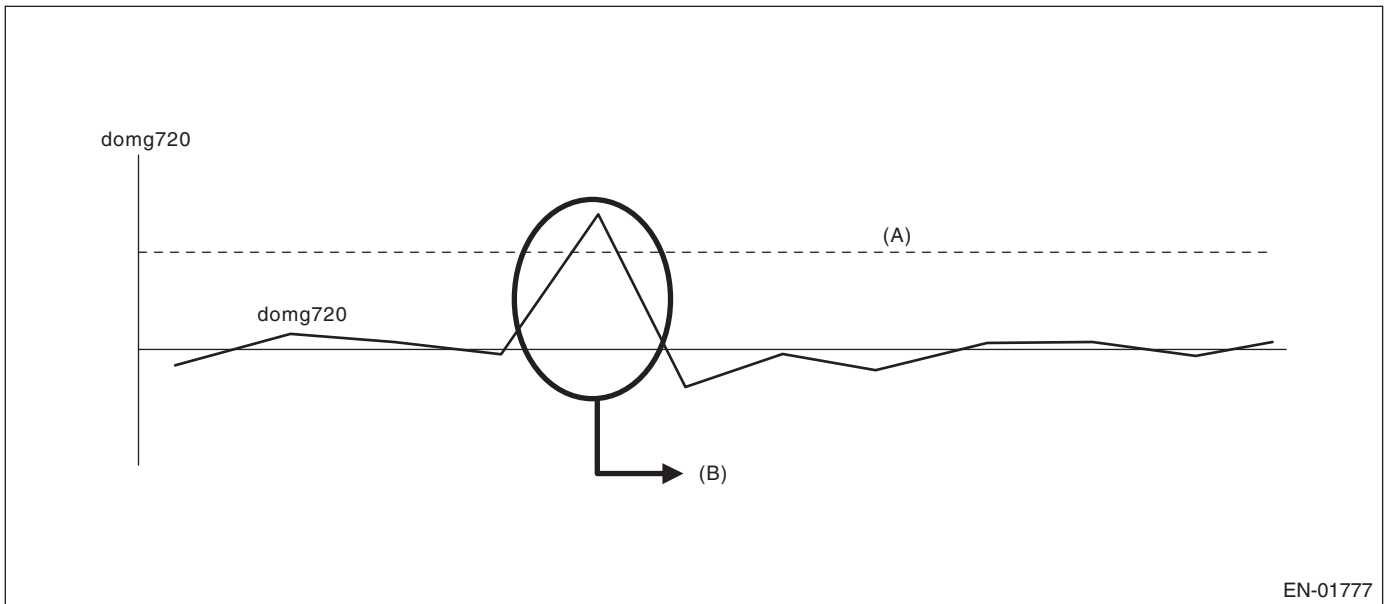
Diagnostic value	$\text{domg } 360 = (\text{omg } 1 - \text{omg } 0) - (\text{omg } 4 - \text{omg } 3)$
Misfire judgment	$\text{domg } 360 > \text{Judgment value} \rightarrow \text{Judge as misfire}$



- (A) Threshold value
- (B) Judged as a misfire

720° Interval Difference Method

Diagnostic value	$\text{domg } 720 = (\text{omg } 1 - \text{omg } 0) - (\text{omg } 7 - \text{omg } 6)$
Misfire judgment	$\text{domg } 720 > \text{Judgment value} \rightarrow \text{Judge as misfire}$



- (A) Threshold value
- (B) Judged as a misfire

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

FTP 1.5 times misfire (Misfire occurrence level which influences exhaust gas)

Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 1000 engine revs.)

Malfunction Criteria	Threshold Value
FTP emission diagnostic value	> 1.0 % in 1000 revs.

Time Needed for Diagnosis: 1000 revs.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Catalyst damage misfire (Misfire occurrence level damaging catalyst)

Judgment Value (Judge that malfunction occurs when the misfire ratio is high in 200 engine revs. (400 ignitions))

Malfunction Criteria	Threshold Value
Catalyst damage misfire judgment value	See Map 1

Map 1 Fault criteria threshold for misfire which would result in catalyst damage

%	AIR INTAKE (g/rev.)										
	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	
ENGINE SPEED (rpm)	1000	37.0	32.0	28.5	26.0	23.0	21.3	21.3	-	-	-
	1500	35.0	29.5	25.5	22.5	21.3	21.3	21.3	18.0	-	-
	2000	32.0	22.5	22.5	18.3	14.5	10.8	10.0	9.0	8.0	5.0
	2500	29.0	21.8	14.3	11.3	9.8	9.0	8.5	8.0	7.5	5.0
	3000	27.0	21.8	14.5	9.8	9.0	9.0	8.0	7.5	7.0	5.0
	3500	24.5	18.5	10.8	6.8	5.8	5.5	5.0	5.0	5.0	5.0
	4000	-	15.3	10.0	6.8	5.5	5.0	5.0	5.0	5.0	5.0
	4500	-	13.8	8.5	6.3	5.0	5.0	5.0	5.0	5.0	-
	5000	-	13.8	8.5	5.8	5.0	5.0	5.0	5.0	5.0	-
	5500	-	13.5	8.3	5.5	5.0	5.0	5.0	5.0	5.0	-
	6000	-	13.0	8.0	5.3	5.0	5.0	5.0	5.0	5.0	-
	6500	-	12.5	7.5	5.0	5.0	5.0	5.0	5.0	-	-
	6700	-	12.3	7.3	5.0	5.0	5.0	5.0	5.0	-	-

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These figures indicate the misfire rate (%) in 400 ignitions; for example, 22.5 (%) means 400 (ignition) × 22.5 (%) = 90 (ignition) misfires. This value or more is judged as a misfire.

Time Needed for Diagnosis: 200 revs.

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When a similar driving cycle is established 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

AT:DTC P0302 CYLINDER 2 MISFIRE DETECTED

NOTE:

For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4DOTC)-100, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AU:DTC P0303 CYLINDER 3 MISFIRE DETECTED

NOTE:

For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4DOTC)-100, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

AV:DTC P0304 CYLINDER 4 MISFIRE DETECTED

NOTE:

For the diagnostic procedure, refer to DTC P0301. <Ref. to GD(H4DOTC)-100, DTC P0301 CYLINDER 1 MISFIRE DETECTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

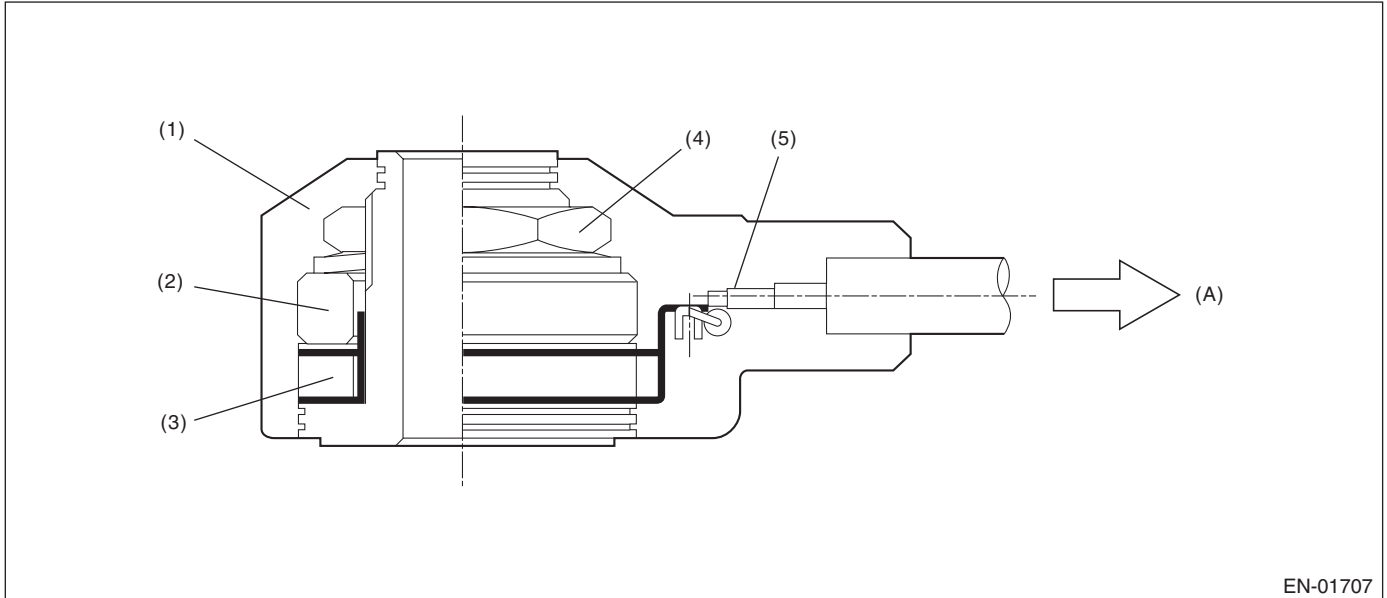
GENERAL DESCRIPTION

AW:DTC P0327 KNOCK SENSOR 1 CIRCUIT LOW (BANK 1 OR SINGLE SENSOR)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of knock sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



- (1) Case
- (2) Weight
- (3) Piezoelectric element
- (4) Nut
- (5) Resistance

(A) To knock sensor harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 1 second or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.238 V
Ignition switch	ON

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 0.238 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Knock compensation:

- Knock compensation final advance/delay angle value = knock compensation value + whole learning compensation value + portional learning compensation value
- When normal: Knock compensation value = Fixed at 0°C.A.
- Failure: Knock compensation value = -5°C.A. (5°C.A retard)
- Whole learning compensation coefficient update not allowed.
- Portional learning zone compensation value calculation not allowed.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

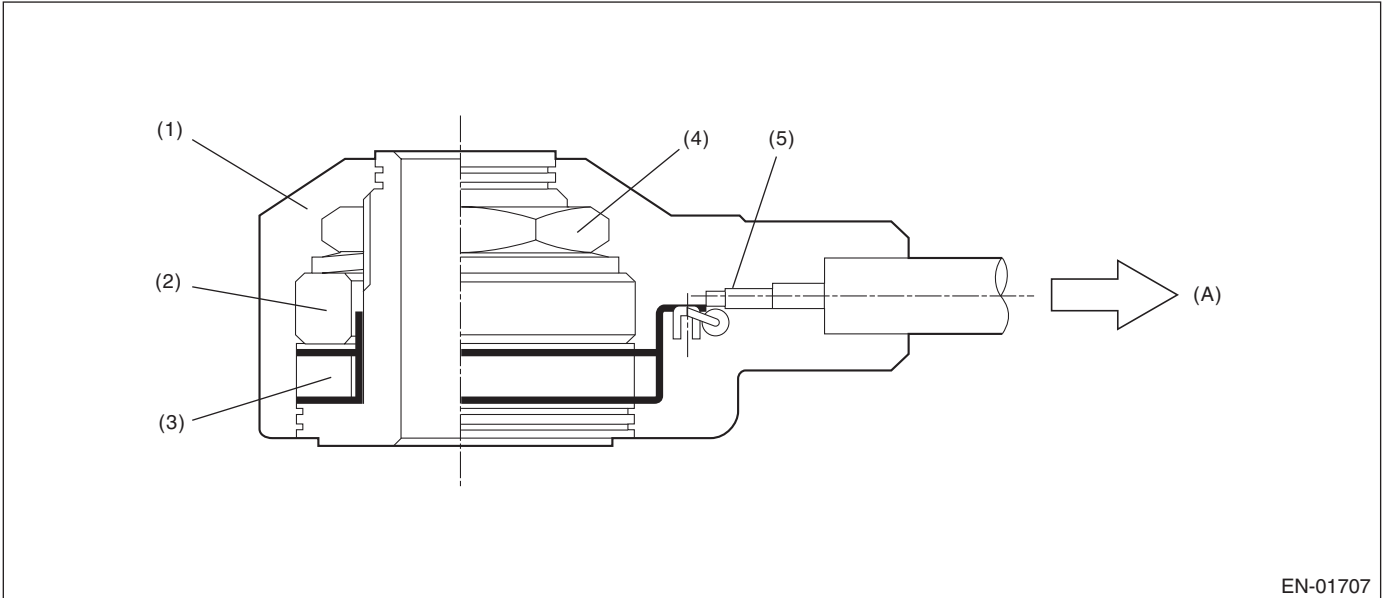
GENERAL DESCRIPTION

AX:DTC P0328 KNOCK SENSOR 1 CIRCUIT HIGH (BANK 1 OR SINGLE SENSOR)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of knock sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



- (1) Case
- (2) Weight
- (3) Piezoelectric element
- (4) Nut
- (5) Resistance

(A) To knock sensor harness

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 1 second or more.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.714 V
Ignition switch	ON

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 4.714 V
Ignition switch	ON

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Knock compensation:

- Knock compensation final advance/delay angle value = knock compensation value + whole learning compensation value + portional learning compensation value
- When normal: Knock compensation value = Fixed at 0°C.A.
- Failure: Knock compensation value = -5°C.A. (5°C.A retard)
- Whole learning compensation coefficient update not allowed.
- Portional learning zone compensation value calculation not allowed.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

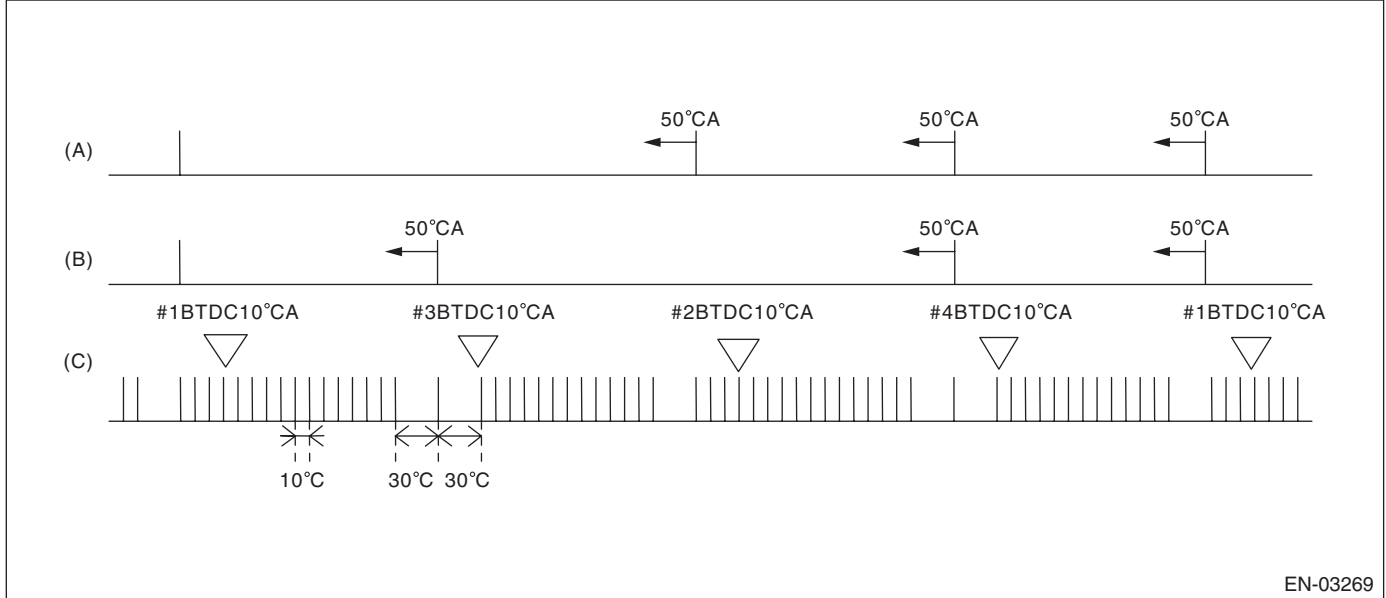
AY:DTC P0335 CRANKSHAFT POSITION SENSOR "A" CIRCUIT

1. OUTLINE OF DIAGNOSIS

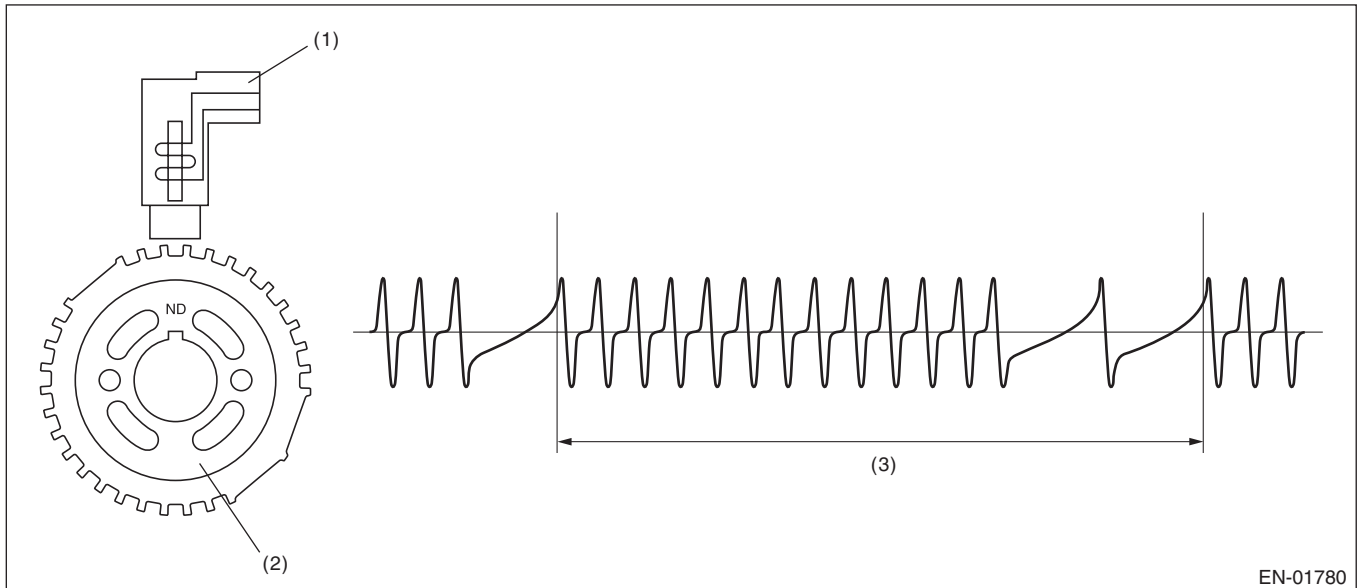
Detect the open or short circuit of the crankshaft position sensor.

Judge as NG when the crank signal is not input even though the starter was turned on.

2. COMPONENT DESCRIPTION



- (A) Camshaft signal (RH)
- (B) Camshaft signal (LH)
- (C) Crankshaft signal



- (1) Crankshaft position sensor
- (2) Crank sprocket
- (3) Crankshaft half-turn

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Starter switch	ON
Crankshaft position sensor signal	Not detected
Battery voltage	≥ 8 V

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK when the continuous time while meeting the malfunction criteria below is 3 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Crankshaft position sensor signal	Input exists
Battery voltage	≥ 8 V

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

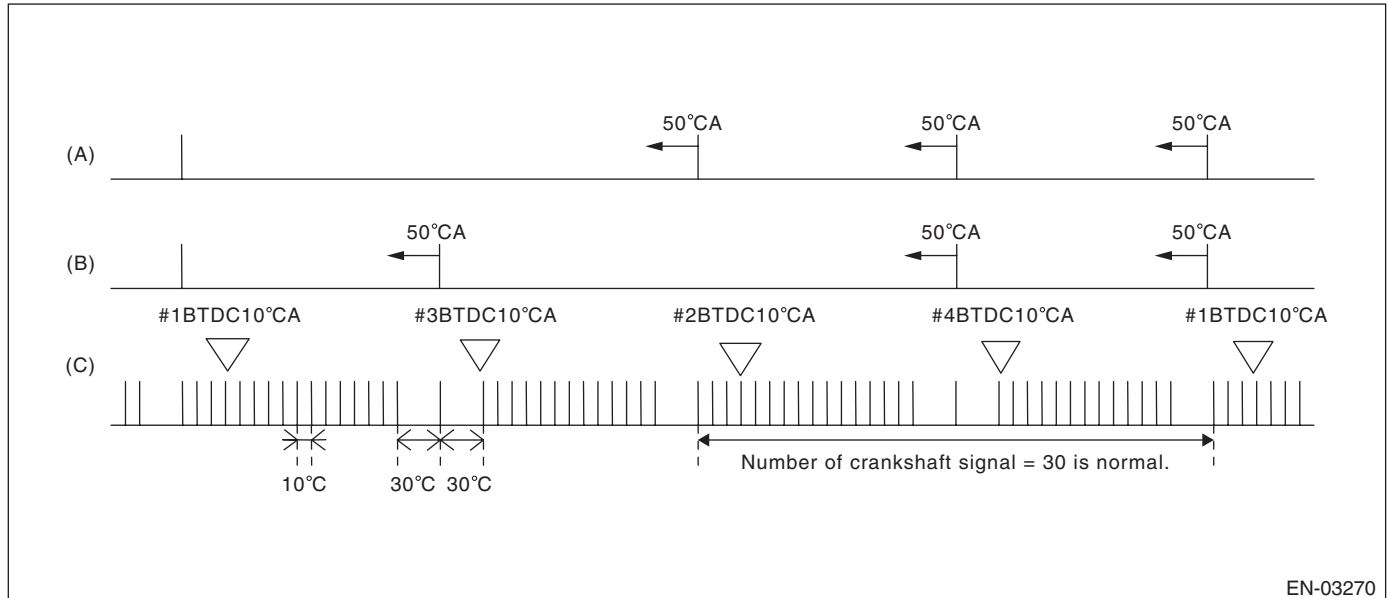
AZ:DTC P0336 CRANKSHAFT POSITION SENSOR "A" CIRCUIT RANGE/ PERFORMANCE

1. OUTLINE OF DIAGNOSIS

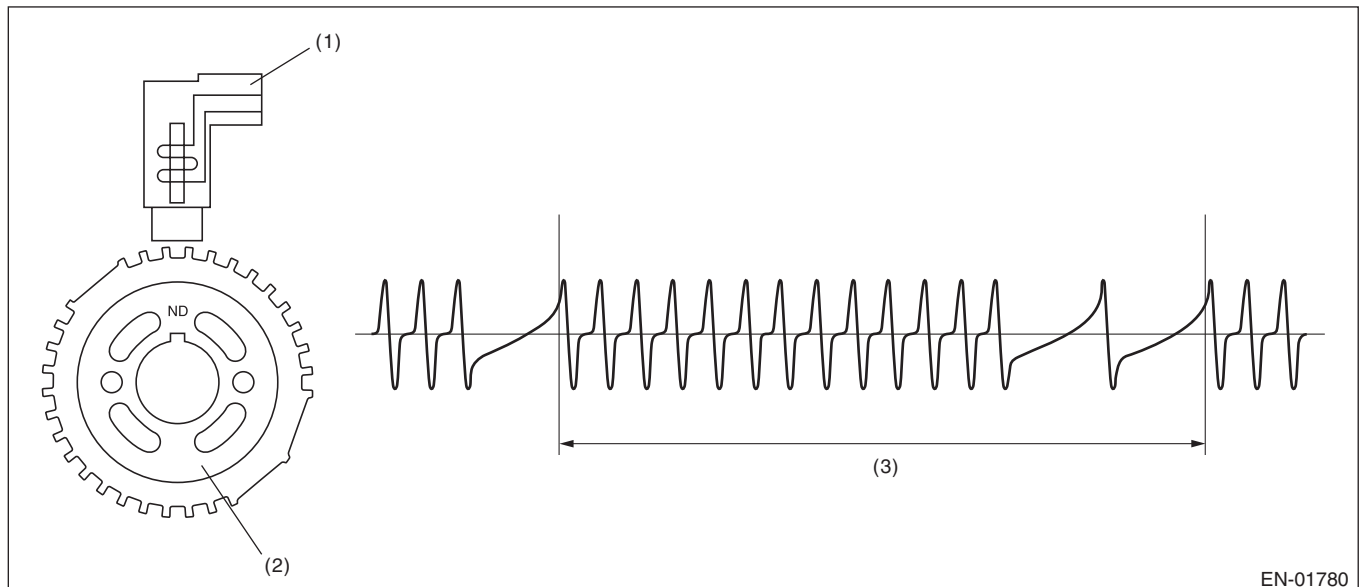
Detect for faults in crankshaft position sensor output properties.

Judge as NG when there is a problem in the number of crankshaft signals for every revolution.

2. COMPONENT DESCRIPTION



- (A) Camshaft signal (RH)
- (B) Camshaft signal (LH)
- (C) Crankshaft signal



- (1) Crankshaft position sensor
- (2) Crank sprocket
- (3) Crankshaft half-turn

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 8 V
Engine speed	< 3000 rpm

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously under 3000 rpm engine speed.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when all the malfunction criteria below are completed more than 10 times in a row.

Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number identification	Completed
Number of crankshaft position sensor signal during 1 rev.	Not = 30

Time Needed for Diagnosis: 10 engine revs.

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when all the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Cylinder number distinction	Completed
Number of crankshaft position sensor signal during 1 rev.	= 30

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

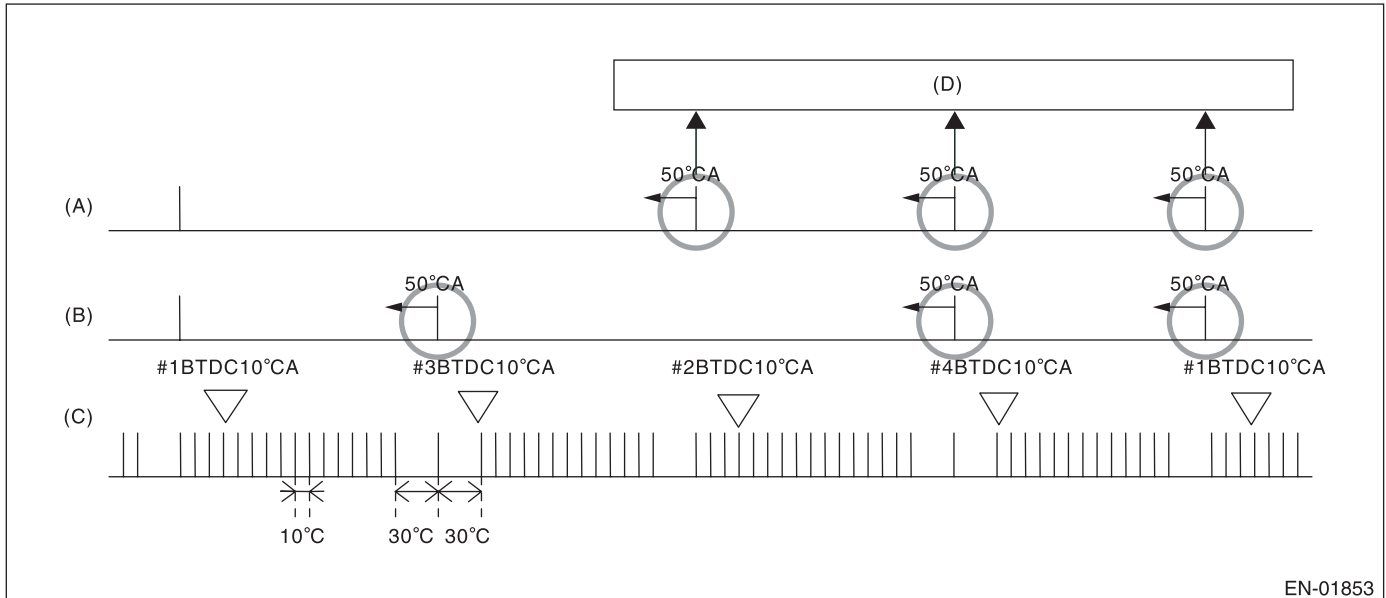
BA:DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the camshaft position sensor.

Judge as NG when the number of camshaft signals remains abnormal.

2. COMPONENT DESCRIPTION



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- (A) Camshaft signal (RH)
- (B) Camshaft signal (LH)
- (C) Crankshaft signal
- (D) Number of camshaft position signals = When normal, there will be 3 cam signals for every 2 engine revolutions.

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Voltage	$\geq 8 \text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

When normal, there should be 3 cam signals per 2 engine revolutions. If a condition where it is not 3 times continues, It is judged as NG.

When the engine speed is over 100 rpm, if the following conditions are established it is judged as NG. Judge as OK and clear the NG when the following criteria are not established.

Judgment Value

Malfunction Criteria	Threshold Value
Number of camshaft sensor signals during 2 revs.	Not = 3
Engine speed	≥ 600 rpm

Time Needed for Diagnosis: 100 revs.

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the following criteria are established.

Judgment Value

Malfunction Criteria	Threshold Value
Number of camshaft angle sensor signals during 2 revs.	3

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

- Ignition timing whole learning compensation:
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment from abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
 - Enter the initial value (0°CA) to the compensation value of partial learning zone with IG OFF.
 - Enter the initial value (0°CA) to the compensation value of the partial learning zone when making a normality judgment → abnormality judgment.
- AVCS control:
 - Maximum timing retard learning is not complete or maximum timing retard learning completion is not experienced.
 - ⇒ ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
 - Make the OCV driving Duty to be the given value (9.36%).

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

BB:DTC P0345 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 2)

NOTE:

For diagnostic procedure, refer to DTC P0340. <Ref. to GD(H4DOTC)-114, DTC P0340 CAMSHAFT POSITION SENSOR "A" CIRCUIT (BANK 1 OR SINGLE SENSOR), Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BC:DTC P0410 SECONDARY AIR INJECTION SYSTEM

1. OUTLINE OF DIAGNOSIS

Detect NG of the secondary air supply pipe pressure, secondary air supply pipe pressure pulse, and secondary air piping flow.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Estimate ambient temperature	4.4°C (39.92°F)
Battery voltage	7 V
Atmosphere pressure	563 mmHg
Engine	In operation
Pump supply pressure check	
Amount of intake air	≥ 2 g (0.07 oz)/sec.
Secondary air pump	In operation
Combination valve	One bank is open. (Except when both banks are open.)
Pulse check with one combination valve closed	
Diagnosable range	≥ 1 (Refer to Map10)
After fuel cut	≥ 500 milliseconds
Pulse check with both combination valves closed	
Engine load	≥ 0.2 g (0.007 oz)/rev
After fuel cut	≥ 500 milliseconds
Pressure check when switching combination valve	
Amount of intake air	≥ 2 g (0.07 oz)/sec. and ≤ 20 g (0.7 oz)/sec.
Engine speed	< 4000 rpm
After fuel cut	≥ 500 milliseconds

3. GENERAL DRIVING CYCLE

Perform diagnosis while secondary pump is operating

4. DIAGNOSTIC METHOD

Measure secondary air supply pipe pressure, secondary air supply pipe pressure pulse, and secondary air piping flow.

Pump supply pressure check

Perform the functional diagnosis of the system by checking the increased pressure value when the secondary air pump is ON in relation to the pressure value when the pump is OFF.

Pulse check with one combination valve closed

When the right combination valve is closed, perform diagnosis of the left combination valve for stuck closed by supply piping pressure pulse.

When the left combination valve is closed, perform diagnosis of the right combination valve for stuck closed by supply piping pressure pulse.

Pulse check with both combination valves closed

When both left and right combination valves are closed, perform the diagnosis of both left and right combination valves for stuck opened by supply pipe pressure pulse. Determine which valve is stuck opened by comparing secondary air flow rate with right combination valve closed and secondary air flow rate with left combination valve closed.

Pressure check when switching combination valve

When the right combination valve is switched from closed position to open position, perform the diagnosis of the right combination valve for the stuck closed by change of the supply pipe pressure.

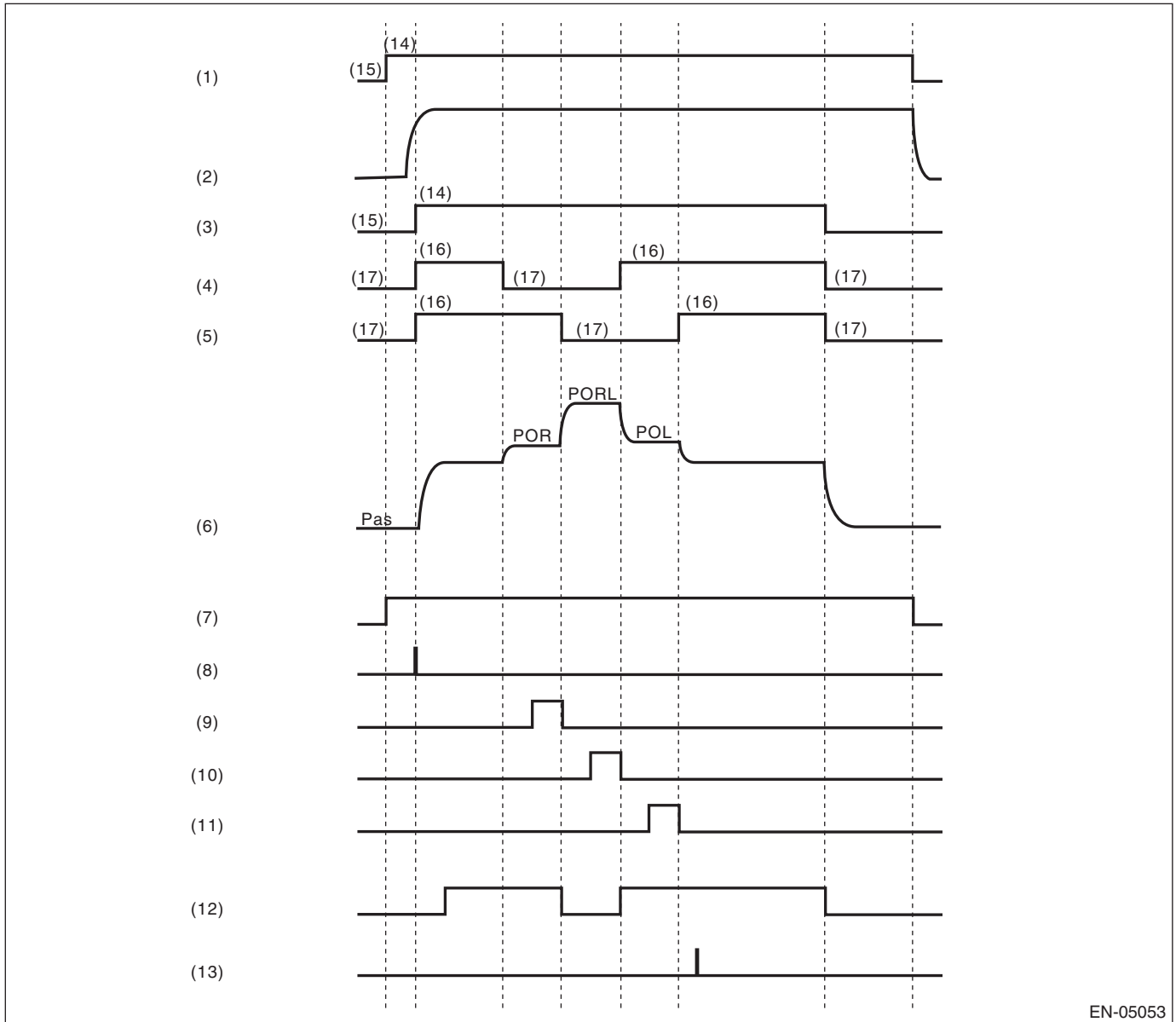
When the left combination valve is switched from open position to closed position, perform the diagnosis of the left combination valve for the stuck closed by change of the supply pipe pressure.

Check for excessive air flow

Perform the diagnosis of the secondary air system for air flow error by the secondary air flow rate with the right combination valve closed and secondary air flow rate with the left combination valve closed.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION



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- | | | |
|--|---|--|
| (1) IG | (8) Atmospheric pressure before secondary air control (Pas) measurement | (12) Pump supply pressure check (judgment) |
| (2) Ne | (9) Right bank shut off pressure (POR) measurement | (13) Flow amount check (judgment) |
| (3) Secondary air pump drive condition | (10) Both bank shut off pressure (PURL) measurement | (14) ON |
| (4) E-COMB valve (Right) condition | (11) Left bank shut off pressure (POL) measurement | (15) OFF |
| (5) E-COMB valve (Left) condition | | (16) Open |
| (6) Secondary air supply piping pressure (psi) | | (17) Close |
| (7) Diagnosis execution conditions | | |

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Judgment Value

Pump supply pressure check

When the secondary air pump is switched from OFF to ON, the pump supply pressure should increase. Judge as NG when the pressure does not increase.

If the following conditions are met, judge as NG. If the following conditions are not met, judge as OK, and clear the NG.

Malfunction Criteria	Threshold Value	DTC
Secondary air supply pipe pressure (after atmospheric pressure compensation)	< 1 kPa (7 mmHg, 0.3 inHg)	P0410

Pulse check with one combination valve closed

Calculate the voltage pulse of the pump supply piping pressure when the right combination valve is closed and left combination valve is open. The integrated value should be large because the left combination valve is open and there are pulses of the pump supply piping pressure. If the value is small, diagnose the left combination valve as stuck closed.

If the following conditions are met, judge as NG. If the following conditions are not met, judge as OK, and clear the NG.

Malfunction Criteria	Threshold Value	DTC
Integrated value of pulse when the right combination valve is closed	< Value of Map 1	P2443

Calculate the voltage pulse of the pump supply piping pressure when the left combination valve is closed and right combination valve is open. The integrated value should be large because the right combination valve is open and there are pulses of the pump supply piping pressure. If the value is small, diagnose the right combination valve as stuck closed.

If the following conditions are met, judge as NG. If the following conditions are not met, judge as OK, and clear the NG.

Malfunction Criteria	Threshold Value	DTC
Integrated value of pulse when the left combination valve is closed	< Value of Map 2	P2441

Pulse check with both combination valves closed

Calculate the voltage pulse of the pump supply piping pressure when both left and right combination valves are closed. The integrated value should be small because both combination valves are closed and there are no pulse of supply piping pressure. If the integrated value is large, diagnose either of left of right combination valves as stuck open.

Determine which valve is stuck opened by comparing secondary air flow rate with right combination valve closed and secondary air flow rate with left combination valve closed. The flow rate of combination valve that is stuck open will be high.

If the following conditions are met, judge as NG. If the following conditions are not met, judge as OK, and clear the NG.

Malfunction Criteria	Threshold Value	DTC
Integrated value of pulse when both left and right combination valves are closed	> Value of Map 3	P2440
Flow rate when the right bank is closed (value of Map 4)	\geq Flow rate when the left bank is closed (value of Map 5)	
Integrated value of pulse when both left and right combination valves are closed	> Map 3	P2442
Flow rate when the left bank is closed (value of Map 5)	> Flow rate when the right bank is closed (value of Map 4)	

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Pressure check when switching combination valve

When the left combination valve is switched from open position to closed position, the supply pipe pressure should change. If the value change little, diagnose the left combination valve as stuck closed.

If the following conditions are met, judge as NG. If the following conditions are not met, judge as OK, and clear the NG.

Malfunction Criteria	Threshold Value	DTC
Changed value when the left combination valve is switched	< Value of Map 6	P2443

When the right combination valve is switched from closed position to open position, the supply pipe pressure should change. If the value change little, diagnose the right combination valve as stuck closed.

If the following conditions are met, judge as NG. If the following conditions are not met, judge as OK, and clear the NG.

Malfunction Criteria	Threshold Value	DTC
Changed value when the right combination valve is switched	< Value of Map 7	P2441

Check for excessive air flow

If the secondary air flow rate when the right combination valve is closed, or the secondary air flow rate when the left combination valve is closed becomes too large, diagnose as secondary air system air flow error.

Malfunction Criteria	Threshold Value	DTC
Flow rate when the right bank is closed (value of Map 4) or Flow rate when the left bank is closed (value of Map 4)	> Map 8 > Map 9	P0411
Voltage when PORL is measured – voltage when POR is measured	≤ 4 V	
Voltage when PORL is measured – voltage when POL is measured	≤ 4 V	

PORL: Both bank shut off pressure
 POR: Right bank shut off pressure
 POL: Left bank shut off pressure

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Map 1

Engine speed (rpm) Amount of intake air (g (oz)/s)	1000	1500	2000	2100	4000
15 (0.53)	2	2	2	1.04	1.04
20 (0.71)	2	2	2	1.04	1.04
25 (0.88)	2	2	2	1.04	1.04
30 (1.06)	1.04	2	1.6	1.04	1.04
35 (1.23)	1.04	1.8	1.3	1.04	1.04
(V)					

Map 2

Engine speed (rpm) Amount of intake air (g (oz)/s)	1000	1500	2000	2100	4000
15 (0.53)	2	2	2	1.04	1.04
20 (0.71)	2	2	2	1.04	1.04
25 (0.88)	2	2	2	1.04	1.04
30 (1.06)	1.04	1.04	1.04	1.04	1.04
35 (1.23)	1.04	1.04	1.04	1.04	1.04
(V)					

Map 3

Intake air (g (oz)/rev)	0.1 (0.004)	0.3 (0.011)	0.35 (0.012)	1 (0.04)
Threshold value (V)	12	12	4	4

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Map 4

Secondary air pressure in the pipe when both comb. valve is closing kPa (mmHg, inHg) Secondary air pressure in the pipe when LH comb. valve is closing kPa (mmHg, inHg)	69.3 (520, 20.47)	74.7 (560, 22.06)	80.0 (600, 23.63)	85.3 (640, 25.19)	90.7 (680, 26.79)	96.0 (720, 28.35)	101.3 (760, 29.92)	106.7 (800, 31.51)	112.0 (840, 33.08)	117.3 (880, 34.64)	122.7 (920, 36.24)	128.0 (960, 37.80)	133.3 (1000, 39.37)	138.7 (1040, 40.96)	144.0 (1080, 42.53)	149.3 (1120, 44.09)
69.3 (520, 20.47)	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2400	2400	2400
74.7 (560, 22.06)	-200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2400	2400
80.0 (600, 23.63)	-400	-200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2400
85.3 (640, 25.19)	-600	-400	-200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400
90.7 (680, 26.79)	-800	-600	-400	-200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200
96.0 (720, 28.35)	-1000	-800	-600	-400	-200	0	200	400	600	800	1000	1200	1400	1600	1800	2000
101.3 (760, 29.92)	-1200	-1000	-800	-600	-400	-200	0	200	400	600	800	1000	1200	1400	1600	1800
106.7 (800, 31.51)	-1400	-1200	-1000	-800	-600	-400	-200	0	200	400	600	800	1000	1200	1400	1600
112.0 (840, 33.08)	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0	200	400	600	800	1000	1200	1400
117.3 (880, 34.64)	-1800	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0	200	400	600	800	1000	1200
122.7 (920, 36.24)	-2000	-1800	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0	200	400	600	800	1000
128.0 (960, 37.80)	-2200	-2000	-1800	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0	200	400	600	800
133.3 (1000, 39.37)	-2400	-2200	-2000	-1800	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0	200	400	600
138.7 (1040, 40.96)	-2400	-2400	-2200	-2000	-1800	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0	200	400
144.0 (1080, 42.53)	-2400	-2400	-2400	-2200	-2000	-1800	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0	200
149.3 (1120, 44.09)	-2400	-2400	-2400	-2400	-2200	-2000	-1800	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0
(L/min)																

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Map 5

Secondary air pressure in the pipe when both comb. valve is closing kPa (mmHg, inHg) Secondary air pressure in the pipe when RH comb. valve is closing kPa (mmHg, inHg)	69.3 (520, 20.47)	74.7 (560, 22.06)	80.0 (600, 23.63)	85.3 (640, 25.19)	90.7 (680, 26.79)	96.0 (720, 28.35)	101.3 (760, 29.92)	106.7 (800, 31.51)	112.0 (840, 33.08)	117.3 (880, 34.64)	122.7 (920, 36.24)	128.0 (960, 37.80)	133.3 (1000, 39.37)	138.7 (1040, 40.96)	144.0 (1080, 42.53)	149.3 (1120, 44.09)
69.3 (520, 20.47)	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2400	2400	2400
74.7 (560, 22.06)	-200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2400	2400
80.0 (600, 23.63)	-400	-200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400	2400
85.3 (640, 25.19)	-600	-400	-200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200	2400
90.7 (680, 26.79)	-800	-600	-400	-200	0	200	400	600	800	1000	1200	1400	1600	1800	2000	2200
96.0 (720, 28.35)	-1000	-800	-600	-400	-200	0	200	400	600	800	1000	1200	1400	1600	1800	2000
101.3 (760, 29.92)	-1200	-1000	-800	-600	-400	-200	0	200	400	600	800	1000	1200	1400	1600	1800
106.7 (800, 31.51)	-1400	-1200	-1000	-800	-600	-400	-200	0	200	400	600	800	1000	1200	1400	1600
112.0 (840, 33.08)	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0	200	400	600	800	1000	1200	1400
117.3 (880, 34.64)	-1800	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0	200	400	600	800	1000	1200
122.7 (920, 36.24)	-2000	-1800	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0	200	400	600	800	1000
128.0 (960, 37.80)	-2200	-2000	-1800	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0	200	400	600	800
133.3 (1000, 39.37)	-2400	-2200	-2000	-1800	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0	200	400	600
138.7 (1040, 40.96)	-2400	-2400	-2200	-2000	-1800	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0	200	400
144.0 (1080, 42.53)	-2400	-2400	-2400	-2200	-2000	-1800	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0	200
149.3 (1120, 44.09)	-2400	-2400	-2400	-2400	-2200	-2000	-1800	-1600	-1400	-1200	-1000	-800	-600	-400	-200	0

(L/min)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Map 6

Amount of intake air when LH comb. valve switches (g (oz)/s) Battery voltage when LH comb. valve switches (V)	10 (0.35)	12.5 (0.441)	15 (0.53)	17.5 (0.617)	20 (0.71)
11	0.05	0.05	0.04	0.03	0.03
12	0.05	0.05	0.05	0.05	0.04
13	0.05	0.05	0.05	0.05	0.05
14	0.05	0.05	0.05	0.05	0.05
(V)					

Map 7

Amount of intake air when RH comb. valve switches (g (oz)/s) Battery voltage when RH comb. valve switches (V)	10 (0.35)	12.5 (0.441)	15 (0.53)	17.5 (0.617)	20 (0.71)
11	0.05	0.05	0.04	0.03	0.03
12	0.05	0.05	0.05	0.05	0.04
13	0.05	0.05	0.05	0.05	0.05
14	0.05	0.05	0.05	0.05	0.05
(V)					

Map 8

Amount of intake air when POR is measuring (g (oz)/s) Battery voltage when POR measuring (V)	2 (0.07)	4 (0.14)	6 (0.21)	8 (0.28)	10 (0.35)	12 (0.42)	14 (0.49)	16 (0.56)	18 (0.63)
10.5	290	290	290	290	290	290	290	290	290
11.5	330	330	330	330	330	330	330	330	330
12.5	370	370	370	370	370	370	370	370	370
13.5	420	420	420	420	420	420	420	420	420
14.5	470	470	470	470	470	470	470	470	470
15.5	520	520	520	520	520	520	520	520	520
(L/min)									

Map 9

Amount of intake air when POL is measuring (g (oz)/s) Battery voltage when POL measuring (V)	2 (0.07)	4 (0.14)	6 (0.21)	8 (0.28)	10 (0.35)	12 (0.42)	14 (0.49)	16 (0.56)	18 (0.63)
10.5	290	290	290	290	290	290	290	290	290
11.5	330	330	330	330	330	330	330	330	330
12.5	370	370	370	370	370	370	370	370	370
13.5	420	420	420	420	420	420	420	420	420
14.5	470	470	470	470	470	470	470	470	470
15.5	520	520	520	520	520	520	520	520	520
(L/min)									

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Map 10

Amount of intake air (g (oz)/s) Engine speed (rpm)	10 (0.35)	15 (0.53)	35 (1.23)	50 (1.76)
500	0	1	1	0
1000	0	1	1	0
4000	0	1	1	0
5000	0	0	0	0

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

BD:DTC P0411 SECONDARY AIR INJECTION SYSTEM INCORRECT FLOW DETECTED

NOTE:

For the diagnostic procedure, refer to DTC P0410. <Ref. to GD(H4DOTC)-116, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BE:DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "A" CIRCUIT OPEN

1. OUTLINE OF DIAGNOSIS

Judge as NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

When the continuous time with following conditions being established exceeds 2.5 seconds, it is judged as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK when the following conditions are established, and clear the NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs OFF signal	High

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BF:DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE "A" CIRCUIT SHORTED

1. OUTLINE OF DIAGNOSIS

Judge as NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

When the continuous time with following conditions being established exceeds 2.5 seconds, it is judged as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK when the following conditions are established, and clear the NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs ON signal	Low

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BG:DTC P0416 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT OPEN

NOTE:

For the diagnostic procedure, refer to DTC P0413. <Ref. to GD(H4DOTC)-126, DTC P0413 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT OPEN, Diagnostic Trouble Code (DTC) Detecting Criteria.>

BH:DTC P0417 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “B” CIRCUIT SHORTED

NOTE:

For the diagnostic procedure, refer to DTC P0414. <Ref. to GD(H4DOTC)-127, DTC P0414 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE “A” CIRCUIT SHORTED, Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BI: DTC P0418 SECONDARY AIR INJECTION SYSTEM CONTROL "A" CIRCUIT OPEN

1. OUTLINE OF DIAGNOSIS

Judge as NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

When the continuous time with following conditions being established exceeds 2.5 seconds, it is judged as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK when the following conditions are established, and clear the NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs OFF signal	High

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BJ:DTC P0420 CATALYST SYSTEM EFFICIENCY BELOW THRESHOLD (BANK 1)

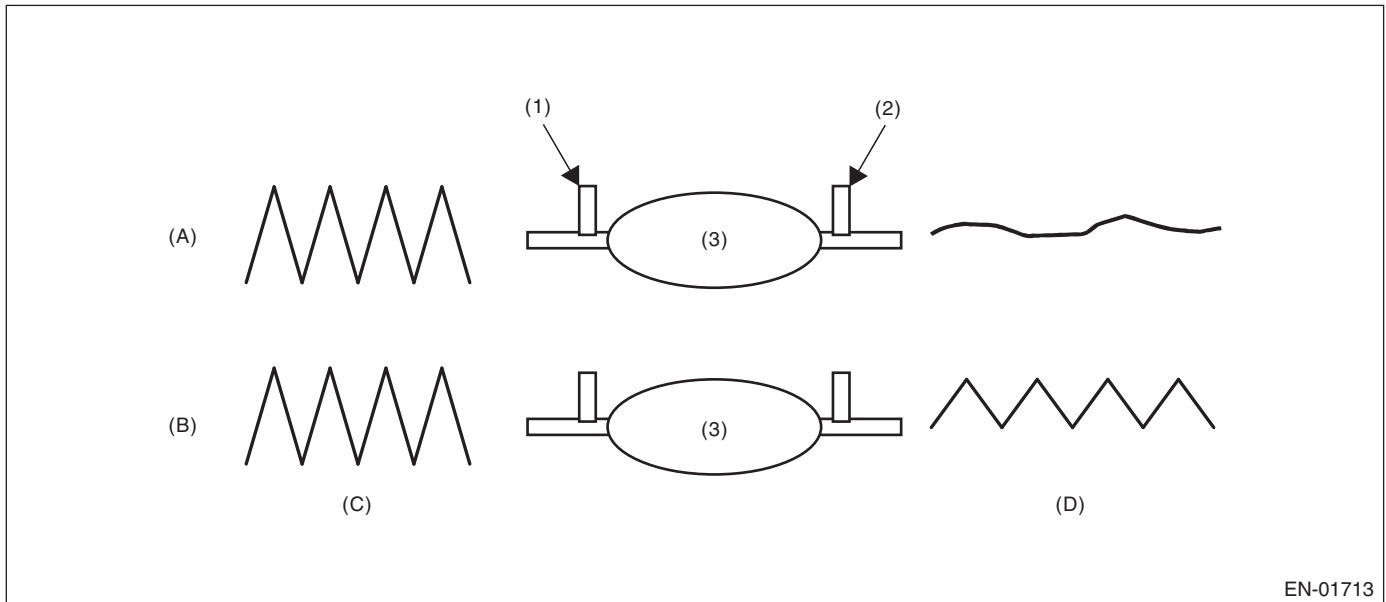
1. OUTLINE OF DIAGNOSIS

Detect the deterioration of the catalyst function.

Though the rear oxygen sensor output would change slowly with a new catalyst, the sensor output with a deteriorated catalyst becomes high and the inversion time is shortened.

For this reason, the catalyst diagnosis is carried out by monitoring the rear oxygen sensor output and comparing it with the front oxygen A/F sensor output.

2. COMPONENT DESCRIPTION



EN-01713

- (1) Front oxygen (A/F) sensor
- (2) Rear oxygen sensor
- (3) Catalytic converter

- (A) Normal
- (B) Deterioration
- (C) Output waveform from the front oxygen (A/F) sensor
- (D) Output waveform from the rear oxygen sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	> 10.9 V
Atmosphere pressure	> 75.0 kPa (563 mmHg, 22.2 inHg)
Engine coolant temperature	≥ 70°C (158°F)
Misfire detection during 200 revs.	< 5 times
Learning value of evaporation gas density	< 0.20
Sub feedback	In operation
Evaporative system diagnosis	Not in operation
Time of difference (< 0.10) between actual and target lambda	1000 milliseconds or more
Vehicle speed	≥ 70 km/h (47 MPH)
Amount of intake air	12 — 40 g/s
Engine load change every 0.5 engine revs.	< 0.02 g/rev
Rear oxygen output change from lower than to higher than 600 mV	Experienced after fuel cut
After engine starting	≥ 235 sec.
Accumulative time of canister purge operation after engine starting	≥ 19.9 sec.
Estimated catalyst layer temperature	≥ 580°C (1076°F)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. GENERAL DRIVING CYCLE

After warm-up, perform the diagnosis only once at a constant 75 km/h (47 MPH).

5. DIAGNOSTIC METHOD

After the execution criterias are established, calculate the output fluctuation value of front oxygen (A/F) sensor and output fluctuation value of rear oxygen sensor. Calculate the diagnosis value when the front oxygen (A/F) sensor output fluctuation value is more than specified value. A/F response properties and diagnosis values are parameters for the judgment value.

Judge as NG when the malfunction criteria below are met. Judge as OK if the criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated variation of rear oxygen sensor output voltage per 32 milliseconds divided by lambda accumulated variation of the front oxygen (A/F) sensor per 32 milliseconds	≥ 12.6

Time Needed for Diagnosis: 33 — 55 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

BK:DTC P0441 EVAPORATIVE EMISSION SYSTEM INCORRECT PURGE FLOW

NOTE:

For the diagnostic procedure, refer to DTC P0442. <Ref. to GD(H4DOTC)-132, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

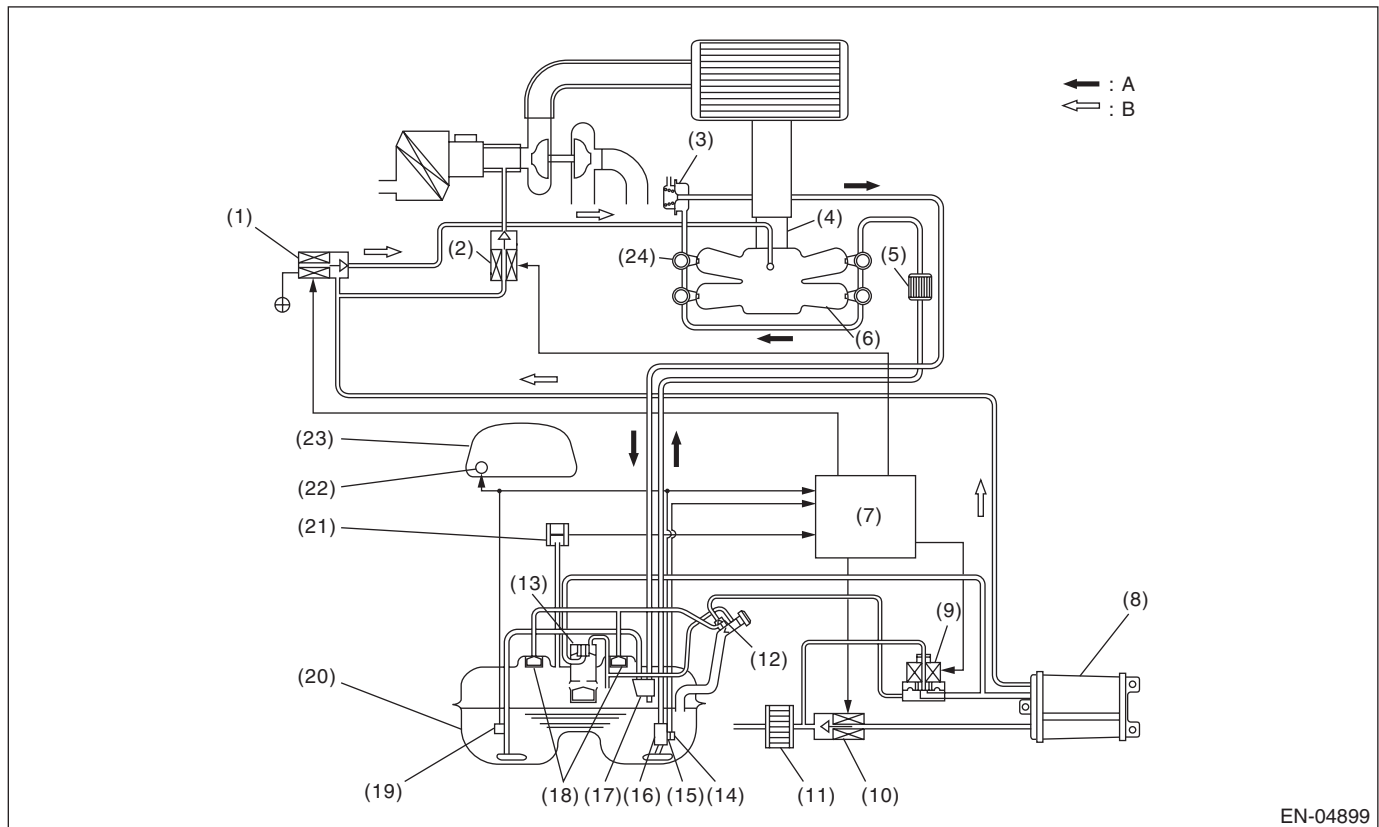
Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BL:DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)

1. OUTLINE OF DIAGNOSIS

Check if there is a leakage in fuel system or not, and perform the function diagnosis of valve.



EN-04899

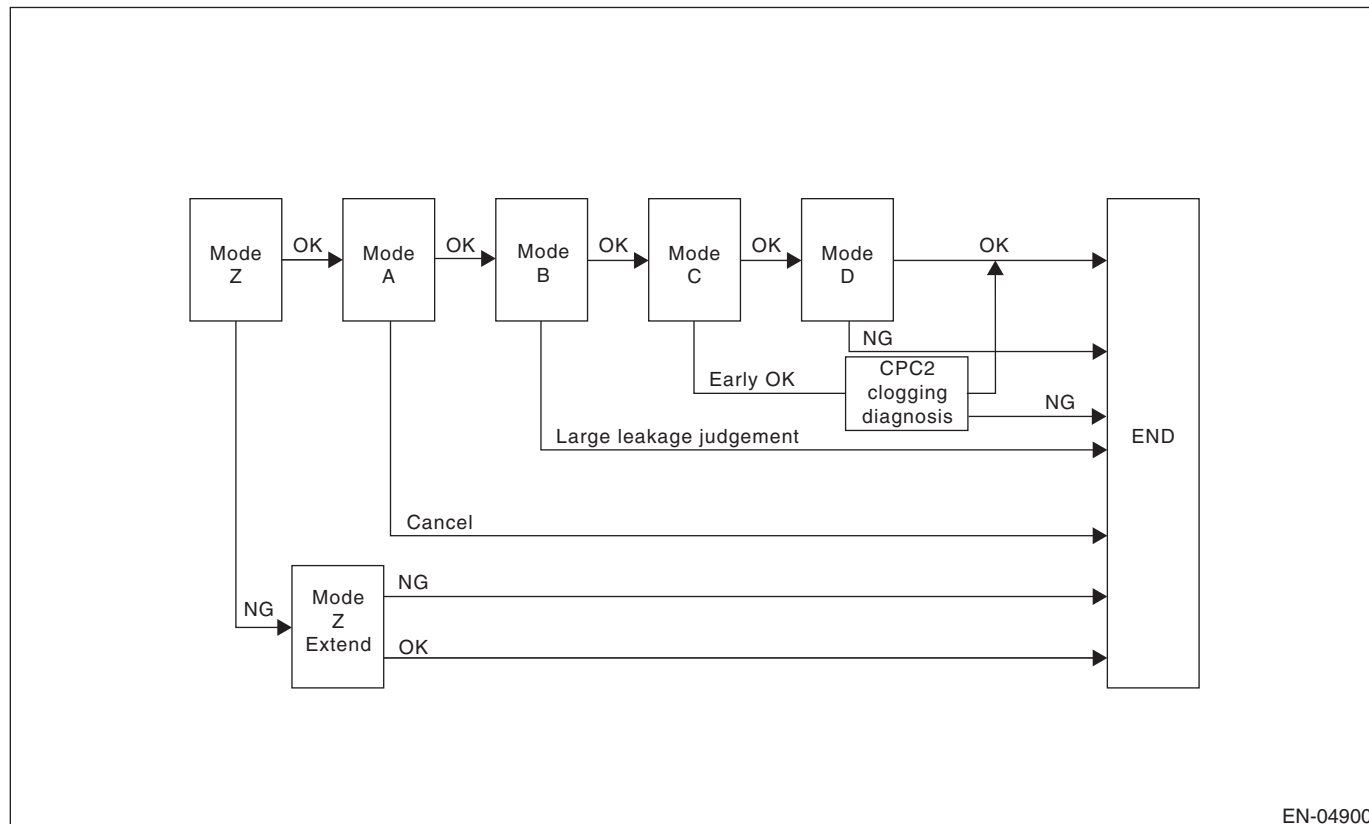
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|-------------------------------------|--------------------------------|
| (1) Purge control solenoid valve | (14) Fuel temperature sensor |
| (2) Purge control solenoid valve 2 | (15) Fuel level sensor |
| (3) Pressure regulator | (16) Fuel pump |
| (4) Throttle body | (17) Jet pump |
| (5) Fuel filter | (18) Fuel cut valve |
| (6) Intake manifold | (19) Fuel sub level sensor |
| (7) Engine control module (ECM) | (20) Fuel tank |
| (8) Canister | (21) Fuel tank pressure sensor |
| (9) Pressure control solenoid valve | (22) Fuel gauge |
| (10) Drain valve | (23) Combination meter |
| (11) Drain filter | (24) Fuel injector |
| (12) Shut-off valve | (A) Fuel line |
| (13) Vent valve | (B) Vaporized fuel line |

In this system diagnosis, check for leakage and valve function is conducted by changing the fuel tank pressure and monitoring the pressure change using the fuel tank pressure sensor. When in 0.04 inch diagnosis, perform in the order of mode Z → mode A → mode B → mode C and mode D; When in 0.02 inch diagnosis, perform in the order of mode A → mode B → mode C → mode D and mode E.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

0.04-INCH DIAGNOSIS



EN-04900

Mode	Mode Description	Diagnosis Period
Mode Z (Purge control solenoid valve opening failure diagnosis)	Perform purge control solenoid valve opening failure diagnosis from the size of tank pressure variation from diagnosis start.	3 — 16 seconds
Mode A (Estimated evaporation amount)	Calculate the tank pressure change amount (P1).	10 seconds
Mode B (Sealed negative pressure, large leakage judgement)	Decrease the pressure in the tank to the target value by introducing the intake manifold pressure to the fuel tank. If the tank pressure cannot be reduced, it is diagnosed as large leak.	5 — 25 seconds
Mode C (Pressure increase check, advanced OK judgment)	Wait until the tank pressure returns to the target (start level of P2 calculation). If the tank pressure does not become the value, make advanced OK judgment.	1 — 15 seconds
Mode D (Negative pressure variation measurement, evaporation leakage diagnosis)	Calculate the tank pressure variation (P2), and obtain the diagnostic value using P1 found in Mode A. Perform the evaporation diagnosis using the diagnostic value.	10 seconds
Blockage diagnosis of purge control solenoid 2	Depending on the amount of change in tank inner pressure during and after mode C end, perform blockage diagnosis of purge control solenoid 2.	3 seconds

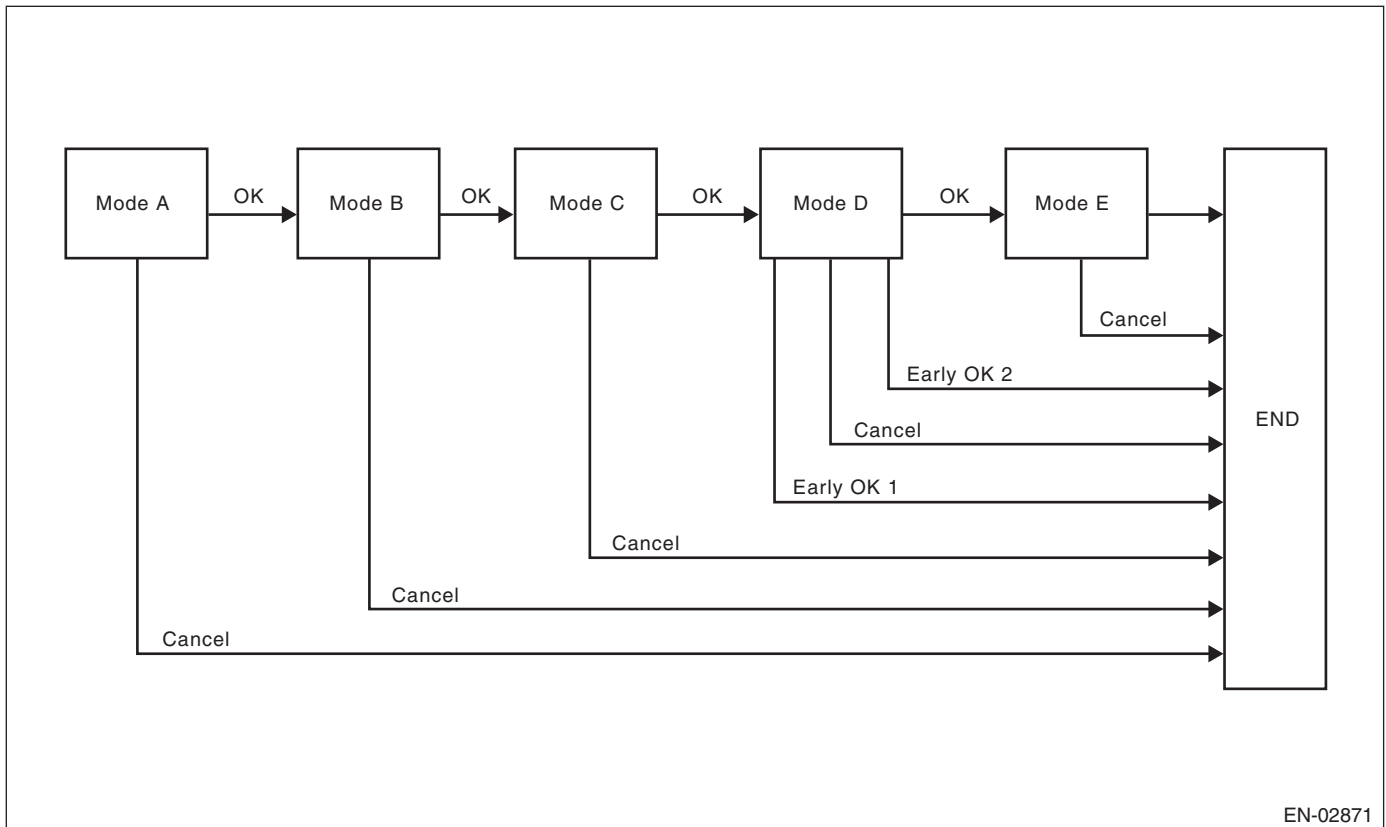
Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Mode Table for Evaporative Emission Control System Diagnosis

Mode	Tank internal pressure under normal conditions	Diagnostic item	DTC
Mode Z	Roughly the same as atmospheric pressure (Same as 0 kPa (0 mmHg, 0 inHg))	Purge control solenoid valve is judged to be open.	P0457
Mode A	Pressure is in proportion to amount of evaporative emission.		
Mode B	Negative pressure is formed due to intake manifold negative pressure.	Large leak	P0457
Mode C	Reaches target pressure		None
Mode D	Pressure change is small.	EVAP system large leak determination. [1.0 mm (0.04 in)]	P0442

0.02-inch Diagnosis



EN-02871

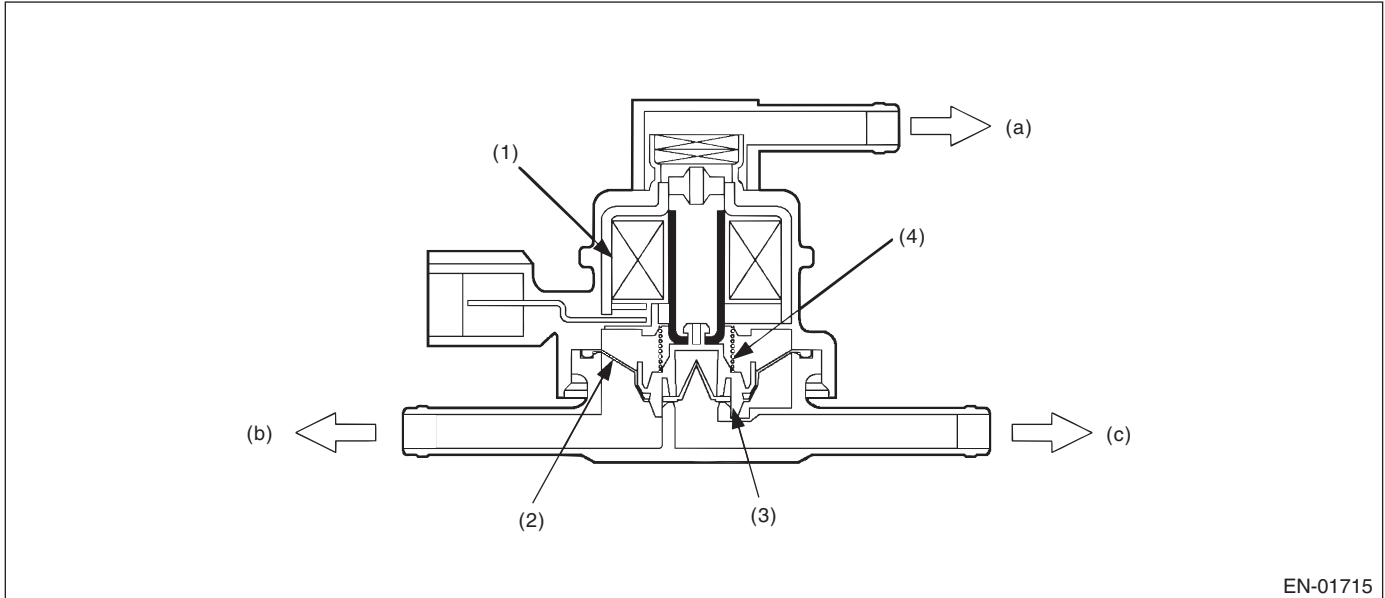
Mode	Mode Description	Diagnosis Period
Mode A (0 point compensation)	When the pressure in the tank is high, wait until it returns to 0 point (Near 0 mmHg).	0 — 12 seconds
Mode B (Negative pressure introduced)	Decrease the pressure in the tank to the target value by introducing the intake manifold pressure to the fuel tank.	0 — 27 seconds
Mode C (Negative pressure maintained)	Wait until the tank pressure returns to the target (start level of P2 calculation).	0 — 20 seconds
Mode D (Negative pressure change calculated)	Calculate the time it takes for the tank pressure to return to the P2 calculation complete pressure. If the tank pressure does not return to the P2 calculation complete pressure, make advanced OK judgment.	0 — 200 seconds
Mode E (Evaporation generated amount calculated)	Calculate the amount of evaporation (P1).	0 — 280 seconds

2. COMPONENT DESCRIPTION

Pressure control solenoid valve

PCV controls the fuel tank pressure to be equal to the atmospheric air pressure. Normally, the solenoid is set to OFF. And the valve opens and closes mechanically in accordance with the pressure difference between tank and atmospheric air, or tank and canister.

The valve is forcibly opened by setting the solenoid to ON at the time of diagnosis.



- (1) Solenoid
- (2) Diaphragm

- (3) Valve
- (4) Spring

- (a) Atmosphere pressure
- (b) Fuel tank
- (c) Canister

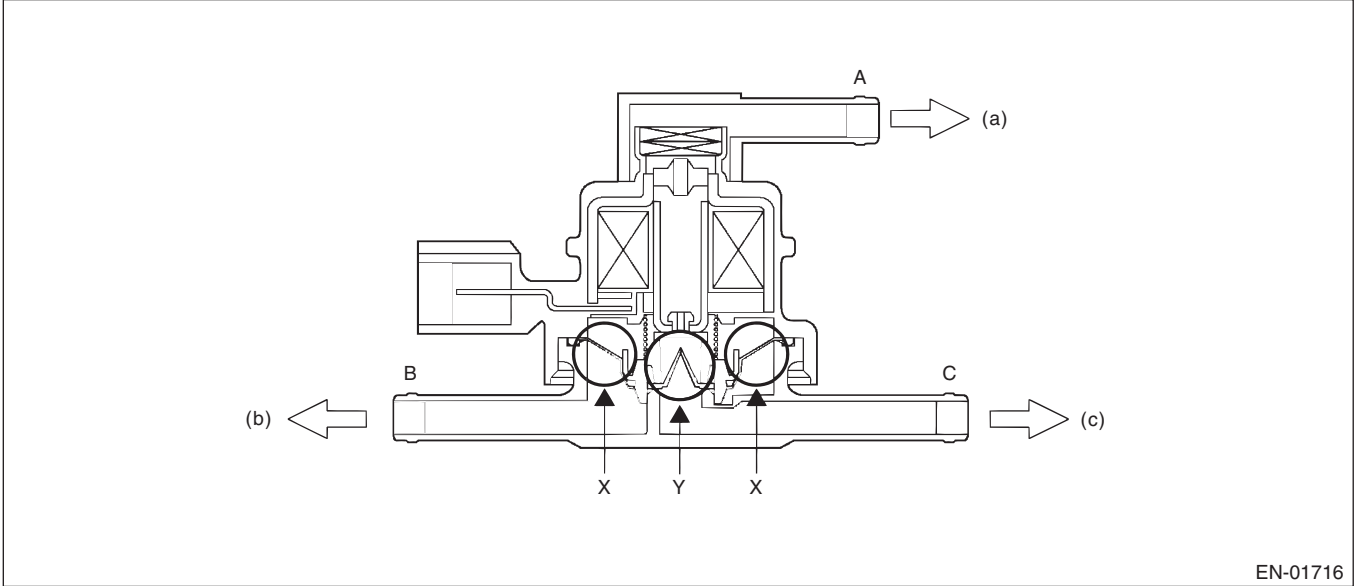
Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Valve Operation and Air Flow

In the figure below, divided by the diaphragm, the part above X is charged with atmospheric air pressure, and the part below X is charged with tank pressure. Also, the part above Y is charged with tank pressure, and the part below Y is charged with canister pressure.

If the atmospheric air pressure port is A, tank pressure port is B, and canister pressure port is C, the air flows according to pressure difference from each port as shown in the table below.



EN-01716

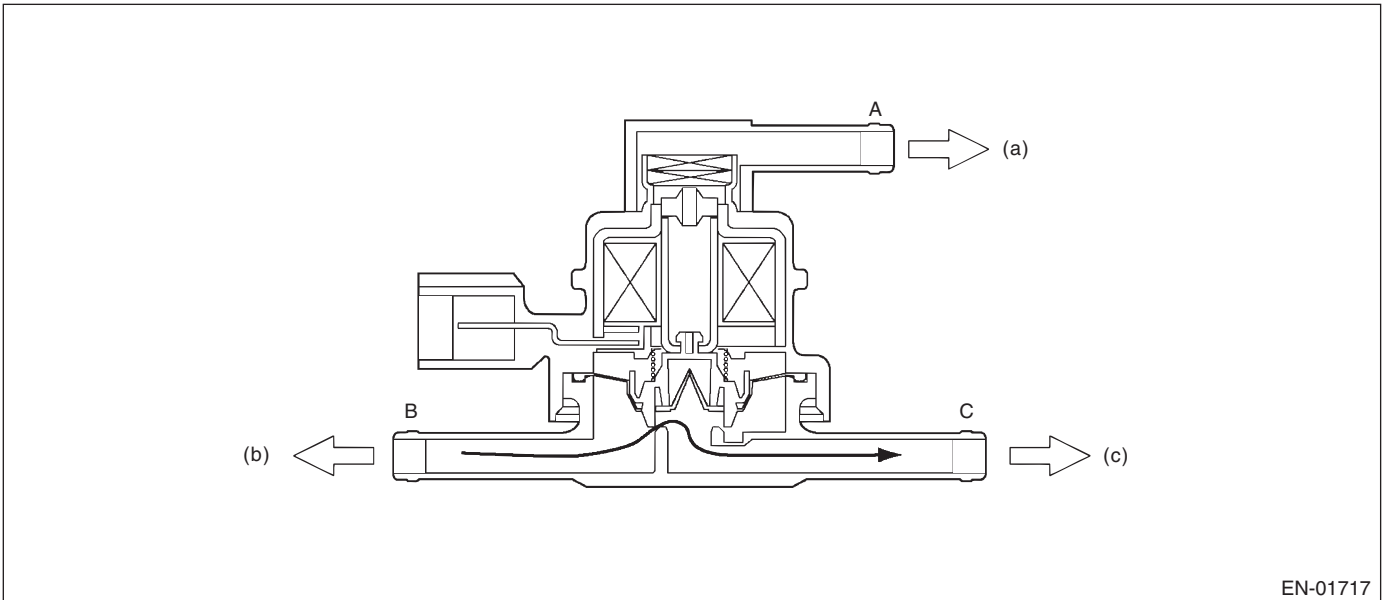
(a) Atmosphere pressure

(b) Fuel tank

(c) Canister

Condition of pressure	Flow
A < B (solenoid OFF)	B → C
B < C (solenoid OFF)	C → B
Solenoid ON	B ↔ C

When A < B (Solenoid OFF)



EN-01717

(a) Atmosphere pressure

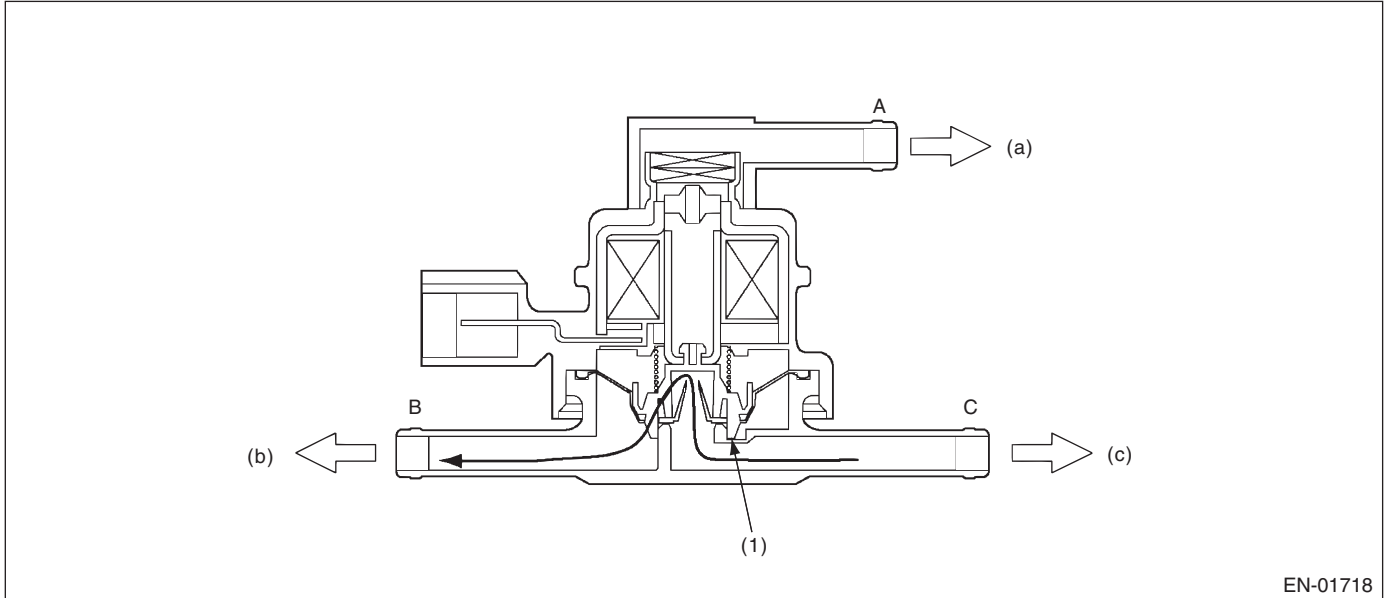
(b) Fuel tank

(c) Canister

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

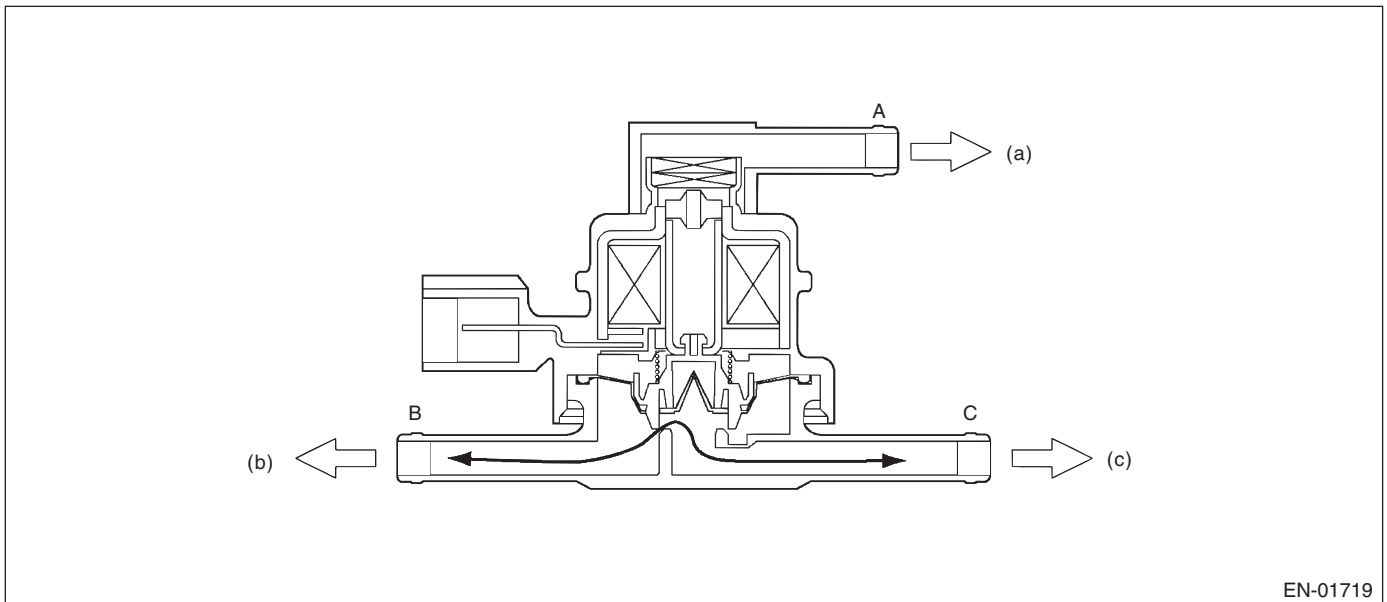
When $B < C$ (Solenoid OFF)



EN-01718

- (1) Valve
- (a) Atmosphere pressure
- (b) Fuel tank
- (c) Canister

When Solenoid is ON



EN-01719

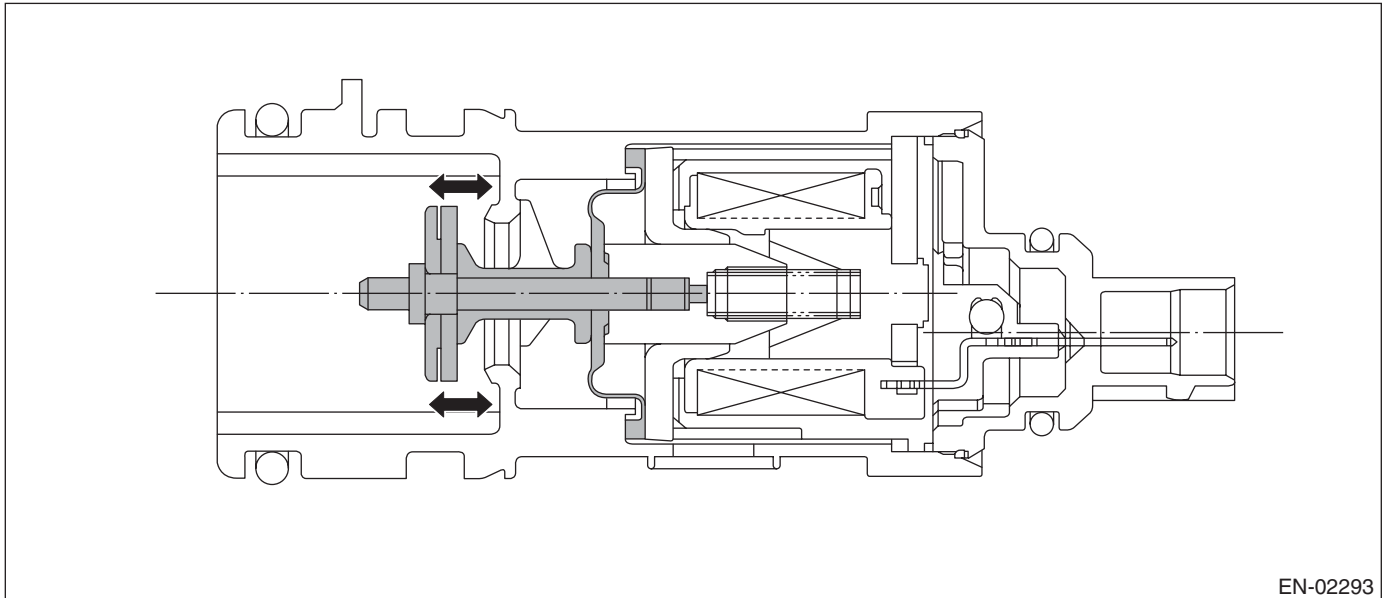
- (a) Atmosphere pressure
- (b) Fuel tank
- (c) Canister

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Drain valve

Drain valve controls the ambient air to be introduced to the canister.



EN-02293

3. ENABLE CONDITION

0.04-inch Diagnosis

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Barometric pressure	≥ 75.0 kPa (563 mmHg, 22.2 inHg)
Total time of canister purge operation	120 seconds or more
After engine starting	856 seconds or more
Learning value of evaporation gas density	≤ 0.04
Engine speed	1050 — 6500 rpm
Fuel tank pressure	≥ -1.4 kPa (-10.7 mmHg, -0.42 inHg)
Intake manifold vacuum (relative pressure)	< -13.3 kPa (-100 mmHg, -3.94 inHg)
Vehicle speed	≥ 32 km/h (19.9 MPH)
Fuel level	9 — 51 \varnothing (2.38 — 13.47 US gal, 1.98 — 11.22 Imp gal)
Closed air/fuel ratio control	In operation
Fuel temperature	-10 — 45°C (14 — 113°F)
Intake air temperature	≥ -10 °C (14°F)
Pressure change per second	< 0.23 kPa (1.7 mmHg, 0.07 inHg)
Minimum pressure change value every one second — Maximum pressure change value every one second	< 0.23 kPa (1.7 mmHg, 0.07 inHg)
Change of fuel level	< 2.5 \varnothing /128 milliseconds (0.66 US gal/128 milliseconds, 0.55 Imp gal/128 milliseconds)
Air fuel ratio	0.76 — 1.25

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

0.02-inch Diagnosis

Secondary Parameters	Enable Condition
(At starting a diagnosis)	
Evap. diagnosis	Incomplete
Battery voltage	≥ 10.9 V
Atmosphere pressure	≥ 75.0 kPa (563 mmHg, 22.2 inHg)
Time since last incomplete diagnosis event of 0.02-inch leakage	
When cancelling in mode A	> 120 seconds
When cancelling in other than mode A	> 600 seconds
Total time of canister purge operation	120 seconds or more
After engine starting	770 seconds or more
Fuel temperature	$-10 - 70^{\circ}\text{C}$ ($14 - 158^{\circ}\text{F}$)
Fuel level	$9 - 51$ \varnothing (2.38 — 13.47 US gal, 1.98 — 11.22 Imp gal)
Intake manifold vacuum (relative pressure)	< -13.3 kPa (-100 mmHg, -3.93 inHg)
Fuel tank pressure	$-0.67 - 1.43$ kPa ($-5 - 10.7$ mmHg, $-0.20 - 0.42$ inHg)
Vehicle speed	≥ 68 km/h (42 MPH)
Closed air/fuel ratio control	In operation
Engine speed	550 — 6000 rpm
(During diagnosis)	
Change of fuel level	\leq Value from Map
Pressure change every one second	< 0.06 kPa (0.44 mmHg, 0.02 inHg)
Minimum pressure change value every one second – Maximum pressure change value every one second	< 0.07 kPa (0.51 mmHg, 0.02 inHg)
Pressure change in tank every second	≤ 0.1 kPa (0.75 mmHg, 0.03 inHg)
Atmospheric pressure change (Mode D)	$-0.47 - 0.32$ kPa ($-3.5 - 2.4$ mmHg, $-0.14 - 0.09$ inHg)
Atmospheric pressure change (Mode E)	$-0.32 - 0.32$ kPa ($-2.4 - 2.4$ mmHg, $-0.09 - 0.09$ inHg)

Map

Fuel level (\varnothing , US gal, Imp gal)	0	10, 2.64, 2.2	20, 5.28, 4.4	30, 7.93, 6.6	40, 10.57, 8.8	50, 13.21, 11	60, 15.85, 13.2
Change (\varnothing , US gal, Imp gal)	4.2, 1.11, 0.92	4.2, 1.11, 0.92	4.1, 1.08, 0.9	4.0, 1.06, 0.88	3.9, 1.03, 0.86	3.8, 1.0, 0.84	3.8, 1.0, 0.84

4. GENERAL DRIVING CYCLE

0.04-inch Diagnosis

- Perform the diagnosis only once in 856 seconds or more after starting the engine, at a constant speed of 32 km/h (19.9 MPH) or more.
- Pay attention to the fuel temperature and fuel level.

0.02-inch Diagnosis

- Perform the diagnosis after 770 seconds or more after starting the engine, at a constant engine speed of 68 km/h (42 MPH) or higher, to judge as NG or OK.
- If judgment cannot be made, repeat the diagnosis.
- Be careful of the remaining fuel level.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Purge control solenoid valve stuck open fault diagnosis

DTC

P0457 Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)

Purpose of Mode Z

When performing the leakage diagnosis of EVAP system, the purge control solenoid valve must operate normally. Therefore, mode Z is used to diagnose the purge control solenoid valve stuck open condition. Note that if a purge control solenoid valve stuck open fault is detected, the EVAP system leakage diagnosis is cancelled.

Diagnostic Method

Purge control solenoid valve functional diagnosis is performed by monitoring the tank pressure in mode Z.

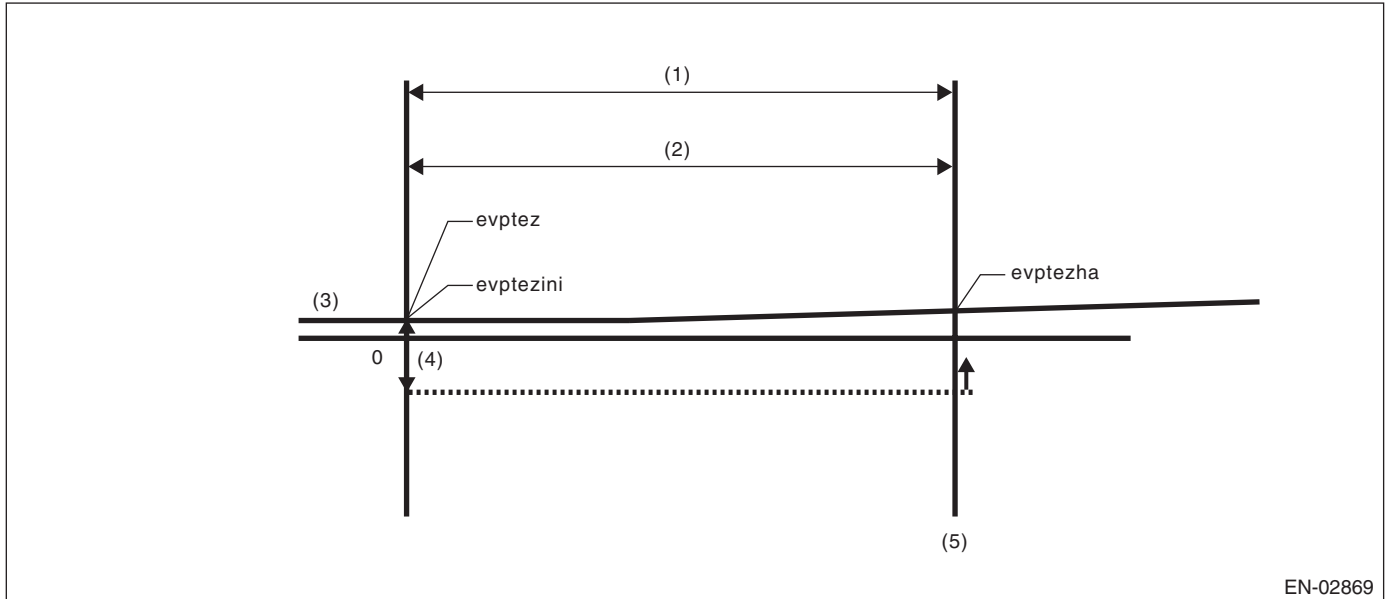
Normality Judgment

Judge OK and change to Mode A when the criteria below are completed in 3 seconds after Mode Z started.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
(Tank pressure when Mode Z started) – (Tank pressure when Mode Z finished)	≤ 0.4 kPa (3 mmHg, 0.12 inHg)	P0457

Normal



EN-02869

- | | | |
|---------------|-----------------------------------|-----------------|
| (1) Mode Z | (3) Fuel tank pressure | (5) OK judgment |
| (2) 3 seconds | (4) 0.4 kPa (3.0 mmHg, 0.12 inHg) | |

- $evptez - evptezha \leq 0.4$ kPa (3.0 mmHg, 0.12 inHg)
- $evptezini - evptezha \leq 0.4$ kPa (3.0 mmHg, 0.12 inHg)

Judge as normal when both calculations are established.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Abnormality Judgment

If OK judgment cannot be made, extend Mode Z 16 seconds more, and judge as NG when all the criteria below are completed after 16 seconds.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
(Tank pressure when Mode Z started) – (Tank pressure when Mode Z finished)	> 0.6 kPa (4.5 mmHg, 0.18 inHg)	P0457
Tank pressure when Mode Z started	≤ 1.43 kPa (10.7 mmHg, 0.42 inHg)	
2 ℓ or more fuel must remain in a static (not sloshing) condition for more than:	≥ 40 sec.	

Time Needed for Diagnosis: 16 seconds

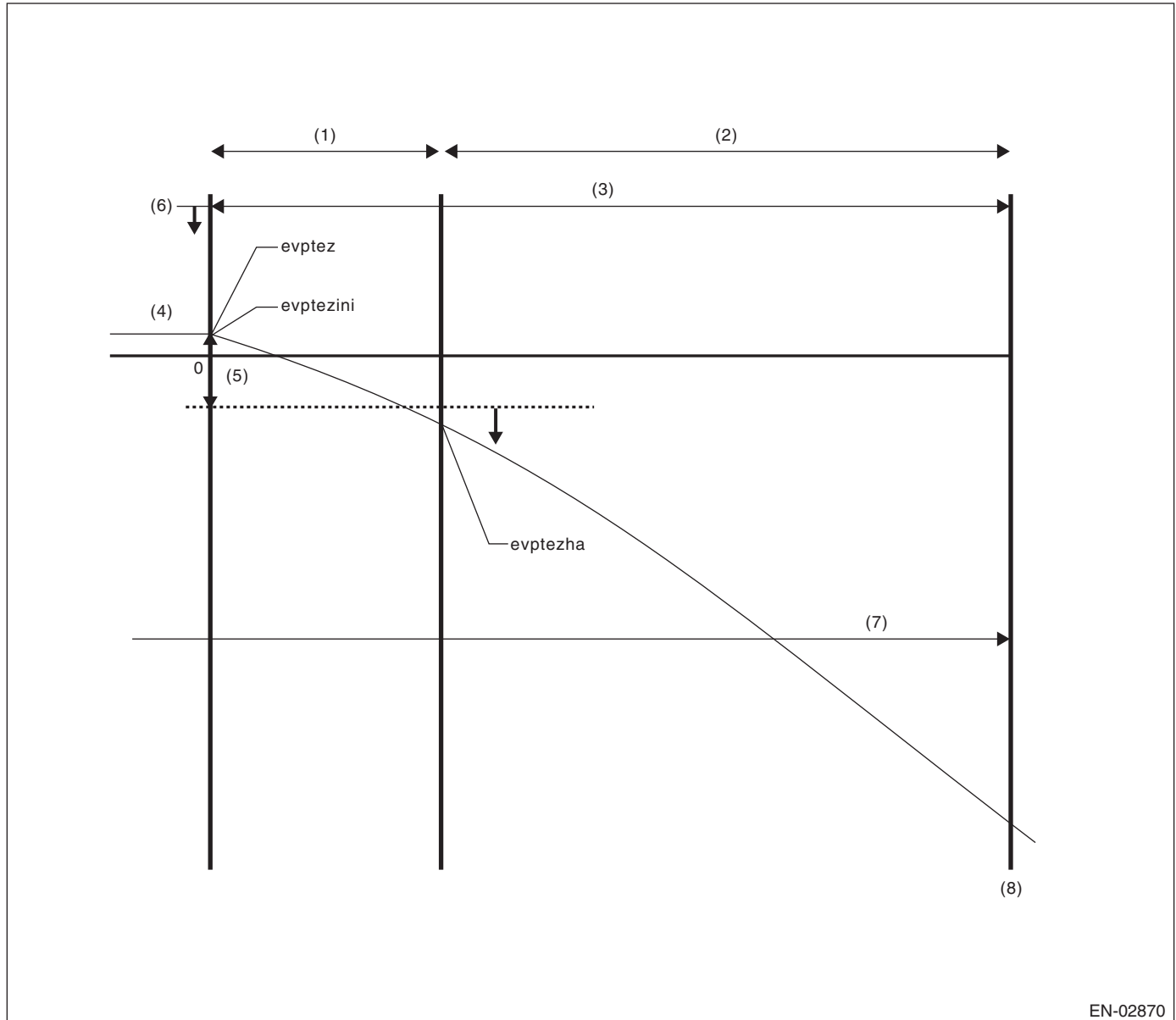
Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

When judgment for purge control solenoid valve stuck open NG is made, end the evaporative diagnosis. Cancel the evaporative diagnosis when the OK/NG judgment for purge control solenoid valve stuck open cannot be made in Mode Z.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Purge Control Solenoid Valve Open Fixation



EN-02870

- | | | |
|---------------------|-------------------------------------|-------------------------------------|
| (1) Mode Z | (4) Fuel tank pressure | (7) No fuel sloshing for 40 seconds |
| (2) Extended mode Z | (5) 0.87 kPa (6.5 mmHg, 0.26 inHg) | (8) NG judgment |
| (3) 16 seconds | (6) 1.43 kPa (10.7 mmHg, 0.42 inHg) | |

- $evptezini, evptez \leq 1.43 \text{ kPa (10.7 mmHg, 0.42 inHg)}$
 - $evptez - evptezha \leq 0.87 \text{ kPa (6.5 mmHg, 0.26 inHg)}$
 - $evptezini - evptezha \leq 0.87 \text{ kPa (6.5 mmHg, 0.26 inHg)}$
 - No fuel sloshing of over 2 \varnothing (0.53 US gal, 0.44 Imp gal) for 40 seconds or more.
- Judge as normal when all are established.

Leak Diagnosis

DTC

P0442 CPC Solenoid Function (Blocked)

P0442 Evaporative Emission Control System Leak Detected (Small Leak)

P0457 Evaporative Emission Control System Leak Detected (Fuel Cap Loose/Off)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Diagnostic method

- The diagnostic method consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to atmospheric pressure.
- The diagnosis is divided into the following five phases.

Mode A: (Estimated evaporation gas amount)

Calculate the tank pressure change amount (P1) when using mode A. After calculating P1, switch to mode B.

Mode B: (Negative pressure sealed)

Introduce negative pressure in the intake manifold to the tank.

Approximately 0 → -1.4 kPa (0 → -10.5 mmHg, 0 → -0.41 inHg)

When the pressure above (desired negative pressure) is reached, enters Mode C.

In this case, if the tank pressure does not reach the target negative pressure, judge that there is a large leakage (10 seconds or 25 seconds) in the system and terminate the evaporative emission control system diagnosis.

Abnormality Judgment

Judge as NG (large leak) when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
Time to reach target negative pressure Or mode B time (Min. pressure value in tank when in mode B) – (Tank pressure when mode B started)	≥ 25 sec. ≥ 10 sec. > -0.5 kPa (-4 mmHg, -0.16 inHg)	P0457

Mode C: (Check pressure rise)

Stop the introduction of negative pressure. (Wait until the tank pressure returns to the start level of P2 calculation.)

Change to Mode D when the tank pressure returns to the start level of P2 calculation.

Judge immediate OK and perform the blockage diagnosis of purge control solenoid 2 when it does not return in spite of spending the specified time.

Tank pressure when starting calculation of P2	Time for advanced OK judgment
-1.3 kPa (-9.75 mmHg, -0.38 inHg)	15 seconds

Mode D: (Measure amount of negative pressure change)

Monitor the tank pressure change amount when using mode D. In this case, the tank pressure increases (nears atmospheric pressure), because evaporation occurs. However, if any leakage exists, the pressure increases additionally in proportion to this leakage. The pressure variation of this tank is P2.

After calculating P2, perform a small leak diagnosis according to the items below.

When Mode D is ended

Assign tank variations measured in Mode A and Mode D; P1 and P2, to the formula below, judge small leaks in the system. If the measured judgment value exceeds the threshold value, it is judged to be a malfunction.

Purge control solenoid valve 2 blockage diagnosis

Perform the purge control solenoid valve 2 blockage diagnosis according to the gap value of tank pressure from the end of mode C to afterwards.

Malfunction Criteria	Threshold Value	DTC
Tank pressure change after mode C completion.	3 seconds < 0.115 kPa (0.86 mmHg, 0.034 inHg)	P0441

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Abnormality Judgment

Judge as NG when the criteria below are met and judge as OK and clear NG when not met.

Judgment Value

Malfunction Criteria	Threshold Value	DTC
P2 – 1.5 × P1 P2: Tank pressure that changes every 16 seconds in mode D P1: Tank pressure that changes every 16 seconds in mode A	> Value from Map 7 * Threshold value: Map (Remaining Fuel vs Tank temperature)	P0442

* 1.5: Evaporation amount compensation value when below negative pressure (Amount of evaporation occurrence increases as a vacuum condition increases.)

Map 7 Malfunction criteria limit for evaporation diagnosis

Fuel temperature vs Fuel level	5°C (41°F)	15°C (59°F)	25°C (77°F)	35°C (95°F)	45°C (113°F)
0 ℓ (0 US gal, 0 Imp gal)	0.49 kPa (3.68 mmHg, 0.14 inHg)	0.49 kPa (3.68 mmHg, 0.14 inHg)	0.53 kPa (3.95 mmHg, 0.16 inHg)	0.54 kPa (4.07 mmHg, 0.16 inHg)	0.56 kPa (4.17 mmHg, 0.16 inHg)
10 ℓ (2.64 US gal, 2.2 Imp gal)	0.49 kPa (3.68 mmHg, 0.14 inHg)	0.49 kPa (3.68 mmHg, 0.14 inHg)	0.53 kPa (3.95 mmHg, 0.16 inHg)	0.54 kPa (4.07 mmHg, 0.16 inHg)	0.56 kPa (4.17 mmHg, 0.16 inHg)
20 ℓ (5.28 US gal, 4.4 Imp gal)	0.50 kPa (3.77 mmHg, 0.15 inHg)	0.51 kPa (3.79 mmHg, 0.15 inHg)	0.53 kPa (4.01 mmHg, 0.16 inHg)	0.56 kPa (4.17 mmHg, 0.16 inHg)	0.57 kPa (4.27 mmHg, 0.17 inHg)
30 ℓ (7.93 US gal, 6.6 Imp gal)	0.51 kPa (3.85 mmHg, 0.15 inHg)	0.52 kPa (3.9 mmHg, 0.15 inHg)	0.54 kPa (4.06 mmHg, 0.16 inHg)	0.57 kPa (4.27 mmHg, 0.17 inHg)	0.60 kPa (4.48 mmHg, 0.18 inHg)
40 ℓ (10.57 US gal, 8.8 Imp gal)	0.65 kPa (4.88 mmHg, 0.19 inHg)	0.65 kPa (4.9 mmHg, 0.19 inHg)	0.66 kPa (4.98 mmHg, 0.20 inHg)	0.71 kPa (5.32 mmHg, 0.21 inHg)	0.76 kPa (5.73 mmHg, 0.23 inHg)
50 ℓ (13.21 US gal, 11.0 Imp gal)	0.794 kPa (5.96 mmHg, 0.235 inHg)	0.794 kPa (5.96 mmHg, 0.235 inHg)	0.794 kPa (5.96 mmHg, 0.235 inHg)	0.85 kPa (6.38 mmHg, 0.25 inHg)	0.88 kPa (6.6 mmHg, 0.26 inHg)
60 ℓ (15.85 US gal, 13.2 Imp gal)	0.794 kPa (5.96 mmHg, 0.235 inHg)	0.794 kPa (5.96 mmHg, 0.235 inHg)	0.794 kPa (5.96 mmHg, 0.235 inHg)	0.85 kPa (6.38 mmHg, 0.25 inHg)	0.88 kPa (6.6 mmHg, 0.26 inHg)

Time Needed for Diagnosis: 30 — 100 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Leak Diagnosis

DTC

P0456 Evaporative Emission Control System Leak Detected (very small leak)

Diagnostic method

- The diagnostic method consists of creating a sealed vacuum in the fuel tank and then determining the presence of leakage from the speed at which the tank internal pressure returns to atmospheric pressure.
- The diagnosis is divided into the following five phases.

Mode A: (0 point compensation)

When the pressure in the tank is high, wait until it returns to 0 point (Near 0 mmHg.). Shift to mode B when returned to the 0 point. Cancel the diagnosis when 0 point does not return in the specified time.

Mode B: (Negative pressure introduced)

Introduce negative pressure in the intake manifold to the tank.

Approximately 0 → -2.0 kPa (0 → -15 mmHg, 0 → -0.59 inHg)

When the pressure above (desired negative pressure) is reached, enters Mode C.

When the tank internal pressure does not reach the target vacuum pressure, the diagnosis is cancelled.

Mode C: (Negative pressure maintained)

Stop the introduction of negative pressure. (Wait until the tank pressure returns to the start level of P2 calculation.)

Change to Mode D either when the tank pressure returns to the start level of P2 calculation, or when the pre-determined amount of time has passed.

Mode D: (Calculate the amount of negative pressure change)

Monitor the tank pressure in mode D, calculate (P2) the pressure change in the tank, and measure the time (evpdset) for the tank pressure to return when calculation of P2 is completed. Shift to Mode E when the tank pressure returns to the end level of P2 calculation. If it does not return to the P2 calculation end tank internal pressure after the predetermined amount of time has passed, make advanced OK judgment or cancel the diagnosis.

Normality Judgment

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Advanced OK judgment 1	
Mode D time	≥ 30 sec.
Tank internal pressure	≤ -1.8 kPa (-13.4 mmHg, -0.53 inHg)
Advanced OK judgment 2	
Mode D time	≥ 200 sec.
P2	≤ 0.9 — 1.3 kPa (7 — 9.6 mmHg, 0.28 — 0.38 inHg)

Mode E: (Evaporation occurrence amount calculation)

Calculate the change of tank pressure with the time evpdset to judge as NG/OK according to the value of P1. (ambiguous determination acceptable).

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Abnormality Judgment

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
P1	< Value from Map 7 * Threshold value: Map (Remaining fuel vs evpdset)

Map 7 Malfunction criteria limit for evaporation diagnosis

Time (evpdset) vs Fuel level	0 seconds	30 seconds	80 seconds	100 seconds	150 seconds	200 seconds
0 ℓ (0 US gal, 0 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.21 kPa (1.6 mmHg, 0.06 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)
10 ℓ (2.64 US gal, 2.2 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.21 kPa (1.6 mmHg, 0.06 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)
30 ℓ (7.93 US gal, 6.6 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.21 kPa (1.6 mmHg, 0.06 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0 kPa (0 mmHg, 0 inHg)
50 ℓ (13.21 US gal, 11.0 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.24 kPa (1.8 mmHg, 0.07 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0 kPa (0 mmHg, 0 inHg)	0 kPa (0 mmHg, 0 inHg)
60 ℓ (15.85 US gal, 13.2 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.24 kPa (1.8 mmHg, 0.07 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0 kPa (0 mmHg, 0 inHg)	0 kPa (0 mmHg, 0 inHg)
70 ℓ (18.49 US gal, 15.4 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.24 kPa (1.8 mmHg, 0.07 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0 kPa (0 mmHg, 0 inHg)	0 kPa (0 mmHg, 0 inHg)
80 ℓ (21.14 US gal, 17.6 Imp gal)	0 kPa (0 mmHg, 0 inHg)	0.24 kPa (1.8 mmHg, 0.07 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0.29 kPa (2.2 mmHg, 0.09 inHg)	0 kPa (0 mmHg, 0 inHg)	0 kPa (0 mmHg, 0 inHg)

Normality Judgment

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
P1	> Value from Map 8 * Threshold value: Map (Remaining fuel vs evpdset)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Map 8 Fault criteria limit for Evaporative emission control system diagnosis

Time (evpdset) vs Fuel level	0 seconds	30 seconds	80 seconds	100 seconds	150 seconds	200 seconds
0 ℓ (0 US gal, 0 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.37 kPa (2.8 mmHg, 0.11 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)
10 ℓ (2.64 US gal, 2.2 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.37 kPa (2.8 mmHg, 0.11 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)
30 ℓ (7.93 US gal, 6.6 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.37 kPa (2.8 mmHg, 0.11 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)
50 ℓ (13.21 US gal, 11.0 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.40 kPa (3.0 mmHg, 0.12 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)
60 ℓ (15.85 US gal, 13.2 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.40 kPa (3.0 mmHg, 0.12 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)
70 ℓ (18.49 US gal, 15.4 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.40 kPa (3.0 mmHg, 0.12 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)
80 ℓ (21.14 US gal, 17.6 Imp gal)	0.16 kPa (1.2 mmHg, 0.05 inHg)	0.40 kPa (3.0 mmHg, 0.12 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)	0.45 kPa (3.4 mmHg, 0.13 inHg)

Time Needed for Diagnosis: 65 — 516 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)
- Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

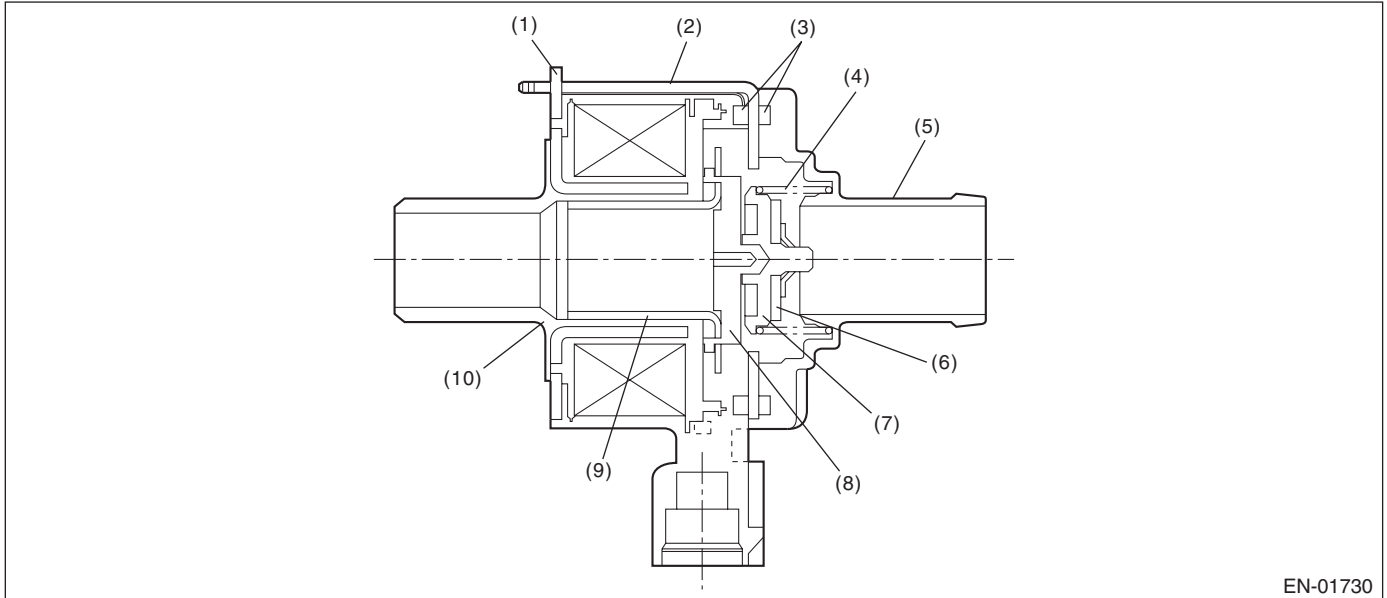
BM:DTC P0447 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT OPEN

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the drain valve.

Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



EN-01730

- (1) Magnetic plate
- (2) Yoke
- (3) Packing
- (4) Spring
- (5) Valve seat

- (6) Valve
- (7) Plate
- (8) Retainer
- (9) Movable core
- (10) Bobbin

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when all the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs OFF signal	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Pressure control solenoid valve control: Open the pressure control solenoid valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

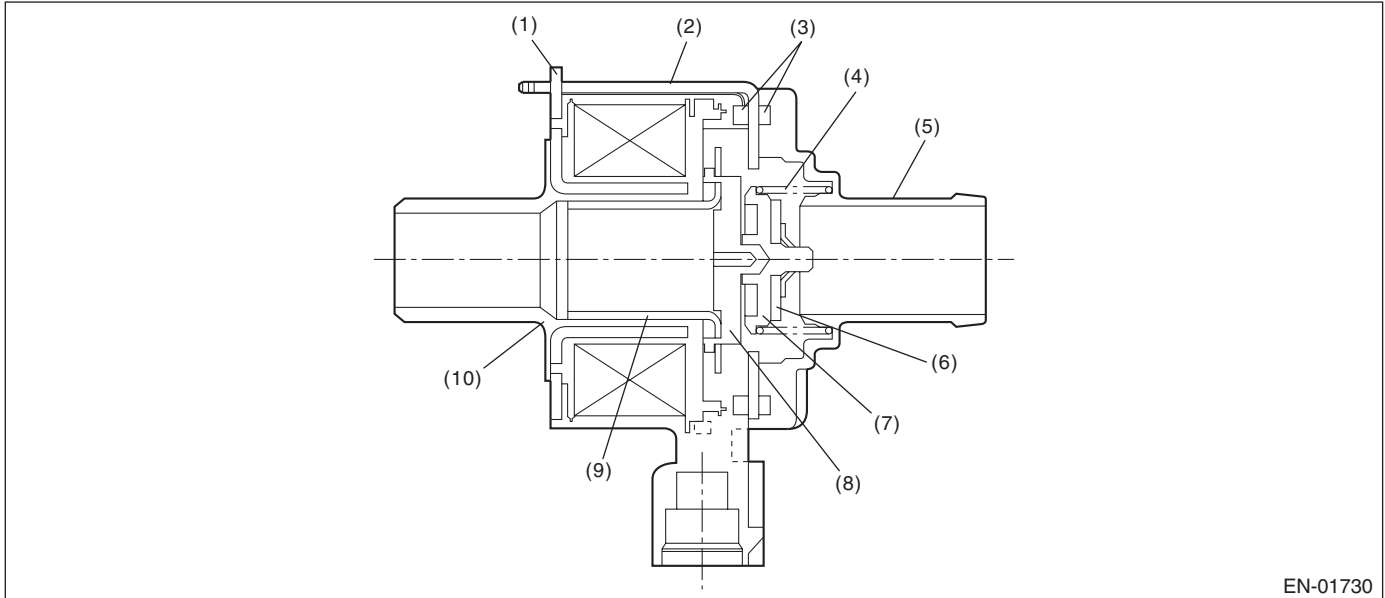
BN:DTC P0448 EVAPORATIVE EMISSION CONTROL SYSTEM VENT CONTROL CIRCUIT SHORTED

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the drain valve.

Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



- (1) Magnetic plate
- (2) Yoke
- (3) Packing
- (4) Spring
- (5) Valve seat

- (6) Valve
- (7) Plate
- (8) Retainer
- (9) Movable core
- (10) Bobbin

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when all the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs ON signal	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Pressure control solenoid valve control: Open the pressure control solenoid valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

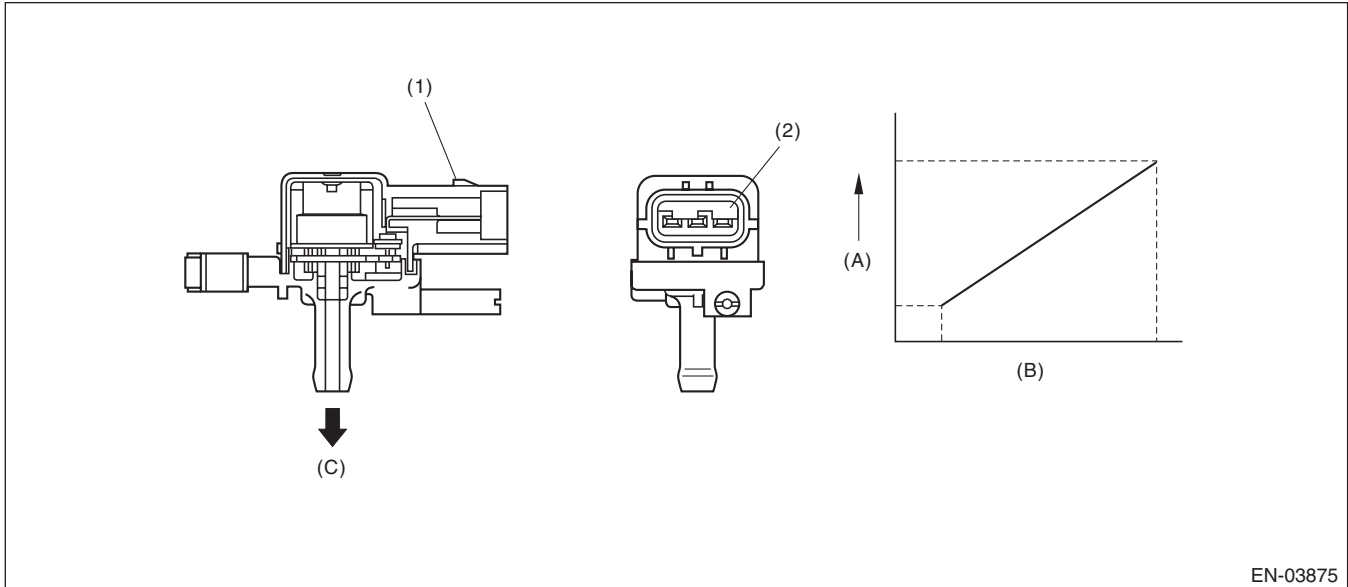
BO:DTC P0451 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR

1. OUTLINE OF DIAGNOSIS

Detect the tank pressure sensor output property abnormality.

Judge NG when there is no pressure variation, which should exist in the tank, considering the engine status.

2. COMPONENT DESCRIPTION



- (1) Connector
- (2) Terminal

- (A) Output voltage
- (B) Input voltage
- (C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
After engine starting	60 seconds or more
Fuel level	$\geq 9 \text{ l}$ (2.38 US gal, 1.98 Imp gal)
Fuel temperature	$< 35^{\circ}\text{C}$ (95°F)
Battery voltage	$\geq 10.9 \text{ V}$
Atmospheric pressure	$> 75.0 \text{ kPa}$ (563 mmHg, 22.2 inHg)
Purge control solenoid valve ON/OFF	Experienced

4. GENERAL DRIVING CYCLE

- Perform the diagnosis continuously after 60 seconds or more have passed since the engine started.
- Be sure to check the fuel level and fuel temperature.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Number of times that the difference between the Max. fuel level and Min. fuel level every 60 seconds is 2 ℓ (0.53 US gal, 0.44 Imp gal) or more (with enable condition completed)	≥ 16 times
Maximum – Minimum tank pressure (with enable condition completed)	< 0.05 kPa (0.375 mmHg, 0.01 inHg)
Maximum – Minimum fuel temperature (with enable condition completed)	≥ 7°C (12.6°F)

If the maximum value – minimum value for the fuel level is less than 2 ℓ every 60 seconds, extend 60 seconds more and make judgment with the maximum and minimum values for the fuel level in 120 seconds. If a difference does not appear though the time was extended 60 seconds, extend the time (180, 240, 300 seconds) and continue the judgment. If the maximum value – minimum value for the fuel level is 5 liters or more, the diagnosis counter counts up.

Time Needed for Diagnosis: 1 minute × 16 times or more

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Maximum – Minimum tank pressure	≥ 0.05 kPa (0.375 mmHg, 0.01 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Purge control solenoid valve control: Not allowed to purge fixed mode.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

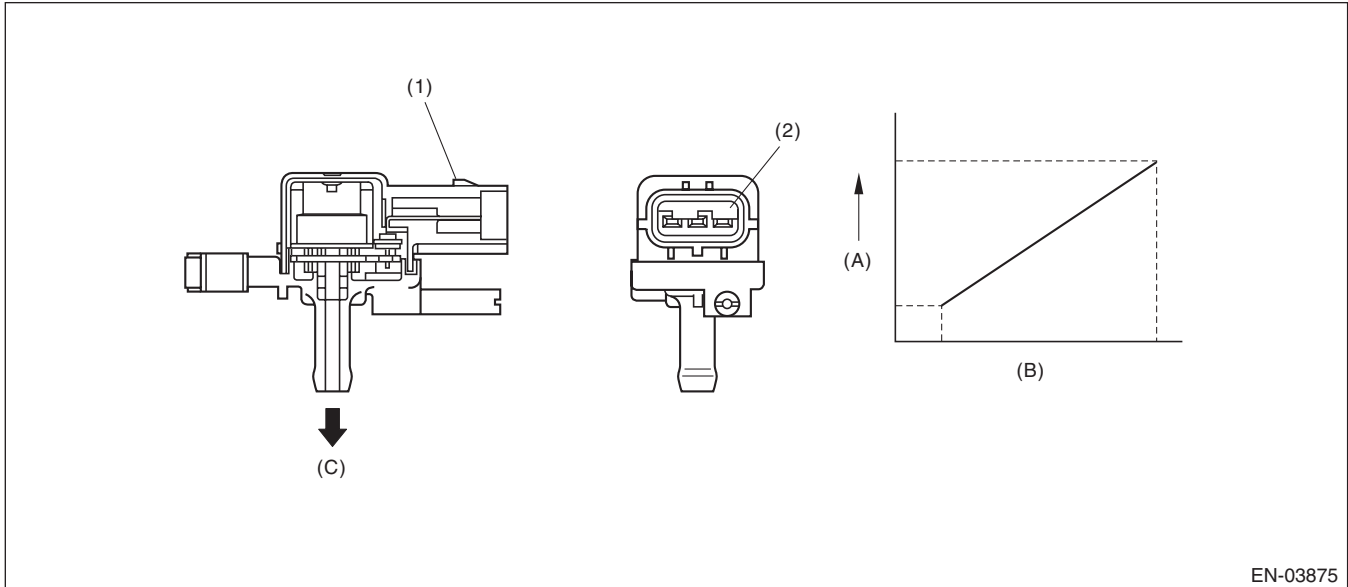
GENERAL DESCRIPTION

BP:DTC P0452 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the fuel tank pressure sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



- (1) Connector
- (2) Terminal

- (A) Output voltage
- (B) Input voltage
- (C) To fuel tank

3. ENABLE CONDITION (USED WITH HIGH SIDE NORMAL/ABNORMALITY JUDGMENT ONLY)

Secondary Parameters	Enable Condition
Battery voltage	$\geq 10.9 \text{ V}$

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 15 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	< -6.82 kPa (-56.15 mmHg, -2.01 inHg)

Time Needed for Diagnosis: 15 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ -6.82 kPa (-56.15 mmHg, -2.01 inHg)
Feedback lambda coefficient	≥ 0.9

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Purge control solenoid valve control: Not allowed to purge fixed mode.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

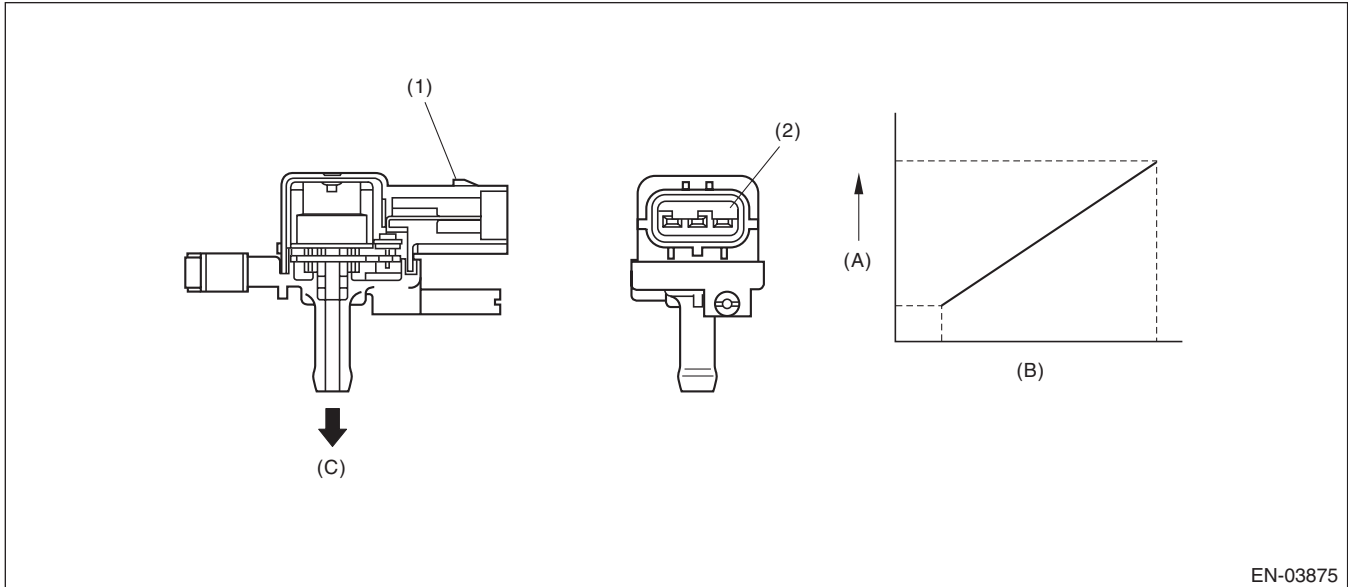
GENERAL DESCRIPTION

BQ:DTC P0453 EVAPORATIVE EMISSION CONTROL SYSTEM PRESSURE SENSOR HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the fuel tank pressure sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



- (1) Connector
- (2) Terminal

- (A) Output voltage
- (B) Input voltage
- (C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Vehicle speed	≥ 2 km/h (1.24 MPH)
All conditions of EVAP canister purge	Complete
Learning value of evaporation gas density	≤ 0.08
Main feedback compensation coefficient	≥ 0.9
Battery voltage	≥ 10.9 V

4. GENERAL DRIVING CYCLE

Perform the diagnosis continually when purging.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 15 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	≥ 7.98 kPa (59.85 mmHg, 2.36 inHg)
Fuel temperature	< 35°C (95°F)
Atmospheric pressure	≥ 75.0 kPa (563 mmHg, 22.2 inHg)

Time Needed for Diagnosis: 15 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK when the criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Fuel tank pressure	< 7.98 kPa (59.85 mmHg, 2.36 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Purge control solenoid valve control: Not allowed to purge fixed mode.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

BR:DTC P0456 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (VERY SMALL LEAK)

NOTE:

For the detection conditions, refer to DTC P0442 "EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)". <Ref. to GD(H4DOTC)-132, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

BS:DTC P0457 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (FUEL CAP LOOSE/OFF)

NOTE:

For the detection conditions, refer to DTC P0442 "EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK)". <Ref. to GD(H4DOTC)-132, DTC P0442 EVAPORATIVE EMISSION CONTROL SYSTEM LEAK DETECTED (SMALL LEAK), Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

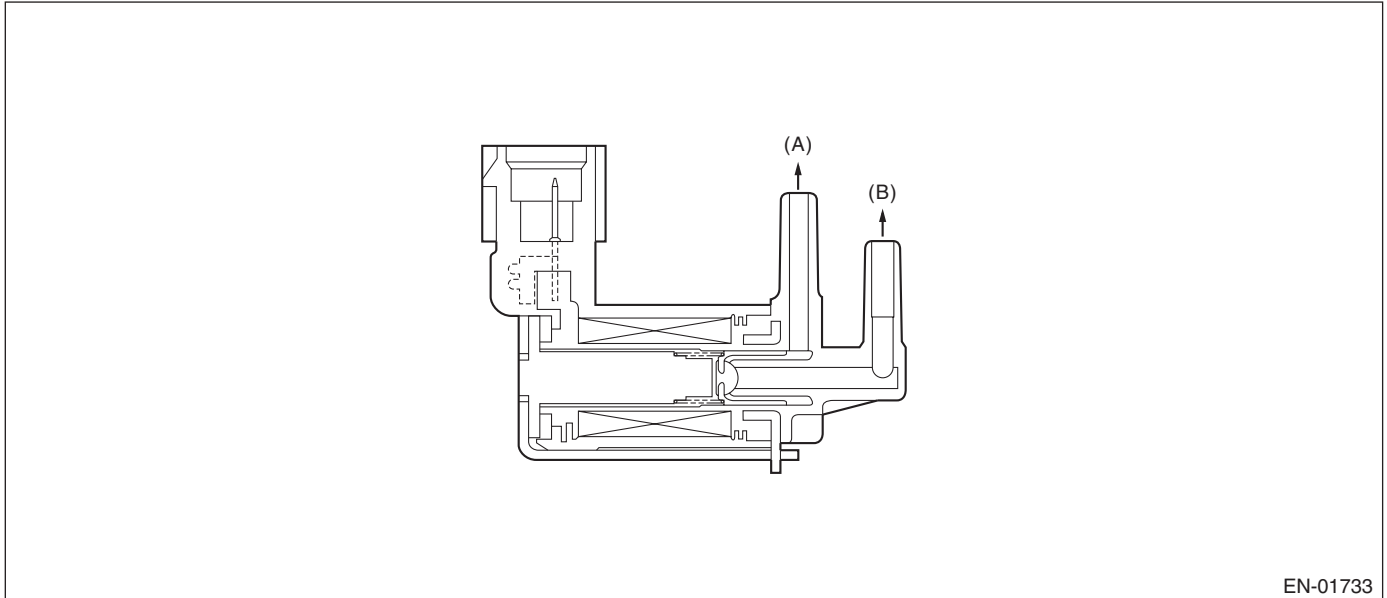
BT:DTC P0458 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the purge control solenoid valve.

Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



(A) To canister

(B) To intake manifold

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Continuous time with the following conditions established:	≥ 2.5 sec.
Duty ratio of "ON"	$< 75\%$
Terminal output voltage	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	High

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

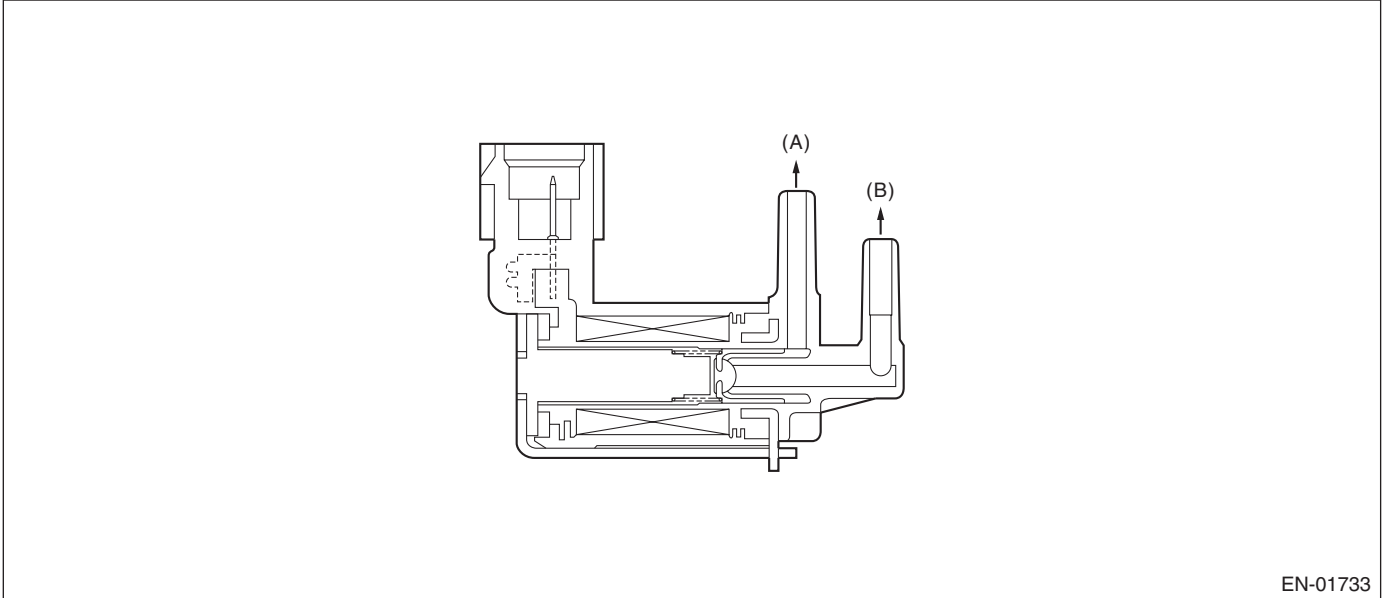
BU:DTC P0459 EVAPORATIVE EMISSION SYSTEM PURGE CONTROL VALVE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the purge control solenoid valve.

Judge as NG when the ECM output level differs from the actual terminal level.

2. COMPONENT DESCRIPTION



(A) To canister

(B) To intake manifold

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Continuous time with the following conditions established:	≥ 2.5 sec.
Duty ratio of "ON"	≥ 25%
Terminal output voltage	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage	Low

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

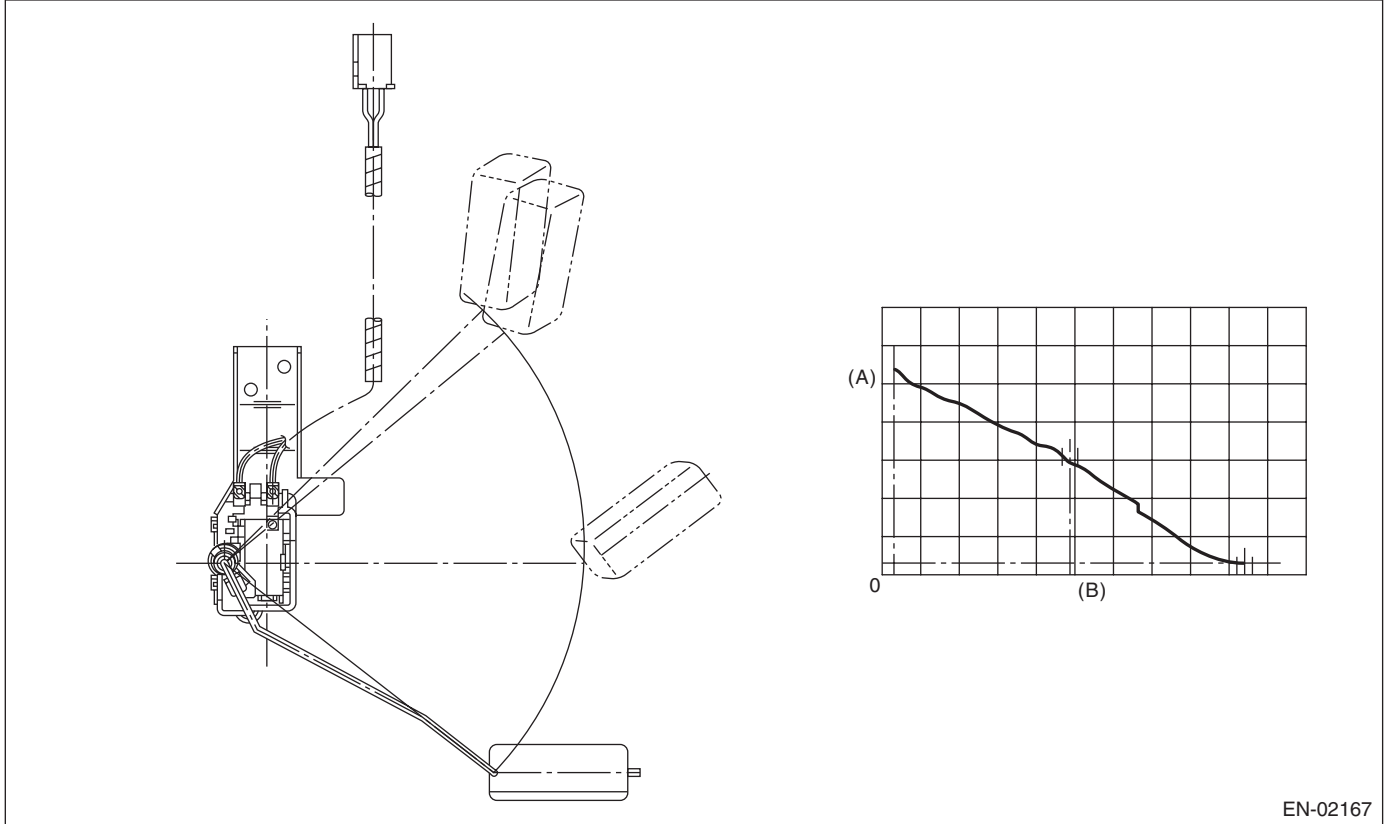
BV:DTC P0461 FUEL LEVEL SENSOR "A" CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect malfunctions of the fuel level sensor output property.

If the fuel level does not vary in a particular driving condition / engine condition where it should, judge as NG.

2. COMPONENT DESCRIPTION



(A) Fuel level (L)

(B) Resistance (Ω)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	> 331 kg (729.8 lb)
Max. – Min. values of fuel level output	< 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
After engine starting	10 seconds or more

Time Needed for Diagnosis: Undetermined

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Accumulated amount of intake air	> 331 kg (729.8 lb)
Max. – Min. values of fuel level output	≥ 2.6 ℓ (0.69 US gal, 0.57 Imp gal)
Battery voltage	≥ 10.9 V
After engine starting	10 seconds or more

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

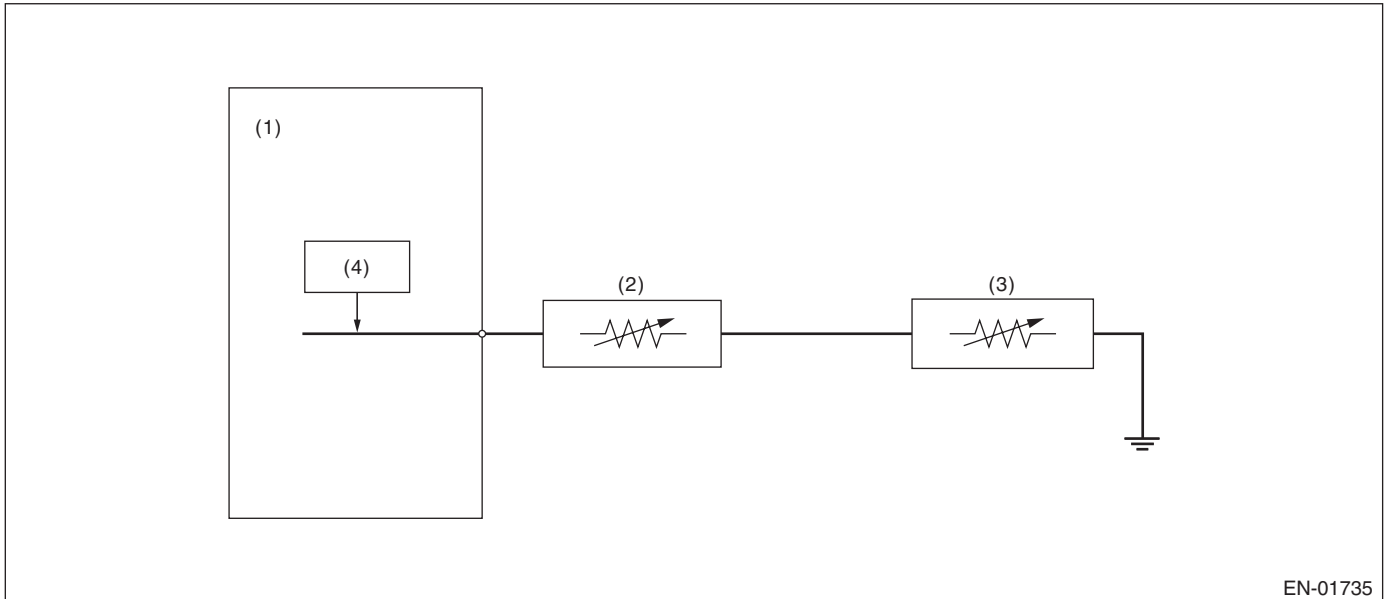
GENERAL DESCRIPTION

BW:DTC P0462 FUEL LEVEL SENSOR "A" CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor. Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Fuel level sensor
- (3) Fuel sub level sensor
- (4) Detecting circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	< 0.035 V

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	≥ 0.035 V

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

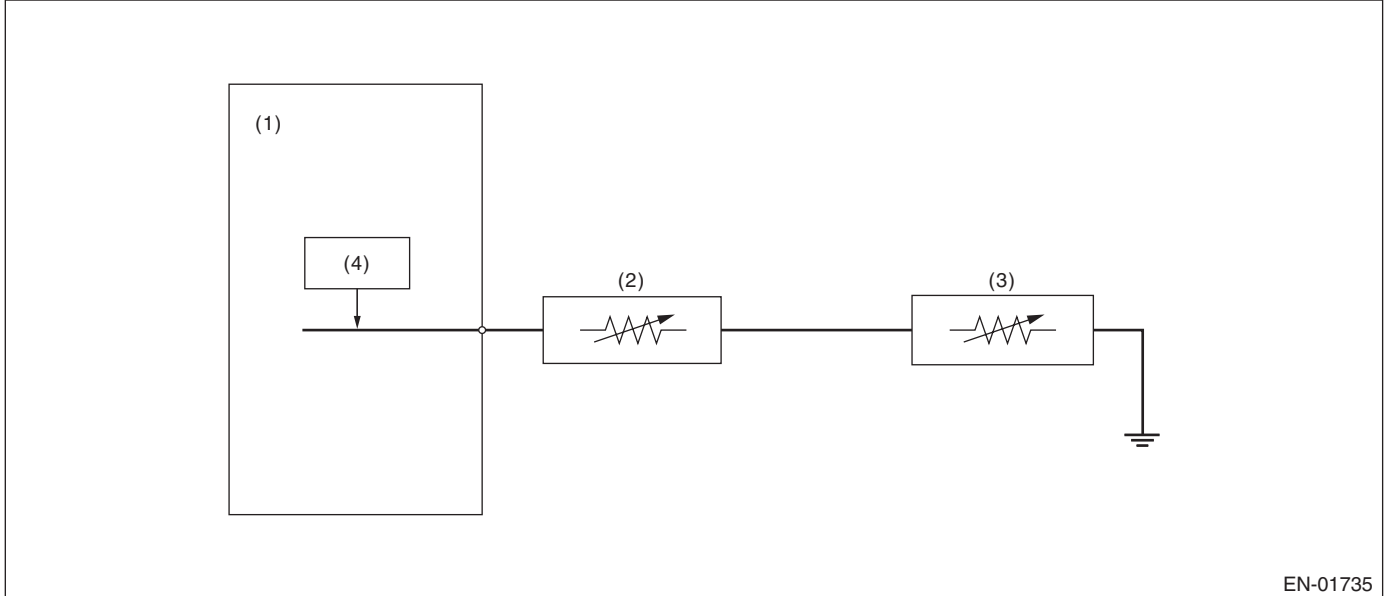
GENERAL DESCRIPTION

BX:DTC P0463 FUEL LEVEL SENSOR "A" CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of fuel level sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Fuel level sensor
- (3) Fuel sub level sensor
- (4) Detecting circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below exceeds the time required for diagnosis (10 seconds).

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	≥ 4.911 V

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	3 seconds or more
Output voltage	< 4.911 V

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

BY:DTC P0464 FUEL LEVEL SENSOR CIRCUIT INTERMITTENT

1. OUTLINE OF DIAGNOSIS

Detect the unstable output faults from the fuel level sensor caused by noise. Judge as NG when the max. value and cumulative value of output voltage variation of the fuel level sensor is larger than the threshold value.

2. ENABLE CONDITION

Malfunction Criteria	Threshold Value
Engine speed	≥ 500 rpm
After engine starting	1 second or more
Ignition switch	ON
Battery voltage	> 10.9 V
Idle switch	ON
Fuel level	9 — 51 ℓ (2.38 — 13.47 US gal, 1.98 — 11.22 Imp gal)
Vehicle speed = 0 km/h (0 MPH)	10 seconds or more

3. GENERAL DRIVING CYCLE

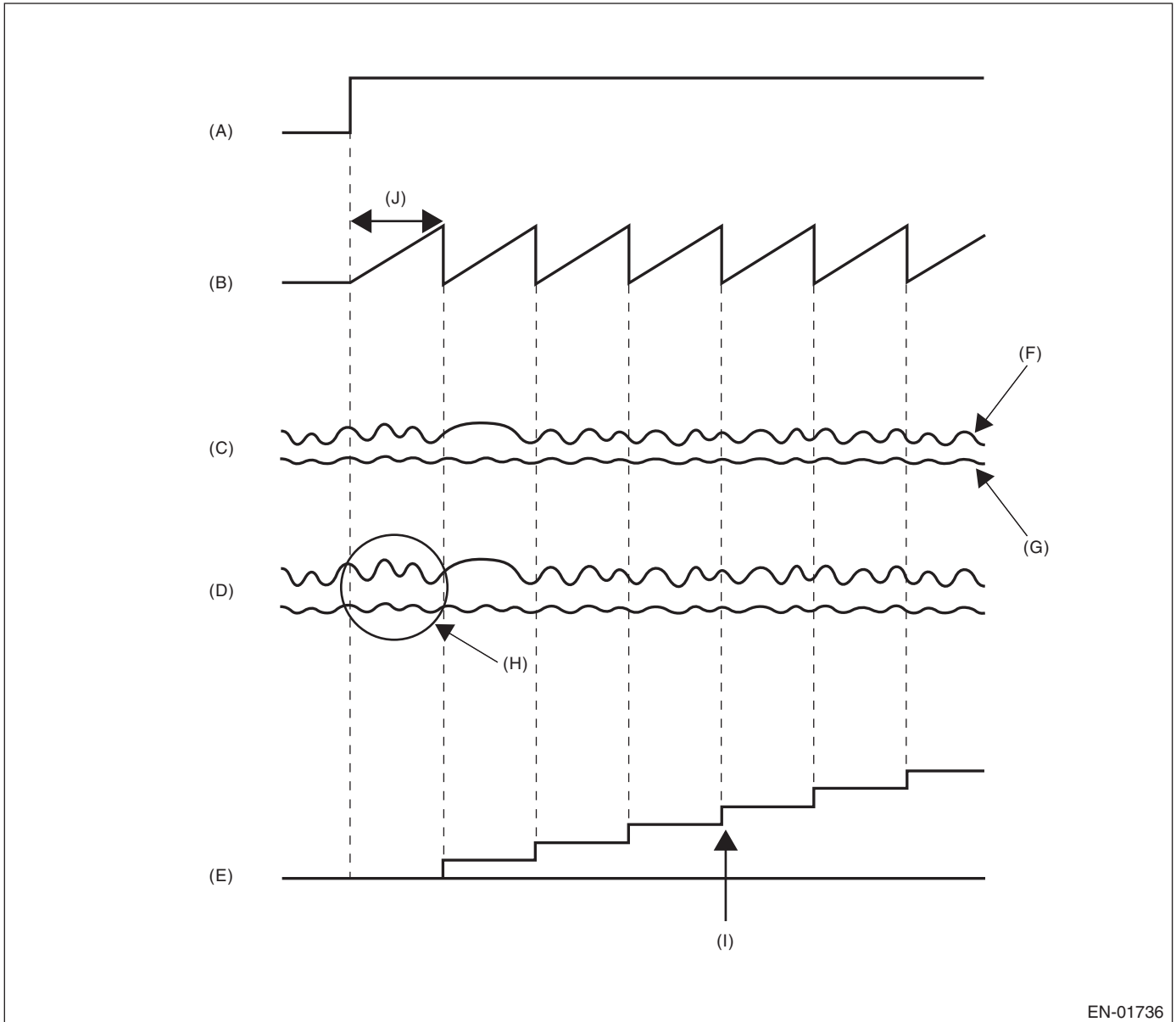
- Always perform the diagnosis continuously at idle speed.
- Pay attention to the fuel level.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. DIAGNOSTIC METHOD

Calculate the Max. value (delflmax) and cumulative value (sumfl) of output voltage variation of fuel level sensor during 12.8 seconds. Judge it normal when both max. and cumulative values are not over the threshold value. Otherwise, when either of them is over the threshold value, the diagnosis counter counts up. Judge as NG if the counter indicated 4 counts.



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- | | |
|---------------------------------|---|
| (A) Diagnosis condition | (G) Normal |
| (B) Diagnosis period | (H) The values of DVFLMAX and SUMVFL are regarded as maximum. |
| (C) Fuel level sensor A/D value | (I) NG 4 at counts |
| (D) Fuel level output voltage | (J) 12.8 seconds |
| (E) Diagnosis counter | |
| (F) Malfunction | |

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Abnormality Judgment

Judge as NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Total times of the condition reaching follows, DELFLMAX \geq 0.228 V or SUMFL \geq 21.8 V DELFLMAX is Max. deviation of sensor output during 12.8 seconds SUMFL: Integrated value of sensor output deviation in 12.8 seconds	\geq 4 times

The diagnosis counter does not count up when the following conditions are completed within 12.8 seconds.

Maximum value – minimum value of change of tank pressure for 12.8 seconds	\geq 0.05 kPa (0.375 mmHg, 0.01 inHg)
Maximum value – minimum value of battery voltage for 12.8 seconds	\geq 0.465 V

Time required for diagnosis: 12.8 seconds \times 4 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
DELFLMAX SUMFL DELFLMAX is Max. deviation of sensor output during 12.8 seconds SUMFL: Integrated value of sensor output deviation in 12.8 seconds	$<$ 0.228 V $<$ 21.8 V

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

BZ:DTC P0483 FAN RATIONALITY CHECK

1. OUTLINE OF DIAGNOSIS

Detect the function abnormality of the radiator fan.

Judge as NG when the engine coolant temperature slowly decreases even when the radiator fan is rotating.

2. ENABLE CONDITION

Diagnostic enable condition is established if the radiator fan changes from OFF → ON when all of the conditions below are met.

When one of the conditions below is not met, the diagnostic enable condition is not established.

Secondary Parameters	Enable Conditions
Engine speed	550 — 950 rpm
Idle switch	ON
Vehicle speed	0 km/h (0 MPH)
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously at idle speed.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 5 minutes.

Judgment Value

Malfunction Criteria	Threshold Value
Engine coolant temperature	≥ 95°C (203°F)
Radiator fan	OFF → ON
Engine coolant temperature	Does not decrease

Time Needed for Diagnosis: 5 minutes

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Radiator fan	OFF → ON
Engine coolant temperature	Decreases

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CA:DTC P0502 VEHICLE SPEED SENSOR “A” CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed. Judge NG when low vehicle speed (0 km/h (0 MPH)) remains whereas it seemed to be in a usual driving speed.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 4000 rpm
Fuel cut in decel.	In operation
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform diagnosis continually during a deceleration fuel cut, at less than 4000 rpm.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 4 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 1

Time Needed for Diagnosis: 4 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when all of the following criteria are established.

Malfunction Criteria	Threshold Value
Vehicle speed	≥ 1
Starter switch	OFF
Starter switch ON → OFF time	≥ 3 sec.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

- Accelerator sensor signal process: Not allowed fully closed point learning. (Hold previous value)
- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6.21 MPH)
- Fuel cut control: Not allowed vehicle speed 0 km/h (0 MPH) fuel cut. Normally the high vehicle speed fuel cut performs on “and” of vehicle speed condition and engine speed, but perform the fuel cut only on engine speed condition (4,800 rpm or more).
- ISC control: Open loop compensation is set to (1 g/s). Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: Both main and sub fan are in High driving.
- Gear ratio judgment: Control as fixed in sixth gear
- Tumble generator valve control: Open the tumble generator valve.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CB:DTC P0503 VEHICLE SPEED SENSOR “A” INTERMITTENT/ERRATIC/HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of vehicle speed. Judge NG when high vehicle speed (300 km/h (186.4 MPH) or more) remains whereas it seemed to be in a usual driving speed.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 4000 rpm
Fuel cut in decel.	In operation
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform diagnosis continually during a deceleration fuel cut, at less than 4000 rpm.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 4 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	≥ 300

Time Needed for Diagnosis: 4 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when all of the following criteria are established.

Malfunction Criteria	Threshold Value
Vehicle speed	< 300 km/h (186.4 MPH)
Starter switch	OFF
Starter switch ON → OFF time	≥ 3 sec.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

- Accelerator sensor signal process: Not allowed fully closed point learning. (Hold previous value)
- Vehicle speed sensor signal process: Vehicle speed = 10 km/h (6.21 MPH)
- Fuel cut control: Not allowed vehicle speed 0 km/h (0 MPH) fuel cut. Normally the high vehicle speed fuel cut performs on “and” of vehicle speed condition and engine speed, but perform the fuel cut only on engine speed condition (4,800 rpm or more).
- ISC control: Open loop compensation is set to (1 g/s). Not allowed ISC feedback volume calculation.
- Air conditioner control: Not allowed air conditioner cut at accelerating.
- Radiator fan control: Both main and sub fan are in High driving.
- Gear ratio judgment: Control as fixed in sixth gear
- Tumble generator valve control: Open the tumble generator valve.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CC:DTC P0506 IDLE AIR CONTROL SYSTEM RPM LOWER THAN EXPECTED

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling. Judge as NG when actual engine speed is not close to target engine speed during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	$\geq 70^{\circ}\text{C}$ (158 $^{\circ}\text{F}$)
Battery voltage	$\geq 10.9\text{ V}$
Atmospheric pressure	$> 75.0\text{ kPa}$ (563 mmHg, 22.2 inHg)
Fuel level	$\geq 9\text{ l}$ (2.38 US gal, 1.98 Imp gal)
After engine starting	10 seconds or more
Feedback in ISC	In operation
Lambda value	0.90 — 1.1
After air condition switching ON-OFF, OFF-ON	5 seconds or more
After intake manifold pressure changes more than 4 kPa (30 mmHg, 1.2 inHg).	$> 5\text{ sec.}$
After neutral switch ON-OFF change	$> 5\text{ sec.}$
Vehicle speed	0 km/h (0 MPH)

3. GENERAL DRIVING CYCLE

After 10 seconds from engine starting, perform diagnosis continuously at idling after warming up.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below is 10 seconds \times 3 times.

Judgment Value

Malfunction Criteria	Threshold Value
Actual — Target engine speed	$< -100\text{ rpm}$
Feedback value for ISC	Max.

Time Needed for Diagnosis: 10 seconds \times 3 time

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear NG when the continuous time of meeting the malfunction criteria below becomes more than 10 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Actual — Target engine speed	$\geq -100\text{ rpm}$

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

- Judgment of heavy fuel: Not allowed to make the judgment of heavy fuel.
- Knock compensation:
 - Knock compensation final advance/delay angle value = knock compensation value + whole learning compensation value + portional learning compensation value
 - When normal: Knock compensation value = Fixed at 0°CA.
 - Failure: Knock compensation value ≠ Fixed at 0°CA. (When knock: Max. 12°CA retard)
 - Whole learning compensation coefficient update not allowed.
 - Portional learning zone compensation value calculation not allowed.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CD:DTC P0507 IDLE AIR CONTROL SYSTEM RPM HIGHER THAN EXPECTED

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that actual engine speed is not close to target engine speed during idling. Judge as NG when actual engine speed is not close to target engine speed during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine coolant temperature	≥ 70°C (158°F)
Battery voltage	≥ 10.9 V
Atmospheric pressure	> 75.0 kPa (563 mmHg, 22.2 inHg)
Fuel level	≥ 9 ℓ (2.38 US gal, 1.98 Imp gal)
After engine starting	10 seconds or more
Feedback in ISC	In operation
Lambda value	0.90 — 1.1
After air condition switching ON-OFF, OFF-ON	5 seconds or more
After intake manifold pressure changes more than 4 kPa (30 mmHg, 1.2 inHg).	> 5 sec.
After neutral switch ON-OFF change	> 5 sec.
Vehicle speed	0 km/h (0 MPH)

3. GENERAL DRIVING CYCLE

After 10 seconds from engine starting, perform diagnosis continuously at idling after warming up.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below is 10 seconds × 3 times.

Judgment Value

Malfunction Criteria	Threshold Value
Actual – Target engine speed	≥ 200 rpm
Feedback value for ISC	Min.

Time Needed for Diagnosis: 10 seconds × 3 time

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear NG when the continuous time of meeting the malfunction criteria below becomes more than 10 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Actual – Target engine speed	< 200 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

- Judgment of heavy fuel: Not allowed to make the judgment of heavy fuel.
- Knock compensation:
 - Knock compensation final advance/delay angle value = knock compensation value + whole learning compensation value + portional learning compensation value
 - When normal: Knock compensation value = Fixed at 0°CA.
 - Failure: Knock compensation value ≠ Fixed at 0°CA. (When knock: Max. 12°CA retard)
 - Whole learning compensation coefficient update not allowed.
 - Portional learning zone compensation value calculation not allowed.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CE:DTC P0512 STARTER REQUEST CIRCUIT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.

Judge ON NG when the starter SW signal remains ON.

Judge OFF NG when the engine starts without starter experience.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as ON NG when the continuous time of meeting the malfunction criteria below becomes more than 3 minutes.

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed	> 500 rpm
Starter OFF signal	Not detected
Battery voltage	> 8 V

Time Needed for Diagnosis: 180 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge ON OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Starter switch	OFF
Battery voltage	> 8 V

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CF:DTC P0513 INCORRECT IMMOBILIZER KEY

1. OUTLINE OF DIAGNOSIS

DTC	Item	OUTLINE OF DIAGNOSIS
P0513	Incorrect Immobilizer Key	Incorrect immobilizer key (Use of unregistered key in IMMCM)
P1570	Antenna	Faulty antenna
P1571	Reference Code Incompatibility	Reference code incompatibility between IMMCM and ECM
P1572	IMM Circuit Failure (Except Antenna Circuit)	Communication failure between IMMCM and ECM
P1574	Key Communication Failure	Failure of IMMCM to verify key (transponder) ID code or transponder failure
P1576	EGI Control Module EEPROM	ECM malfunctioning
P1577	IMM Control Module EEPROM	IMMCM malfunctioning

2. ENABLE CONDITION

When starting the engine.

3. GENERAL DRIVING CYCLE

Perform the diagnosis only after starting the engine.

4. DIAGNOSTIC METHOD

Judge as NG when the conditions of the diagnosis outline above are established.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CG:DTC P0519 IDLE AIR CONTROL SYSTEM PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect the malfunction that engine speed increases more than that in normal condition during idling.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Feedback in ISC	In operation
Vehicle speed	< 4 km/h (2.49 MPH)
After engine starting	1 second or more

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously if the vehicle speed at less than 4 km/h (2.49 MPH).

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the all malfunction criteria below becomes more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed — targeted engine speed	≥ 1500 rpm
Feedback value for ISC	$\leq 0\%$
Engine speed change every 180 degree engine revs.	≥ -5 rpm

Time Needed for Diagnosis: 2 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear NG when the continuous time of meeting the malfunction criteria below becomes more than 5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Engine speed — targeted engine speed	< 200 rpm

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

Fuel cut: Cuts off fuel for only #1 and #2 cylinders, or for all cylinders according to vehicle speed, engine speed, and throttle position.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

CH:DTC P0600 SERIAL COMMUNICATION LINK

1. OUTLINE OF DIAGNOSIS

Detect malfunction of CAN communication.

Judge as NG when CAN communication is not established, CAN communication with AT is not established, and the data from the AT is not normal.

2. COMPONENT DESCRIPTION

ECM and TCM are connected by high speed CAN.

(Common Specifications)

CAN Protocol 2.0 B (Active)

Frame Format: 11 Bit ID Frame (Standard Frame)

(High speed CAN)

Conforms to ISO11898

Communication Speed: 500 kbps

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Starter switch	OFF
Engine	run

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously after starting the engine.

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when either of the following conditions is established.

Judge as OK and clear the NG when the continuous time when all of the following criteria are established is more than the predetermined time (1 second).

Judgment Value

Malfunction Criteria	Threshold Value
bus off flag or warning flag	set
ID is not received from the TCM	= 500 milliseconds

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CI: DTC P0604 INTERNAL CONTROL MODULE RANDOM ACCESS MEMORY (RAM) ERROR

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of microcomputer (RAM).

Zero clear all normal RAM areas with the initial routine, and judge as NG when the sum of all added RAM after clearing is other than zero.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	OFF → ON

Diagnosis with the initial routine.

3. GENERAL DRIVING CYCLE

Perform the diagnosis as soon as the ignition switch is turned to ON.

4. DIAGNOSTIC METHOD

Judge as NG when the criteria below are met and judge as OK when not met, and clear the NG.

Judgment Value

Malfunction Criteria	Threshold Value
Sum of RAM data after data clear	Cannot be read.

Time Needed for Diagnosis: Undetermined

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

CJ:DTC P0605 INTERNAL CONTROL MODULE READ ONLY MEMORY (ROM) ERROR

1. OUTLINE OF DIAGNOSIS

Judge as NG when SUM value of ROM is outside the standard value.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
SUM value of ROM	Specification

Time Needed for Diagnosis: Undetermined

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

8. ECM OPERATION AT DTC SETTING

- Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

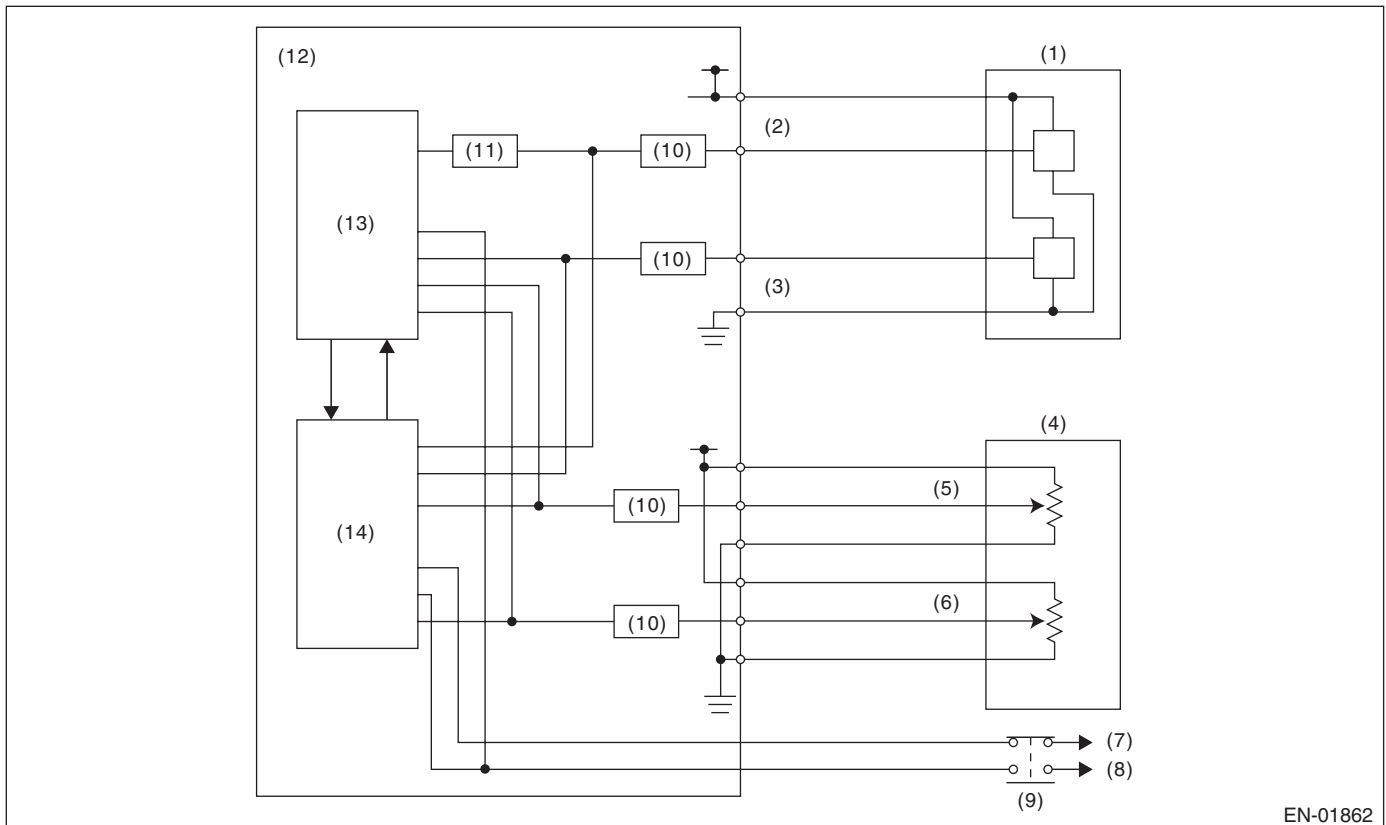
CK:DTC P0607 CONTROL MODULE PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge as NG when either the following is completed.

- When the read value of throttle position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the read value of accelerator pedal position sensor 1 signal is mismatched between main CPU and sub CPU.
- When the sub CPU operates abnormally.
- When the communication between main CPU \leftrightarrow sub CPU is abnormal.
- When the input amplifier circuit of throttle position sensor 1 is abnormal.
- When the cruise control cannot be canceled correctly.
- When the signal of brake SW1 and 2 is mismatched.
- When the directed angle from the main CPU is abnormal.

2. COMPONENT DESCRIPTION



EN-01862

- | | |
|---|----------------------------------|
| (1) Throttle position sensor | (8) Stop light |
| (2) Throttle position sensor 1 | (9) Brake switch |
| (3) Throttle position sensor 2 | (10) I/F circuit |
| (4) Accelerator pedal position sensor | (11) Amplifier circuit |
| (5) Accelerator pedal position sensor 1 | (12) Engine control module (ECM) |
| (6) Accelerator pedal position sensor 2 | (13) Sub CPU |
| (7) Battery | (14) Main CPU |

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
(1) Ignition switch	ON
(2) Ignition switch	ON
(3) None	—
(4) None	—
(5) Throttle opening angle	
(6) Brake switch (only with cruise control)	ON
(7) None	—

4. GENERAL DRIVING CYCLE

- (1) — (4): Always perform the diagnosis continuously.
(5): Always perform the diagnosis continuously when idling.
(6): Perform the diagnosis when the brake pedal is depressed.
(7): Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
1. Difference of CPU on reading value of throttle position sensor signal	Within 0.858 V
2. Difference of CPU on read value of accelerator pedal position sensor signal	Within 0.042 V
3. WD pulse from sub CPU	WD pulse occur
4. Communication between CPU	Possible to communicate
5. Difference of signal on connection of amplifier	Within X 4±3°
6. Cruise control cancel signal at brake ON	Cruise control cancel signal ON
7. Brake switch 1, 2 signal	SW 1 and 2 are matched

Time Needed for Diagnosis:

1. 250 milliseconds
2. 250 milliseconds
3. 200 milliseconds
4. 200 milliseconds
5. 24 milliseconds
6. 250 milliseconds
7. 200 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

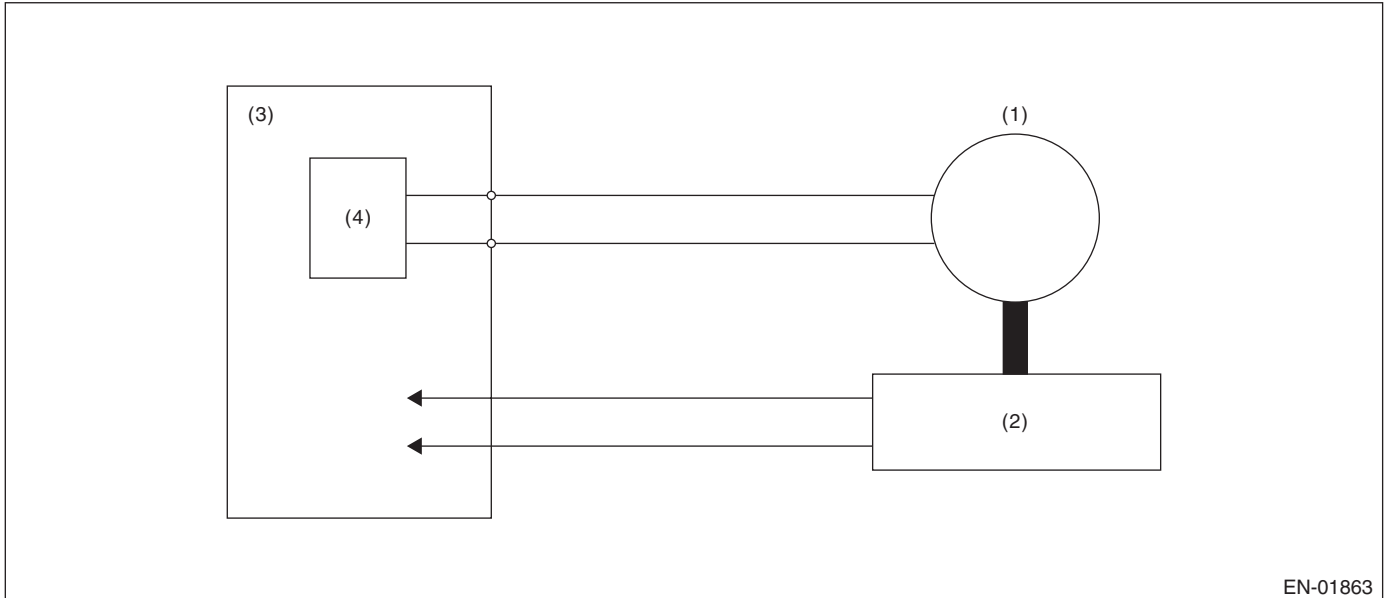
GENERAL DESCRIPTION

CL:DTC P0638 THROTTLE ACTUATOR CONTROL RANGE/PERFORMANCE (BANK 1)

1. OUTLINE OF DIAGNOSIS

Judge as NG when the target opening angle and actual opening angle is mismatched or the current to motor is more than specified duty for specified time continuously.

2. COMPONENT DESCRIPTION



- (1) Motor
- (2) Throttle position sensor
- (3) Engine control module (ECM)
- (4) Drive circuit

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Normal operation of electric throttle control	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously when the electric throttle control is operating.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

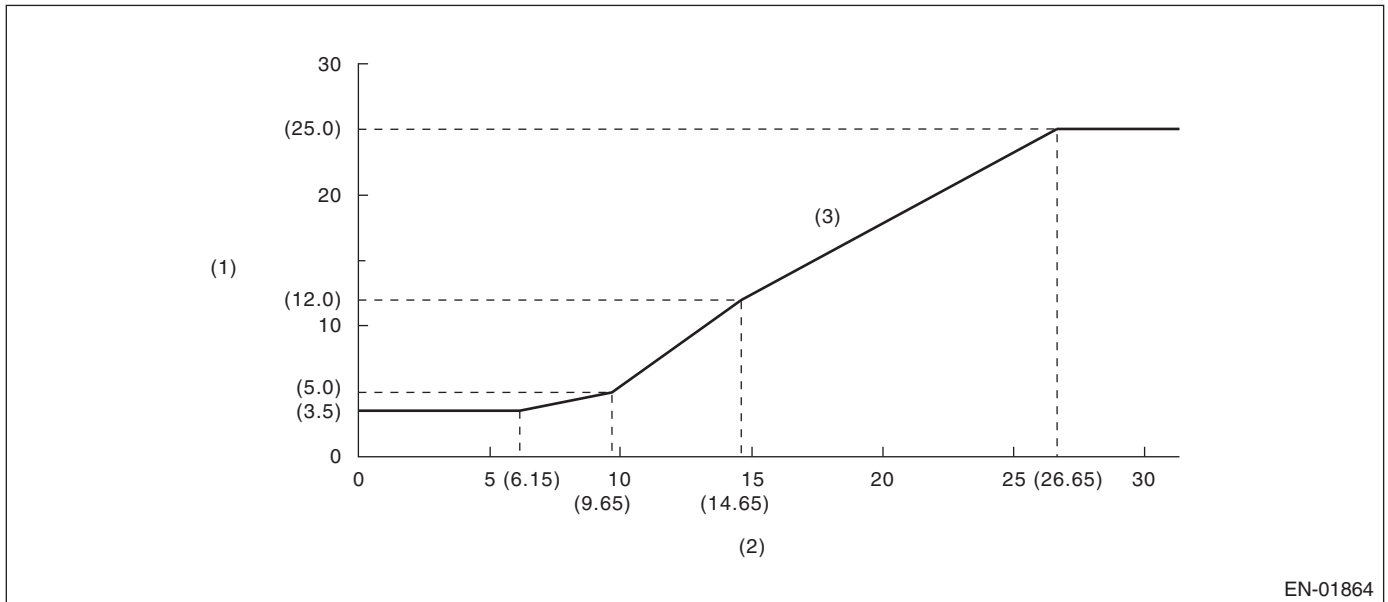
Judgment Value

Malfunction Criteria	Threshold Value
Difference between target opening angle and actual opening angle	3.5° or less
Output duty to drive circuit	95% or less

Time Needed for Diagnosis:

- Target opening angle and actual opening angle: 250 milliseconds (For NG) 2000 milliseconds (For OK)
- Output duty to drive circuit: 2000 milliseconds

Details of Judgment Value

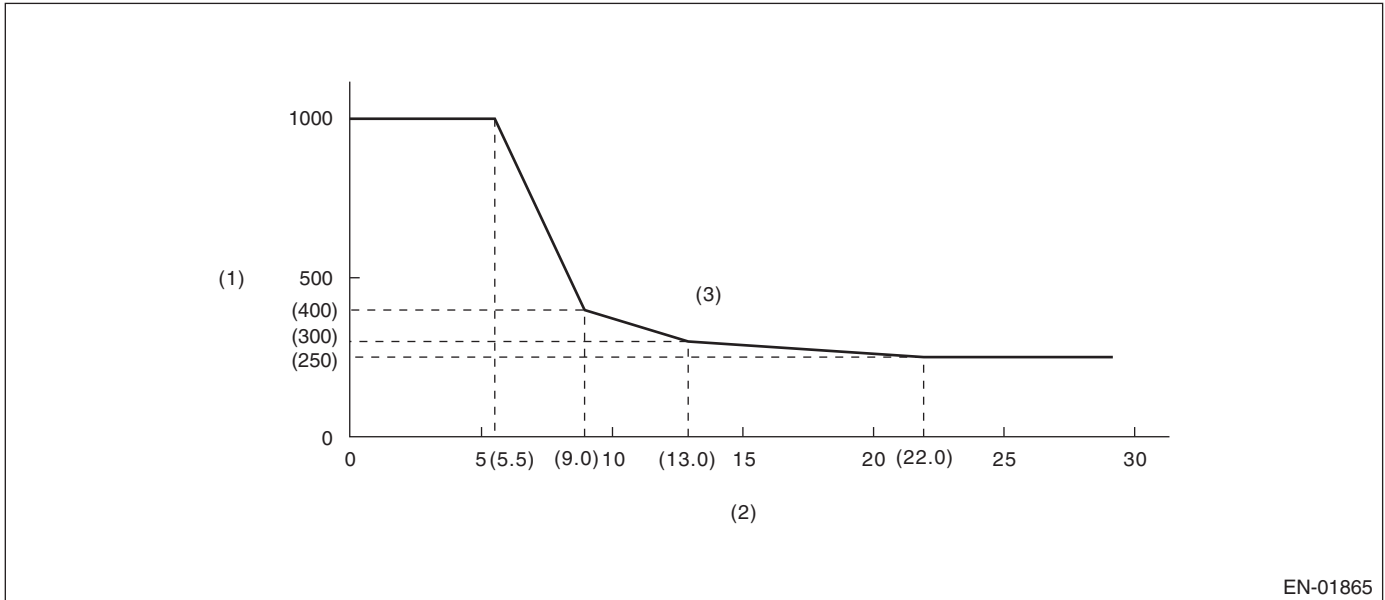


- (1) Difference between target opening angle and actual opening angle (°)
(2) Target throttle opening angle (°)
(3) NG area

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Details of Judgment (The actual opening angle \leq target opening angle is always 1000 milliseconds)



- (1) Judgment time (milliseconds)
- (2) Throttle position sensor 1 opening angle
- (3) NG area

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CM:DTC P0691 FAN 1 CONTROL CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of radiator fan circuit.

Judge as NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
After engine starting	1 second or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM outputs OFF signal	Low level

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
After engine starting	1 second or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM outputs OFF signal	High level

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CN:DTC P0692 FAN 1 CONTROL CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of radiator fan circuit.

Judge as NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
After engine starting	1 second or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM outputs ON signal	High level

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
After engine starting	1 second or more
Engine speed	≥ 500 rpm
Ignition switch	ON
Battery voltage	≥ 10.9 V
Terminal voltage level when ECM outputs ON signal	Low level

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CO:DTC P0700 TRANSMISSION CONTROL SYSTEM (MIL REQUEST)

1. OUTLINE OF DIAGNOSIS

CAN communication is established with AT and, judge as NG when there is a MIL lighting request.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes longer than the predetermined amount of time (2.5 seconds).

Judge as OK and clear the NG when the following conditions are not met.

Judgment Value

Malfunction Criteria	Threshold Value
MIL lighting request from TCM	set

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CP:DTC P0851 PARK/NEUTRAL SWITCH INPUT CIRCUIT LOW (AT MODEL)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of the neutral SW.

Judge NG when the ECM neutral terminal input differs from the reception data from TCM.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

4. DIAGNOSTIC METHOD

Judge as NG when the continuous time until meeting the malfunction criteria below becomes more than 6.5 seconds. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal when park/neutral = "OFF" and any other switches = "ON" on AT	LOW (ON)

Time Needed for Diagnosis: 6.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CQ:DTC P0851 NEUTRAL SWITCH INPUT CIRCUIT LOW (MT MODEL)

1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.

Judge NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change. And clear NG if there is change in the neutral SW.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below)	Low continues
Driving condition change	a) to b)
a) Vehicle speed = 0 km/h (0 MPH) and engine speed 600 — 900 rpm	
b) Vehicle speed ≥ 64 km/h (39.8 MPH) and engine speed 1600 — 2550 rpm	

Time Needed for Diagnosis: Monitoring 3 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

Cruise control: Not allowed to command cruise control.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CR:DTC P0852 PARK/NEUTRAL SWITCH INPUT CIRCUIT HIGH (AT MODEL)

1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.

Judge NG when the ECM neutral terminal input differs from the reception data from TCM.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

4. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 6.5 seconds.

Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal when park/neutral = "ON" and any other switches = "OFF" on AT	HIGH (OFF)

Time Needed for Diagnosis: 6.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CS:DTC P0852 NEUTRAL SWITCH INPUT CIRCUIT HIGH (MT MODEL)

1. OUTLINE OF DIAGNOSIS

Judge the open or short circuit of the neutral SW.

Judge NG when there is no change in the neutral SW even if the driving shift was applied. (There is neutral SW ON/OFF inversion from the vehicle speed and engine speed.)

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	2 seconds or more
Starter switch	OFF

3. GENERAL DRIVING CYCLE

Perform the diagnosis continuously in 2 seconds after starting the engine.

4. DIAGNOSTIC METHOD

Judge NG when the malfunction criteria below are completed 3 time or more after the neutral SW change. And clear NG if there is change in the neutral SW.

Judgment Value

Malfunction Criteria	Threshold Value
Neutral switch signal (while changing from a to b below)	High continues
Driving condition change	a) to b)
a) Vehicle speed = 0 km/h (0 MPH) and engine speed 600 — 900 rpm	
b) Vehicle speed ≥ 64 km/h (39.8 MPH) and engine speed 1600 — 2550 rpm	

Time Needed for Diagnosis: Monitoring 3 times

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CT:DTC P1152 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (LOW) (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect that λ value remains Low.

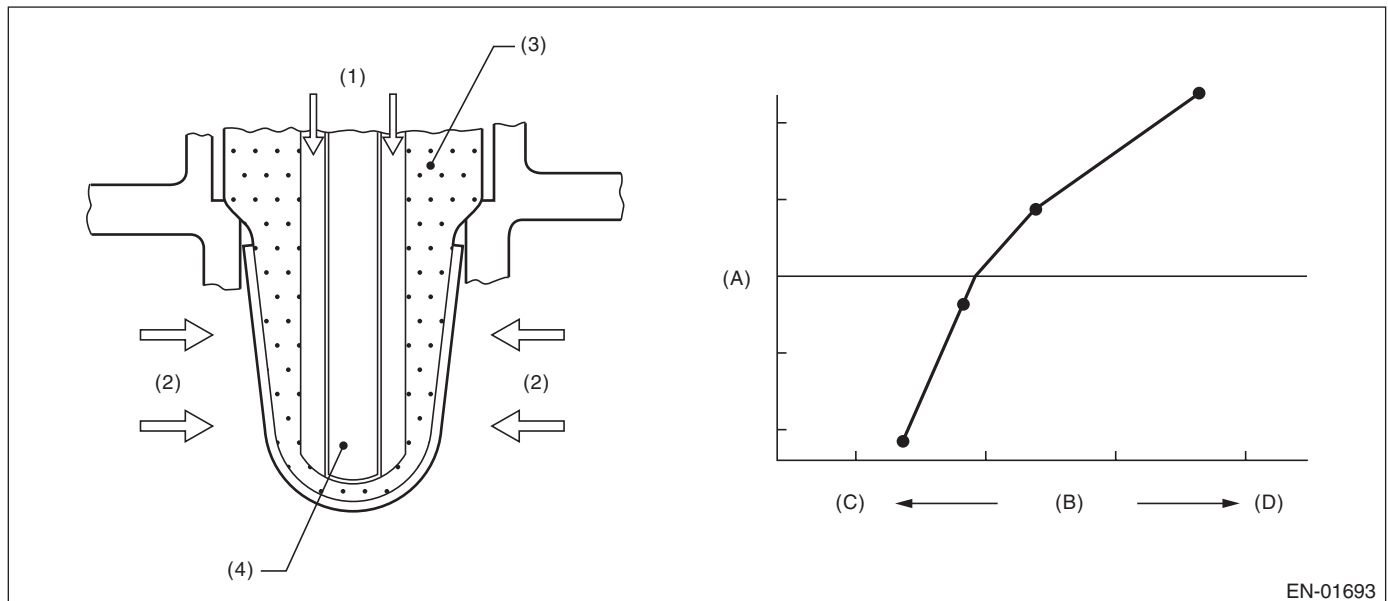
Judge as NG when lambda value is abnormal in accordance with λ value of front oxygen (A/F) sensor and running conditions such as vehicle speed, amount of intake air, engine coolant temperature, sub feedback control, etc.

λ value = Actual air fuel ratio/Theoretical air fuel ratio

$\lambda > 1$: Lean

$\lambda < 1$: Rich

2. COMPONENT DESCRIPTION



- (1) Atmosphere
- (2) Exhaust gas
- (3) ZrO₂
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

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Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters enable conditions	4 seconds or more
Battery voltage	> 10.9 V
Atmosphere pressure	> 75.0 kPa (563 mmHg, 22.2 inHg)
Rear oxygen sensor sub feedback	Execution
Rear oxygen sensor output voltage – Feedback target voltage	–0.2 V — 0.1 V
or	
Rear oxygen sensor sub feedback compensation coefficient	On Min.
or	
Rear oxygen sensor sub feedback compensation coefficient	On Max.
After engine starting	60 seconds or more
Engine coolant temperature	≥ 70°C (158°F)
Vehicle speed	≥ 20 km/h (12.4 MPH)
Amount of intake air	≥ 6 g/s
Load change during 0.5 engine revs.	≤ 0.01 g/rev
Front oxygen (A/F) sensor impedance	0 — 50 Ω
Learning value of evaporation gas density	≤ 0.2
Total time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant speed of 20 km/h (12 MPH) or more, from 60 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 10 seconds. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
λ value when rear oxygen sensor sub feedback compensation coefficient is not at maximum limit	≤ 0.85

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CU:DTC P1153 O2 SENSOR CIRCUIT RANGE/PERFORMANCE (HIGH) (BANK 1 SENSOR 1)

1. OUTLINE OF DIAGNOSIS

Detect that λ value remains High.

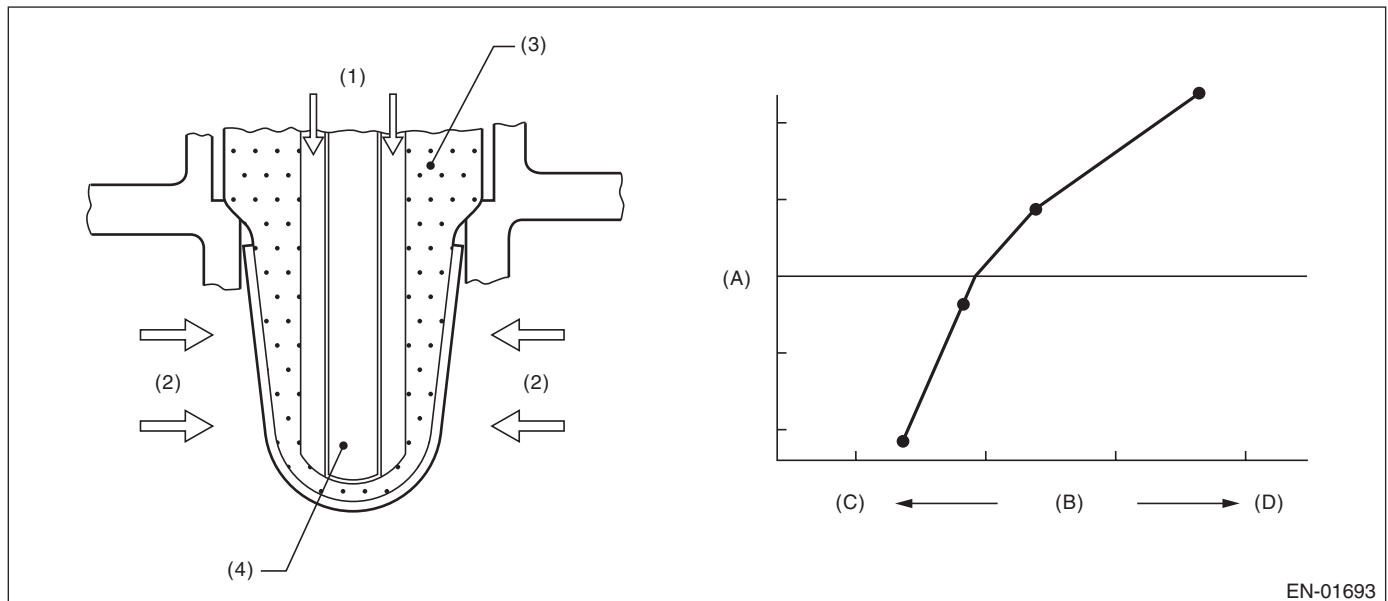
Judge as NG when lambda value is abnormal in accordance with λ value of front oxygen (A/F) sensor and running conditions such as vehicle speed, amount of intake air, engine coolant temperature, sub feedback control, etc.

λ value = Actual air fuel ratio/Theoretical air fuel ratio

$\lambda > 1$: Lean

$\lambda < 1$: Rich

2. COMPONENT DESCRIPTION



EN-01693

- (1) Atmosphere
- (2) Exhaust gas
- (3) ZrO₂
- (4) Ceramic heater

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Lean
- (D) Rich

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
All secondary parameters enable conditions	4 seconds or more
Battery voltage	> 10.9 V
Atmospheric pressure	> 75.0 kPa (563 mmHg, 22.2 inHg)
Rear oxygen sensor sub feedback	Execution
Rear oxygen sensor output voltage – Feedback target voltage	–0.2 V — 0.1 V
or	
Rear oxygen sensor sub feedback compensation coefficient	On Min.
or	
Rear oxygen sensor sub feedback compensation coefficient	On Max.
After engine starting	60 seconds or more
Engine coolant temperature	≥ 70°C (158°F)
Vehicle speed	≥ 20 km/h (12.4 MPH)
Amount of intake air	≥ 6 g/s
Load change during 0.5 engine revs.	≤ 0.02 g/rev
Front oxygen (A/F) sensor impedance	0 — 50 Ω
Learning value of evaporation gas density	≤ 0.2
Total time of operating canister purge	20 seconds or more

4. GENERAL DRIVING CYCLE

Perform diagnosis continuously at a constant vehicle speed of 20 km/h (12 MPH) or more, from 60 seconds after starting the engine.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 10 seconds. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
λ value when rear oxygen sensor sub feedback compensation coefficient cannot be at minimum limit	≥ 1.15

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

- Front oxygen (A/F) sensor main learning compensation: Not allowed to calculate.
- Correction when re-starting at high temperature: Normally minimum value 0.3 → 0.
- Purge control: Not allowed to purge.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

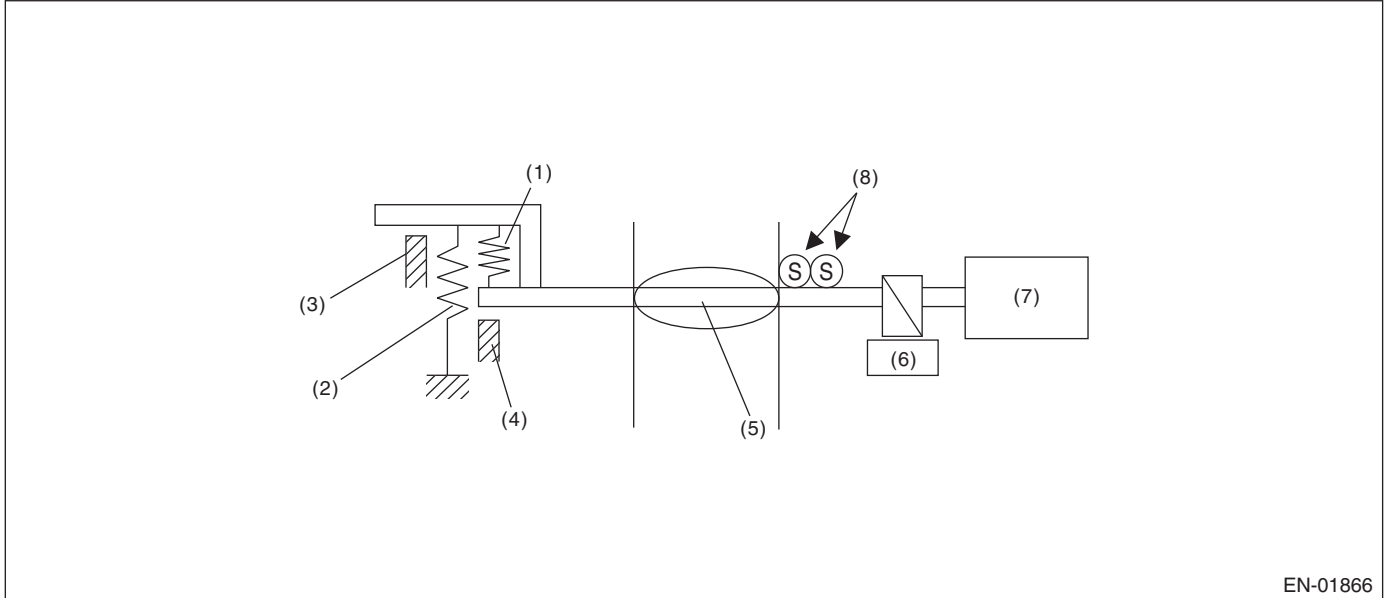
GENERAL DESCRIPTION

CV:DTC P1160 RETURN SPRING FAILURE

1. OUTLINE OF DIAGNOSIS

Judge as NG when the valve does not move to the close direction with the motor power stopped and the valve open more than the default opening.

2. COMPONENT DESCRIPTION



- | | |
|--------------------------|----------------------------------|
| (1) Opener spring | (5) Throttle valve |
| (2) Return spring | (6) Gear |
| (3) Intermediate stopper | (7) DC motor |
| (4) Full closed stopper | (8) Main and sub throttle sensor |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Throttle opening angle	OFF
Motor continuity	OFF

4. GENERAL DRIVING CYCLE

- Ignition switch ON → OFF
- Ignition switch OFF → ON (Only after clearing memory)

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.6 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Opening variation after continuity is set to OFF	< 2°

Time Needed for Diagnosis: 600 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

8. FAIL SAFE

Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

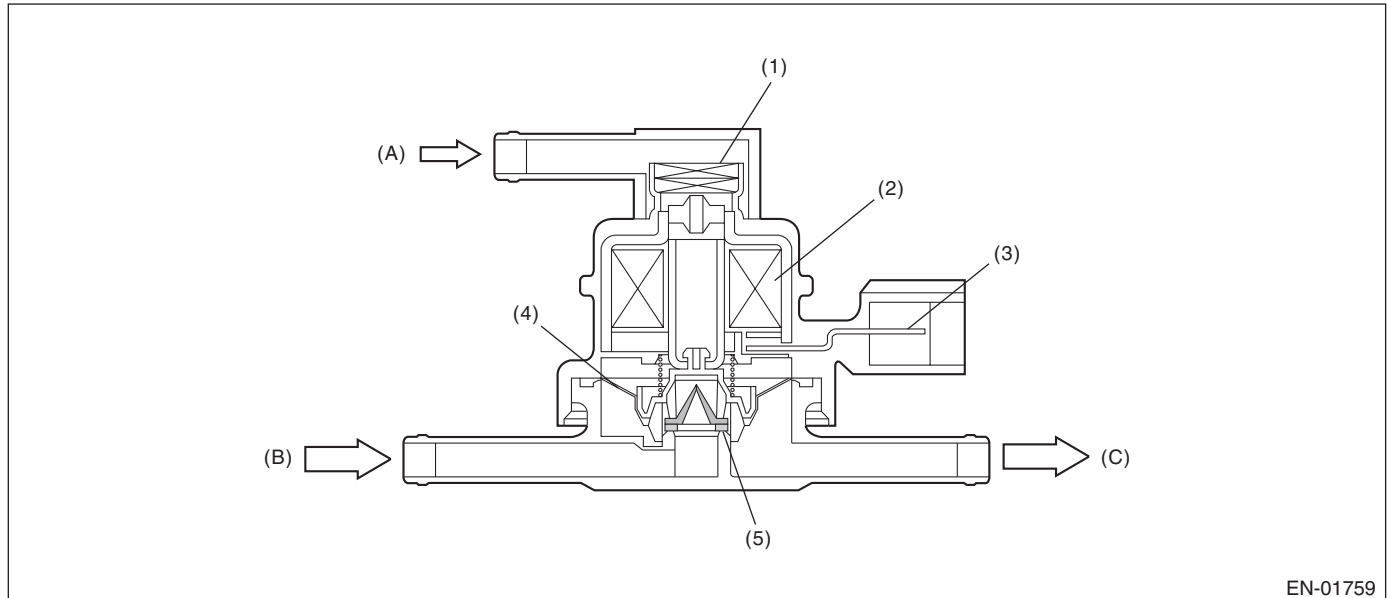
CW:DTC P1400 FUEL TANK PRESSURE CONTROL SOLENOID VALVE CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of pressure control solenoid valve.

Judge as NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



- (1) Filter
- (2) Coil
- (3) Connector terminal
- (4) Diaphragm
- (5) Valve

- (A) Atmospheric pressure
- (B) Shut-off valve
- (C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CX:DTC P1410 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN

1. OUTLINE OF DIAGNOSIS

Continually detects for a combination solenoid valve and lead valve stuck open condition. Calculate the integrated value of secondary air supply piping pressure sensor output voltage maximum/minimum values and output voltage deviation for a constant time period after engine start, and if the difference between the maximum/minimum is large and the integrated value is also large, judge as NG.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed	< 500 rpm
After engine starting	9 seconds or more
After secondary air injection system stop	9 seconds or more
Amount of intake air	2 g (0.07 oz)/seconds or more and Less than 400 g (14.11 oz)/seconds
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Perform diagnosis continuously after engine start with the secondary air pump stopped and with a high air flow amount.

4. DIAGNOSTIC METHOD

When the solenoid and lead valves of the combination valve both are open and malfunctioning, a pulse will appear in the secondary air supply piping pressure sensor output. This pulse is tracked by the following method to detect the problem.

Calculate the maximum and minimum values of the secondary air supply piping pressure sensor output voltage, and integrated value (sum) of the output voltage deviation for kCOTIM seconds. The difference between the maximum/minimum values is compared with the threshold value, and the sum is also compared with the threshold value. If both exceed the threshold, the NG counter is counted up, and when the counter becomes kCOCOT times, an NG judgment is made. If neither exceed the threshold, or only one exceeds the threshold, it is judged as being normal.

Judgment Value

Malfunction Criteria	Threshold Value
Pipe inner pressure difference between Max. and Min.	≥ 0.048 V
Cumulative pipe inner pressure change per 4 milliseconds	≥ 24 V
Amount of atmospheric pressure change	< 4 mmHg

Time Needed for Diagnosis: 10 seconds × 2 time

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

CY:DTC P1418 SECONDARY AIR INJECTION SYSTEM CONTROL "A" CIRCUIT SHORTED

1. OUTLINE OF DIAGNOSIS

Judge as NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

When the continuous time with following conditions being established exceeds 2.5 seconds, it is judged as NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK when the following conditions are established, and clear the NG.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	≥ 10.9 V
Ignition	ON
Terminal output voltage when ECM outputs ON signal	Low

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

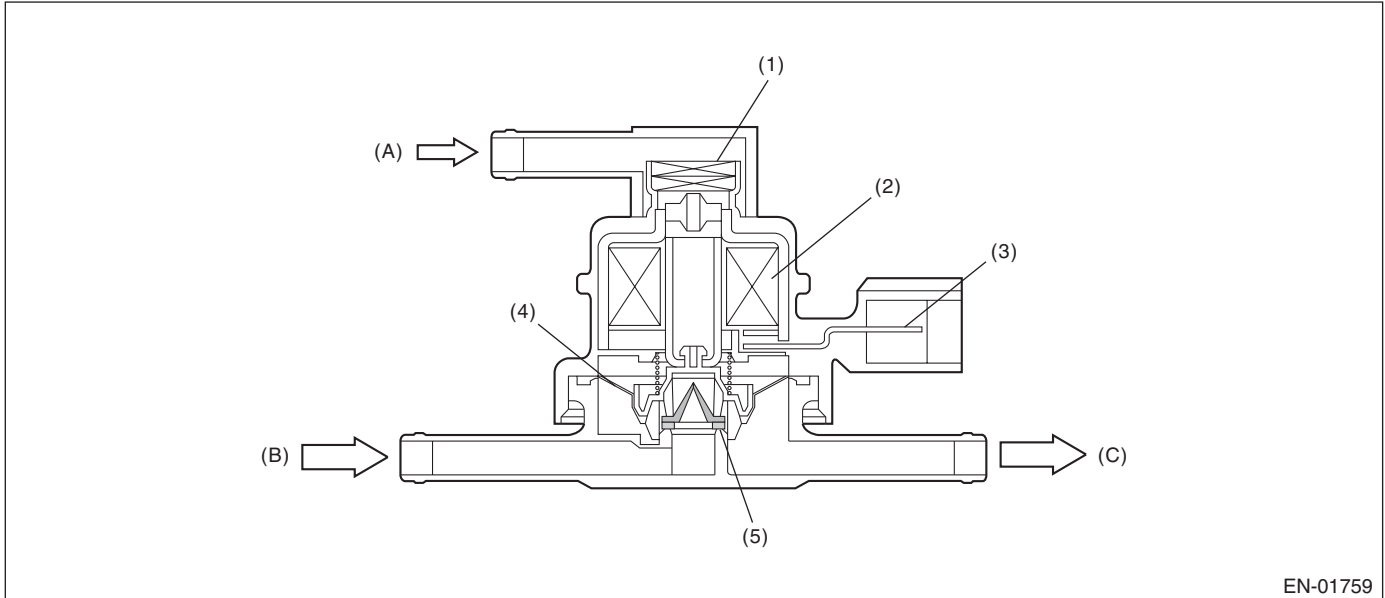
CZ:DTC P1420 FUEL TANK PRESSURE CONTROL SOL. VALVE CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of pressure control solenoid valve.

Judge as NG when ECM output level is different from actual terminal level.

2. COMPONENT DESCRIPTION



- (1) Filter
- (2) Coil
- (3) Connector terminal
- (4) Diaphragm
- (5) Valve

- (A) Atmospheric pressure
- (B) Shut-off valve
- (C) To fuel tank

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON
Battery voltage	$\geq 10.9 \text{ V}$
After engine starting	1 second or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis after starting the engine.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than time needed for diagnosis (2.5 seconds). Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

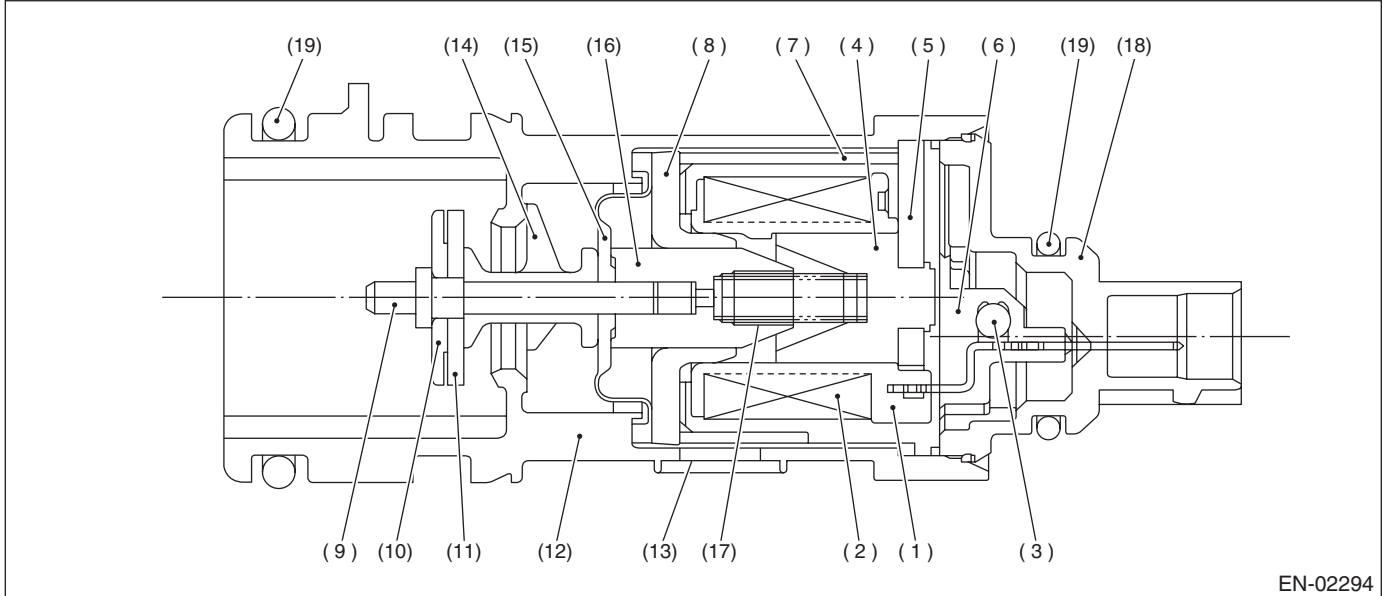
GENERAL DESCRIPTION

DA:DTC P1443 VENT CONTROL SOLENOID VALVE FUNCTION PROBLEM

1. OUTLINE OF DIAGNOSIS

Detect the abnormal function (stuck closed) of the drain valve.
Judge as NG when fuel tank pressure is low.

2. COMPONENT DESCRIPTION



- | | | |
|-----------------|--------------------|-------------------|
| (1) Bobbin | (8) Magnetic plate | (14) Retainer |
| (2) Coil | (9) Shaft | (15) Diaphragm |
| (3) Diode | (10) Plate | (16) Movable core |
| (4) Stator core | (11) Valve | (17) Spring |
| (5) End plate | (12) Housing | (18) Cover |
| (6) Body | (13) Filter | (19) O-ring |
| (7) Yoke | | |

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Drain valve	Open
Battery voltage	$\geq 10.9 \text{ V}$
Atmospheric pressure	$\geq 75.0 \text{ kPa}$ (563 mmHg, 22.2 inHg)
Tank pressure when starter is OFF → ON	$-0.67 \text{ — } 1.43 \text{ kPa}$ ($-5 \text{ — } 10.7 \text{ mmHg}$, $-0.20 \text{ — } 0.42 \text{ inHg}$)

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tank pressure	≤ -4.0 kPa (-30 mmHg, -1.18 inHg)

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when all the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Tank pressure	> -4.0 kPa (-30 mmHg, -1.18 inHg)
Cumulative time when all of the malfunction criteria below is completed.	≥ 30 sec.
Purge control solenoid valve duty ratio	Not = 0
Fuel temperature	-10 — 45°C (14 — 113°F)
Intake manifold relative pressure	≤ -26.7 kPa (-200 mmHg, -7.87 inHg)

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Pressure control solenoid valve control: Open the pressure control solenoid valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

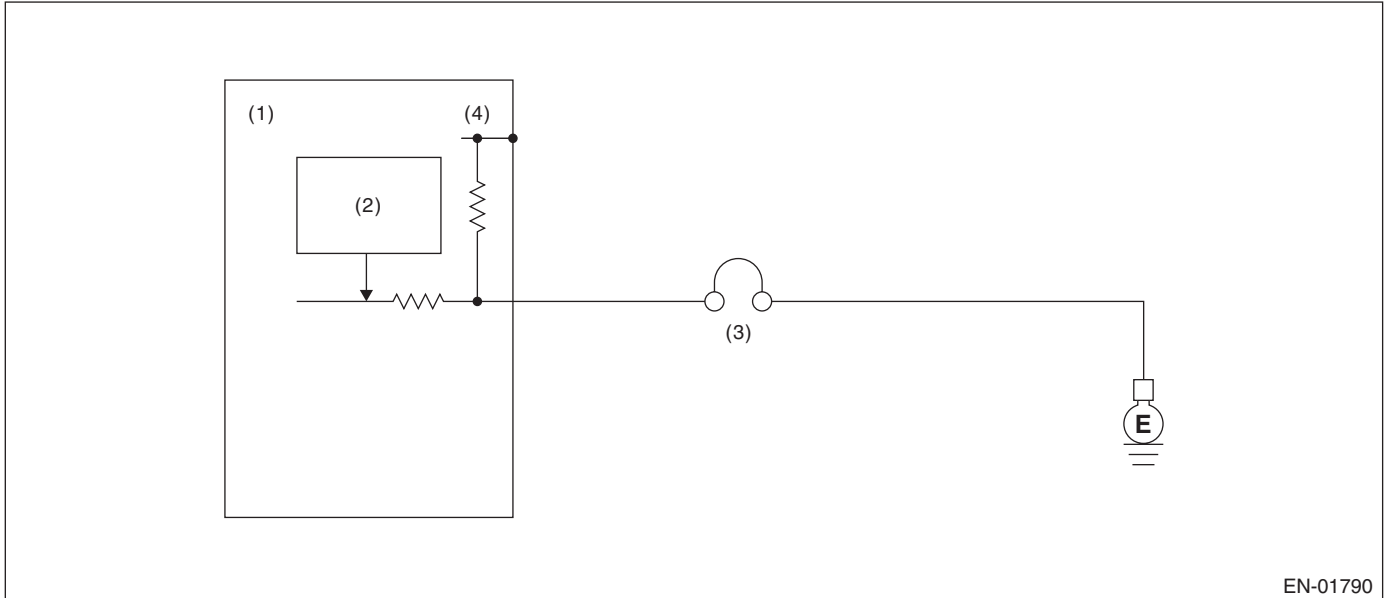
DB:DTC P1491 POSITIVE CRANKCASE VENTILATION (BLOW-BY) FUNCTION PROBLEM

1. OUTLINE OF DIAGNOSIS

Detect the blow-by hose release abnormality.

Judge as NG when the diagnosis terminal voltage is high.

2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Detecting circuit
- (3) PCV diagnosis connector
- (4) 5 V

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Positive crankcase ventilation diagnosis voltage	High
Engine speed	≥ 500 rpm

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Battery voltage	> 10.9 V
Positive crankcase ventilation diagnosis voltage	Low
Engine speed	≥ 500 rpm

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

Memorize the diagnostic value and trouble standard value. (For test mode \$06)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DC:DTC P1518 STARTER SWITCH CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of starter SW.

Judge as OFF NG when the engine starts without starter ON experience.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as OFF NG when the following conditions are established.

Judgment Value

Malfunction Criteria	Threshold Value
Vehicle speed	< 1 km/h (0.62 MPH)
Starter ON signal	Not detected
Engine speed in 0.8 seconds or more for which the condition that engine speed is less than 500 rpm continues	≥ 500 rpm

Time Needed for Diagnosis: 1 second

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OFF OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Starter ON	Experienced
Starter ON diagnosis	Not diagnosed
Battery voltage	> 8 V

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

DD:DTC P1560 BACK-UP VOLTAGE CIRCUIT MALFUNCTION

1. OUTLINE OF DIAGNOSIS

Detect the open/short circuit of back-up power supply circuit.

Judge as NG when the backup voltage becomes smaller than the battery voltage.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	< Battery voltage × 0.7
Battery voltage	≥ 10.9 V

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Voltage of back-up power supply	≥ Battery voltage × 0.7
Battery voltage	≥ 10.9 V

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DE:DTC P1570 ANTENNA

NOTE:

For the detection standard, refer to DTC P0513 "INCORRECT IMMOBILIZER KEY". <Ref. to GD(H4DOTC)-179, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DF:DTC P1571 REFERENCE CODE INCOMPATIBILITY

NOTE:

For the detection standard, refer to DTC P0513 "INCORRECT IMMOBILIZER KEY". <Ref. to GD(H4DOTC)-179, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DG:DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT)

NOTE:

For the detection standard, refer to DTC P0513 "INCORRECT IMMOBILIZER KEY". <Ref. to GD(H4DOTC)-179, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DH:DTC P1574 KEY COMMUNICATION FAILURE

NOTE:

For the detection standard, refer to DTC P0513 "INCORRECT IMMOBILIZER KEY". <Ref. to GD(H4DOTC)-179, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DI: DTC P1576 EGI CONTROL MODULE EEPROM

NOTE:

For the detection standard, refer to DTC P0513 "INCORRECT IMMOBILIZER KEY". <Ref. to GD(H4DOTC)-179, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DJ:DTC P1577 IMM CONTROL MODULE EEPROM

NOTE:

For the detection standard, refer to DTC P0513 "INCORRECT IMMOBILIZER KEY". <Ref. to GD(H4DOTC)-179, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Trouble Code (DTC) Detecting Criteria.>

DK:DTC P1602 CONTROL MODULE PROGRAMMING ERROR

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of catalytic converter initial warm-up retard angle control.

Judge as NG if the ECM is not operating properly when performing catalytic converter initial warm-up retard angle control.

Judge as NG when either the exhaust temperature diagnosis or the idle speed diagnosis becomes NG.

- Exhaust temperature diagnosis

Judge as NG if the exhaust temperature is below the specified value at 14 seconds after a cold start.

- Idle speed diagnosis

Judge as NG when actual engine speed is not close to the target engine speed after stopping the retard angle control.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Atmospheric pressure	> 75.1 kPa (563 mmHg, 22.2 inHg)
Battery voltage	> 10.9 V
Cold start diagnosis	Incomplete
Engine	Run
Vehicle speed	≤ 2 km/h (1 MPH)
Misfire in 200 engine revs.	< 5
Time elapsed after engine start	14 seconds

3. GENERAL DRIVING CYCLE

Perform diagnosis during cold start.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

4. DIAGNOSTIC METHOD

- Exhaust temperature diagnosis

Abnormality Judgment

When the diagnostic execution conditions are established, calculate the estimated exhaust temperature. Judge as NG if the following conditions are established within 14 seconds after starting the engine.

Judgment Value

Malfunction Criteria	Threshold Value
Estimated exhaust temperature	< Value from Map 1

Map 1

Coolant temperature at engine start	- 40°C (-40°F)	- 30°C (-22°F)	- 20°C (-4°F)	- 10°C (14°F)	0°C (32°F)	10°C (50°F)	20°C (68°F)	30°C (86°F)	40°C (104°F)	50°C (122°F)
Threshold Value	200°C (392°F)	200°C (392°F)	200°C (392°F)	200°C (392°F)	200°C (392°F)	200°C (392°F)	180°C (356°F)	180°C (356°F)	180°C (356°F)	180°C (356°F)

Time Needed for Diagnosis: 14 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK when the following conditions are established after predetermined amount of time has passed.

Judgment Value

Malfunction Criteria	Threshold Value
Estimated exhaust temperature	≥ Value from Map 1

- Idle speed diagnosis

Judge as NG when all the following conditions are established and judge as OK when not met.

Malfunction Criteria	Threshold Value
Continuous time of (target engine RPM – engine RPM > 100)	≥ 10000 milliseconds
(actual retard amount > 5°C/A)	≥ 3000 milliseconds

Time Needed for Diagnosis: 6 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DL:DTC P2004 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generator valve motor function.

Judge open fixing malfunction when the opening degree is large even after finishing the tumble generator valve closing driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Engine coolant temperature	$\geq 0^\circ\text{C}$ (32°F)
Ambient air temperature	$\geq 0^\circ\text{C}$ (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	$\geq 67.4^\circ$
Tumble generator valve "close" signal output	2.2 seconds or more

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	$< 67.4^\circ$
Tumble generator valve "close" signal output	2.2 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve all closing points learning, not allowed to update to closing side.
- For tumble generator valve all opening points learning, not allowed to update to opening side.

Tumble generator valve control

- Output the open signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DM:DTC P2005 INTAKE MANIFOLD RUNNER CONTROL STUCK OPEN (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generator valve motor function.

Judge open fixing malfunction when the opening degree is large even after finishing the tumble generator valve closing driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
Engine coolant temperature	$\geq 0^\circ\text{C}$ (32°F)
Ambient air temperature	$\geq 0^\circ\text{C}$ (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	$\geq 67.4^\circ$
Tumble generator valve "close" signal output	2.2 seconds or more

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	$< 67.4^\circ$
Tumble generator valve "close" signal output	2.2 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve all closing points learning, not allowed to update to closing side.
- For tumble generator valve all opening points learning, not allowed to update to opening side.

Tumble generator valve control

- Output the open signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DN:DTC P2006 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generator valve motor function.

Judge close fixing malfunction when the opening degree is small even after finishing the tumble generator valve open driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine coolant temperature	$\geq 0^{\circ}\text{C}$ (32°F)
Ambient air temperature	$\geq 0^{\circ}\text{C}$ (32°F)

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	$< 67.4^{\circ}$
Tumble generator valve "open" signal output	2.2 seconds or more

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	$\geq 67.4^{\circ}$
Tumble generator valve "open" signal output	2.2 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve all closing points learning, not allowed to update to closing side.
- For tumble generator valve all opening points learning, not allowed to update to opening side.

Tumble generator valve control

- Output the close signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DO:DTC P2007 INTAKE MANIFOLD RUNNER CONTROL STUCK CLOSED (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect the malfunction of tumble generator valve motor function.

Judge close fixing malfunction when the opening degree is small even after finishing the tumble generator valve open driving.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
Engine coolant temperature	$\geq 0^{\circ}\text{C}$ (32°F)
Ambient air temperature	$\geq 0^{\circ}\text{C}$

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	$< 67.4^{\circ}$
Tumble generator valve "open" signal output	2.2 seconds or more

Time Needed for Diagnosis: 3 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Tumble generator valve opening	$\geq 67.4^{\circ}$
Tumble generator valve "open" signal output	2.2 seconds or more

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve all closing points learning, not allowed to update to closing side.
- For tumble generator valve all opening points learning, not allowed to update to opening side.

Tumble generator valve control

- Output the close signal.

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

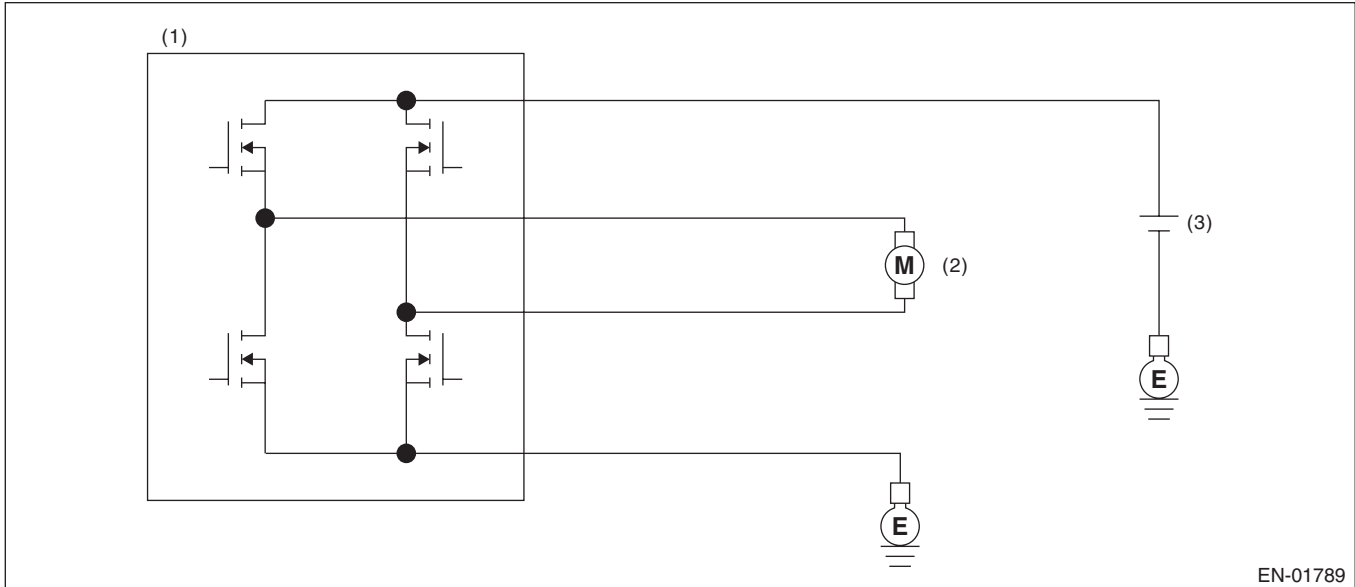
DP:DTC P2008 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.

Judge NG when the open signal is sent from IC after tumble generator valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Tumble generator valve
- (3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
ECM output signal	Before signal change from ON \rightarrow OFF
Tumble generator valve ON signal output time	20 milliseconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON \rightarrow OFF, and judge open NG when the open NG signal is sent 1 second in a row.

Judge OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Open NG signal input	Low
Overcurrent NG signal input	High

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

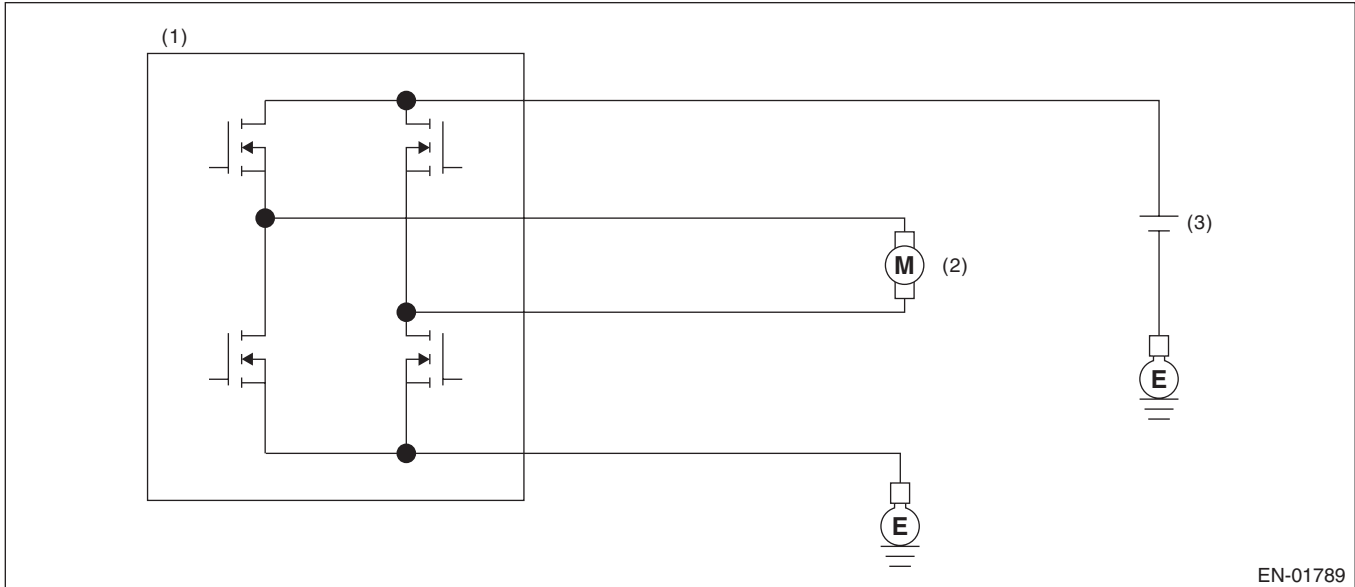
DQ:DTC P2009 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.

Judge NG when the overcurrent signal is sent from IC after tumble generator valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Tumble generator valve
- (3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V
ECM output signal	Before signal change from ON → OFF
Tumble generator valve ON signal output time	20 milliseconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON → OFF, and judge overcurrent NG when the overcurrent NG signal is sent 1 second in a row. Judge OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Open NG signal input	High
Overcurrent NG signal input	Low

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

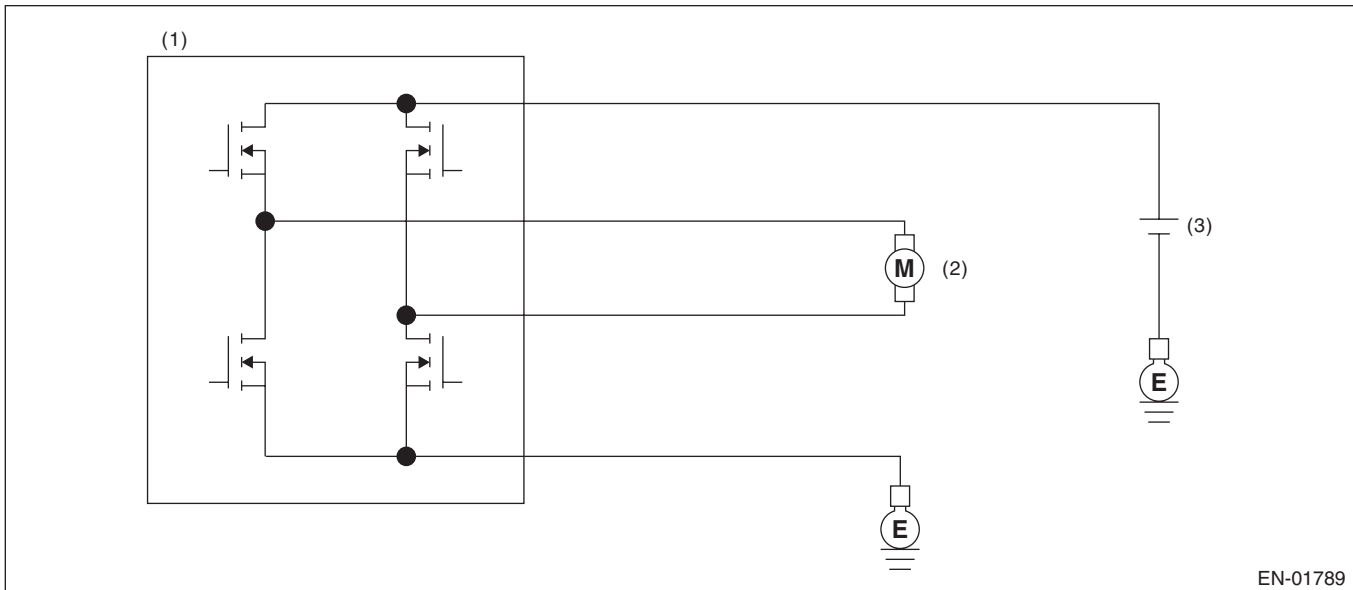
DR:DTC P2011 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT / OPEN (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.

Judge NG when the open signal is sent from IC after tumble generator valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Tumble generator valve
- (3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
ECM output signal	Before signal change from ON \rightarrow OFF
Tumble generator valve ON signal output time	20 milliseconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON \rightarrow OFF, and judge open NG when the open NG signal is sent 1 second in a row. Judge OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Open NG signal input	Low
Overcurrent NG signal input	High

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

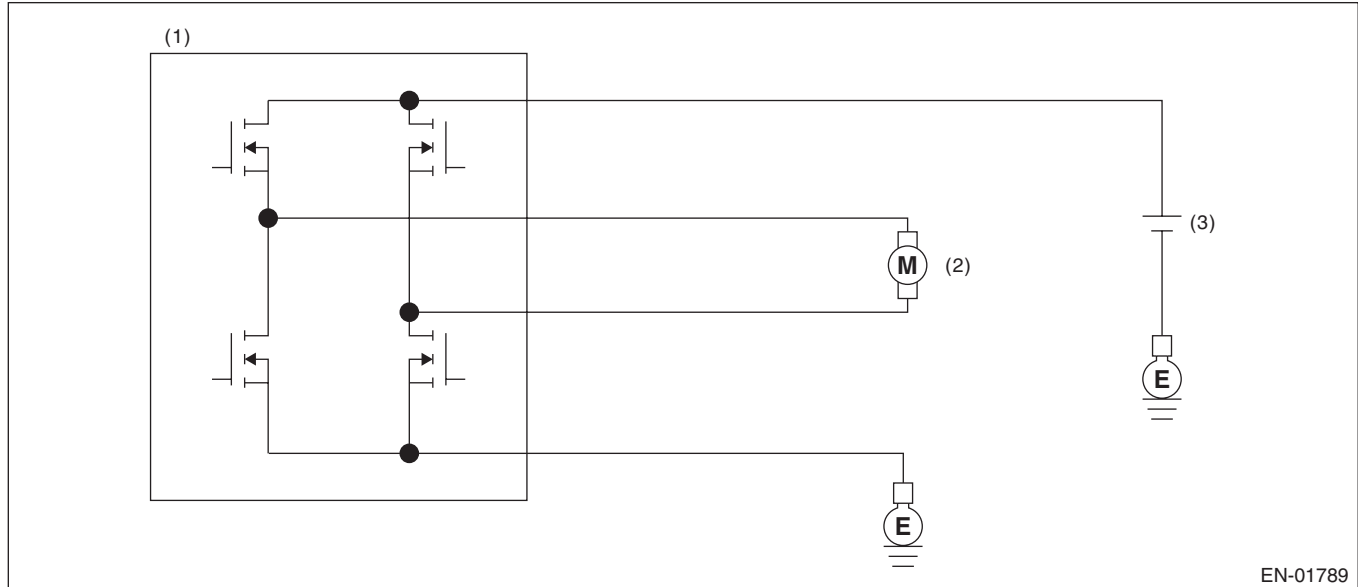
DS:DTC P2012 INTAKE MANIFOLD RUNNER CONTROL CIRCUIT LOW (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of tumble generator valve motor.

Judge NG when the overcurrent signal is sent from IC after tumble generator valve driving IC diagnosis.

2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Tumble generator valve
- (3) Battery

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	$\geq 10.9 \text{ V}$
ECM output signal	Before signal change from ON \rightarrow OFF
Tumble generator valve ON signal output time	20 milliseconds or more

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

At the main IC, check the sent signal at each timing which occurs just before the tumble generator valve output is set to ON \rightarrow OFF, and judge overcurrent NG when the overcurrent NG signal is sent 1 second in a row. Judge OK and clear the NG when the OK signal is sent.

Judgment Value

Malfunction Criteria	Threshold Value
Open NG signal input	High
Overcurrent NG signal input	Low

Time Needed for Diagnosis: 10 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Tumble generator valve control: Not allowed to move tumble generator valve.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

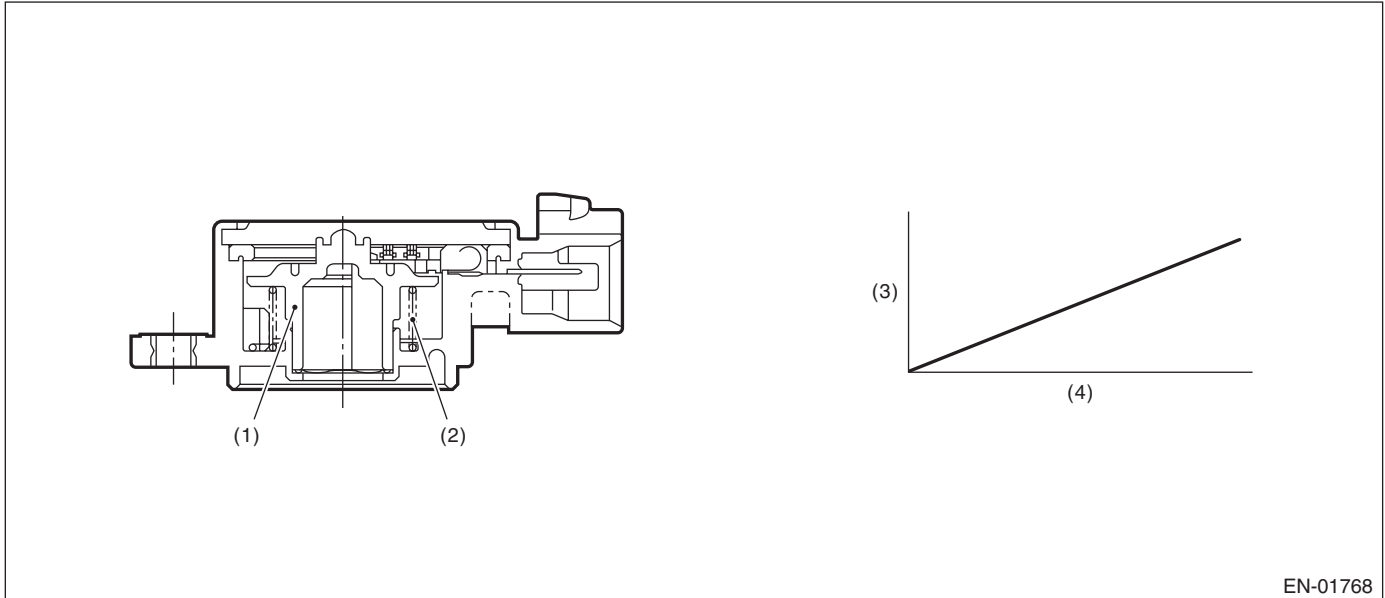
DT:DTC P2016 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generator valve position sensor.

Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



EN-01768

- (1) Rotor
- (2) Return spring
- (3) Voltage (V)
- (4) Tumble generator valve opening (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.167 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve all closing points learning, not allowed to update to closing side.
- For tumble generator valve all opening points learning, not allowed to update to opening side.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

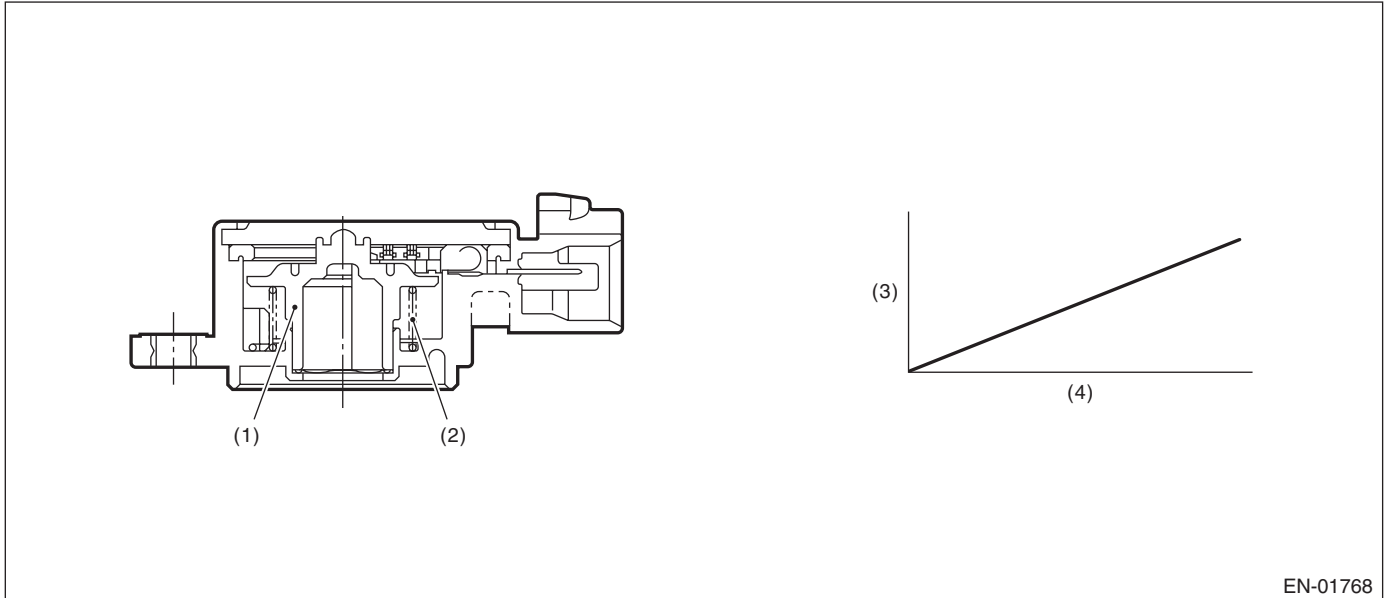
DU:DTC P2017 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generator valve position sensor.

Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



EN-01768

- (1) Rotor
- (2) Return spring
- (3) Voltage (V)
- (4) Throttle valve opening angle (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.843 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve all closing points learning, not allowed to update to closing side.
- For tumble generator valve all opening points learning, not allowed to update to opening side.

9. ECM OPERATION AT DTC SETTING

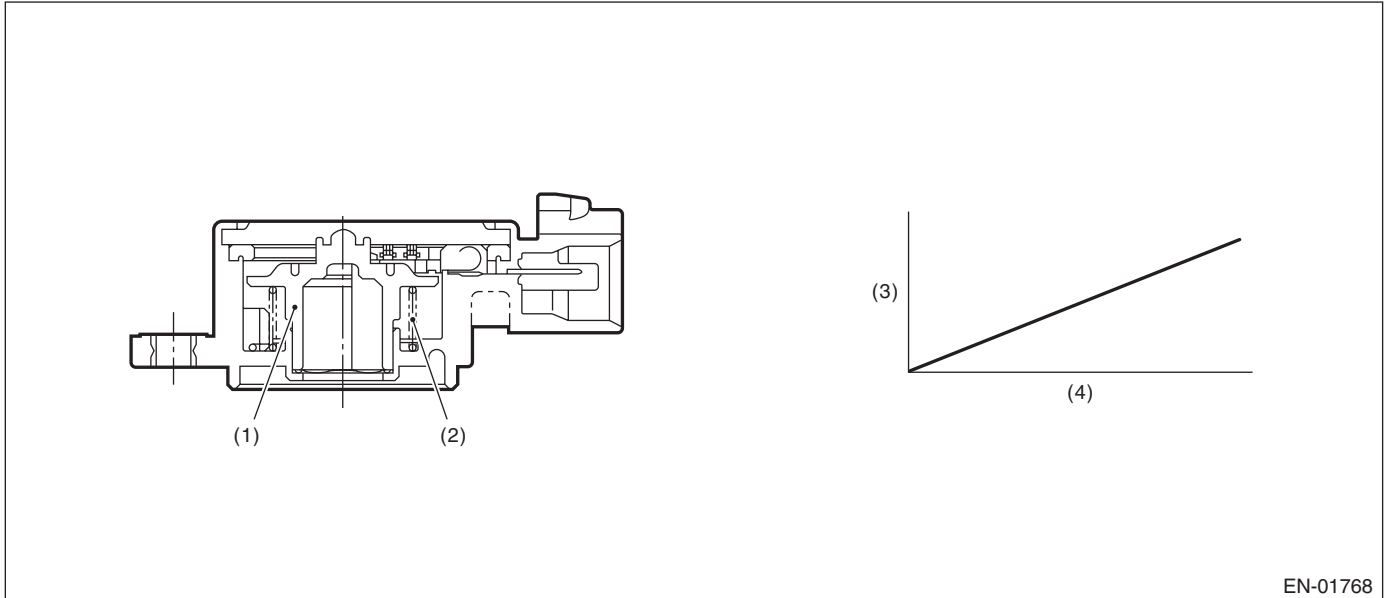
Memorize the freeze frame data. (For test mode \$02)

DV:DTC P2021 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT LOW (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generator valve position sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



EN-01768

- (1) Rotor
- (2) Return spring
- (3) Voltage (V)
- (4) Tumble generator valve opening (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	< 0.167 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve all closing points learning, not allowed to update to closing side.
- For tumble generator valve all opening points learning, not allowed to update to opening side.

9. ECM OPERATION AT DTC SETTING

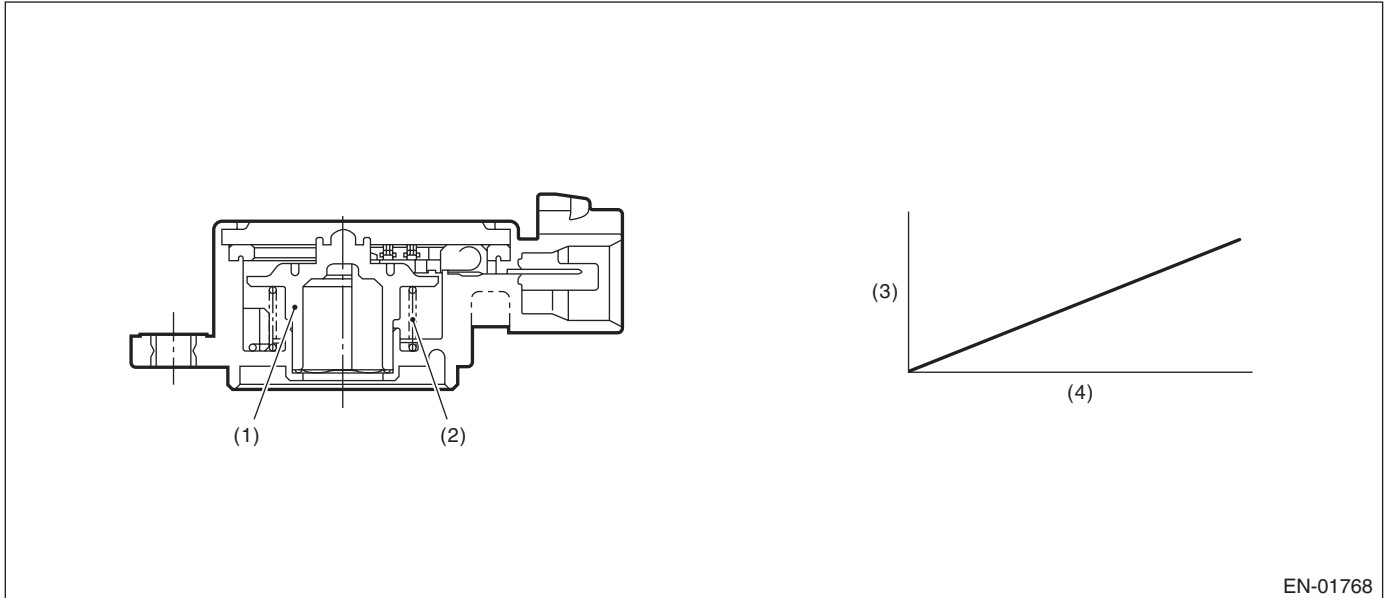
Memorize the freeze frame data. (For test mode \$02)

DW:DTC P2022 INTAKE MANIFOLD RUNNER POSITION SENSOR / SWITCH CIRCUIT HIGH (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of tumble generator valve position sensor.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



EN-01768

- (1) Rotor
- (2) Return spring
- (3) Voltage (V)
- (4) Tumble generator valve opening (°)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more. Judge as OK and clear the NG when the malfunction criteria below are not met.

Judgment Value

Malfunction Criteria	Threshold Value
Output voltage	≥ 4.843 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

8. FAIL SAFE

Tumble generator valve opening

- For tumble generator valve all closing points learning, not allowed to update to closing side.
- For tumble generator valve all opening points learning, not allowed to update to opening side.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DX:DTC P2088 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the oil flow control valve solenoid.

Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Oil flow control solenoid valve control duty	$\geq 99.61\%$
Oil control solenoid valve control present current	< 0.306 A

Time Needed for Diagnosis: 2000 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the continuous time with the following criteria established is more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Target current value of the oil flow control solenoid valve	$\geq 0.14\%$
Target current value of the oil flow control solenoid valve – Oil flow control solenoid valve control current value	≥ 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

- Ignition timing whole learning compensation:
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment → abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
 - Enter the initial value (0°CA) to the compensation value of partial learning zone with IG OFF.
 - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment → abnormality judgment.
- AVCS control:
 - Maximum timing retard learning is not complete or maximum timing retard learning completion is not experienced.
 - ⇒ ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
 - Make the oil flow control solenoid valve drive duty a predetermined value (9.36%).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DY:DTC P2089 OCV SOLENOID VALVE SIGNAL A CIRCUIT SHORT (BANK 1)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the oil flow control valve solenoid.

Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Oil flow control solenoid valve control duty	$< 0.39\%$
Oil control solenoid valve control present current	≥ 0.306 A

Time Needed for Diagnosis: 2000 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the continuous time with the following criteria established is more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Target current value of the oil flow control solenoid valve – Oil flow control solenoid valve control current value	< 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

- Ignition timing whole learning compensation:
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment → abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
 - Enter the initial value (0°CA) to the compensation value of partial learning zone with IG OFF.
 - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment → abnormality judgment.
- AVCS control:
 - Maximum timing retard learning is not complete or maximum timing retard learning completion is not experienced.
 - ⇒ ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
 - Make the oil flow control solenoid valve drive duty a predetermined value (9.36%).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

DZ:DTC P2092 OCV SOLENOID VALVE SIGNAL A CIRCUIT OPEN (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the oil flow control valve solenoid.

Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Oil flow control solenoid valve control duty	$\geq 99.61\%$
Oil control solenoid valve control present current	< 0.306 A

Time Needed for Diagnosis: 2000 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the continuous time with the following criteria established is more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Target current value of the oil flow control solenoid valve	$\geq 0.14\%$
Target current value of the oil flow control solenoid valve – Oil flow control solenoid valve control current value	≥ 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

- Ignition timing whole learning compensation:
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment → abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
 - Enter the initial value (0°CA) to the compensation value of partial learning zone with IG OFF.
 - Enter the initial value (0°CA) to the compensation value of partial learning zone when making a normality judgment → abnormality judgment.
- AVCS control:
 - Maximum timing retard learning is not complete or maximum timing retard learning completion is not experienced.
 - ⇒ ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
 - Make the oil flow control solenoid valve drive duty a predetermined value (9.36%).

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

EA:DTC P2093 INTAKE CAMSHAFT POSITION ACTUATOR CONTROL CIRCUIT HIGH (BANK 2)

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the oil flow control valve solenoid.

Judge open NG when the current flow is small whereas duty signal is large, and judge short NG when the current flow is large whereas duty signal is small.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Battery voltage	≥ 10.9 V

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 2 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Oil flow control solenoid valve control duty	$< 0.39\%$
Oil control solenoid valve control present current	≥ 0.306 A

Time Needed for Diagnosis: 2000 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when the continuous time with the following criteria established is more than 2 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Target current value of the oil flow control solenoid valve – Oil flow control solenoid valve control current value	< 0.08 A

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

7. FAIL SAFE

- Ignition timing whole learning compensation:
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when IG OFF, and then make the whole learning incomplete.
 - Enter the initial value (whole learning compensation factor = 0.5, Variable amount of whole learning compensation factor = 0.25) to the whole learning compensation factor and variable amount of whole learning compensation factor when making a normality judgment → abnormality judgment, and then make the whole learning incomplete.
- Ignition timing partial learning compensation:
 - Enter the initial value (0°C) to the compensation value of partial learning zone with IG OFF.
 - Enter the initial value (0°C) to the compensation value of partial learning zone when making a normality judgment → abnormality judgment.
- AVCS control:
 - Maximum timing retard learning is not complete or maximum timing retard learning completion is not experienced.
 - ISC feedback compensation: Do not perform the AVCS actual timing advance compensation.
 - Make the oil flow control solenoid valve drive duty a predetermined value (9.36%).

8. ECM OPERATION AT DTC SETTING

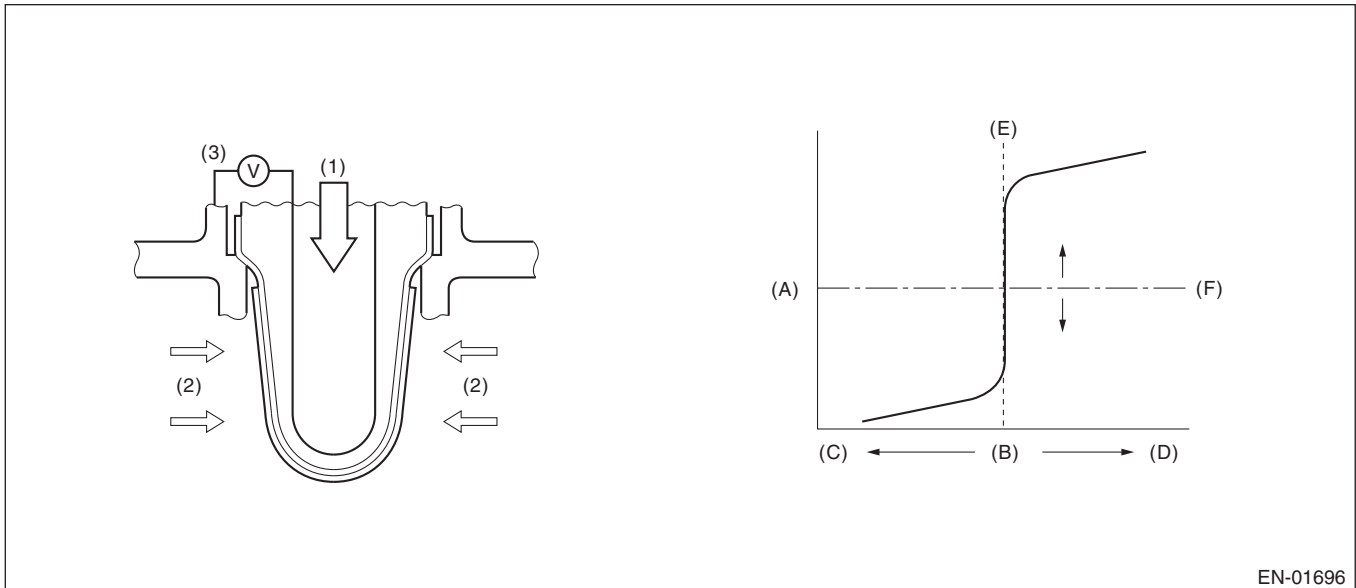
Memorize the freeze frame data. (For test mode \$02)

EB:DTC P2096 POST CATALYST FUEL TRIM SYSTEM TOO LEAN BANK 1

1. OUTLINE OF DIAGNOSIS

Detect abnormalities in the fuel system by determining whether the sub feedback compensation amount is shifting to rich or lean. If the sub feedback compensation amount from engine start to ignition off is shifting to rich or lean, there is insufficient compensation. → If it is insufficient, change the sub feedback compensation guard value, shift judgment line, and increment the guard operation counter (temporary NG counter). When the guard operation counter (temporary NG counter) exceeds the set value, and the sub feedback compensation is shifting to rich or lean, it is judged as NG.

2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust gas
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich
- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Continuous time when the following conditions are established	1 second or more
Conditions for carrying out the sub feedback learning	Complete

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant speed of approx. 75 km/h (47 MPH) or higher.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time when the following conditions are established is more than 5 seconds. Judge as OK and clear the NG when the following conditions are not established for a continuous time of 5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	< -0.018

Time Needed for Diagnosis: 5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When similar driving conditions are repeated 3 times and the result is OK.
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

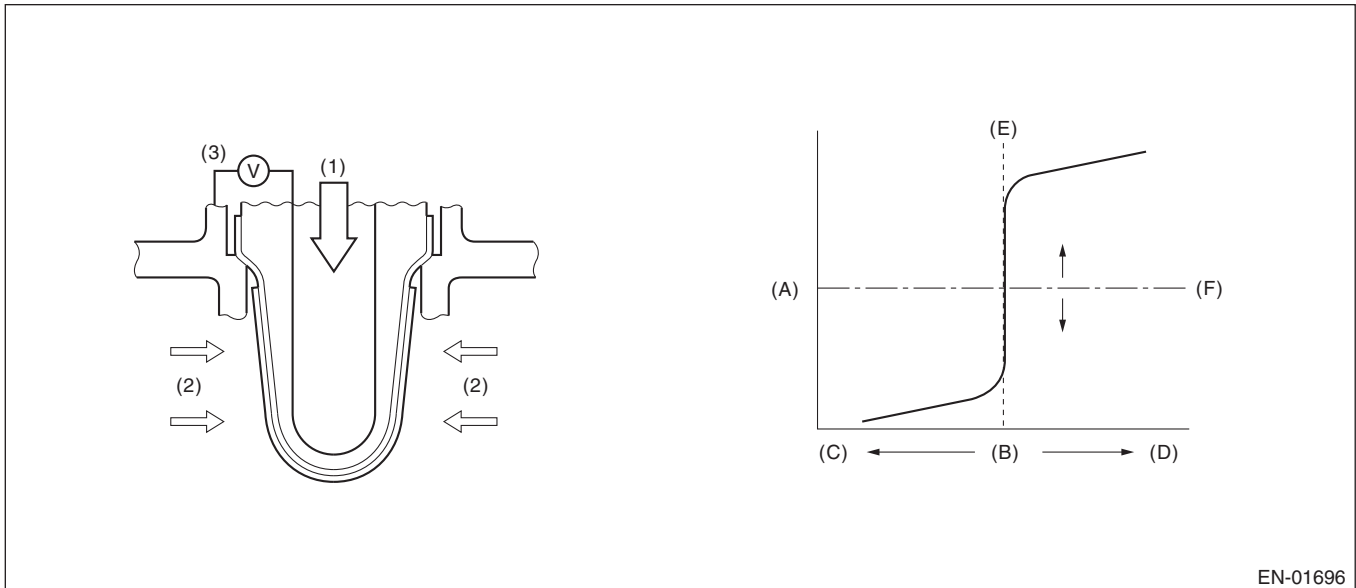
Memorize the freeze frame data. (For test mode \$02)

EC:DTC P2097 POST CATALYST FUEL TRIM SYSTEM TOO RICH BANK 1

1. OUTLINE OF DIAGNOSIS

Detect abnormalities in the fuel system by determining whether the sub feedback compensation amount is shifting to rich or lean. If the sub feedback compensation amount from engine start to ignition off is shifting to rich or lean, there is insufficient compensation. → If it is insufficient, change the sub feedback compensation guard value, shift judgment line, and increment the guard operation counter (temporary NG counter). When the guard operation counter (temporary NG counter) exceeds the set value, and the sub feedback compensation is shifting to rich or lean, it is judged as NG.

2. COMPONENT DESCRIPTION



EN-01696

- (1) Atmosphere
- (2) Exhaust gas
- (3) Electromotive force

- (A) Electromotive force
- (B) Air fuel ratio
- (C) Rich
- (D) Lean
- (E) Theoretical air fuel ratio
- (F) Comparative voltage

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Continuous time when the following conditions are established	1 second or more
Conditions for carrying out the sub feedback learning	Complete

4. GENERAL DRIVING CYCLE

Perform the diagnosis continuously at a constant speed of approx. 75 km/h (47 MPH) or higher.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Judge as NG when the continuous time when the following conditions are established is more than 5 seconds. Judge as OK and clear the NG when the following conditions are not established for a continuous time of 5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Sub feedback learning value	≥ 0.018
Count of limits moving to rich	≥ 4 times
Ratio of time for oxygen sensor upper or lower to time or rich time/lean tim	≤ 9 (AT model) ≤ 5.7 (MT model)

Time Needed for Diagnosis: 5 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When similar driving conditions are repeated 3 times and the result is OK.
- When "Clear Memory" is performed

8. FAIL SAFE

None

9. ECM OPERATION AT DTC SETTING

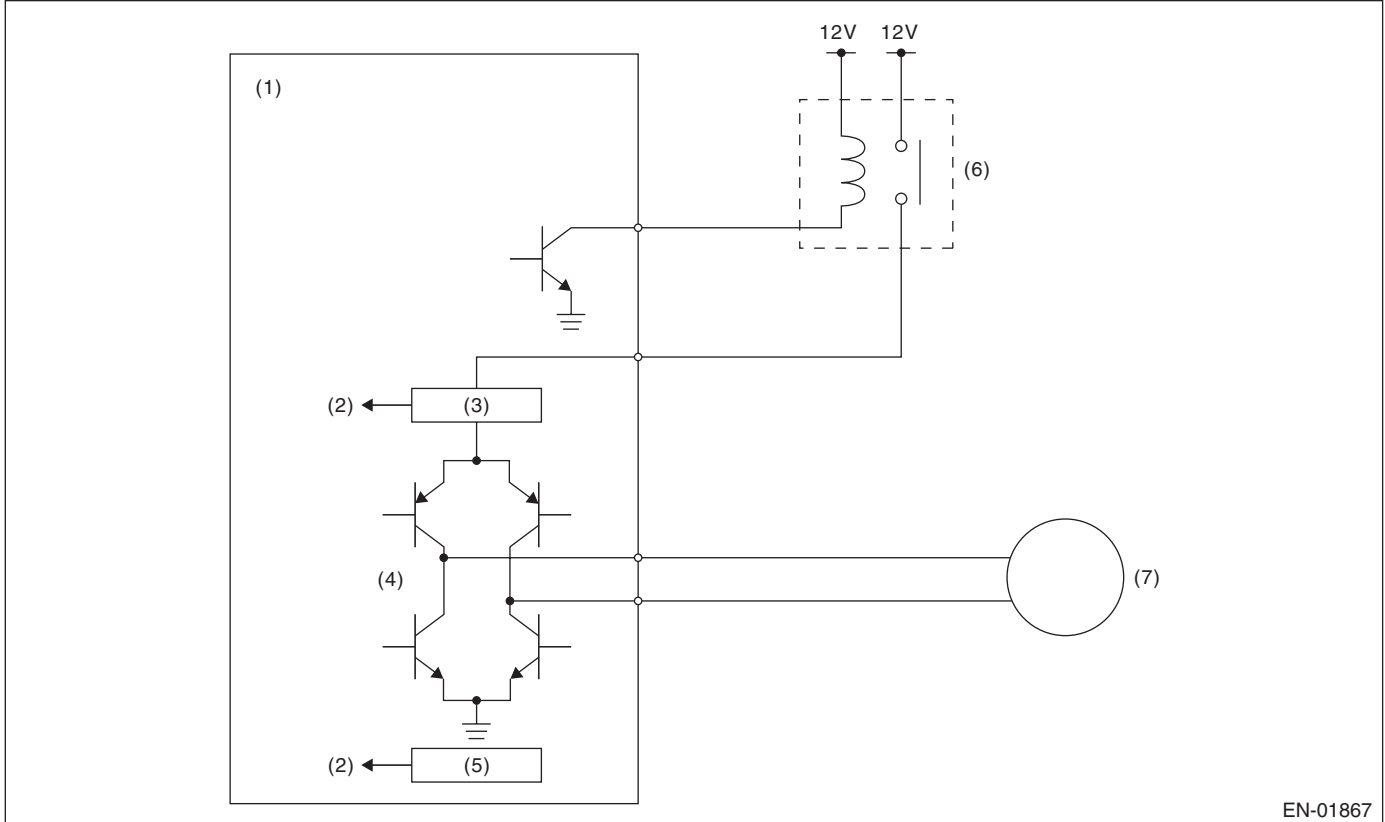
Memorize the freeze frame data. (For test mode \$02)

ED:DTC P2101 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/ PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge as NG when the motor current becomes too large or drive circuit is heated.

2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Detecting circuit
- (3) Overcurrent detection circuit
- (4) Drive circuit

- (5) Temperature detection circuit
- (6) Electronic throttle control relay
- (7) Motor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Under control of electronic throttle control	ON
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Motor current	$\leq 8 \text{ A}$
Drive circuit inner temperature	$\leq 175^{\circ}\text{C}$ (347°F)

Time Needed for Diagnosis:

- 500 milliseconds (For NG)
- 2000 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

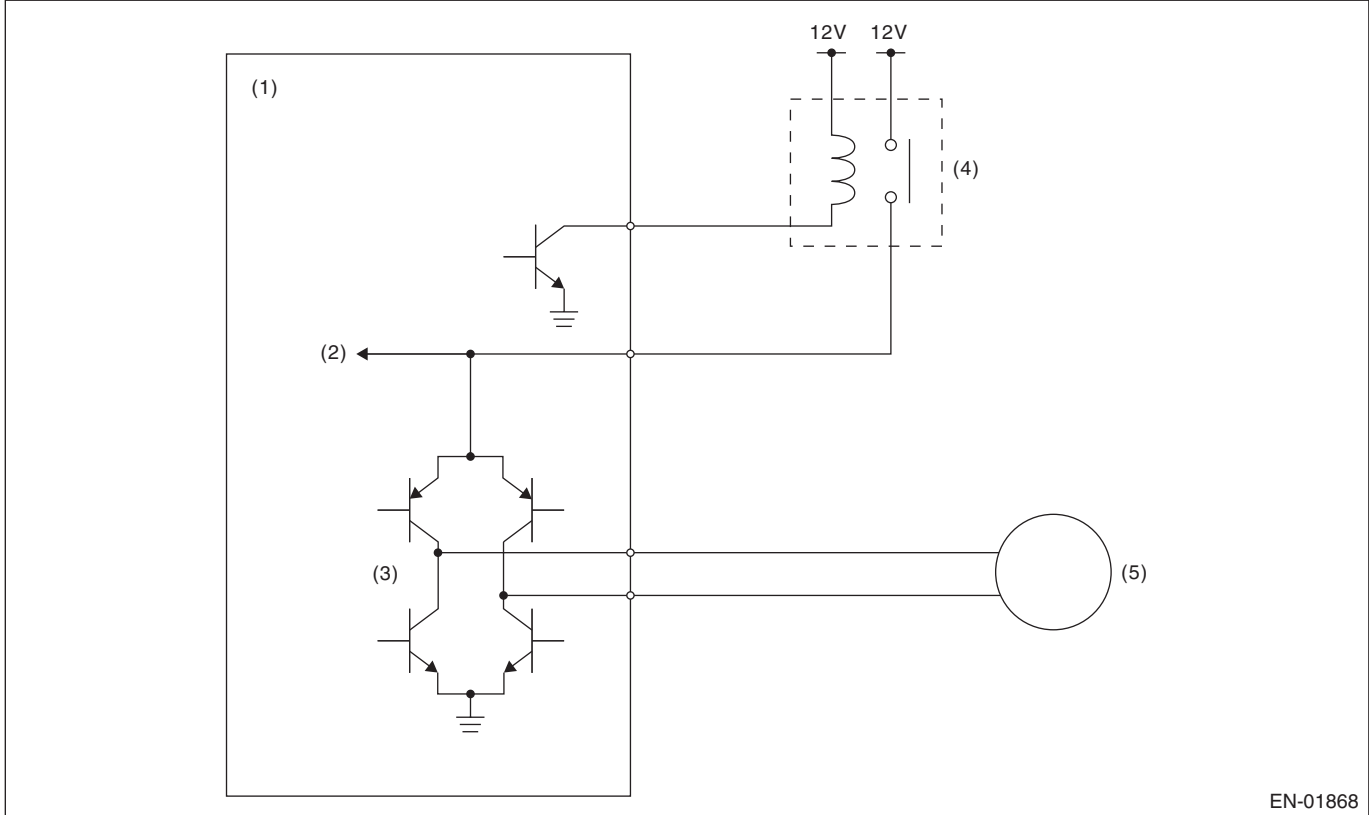
Memorize the freeze frame data. (For test mode \$02)

EE:DTC P2102 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Judge as NG when the electronic throttle control power is not supplied even when ECM sets the electric throttle control relay to ON.

2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Voltage detection circuit
- (3) Drive circuit
- (4) Electronic throttle control relay
- (5) Motor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
electronic throttle control relay output	ON
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes 0.5 seconds or more.

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	$\leq 5 \text{ V}$

Time Needed for Diagnosis:

- 400 milliseconds (For NG)
- 2000 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

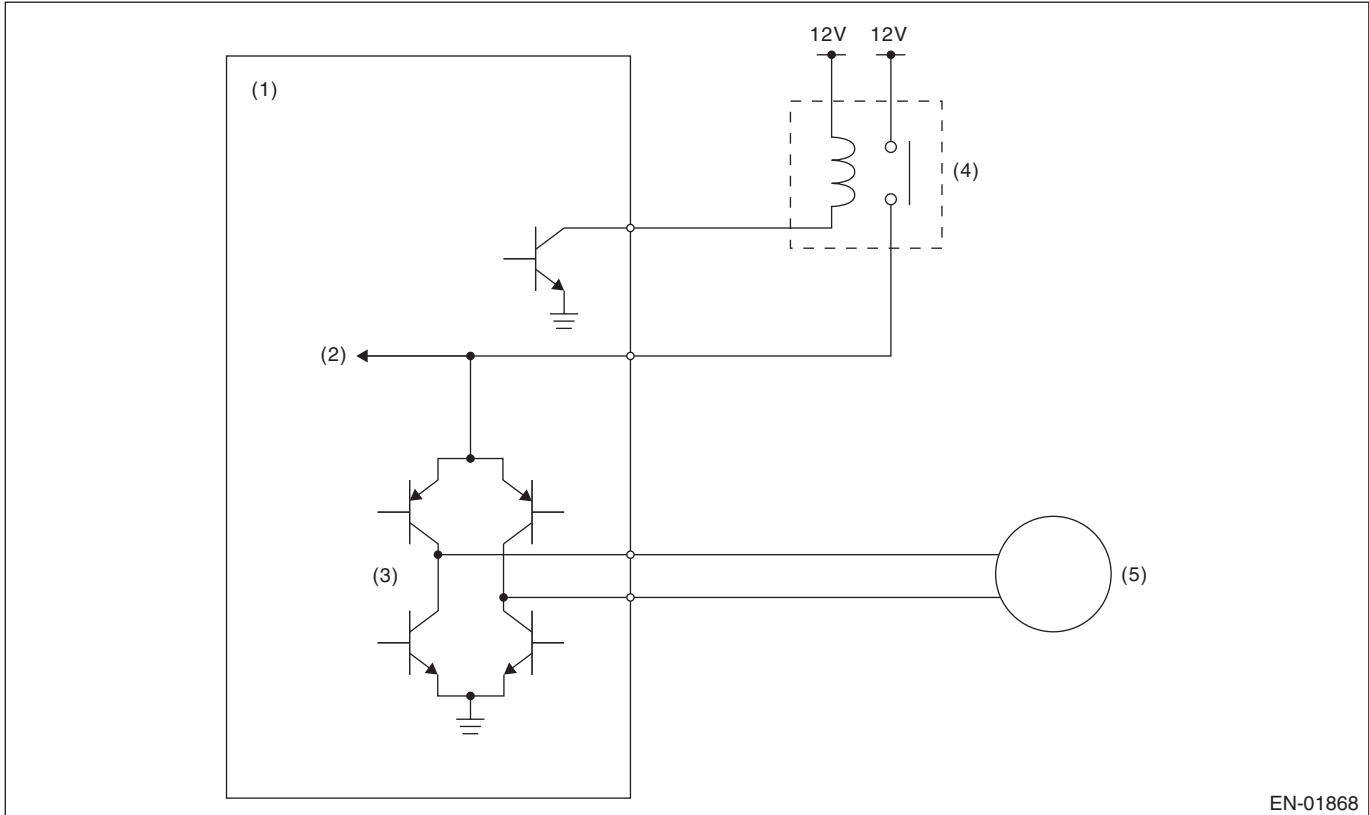
Memorize the freeze frame data. (For test mode \$02)

EF:DTC P2103 THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Judge as NG when the electronic throttle control power is supplied even when ECM sets the electric throttle control relay to OFF.

2. COMPONENT DESCRIPTION



EN-01868

- (1) Engine control module (ECM)
- (2) Voltage detection circuit
- (3) Drive circuit
- (4) Electronic throttle control relay
- (5) Motor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
electronic throttle control relay output	OFF
Battery voltage	≥ 6 V

4. GENERAL DRIVING CYCLE

- When ignition switch ON → OFF
- Ignition switch OFF → ON (Only after clearing memory)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Motor power voltage	≤ 5 V

Time Needed for Diagnosis:

- 600 milliseconds (For NG)
- 400 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

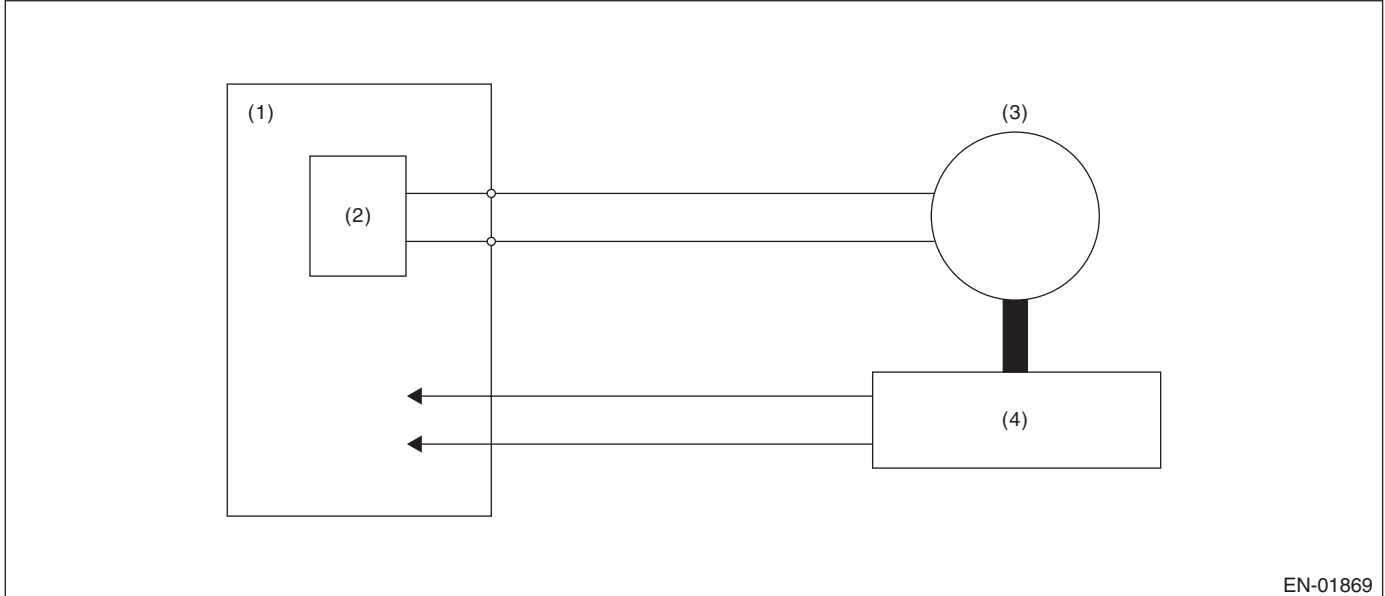
Memorize the freeze frame data. (For test mode \$02)

EG:DTC P2109 THROTTLE/PEDAL POSITION SENSOR “A” MINIMUM STOP PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Judge as NG when fully close point learning cannot conducted or outside the standard value.

2. COMPONENT DESCRIPTION



EN-01869

- (1) Engine control module (ECM)
- (2) Drive circuit
- (3) Motor
- (4) Throttle position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON → OFF
Ignition switch (only after cleaning the memory)	OFF → ON

4. GENERAL DRIVING CYCLE

Perform the diagnosis at full closed point learning.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Throttle sensor opening angle at all close point learning	10.127° or more, 19.872° or less
Throttle opening angle when the ignition switch is ON – Throttle minimum stop position	≥ 1.683°

Time Needed for Diagnosis: 8 — 80 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to the electronic throttle control motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

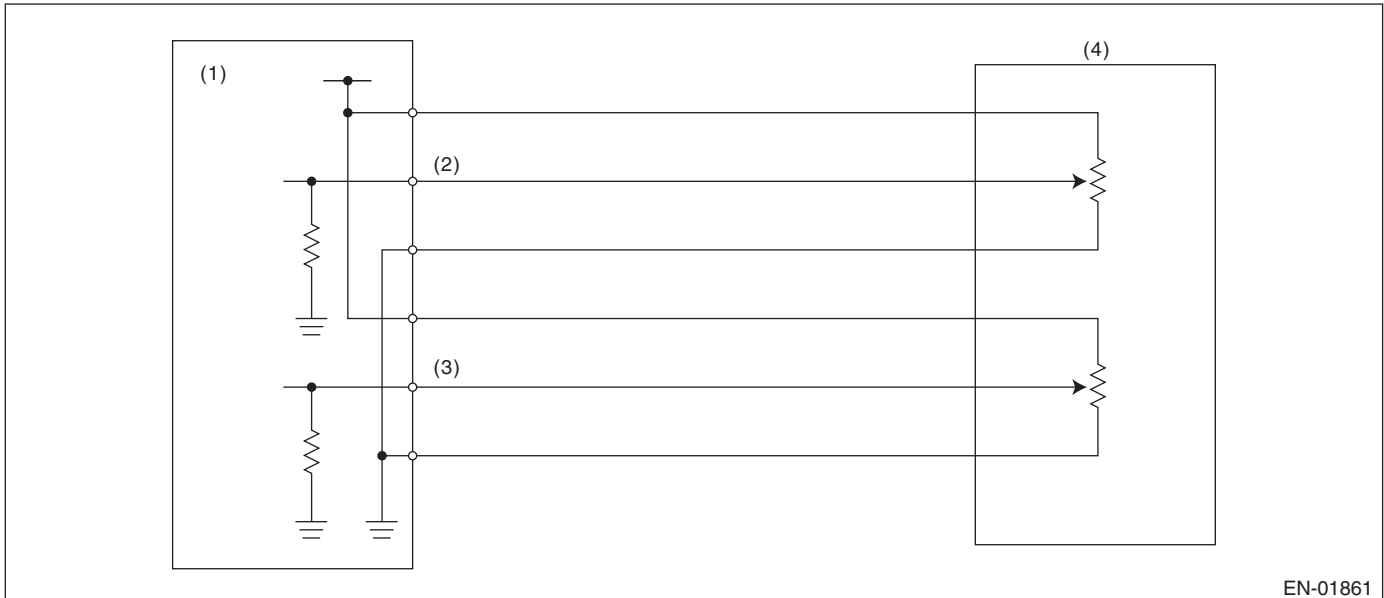
Memorize the freeze frame data. (For test mode \$02)

EH:DTC P2122 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 1.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Accelerator pedal position sensor 1 signal
- (3) Accelerator pedal position sensor 2 signal
- (4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 0.219 V

Time Needed for Diagnosis: 100 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

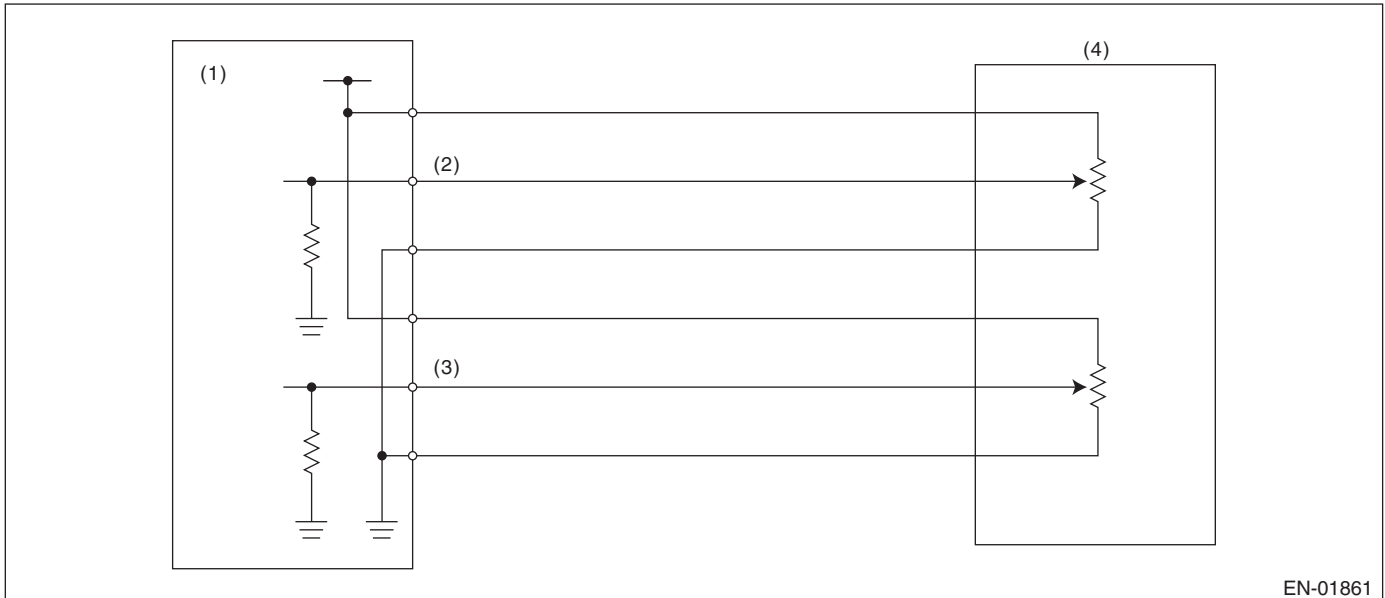
Memorize the freeze frame data. (For test mode \$02)

EI: DTC P2123 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D” CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 1.
Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



EN-01861

- (1) Engine control module (ECM)
- (2) Accelerator pedal position sensor 1 signal
- (3) Accelerator pedal position sensor 2 signal
- (4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≤ 4.781 V

Time Needed for Diagnosis: 100 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

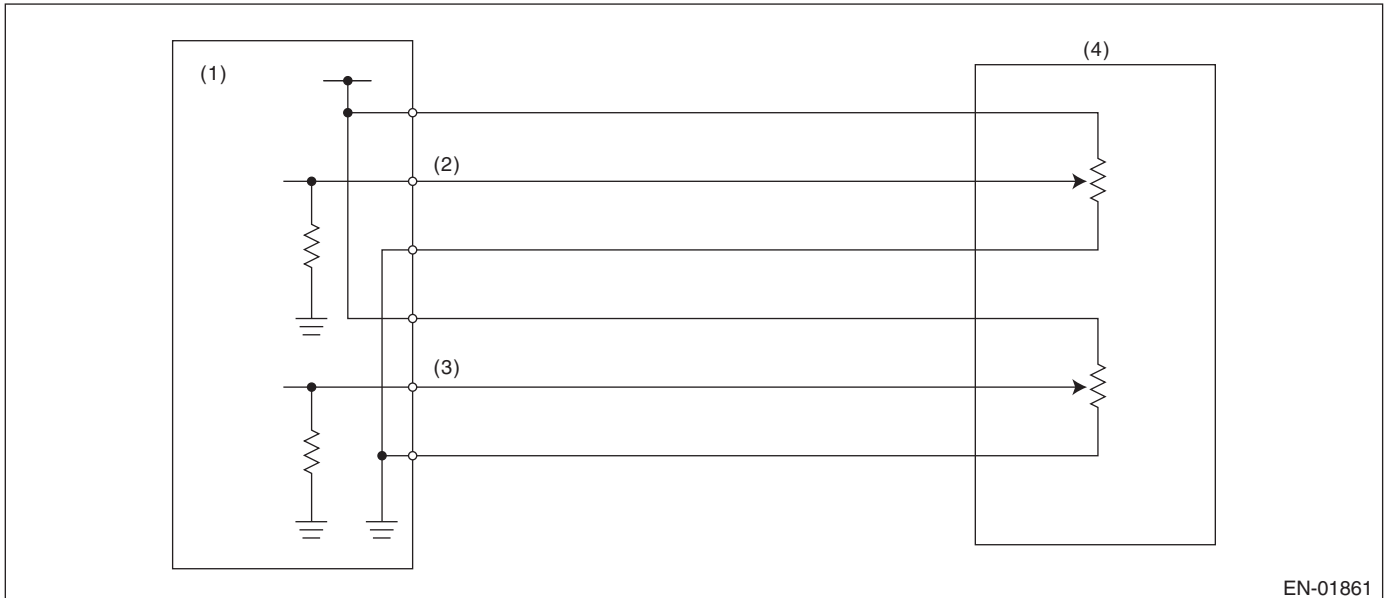
EJ: DTC P2127 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT LOW INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2.

Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



EN-01861

- (1) Engine control module (ECM)
- (2) Accelerator pedal position sensor 1 signal
- (3) Accelerator pedal position sensor 2 signal
- (4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≥ 0.219 V

Time Needed for Diagnosis: 100 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

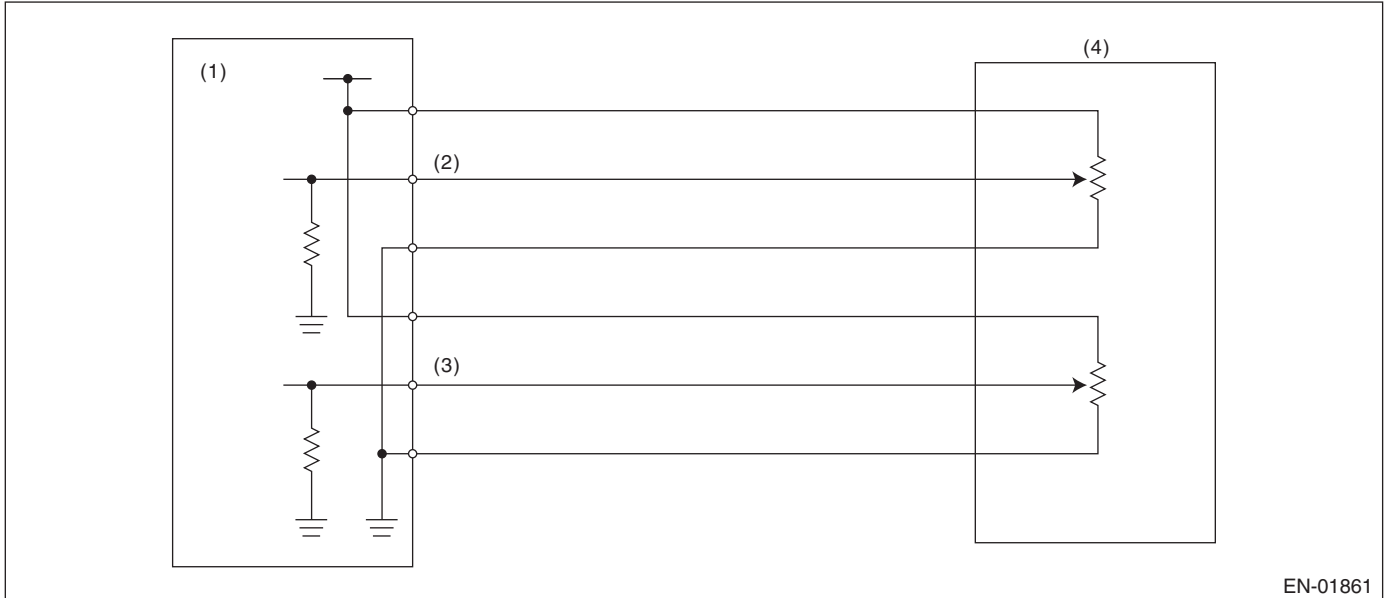
EK:DTC P2128 THROTTLE/PEDAL POSITION SENSOR/SWITCH “E” CIRCUIT HIGH INPUT

1. OUTLINE OF DIAGNOSIS

Detect the open or short circuit of accelerator pedal position sensor 2.

Judge as NG if it is out of specification.

2. COMPONENT DESCRIPTION



EN-01861

- (1) Engine control module (ECM)
- (2) Accelerator pedal position sensor 1 signal
- (3) Accelerator pedal position sensor 2 signal
- (4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Sensor 1 input voltage	≤ 4.781 V

Time Needed for Diagnosis: 100 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed (Only with engine stopped)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

8. FAIL SAFE

- Single malfunction: Control with normal sensor
- Simultaneous failure: Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

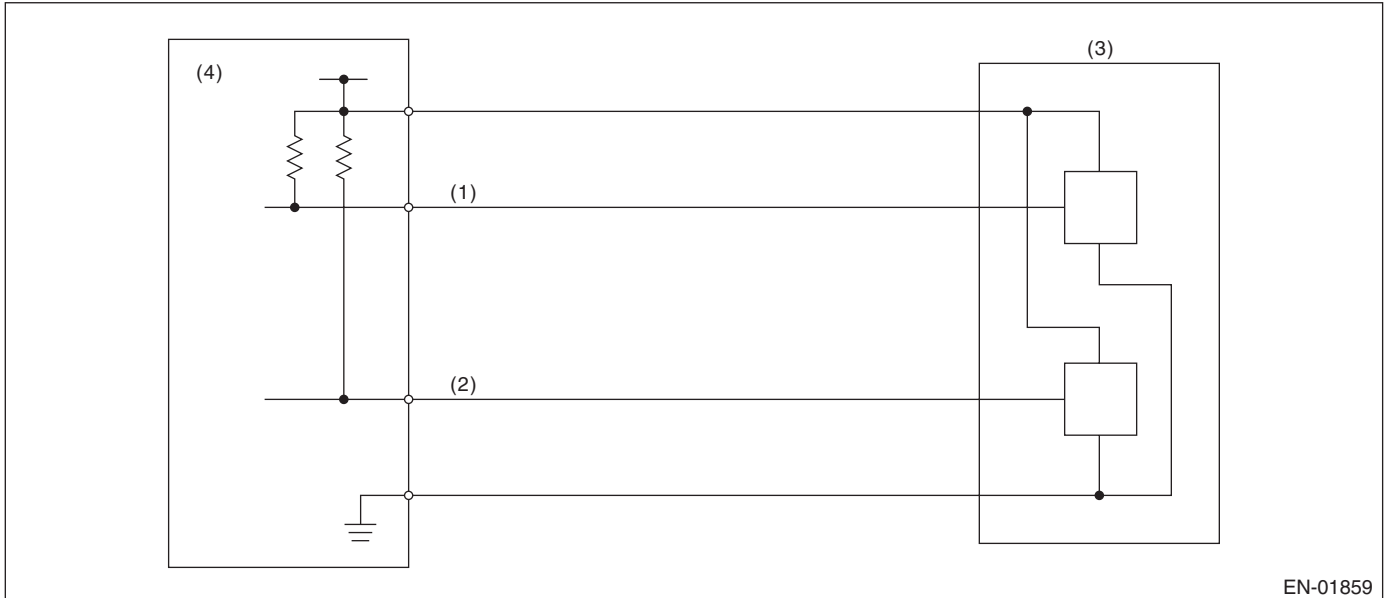
Memorize the freeze frame data. (For test mode \$02)

EL:DTC P2135 THROTTLE/PEDAL POSITION SENSOR/SWITCH “A”/“B” VOLTAGE CORRELATION

1. OUTLINE OF DIAGNOSIS

Judge as NG when the signal level of accelerator pedal position sensor 1 is different from the throttle position sensor 2.

2. COMPONENT DESCRIPTION



- (1) Throttle position sensor 1 signal
- (2) Throttle position sensor 2 signal
- (3) Throttle position sensor
- (4) Engine control module (ECM)

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

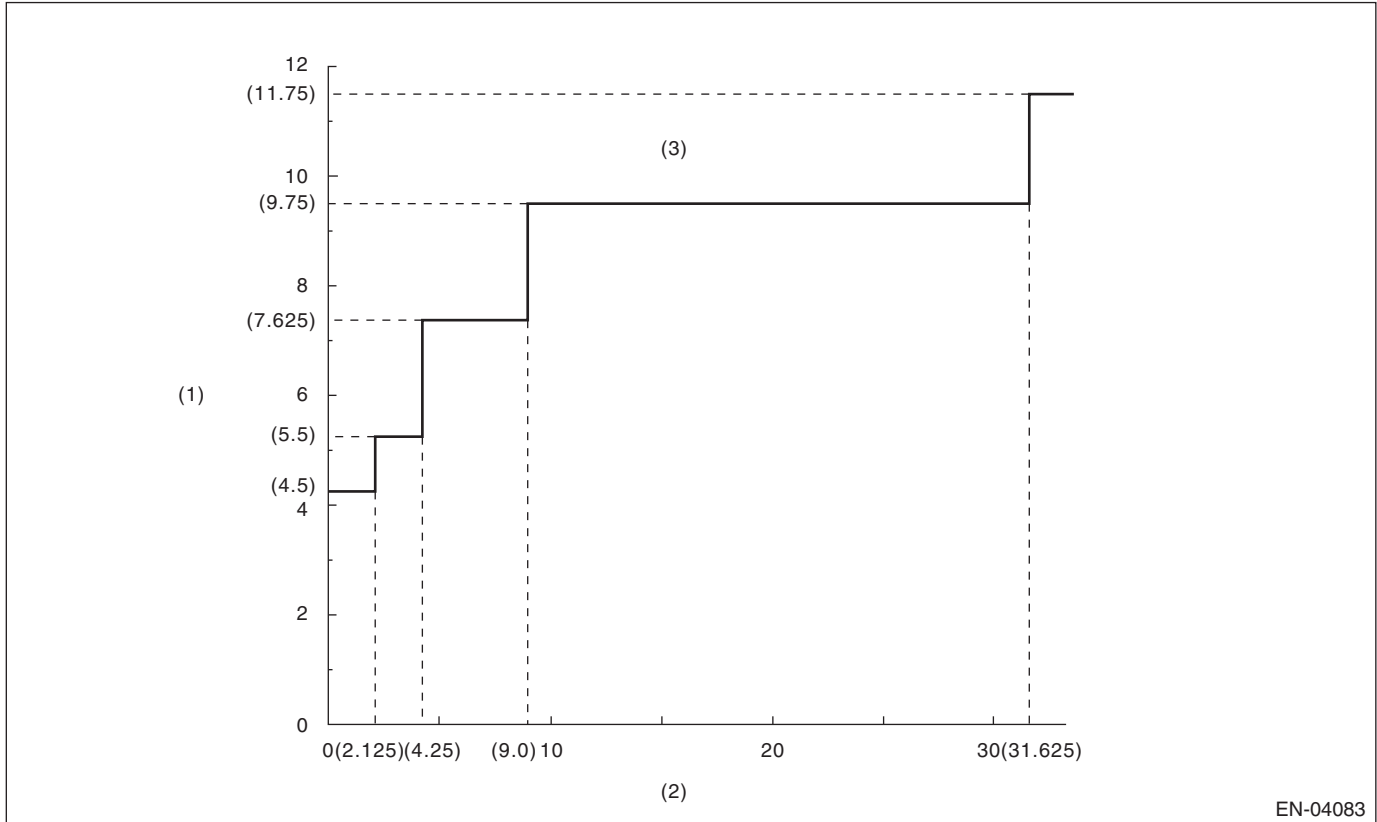
5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	≤ 4.25

Details of Judgment Value



- (1) Sensor output difference (°)
- (2) Throttle position sensor 1 opening angle (°)
- (3) NG area

Time Needed for Diagnosis: 212 milliseconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed (Only with engine stopped)

8. FAIL SAFE

Stop the continuity to ETC motor. (Throttle opening is fixed to 6°.)

9. ECM OPERATION AT DTC SETTING

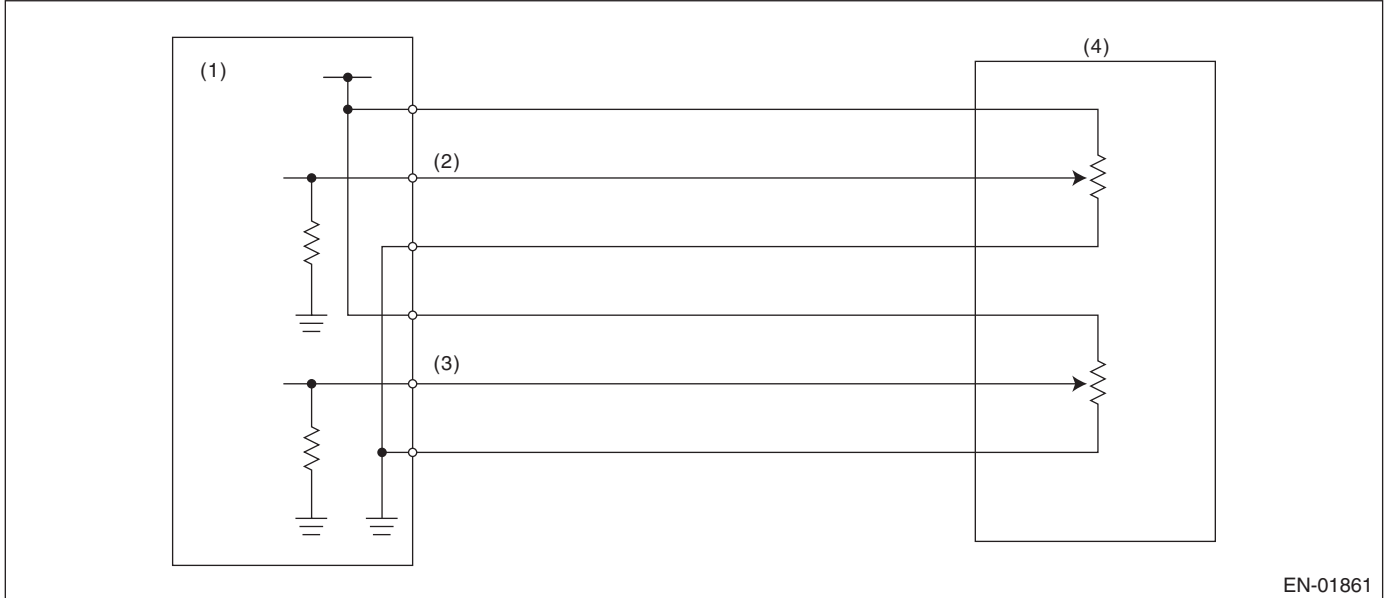
Memorize the freeze frame data. (For test mode \$02)

EM:DTC P2138 THROTTLE/PEDAL POSITION SENSOR/SWITCH “D”/“E” VOLTAGE CORRELATION

1. OUTLINE OF DIAGNOSIS

Judge as NG when the signal level of throttle position sensor 1 is different from the throttle position sensor 2.

2. COMPONENT DESCRIPTION



- (1) Engine control module (ECM)
- (2) Accelerator pedal position sensor 1 signal
- (3) Accelerator pedal position sensor 2 signal
- (4) Accelerator pedal position sensor

3. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Ignition switch	ON

4. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

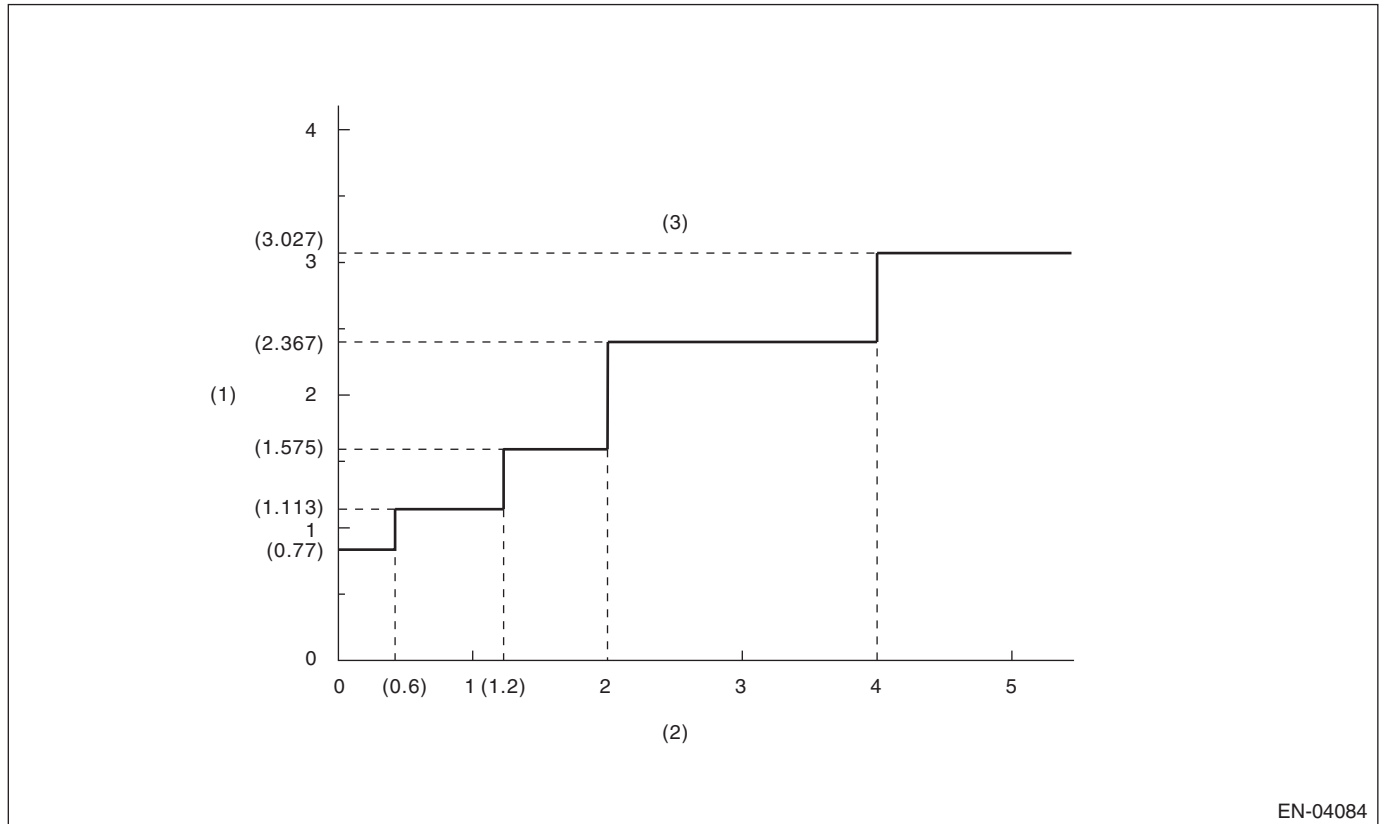
5. DIAGNOSTIC METHOD

Judge as OK and clear the NG when the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Signal difference between two sensors	$\leq 0.77^\circ$

Details of Judgment Value



- (1) Sensor output difference
- (2) Accelerator pedal position sensor 2 opening angle (°)
- (3) NG area

Time Needed for Diagnosis:

- 116 milliseconds (For NG)
- 1000 milliseconds (For OK)

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

6. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

7. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

8. FAIL SAFE

Throttle opening is fixed to 6°.

9. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

EN:DTC P2419 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the purge control solenoid valve 2.
Judge as NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs OFF signal	Low

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when all the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs OFF signal	High

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

EO:DTC P2420 EVAPORATIVE EMISSION SYSTEM SWITCHING VALVE CONTROL CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Detect open or short circuit of the purge control solenoid valve 2.
Judge as NG when the ECM output level differs from the actual terminal level.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG when the continuous time of meeting the malfunction criteria below becomes more than 2.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs ON signal	High

Time Needed for Diagnosis: 2.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK and clear the NG when all the malfunction criteria below are met.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Battery voltage	≥ 10.9 V
After engine starting	1 second or more
Terminal output voltage when ECM outputs ON signal	Low

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

EP:DTC P2431 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT RANGE/PERFORMANCE

1. OUTLINE OF DIAGNOSIS

Detect malfunction in the secondary air pressure sensor output properties.

Judge as NG when the secondary air pressure sensor output is largely different from the intake manifold pressure at engine start.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
Engine speed at startup	< 300 rpm
Vehicle speed	< 1 km/h
After secondary air injection system stop	3 seconds or more

3. GENERAL DRIVING CYCLE

Perform the diagnosis with the ignition switch ON.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the continuous time with the following conditions established is more than 0.3 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Secondary air supply piping pressure – Intake manifold pressure	≥ 200 mmHg
Intake manifold pressure at engine start-up – Intake manifold pressure	< 10 mmHg

Time Needed for Diagnosis: 0.3 seconds

Malfunction Indicator Light Illumination: Illuminates when malfunction occurs in 2 continuous driving cycles.

Normality Judgment

Judge as OK and clear the NG when the continuous time when the following conditions are established are more than 0.26 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Secondary air supply piping pressure – Intake manifold pressure	< 200 mmHg

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When “Clear Memory” is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When “Clear Memory” is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

EQ:DTC P2432 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT LOW

1. OUTLINE OF DIAGNOSIS

Judge as NG if it is out of specification.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the continuous time with the following conditions established is more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 0.568 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK when the following conditions are established, and clear the NG.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 0.568 V

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

ER:DTC P2433 SECONDARY AIR INJECTION SYSTEM AIR FLOW /PRESSURE SENSOR CIRCUIT HIGH

1. OUTLINE OF DIAGNOSIS

Judge as NG if it is out of specification.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

Abnormality Judgment

Judge as NG if the continuous time with the following conditions established is more than 0.5 seconds.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	≥ 4.921 V

Time Needed for Diagnosis: 0.5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Normality Judgment

Judge as OK when the following conditions are established, and clear the NG.

Judgment Value

Malfunction Criteria	Threshold Value
Ignition switch	ON
Output voltage	< 4.921 V

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

ES:DTC P2440 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 1)

NOTE:

For the diagnostic procedure, refer to DTC P0410. <Ref. to GD(H4DOTC)-116, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

ET:DTC P2441 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK 1)

NOTE:

For the diagnostic procedure, refer to DTC P0410. <Ref. to GD(H4DOTC)-116, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

EU:DTC P2442 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK OPEN (BANK 2)

NOTE:

For the diagnostic procedure, refer to DTC P0410. <Ref. to GD(H4DOTC)-116, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

EV:DTC P2443 SECONDARY AIR INJECTION SYSTEM SWITCHING VALVE STUCK CLOSED (BANK 2)

NOTE:

For the diagnostic procedure, refer to DTC P0410. <Ref. to GD(H4DOTC)-116, DTC P0410 SECONDARY AIR INJECTION SYSTEM, Diagnostic Trouble Code (DTC) Detecting Criteria.>

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

EW:DTC P2444 SECONDARY AIR INJECTION SYSTEM PUMP STUCK ON

1. OUTLINE OF DIAGNOSIS

Detect functional errors (continually ON) of the secondary air pump.

When the secondary air supply piping pressure is high in comparison to the atmospheric pressure, it is judged as NG.

2. ENABLE CONDITION

Secondary Parameters	Enable Conditions
None	

3. GENERAL DRIVING CYCLE

Always perform the diagnosis continuously.

4. DIAGNOSTIC METHOD

When the secondary air pump is OFF, the secondary air supply pipe pressure should be atmospheric pressure. If it is higher than atmospheric pressure, judge as NG.

Abnormality Judgment

Judge as NG if the continuous time with all of the following conditions established is more than 5 seconds.

Malfunction Criteria	Threshold Value
Estimate ambient temperature	≥ 4.4°C (39.92°F)
Battery voltage	≥ 10.9 V
After secondary air injection system operation	0.6 seconds or more
Battery voltage	≥ 7 V
Atmospheric pressure	≥ 75.0 kPa (563 mmHg, 22.15 inHg)
Engine	In operation
After secondary air injection system stop	3 seconds or more
Secondary air supply piping pressure (Absolute pressure)	> Value from Map 22

Map 22

Unit: (kPa (mmHg, inHg))		Atmospheric pressure (kPa (mmHg, inHg))							
		69.3 (520, 20.47)	74.6 (560, 22.03)	80.0 (600, 23.63)	85.3 (640, 25.19)	90.6 (680, 26.76)	96.0 (720, 28.35)	101.3 (760, 29.92)	106.6 (800, 31.48)
Battery voltage (V)	10.5	78.0 (585, 23.03)	84.0 (630, 24.80)	90.0 (675, 26.58)	96.0 (720, 28.35)	102.0 (765, 30.13)	108.0 (810, 31.90)	114.0 (855, 33.67)	120.0 (900, 35.44)
	11.5	79.3 (595, 23.42)	85.4 (641, 25.22)	91.6 (687, 27.05)	97.7 (733, 28.86)	103.7 (778, 30.63)	109.8 (824, 32.43)	116.0 (870, 34.26)	122.1 (916, 36.28)
	12.5	80.8 (606, 23.86)	86.9 (652, 25.67)	93.2 (699, 27.53)	99.3 (745, 29.33)	105.6 (792, 31.19)	111.7 (838, 32.99)	118.0 (885, 34.85)	124.2 (932, 36.68)
	13.5	82.1 (616, 24.25)	88.4 (663, 26.11)	94.8 (711, 28.0)	101.0 (758, 29.83)	107.3 (805, 31.69)	113.7 (853, 33.58)	120.0 (900, 35.44)	126.2 (947, 37.27)
	14.5	83.4 (626, 24.63)	89.8 (674, 26.52)	96.2 (722, 28.41)	102.8 (771, 30.36)	109.2 (819, 32.25)	115.6 (867, 34.14)	122.0 (915, 36.03)	128.4 (963, 37.92)
	15.5	84.8 (636, 25.05)	89.8 (685, 26.52)	97.8 (734, 28.89)	104.4 (783, 30.83)	110.9 (832, 32.75)	117.4 (881, 34.67)	124.0 (930, 36.62)	130.5 (979, 38.54)

Time Needed for Diagnosis: 5 seconds

Malfunction Indicator Light Illumination: Illuminates as soon as a malfunction occurs.

Diagnostic Trouble Code (DTC) Detecting Criteria

GENERAL DESCRIPTION

Normality Judgment

Judge as OK if the continuous time with all of the following conditions established is more than 5 seconds, and clear the NG.

Judgment Value

Malfunction Criteria	Threshold Value
Estimate ambient temperature	$\geq 4.4^{\circ}\text{C}$ (39.92°F)
Battery voltage	$\geq 10.9\text{ V}$
After secondary air injection system operation	0.6 seconds or more
Battery voltage	$\geq 7\text{ V}$
Atmospheric pressure	$\geq 75.0\text{ kPa}$ (563 mmHg, 22.15 inHg)
Engine	In operation
After secondary air injection system stop	3 seconds or more
Secondary air supply piping pressure (Absolute pressure)	\leq Value from Map 22

5. DTC CLEAR CONDITION

- When the OK idling cycle is completed 40 times in a row
- When "Clear Memory" is performed

6. MALFUNCTION INDICATOR LIGHT CLEAR CONDITION

- When the OK driving cycle is completed 3 times in a row
- When "Clear Memory" is performed

7. FAIL SAFE

None

8. ECM OPERATION AT DTC SETTING

Memorize the freeze frame data. (For test mode \$02)

General Description

CONTROL SYSTEMS

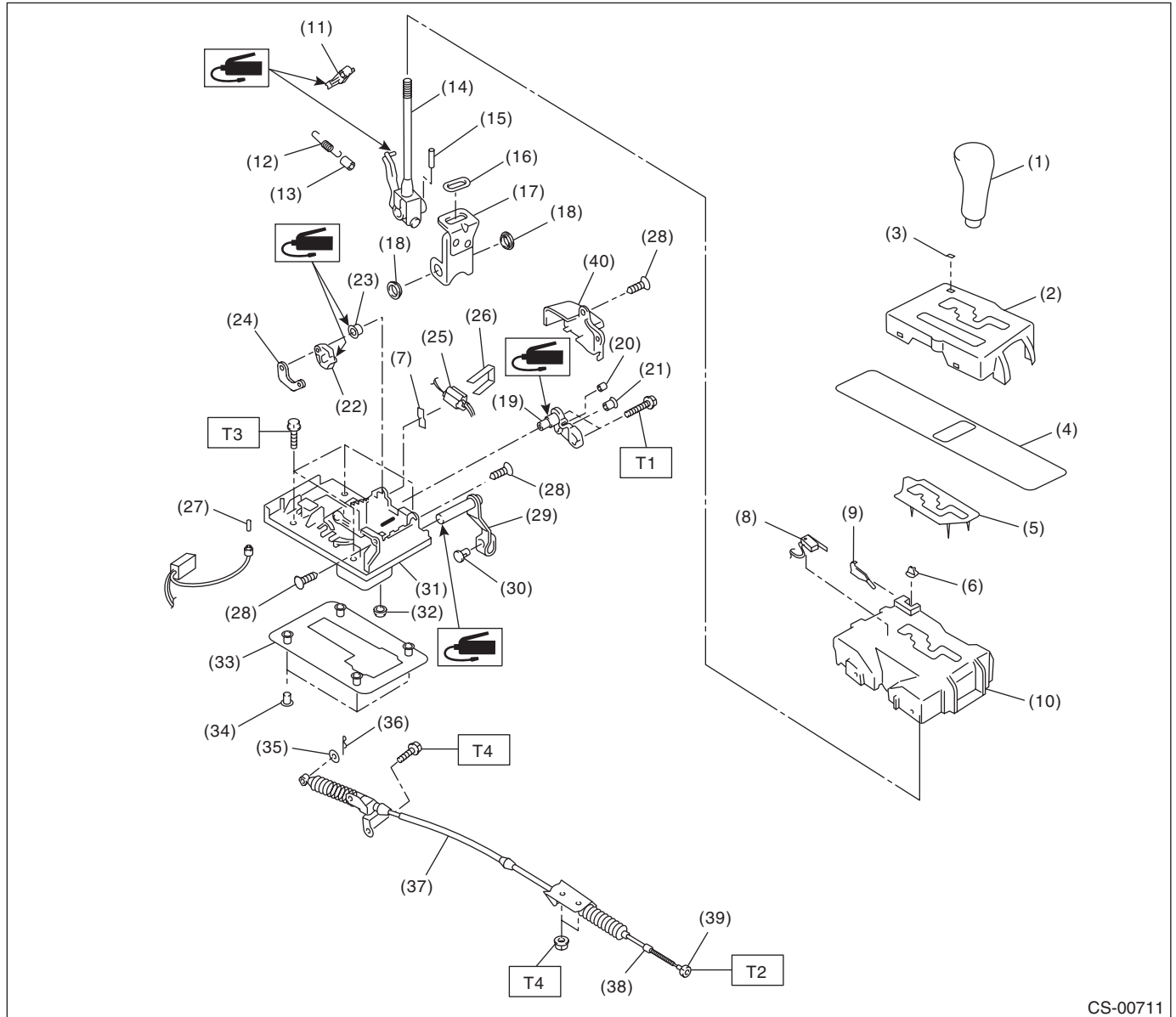
1. General Description

A: SPECIFICATION

Item		Specification
Swing torque of rod against lever	N (kgf, lb)	3.7 (0.38, 0.84) or less

B: COMPONENT

1. AT SELECT LEVER



CS-00711

General Description

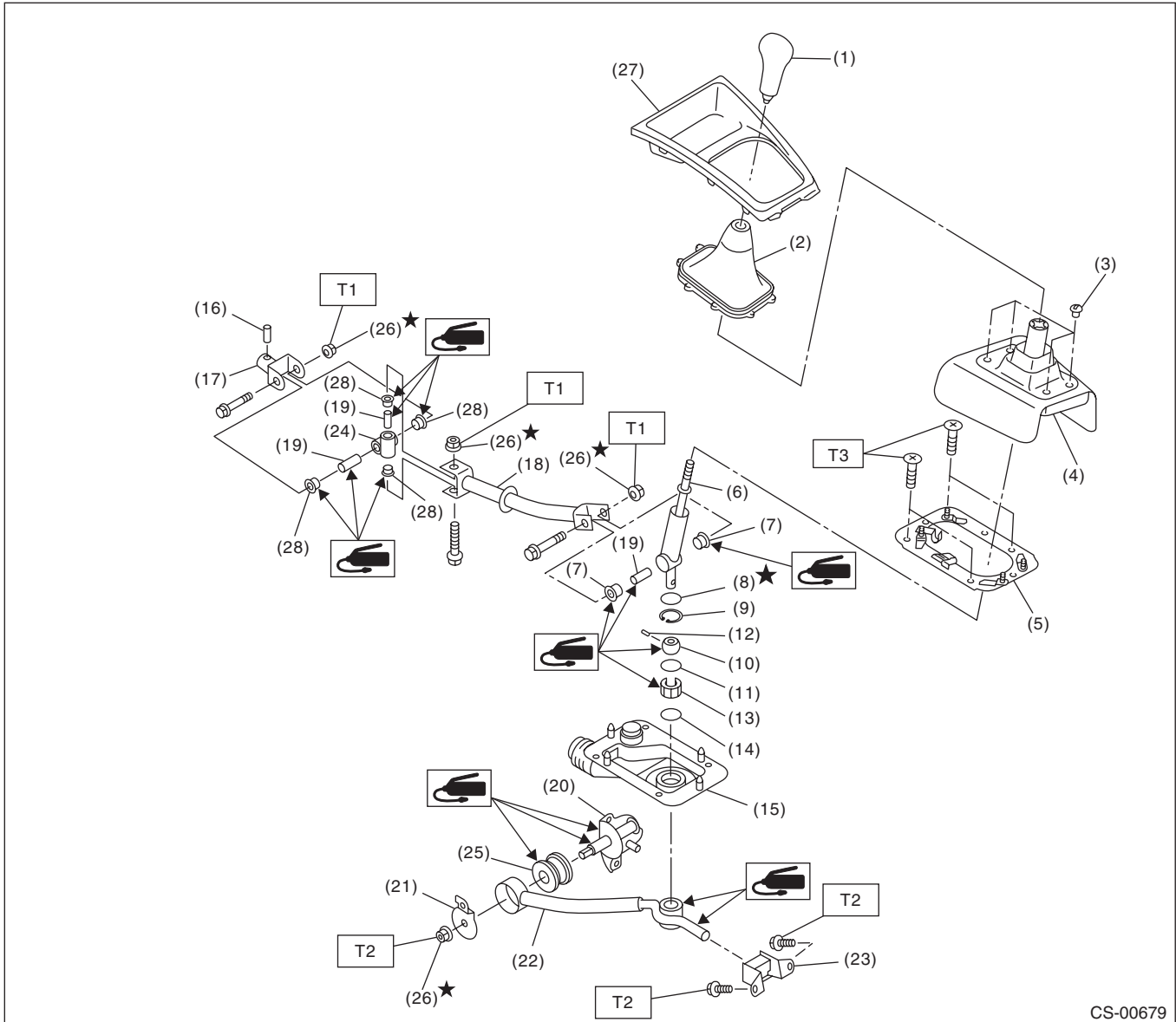
CONTROL SYSTEMS

(1) Grip	(17) Bracket	(32) Grommet
(2) Indicator cover	(18) Bushing	(33) Packing
(3) Cover	(19) Lock plate B	(34) Spacer
(4) Blind	(20) Bushing	(35) Washer
(5) Cushion	(21) Bushing	(36) Snap pin
(6) Button	(22) Lock plate A	(37) Select cable
(7) Cushion	(23) Bushing	(38) Adjusting nut B
(8) P range switch	(24) Lock plate C	(39) Adjusting nut A
(9) Spring	(25) Shift lock solenoid	(40) Cover
(10) Guide plate	(26) Clamp	
(11) Detent arm	(27) Indicator bulb	<hr/> Tightening torque: N·m (kgf·m, ft·lb)
(12) Detent spring	(28) Clip	T1: 2.0 (0.2, 1.4)
(13) Tube	(29) Select lever arm	T2: 7.5 (0.76, 5.5)
(14) Selector lever COMPL	(30) Bushing COMPL	T3: 13 (1.3, 9.4)
(15) Spring pin	(31) Base plate	T4: 18 (1.8, 13.0)
(16) Bushing		<hr/>

General Description

CONTROL SYSTEMS

2. MT GEAR SHIFT LEVER



CS-00679

- | | | |
|-----------------------------|-----------------|-----------------------|
| (1) Gear shift knob | (12) Spring pin | (23) Cushion rubber |
| (2) Console boot | (13) Bushing B | (24) Boss |
| (3) Clamp | (14) O-ring | (25) Bushing |
| (4) Boot and insulator ASSY | (15) Boot | (26) Self-locking nut |
| (5) Plate ASSY | (16) Spring pin | (27) Front cover |
| (6) Lever | (17) Joint | (28) Bushing |
| (7) Bushing | (18) Rod | |
| (8) Lock wire | (19) Spacer | |
| (9) Snap ring | (20) Bracket | |
| (10) Bushing | (21) Washer | |
| (11) O-ring | (22) Stay | |
| | | (23) Cushion rubber |
| | | (24) Boss |
| | | (25) Bushing |
| | | (26) Self-locking nut |
| | | (27) Front cover |
| | | (28) Bushing |

Tightening torque: N-m (kgf-m, ft-lb)

T1: 12 (1.2, 8.9)

T2: 18 (1.8, 13.3)

T3: 7.5 (0.76, 5.5)

C: CAUTION

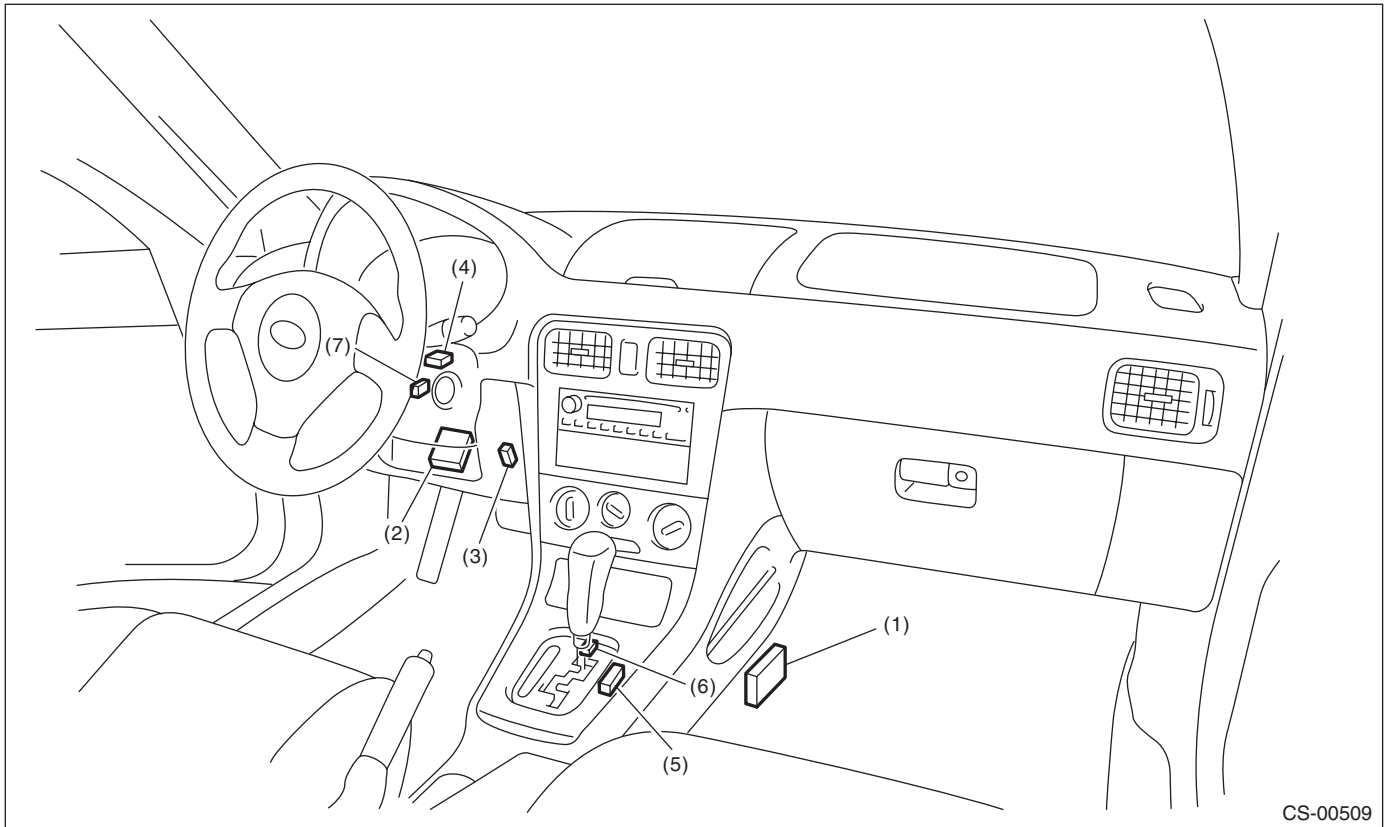
- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Use SUBARU genuine fluid, grease etc. or equivalent. Do not mix fluid, grease, etc. of different grades or manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Apply grease onto sliding or revolving surfaces before installation.
- Before installing O-rings or snap rings, apply sufficient amount of grease to avoid damage and deformation.
- Before securing a part on a vise, set cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Before disconnecting electrical connectors, be sure to disconnect the negative terminal from battery.

Electrical Component Location

CONTROL SYSTEMS

2. Electrical Component Location

A: LOCATION

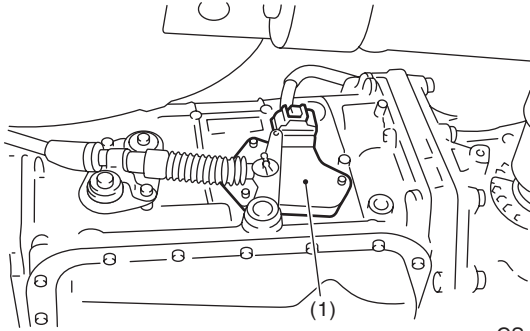


CS-00509

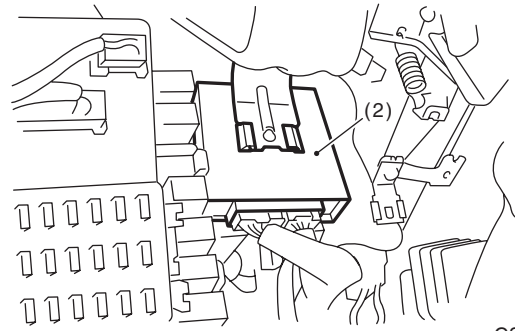
- | | | |
|--------------------------|-------------------------|-----------------------|
| (1) Inhibitor switch | (4) Key warning switch | (6) "P" range switch |
| (2) Body integrated unit | (5) Shift lock solenoid | (7) Key lock solenoid |
| (3) Stop light switch | | |

Electrical Component Location

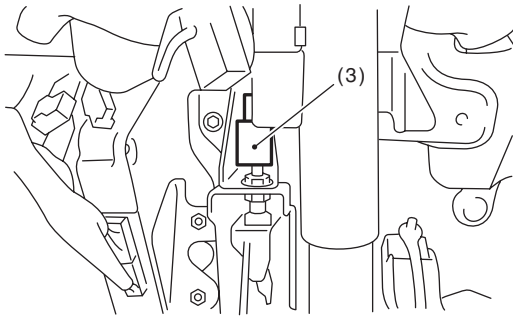
CONTROL SYSTEMS



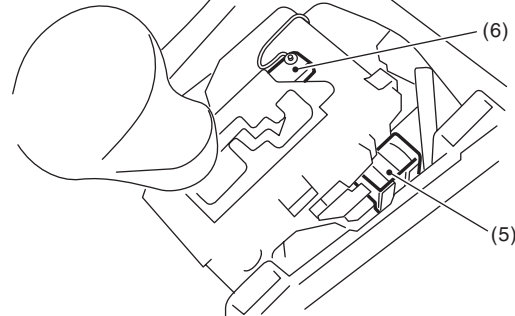
CS-00006



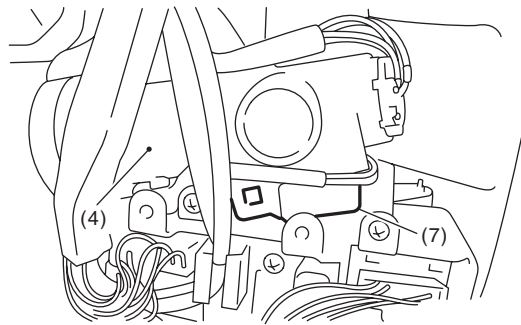
CS-00083



CS-00084



CS-00085



CS-00008

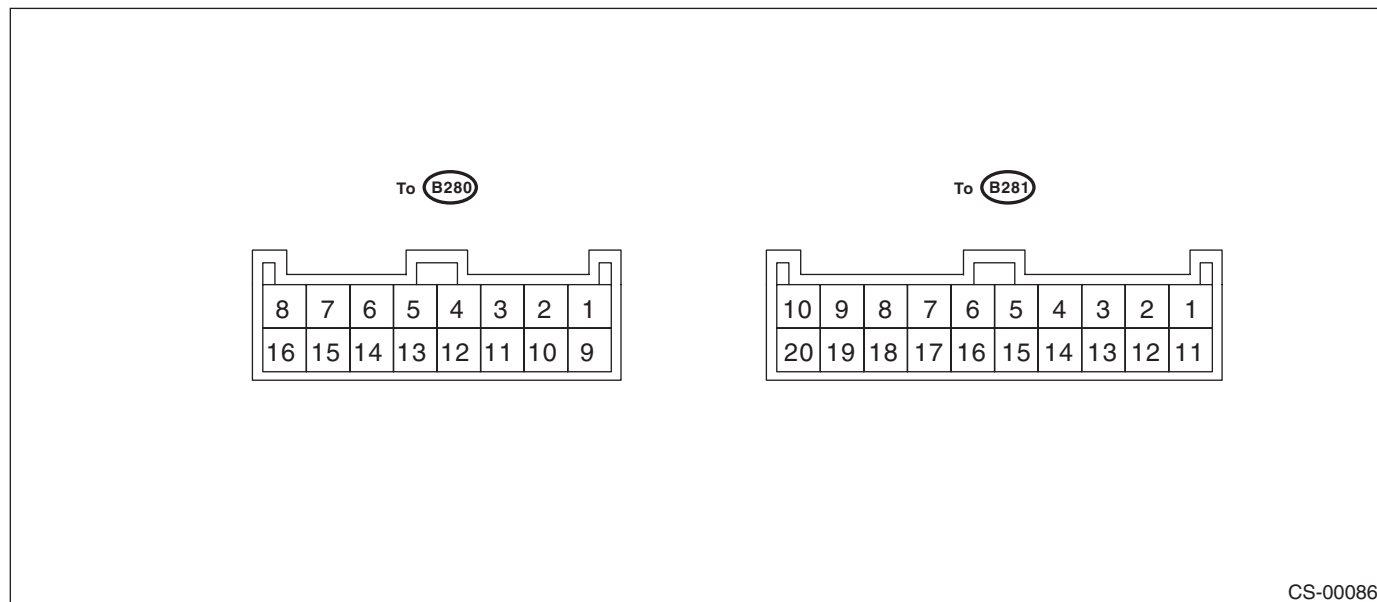
SUBARU.

AT Shift Lock Control System

CONTROL SYSTEMS

3. AT Shift Lock Control System

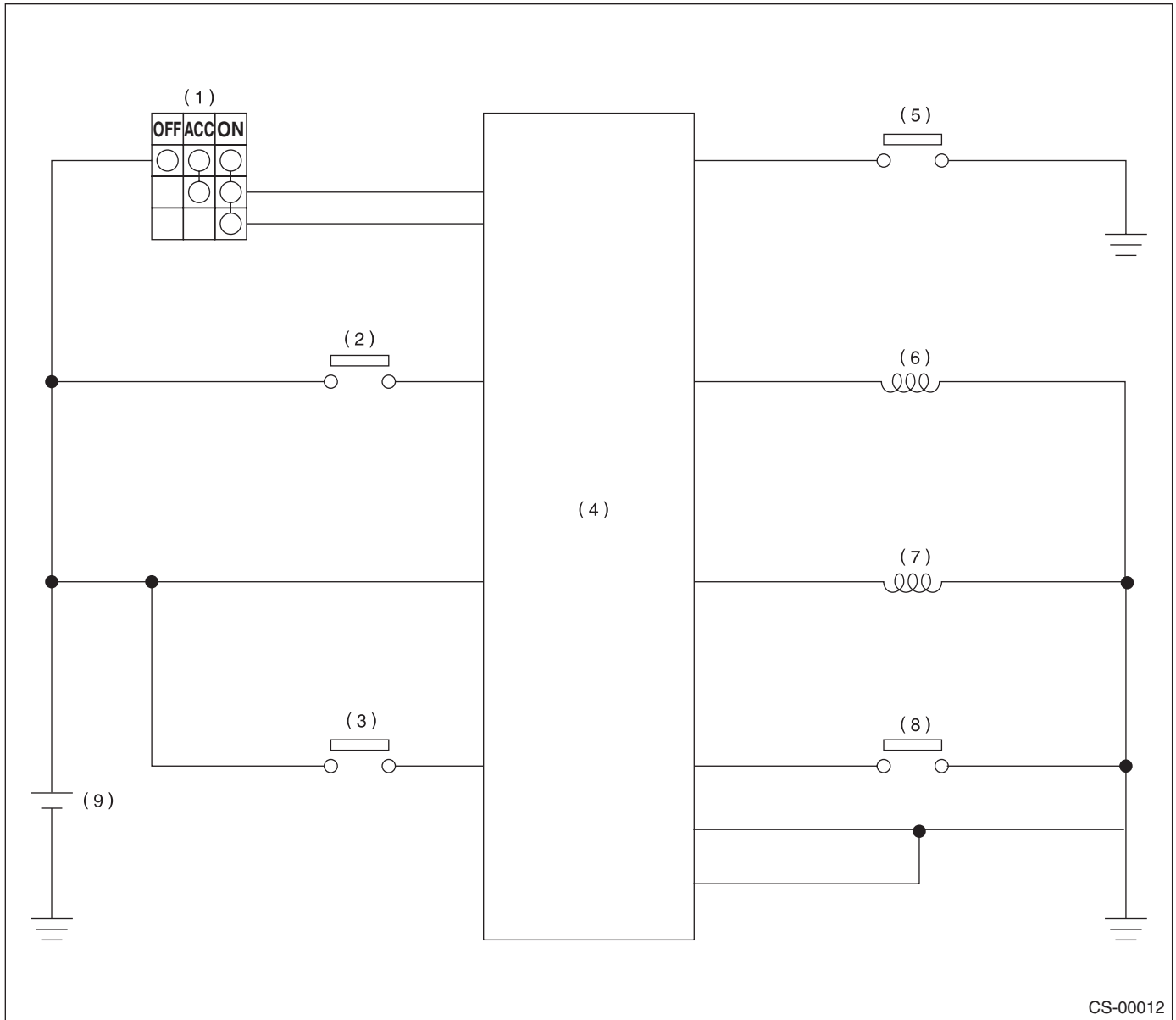
A: ELECTRICAL SPECIFICATION



CS-00086

Contents	To Connector No.	Terminal No.	Input/Output signal
			Measured value and measuring conditions
Battery power supply	B280	2	9 — 16 V
Ignition power supply	B281	19	10 — 15 V when ignition switch is at ON or START.
Ignition power supply	B281	10	10 — 15 V when ignition switch is at ACC or ON.
Inhibitor switch ("P" range)	B281	5	0 V when select lever is in "P" range. 9 — 16 V when select lever is in other ranges than "P" range.
Stop light switch	B281	9	9 — 16 V when stop light switch is ON. 0 V when stop light switch is OFF.
"P" range switch	B281	6	0 V when select lever is in "P" range. 9 — 16 V when select lever is in other ranges than "P" range.
Shift lock solenoid signal	B280	9	8.5 — 16 V when shift lock is released. 0 V when shift lock is operating.
Key warning switch signal	B281	20	9 — 16 V when key is inserted. 0 V when key is removed.
Key lock solenoid signal	B280	3	Pulse is output when switching key lock between locked and unlocked. 0 V at other conditions than above.
Ground	B280	4	—
Ground	B280	13	—

B: WIRING DIAGRAM



CS-00012

- | | | |
|------------------------|--------------------------|-------------------------|
| (1) Ignition switch | (4) Body integrated unit | (7) Shift lock solenoid |
| (2) Stop light switch | (5) Inhibitor switch | (8) "P" range switch |
| (3) Key warning switch | (6) Key lock solenoid | (9) Battery |

AT Shift Lock Control System

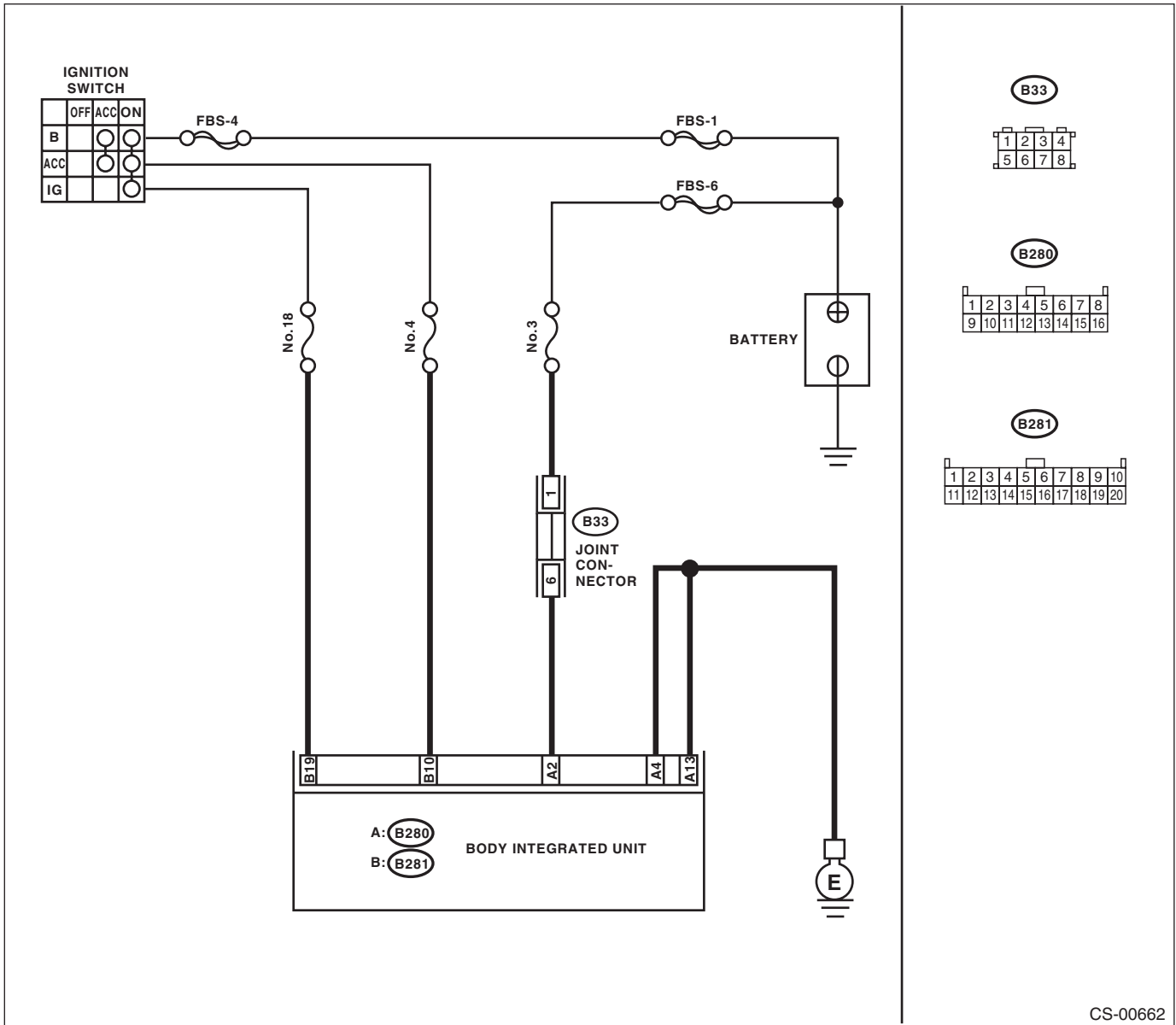
CONTROL SYSTEMS

C: INSPECTION

1. SHIFT LOCK OPERATION

Step	Check	Yes	No
1 CHECK SHIFT LOCK. 1) Turn the ignition switch to ON. 2) Move the select lever to "P" range.	While brake pedal is not depressed, can the select lever move from "P" range to other ranges?	Inspect "SELECT LEVER CANNOT BE SHIFT LOCKED". <Ref. to CS-15, SELECT LEVER CANNOT BE SHIFT LOCKED, INSPECTION, AT Shift Lock Control System.>	Go to step 2.
2 CHECK SHIFT LOCK.	While brake pedal is depressed, can select lever move from "P" range to other ranges?	Go to step 3.	Inspect "SELECT LEVER CANNOT BE SHIFTED". <Ref. to CS-13, SELECT LEVER CANNOT BE SHIFTED, INSPECTION, AT Shift Lock Control System.>
3 CHECK KEY INTERLOCK.	Is the ignition switch turned to the "LOCK" position when the select lever is set to other than "P" range?	Inspect "KEY INTERLOCK DOES NOT BE LOCK OR UNLOCK". <Ref. to CS-18, KEY INTERLOCK DOES NOT LOCK OR RELEASE, INSPECTION, AT Shift Lock Control System.>	Go to step 4.
4 CHECK KEY INTERLOCK.	Is the ignition switch turned to the "LOCK" position when the select lever is set to the "P" range?	AT shift lock control system is normal.	Inspect "KEY INTERLOCK DOES NOT BE LOCK OR UNLOCK". <Ref. to CS-18, KEY INTERLOCK DOES NOT LOCK OR RELEASE, INSPECTION, AT Shift Lock Control System.>

2. BODY INTEGRATED UNIT POWER SUPPLY AND GROUND CIRCUIT WIRING DIAGRAM:



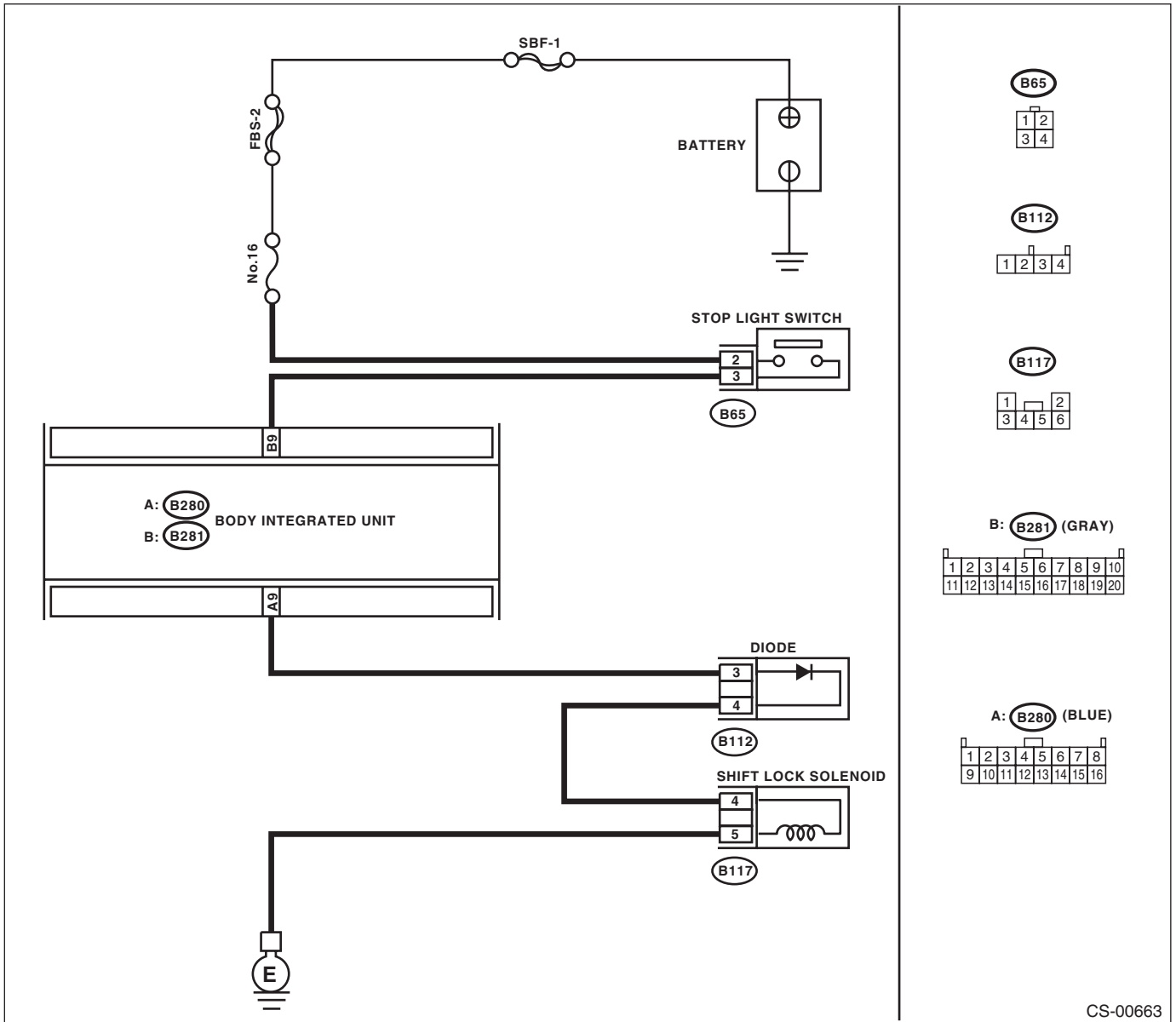
CS-00662

AT Shift Lock Control System

CONTROL SYSTEMS

Step	Check	Yes	No
1 CHECK FUSE. Remove the fuses No. 3, 4 and 18.	Are the fuses No. 3, 4 and 18 blown?	Replace the fuses No. 3, 4 and 18. If the replaced fuse No. 3, 4 or 18 blows easily, repair the short circuit of harness between the fuse and body integrated unit.	Go to step 2.
2 CHECK HARNESS CONNECTOR BETWEEN BODY INTEGRATED UNIT AND CHASSIS GROUND. 1) Turn the ignition switch to OFF. 2) Measure the harness resistance between the body integrated unit and chassis ground. <i>Connector & terminal</i> <i>(B280) No. 4 — Chassis ground:</i> <i>(B280) No. 13 — Chassis ground:</i>	Is the resistance less than 1 Ω ?	Go to step 3.	Repair the open circuit of harness between the body integrated unit and chassis ground.
3 CHECK BATTERY POWER SUPPLY. 1) Turn the ignition switch to ON. (engine OFF) 2) Check the voltage between body integrated unit and chassis ground. <i>Connector & terminal</i> <i>(B280) No. 2 (+) — Chassis ground (-):</i>	Is the voltage 9 V or more?	Go to step 4.	Repair the open circuit harness between battery and body integrated unit, and poor contact in connector.
4 CHECK IGNITION POWER SUPPLY CIRCUIT. 1) Turn the ignition switch to ACC. 2) Check the voltage between body integrated unit and chassis ground. <i>Connector & terminal</i> <i>(B281) No. 10 (+) — Chassis ground (-):</i>	Is the voltage 9 V or more?	Go to step 5.	Repair the open circuit harness between battery and body integrated unit, and poor contact in connector.
5 CHECK IGNITION POWER SUPPLY CIRCUIT. 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the voltage between body integrated unit and chassis ground. <i>Connector & terminal</i> <i>(B281) No. 19 (+) — Chassis ground (-):</i>	Is the voltage 9 V or more?	Go to step 6.	Repair the open circuit harness between battery and body integrated unit, and poor contact in connector.
6 CHECK POOR CONTACT.	Is there poor contact in the connector?	Repair the poor contact.	Replace the body integrated unit.

3. SELECT LEVER CANNOT BE SHIFTED WIRING DIAGRAM:



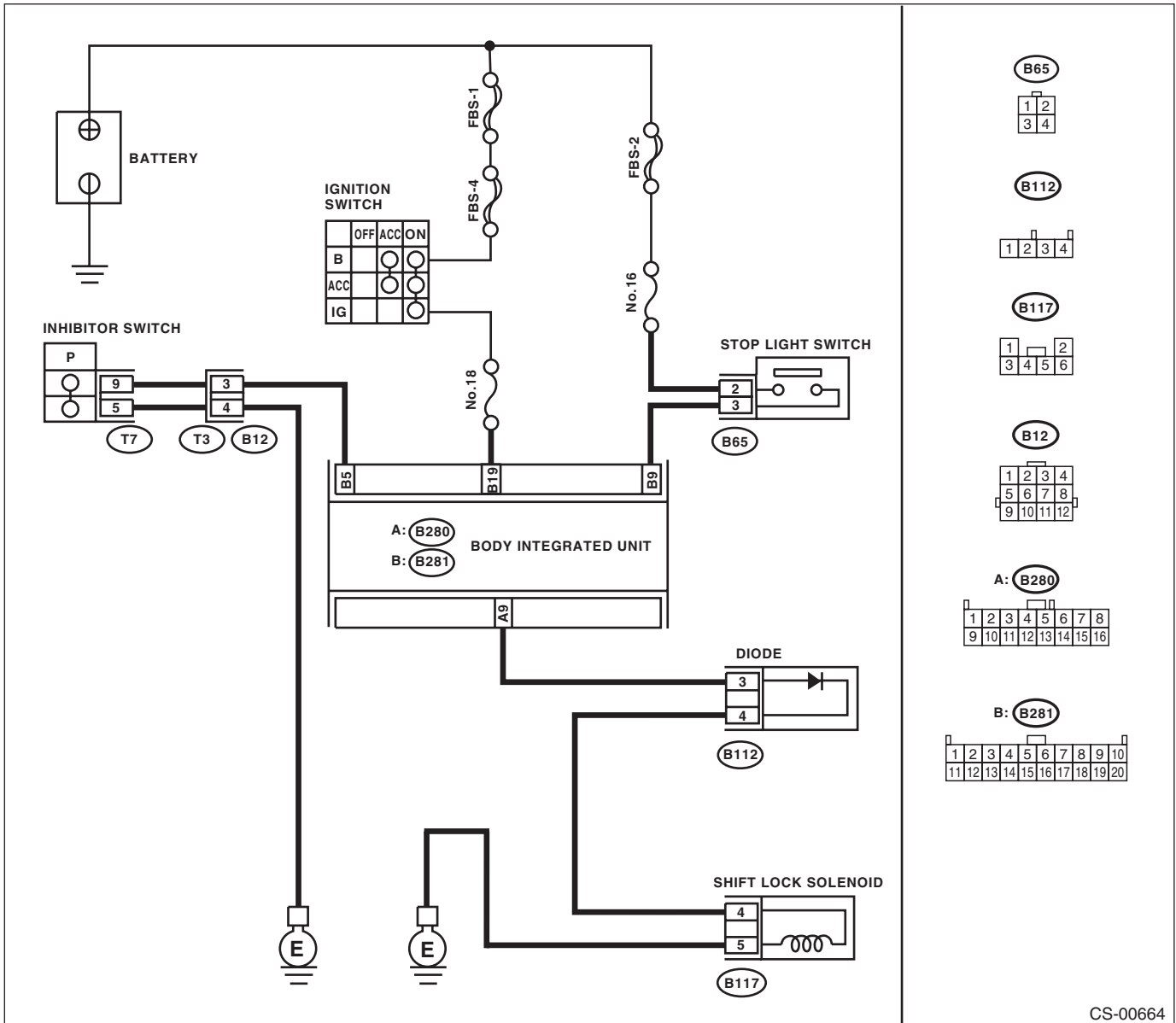
CS-00663

AT Shift Lock Control System

CONTROL SYSTEMS

	Step	Check	Yes	No
1	CHECK STOP LIGHT SWITCH. Depress the brake pedal.	Does the stop light illuminate?	Go to step 2.	Check the stop light system.
2	CHECK HARNESS BETWEEN STOP LIGHT SWITCH AND BODY INTEGRATED UNIT. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors of body integrated unit and stop light switch. 3) Measure the resistance of harness between stop light switch and body integrated unit. Connector & terminal (B65) No. 3 — (B281) No. 9:	Is the resistance 1 M Ω or more?	Repair the open circuit of harness between the body integrated unit and stop light switch.	Go to step 3.
3	CHECK HARNESS BETWEEN STOP LIGHT SWITCH AND BODY INTEGRATED UNIT. Measure the resistance of harness between stop light switch and chassis ground. Connector & terminal (B65) No. 3 — Chassis ground:	Is the resistance less than 1 Ω ?	Repair the short circuit of harness between the body integrated unit and stop light switch.	Go to step 4.
4	CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND SHIFT LOCK SOLENOID. 1) Disconnect the connector of shift lock solenoid. 2) Measure the harness resistance between body integrated unit and the shift lock solenoid. Connector & terminal (B117) No. 4 — (B280) No. 9:	Is the resistance 1 M Ω or more?	Repair the open circuit of harness between body integrated unit and shift lock solenoid.	Go to step 5.
5	CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND SHIFT LOCK SOLENOID. Measure the resistance of harness between shift lock solenoid and chassis ground. Connector & terminal (B117) No. 4 — Chassis ground:	Is the resistance less than 1 Ω ?	Repair the short circuit of harness between the body integrated unit and shift lock solenoid.	Go to step 6.
6	CHECK HARNESS BETWEEN SHIFT LOCK SOLENOID AND CHASSIS GROUND. Measure the resistance of harness between shift lock solenoid and chassis ground. Connector & terminal (B117) No. 5 — Chassis ground:	Is the resistance 1 M Ω or more?	Repair open circuit of harness between shift lock solenoid and chassis ground.	Go to step 7.
7	CHECK SHIFT LOCK SOLENOID. Measure the resistance of the shift lock solenoid connector terminals. Terminals No. 4 — No. 5:	Is the resistance between 20 and 40 Ω ?	Go to step 8.	Replace the shift lock solenoid.
8	CHECK SHIFT LOCK SOLENOID. Connect the battery to connector terminal of shift lock solenoid, and operate the solenoid. Terminals No. 4 (+) — No. 5 (-):	Is the shift lock solenoid operating properly?	Go to step 9.	Replace the shift lock solenoid.
9	CHECK POOR CONTACT.	Is there poor contact in the connector?	Repair the poor contact.	Replace the body integrated unit.

4. SELECT LEVER CANNOT BE SHIFT LOCKED WIRING DIAGRAM:



CS-00664

AT Shift Lock Control System

CONTROL SYSTEMS

Step	Check	Yes	No
1 CHECK INHIBITOR SWITCH. 1) Turn the ignition switch to ON. (engine OFF) 2) Move the select lever from "P" to "1" range.	Combination meter indicator light and select lever "P", "R", "N", "3", "2" and "1" are correctly matched?	Go to step 2.	Adjust inhibitor switch and select cable.
2 CHECK IGNITION POWER SUPPLY CIRCUIT. 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the voltage between body integrated unit and chassis ground. <i>Connector & terminal</i> <i>(B281) No. 19 (+) — Chassis ground (-):</i>	Is the voltage 9 V or more?	Go to step 3.	Repair the open circuit harness between battery and body integrated unit, and poor contact in connector.
3 CHECK HARNESS BETWEEN THE INHIBITOR SWITCH AND THE BODY INTEGRATED UNIT. 1) Turn the ignition switch to OFF. 2) Disconnect the transmission harness and body integrated unit connector. 3) Measure the harness resistance between the body integrated unit and chassis ground. <i>Connector & terminal</i> <i>(B280) No. 5 — Chassis ground:</i>	Is the resistance less than 1 Ω ?	Repair the short circuit of harness between the body integrated unit and transmission connector.	Go to step 4.
4 CHECK HARNESS BETWEEN THE INHIBITOR SWITCH AND THE BODY INTEGRATED UNIT. Measure the resistance of harness between body integrated unit and inhibitor switch. <i>Connector & terminal</i> <i>(B12) No. 3 — (B281) No. 5:</i>	Is the resistance 1 M Ω or more?	Repair the open wire of harness between the body integrated unit and transmission connector.	Go to step 5.
5 CHECK HARNESS BETWEEN INHIBITOR SWITCH AND CHASSIS GROUND. Measure the harness resistance between the body integrated unit and chassis ground. <i>Connector & terminal</i> <i>(B12) No. 4 — Chassis ground:</i>	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the open circuit of harness between the body integrated unit and chassis ground.
6 CHECK INHIBITOR SWITCH. 1) Move the select lever to "P" range. 2) Measure the resistance between transmission harness connector terminals. <i>Connector & terminal</i> <i>(T3) No. 3 — No. 4:</i>	Is the resistance 1 M Ω or more?	Repair or replace inhibitor switch.	Go to step 7.
7 CHECK OUTPUT SIGNAL OF BODY INTEGRATED UNIT. 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Measure the voltage between body integrated unit and chassis ground. <i>Connector & terminal</i> <i>(B281) No. 5 (+) — Chassis ground (-):</i>	Is the voltage 9 — 16 V?	Go to step 8.	Go to step 16.
8 CHECK STOP LIGHT SWITCH. Depress the brake pedal.	Does the stop light illuminate?	Go to step 9.	Check the stop light system.
9 CHECK HARNESS BETWEEN STOP LIGHT SWITCH AND AT SHIFT LOCK CONTROL MODULE. 1) Depress the brake pedal. 2) Measure the voltage between body integrated unit and chassis ground. <i>Connector & terminal</i> <i>(B281) No. 9 (+) — Chassis ground (-):</i>	Is the voltage 9 V or more?	Go to step 10.	Repair the open or short circuit of harness between the body integrated unit and stop light switch.

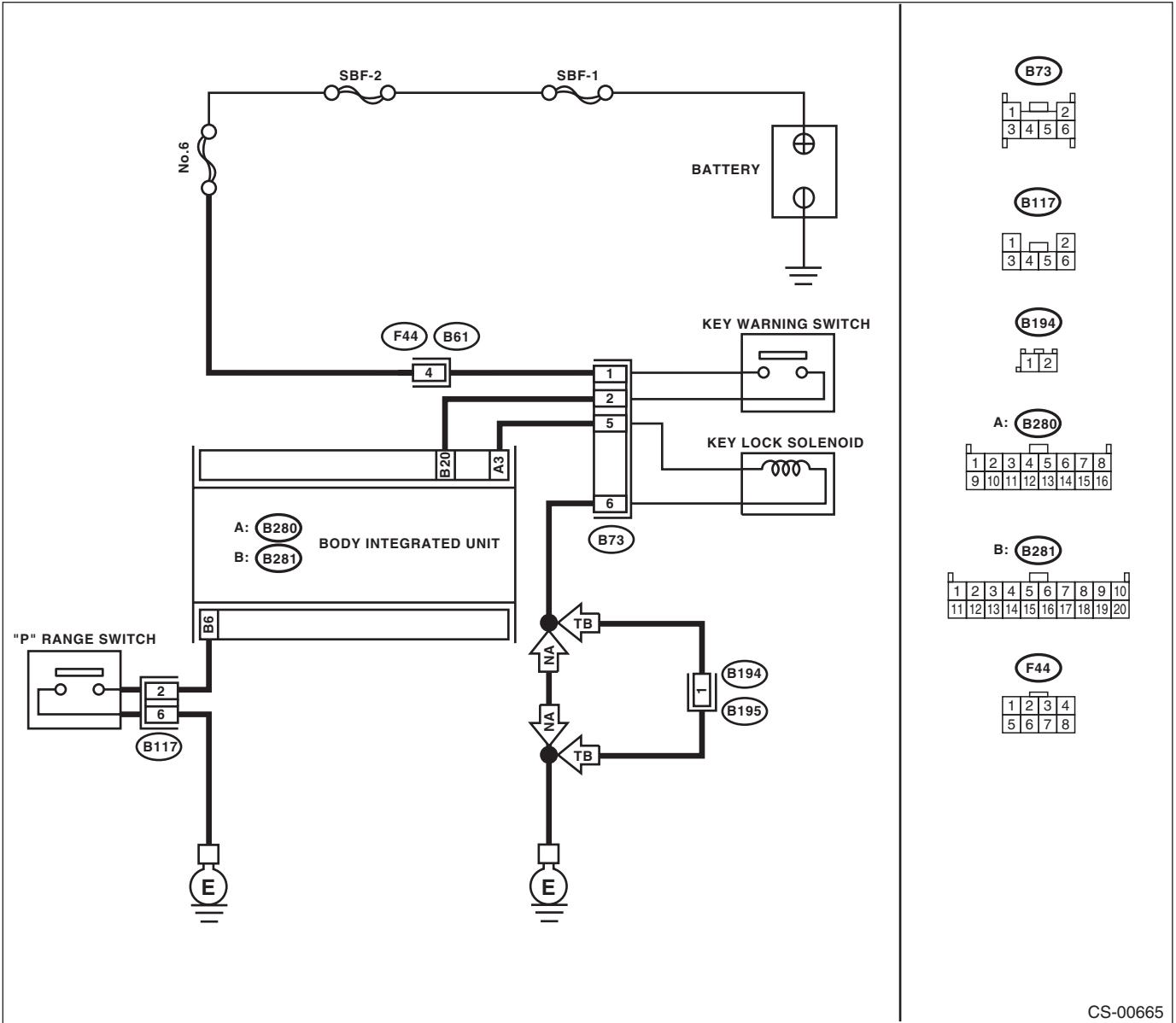
AT Shift Lock Control System

Step	Check	Yes	No
10 CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND SHIFT LOCK SOLENOID. 1) Turn the ignition switch to OFF. 2) Disconnect the shift lock solenoid and body integrated unit connector. 3) Measure the harness resistance between body integrated unit and the shift lock solenoid. <i>Connector & terminal (B280) No. 9 — (B117) No. 4:</i>	Is the resistance 1 M Ω or more?	Repair the open circuit of harness between body integrated unit and shift lock solenoid.	Go to step 11.
11 CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND SHIFT LOCK SOLENOID. Measure the resistance of harness between shift lock solenoid and chassis ground. <i>Connector & terminal (B280) No. 9 — Chassis ground:</i>	Is the resistance less than 10 Ω ?	Go to step 12.	Repair the short circuit of harness between the body integrated unit and shift lock solenoid.
12 CHECK HARNESS BETWEEN SHIFT LOCK SOLENOID AND CHASSIS GROUND. Measure the resistance of harness between shift lock solenoid and chassis ground. <i>Connector & terminal (B117) No. 5 — Chassis ground:</i>	Is the resistance less than 1 Ω ?	Go to step 13.	Repair open circuit of harness between shift lock solenoid and chassis ground.
13 CHECK SHIFT LOCK SOLENOID. Measure the resistance of the shift lock solenoid connector terminals. <i>Terminals No. 4 — No. 5:</i>	Is the resistance between 20 and 40 Ω ?	Go to step 14.	Replace the shift lock solenoid.
14 CHECK SHIFT LOCK SOLENOID. Connect the battery to connector terminal of shift lock solenoid, and operate the solenoid. <i>Terminals No. 4 (+) — No. 5 (-):</i>	Is the shift lock solenoid operating properly?	Go to step 15.	Replace the shift lock solenoid.
15 CHECK OUTPUT SIGNAL FOR AT SHIFT LOCK CONTROL MODULE. 1) Turn the ignition switch to ON. (engine OFF) 2) Measure the voltage between body integrated unit and chassis ground. <i>Connector & terminal (B280) No. 9 (+) — Chassis ground (-):</i>	Is the voltage 8.5 V or more?	Go to step 16.	Replace the body integrated unit.
16 CHECK POOR CONTACT.	Is there poor contact in the connector?	Repair the poor contact.	Replace the body integrated unit.

AT Shift Lock Control System

CONTROL SYSTEMS

5. KEY INTERLOCK DOES NOT LOCK OR RELEASE WIRING DIAGRAM:



CS-00665

AT Shift Lock Control System

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN BATTERY AND KEY WARNING SWITCH. 1) Disconnect the connector of key warning switch. 2) Measure the voltage of harness between key warning switch and chassis ground. <i>Connector & terminal</i> <i>(B73) No. 1 (+) — Chassis ground (-):</i>	Is the voltage 9 — 16 V?	Go to step 2.	Repair the open or short circuit of harness between battery and key warning switch.
2 CHECK KEY WARNING SWITCH. Measure the resistance between connector terminals of key warning switch. <i>Terminals</i> <i>No. 1 — No. 2:</i>	Is the resistance 1 M Ω or more?	Replace the key warning switch.	Go to step 3.
3 CHECK KEY WARNING SWITCH. 1) Remove the key. 2) Measure the resistance between connector terminals of key warning switch. <i>Terminals</i> <i>No. 1 — No. 2:</i>	Is the resistance 1 M Ω or more?	Go to step 4.	Replace the key warning switch.
4 CHECK HARNESS BETWEEN AT SHIFT LOCK CONTROL MODULE AND KEY WARNING SWITCH. 1) Disconnect the body integrated unit connector. 2) Measure the voltage between body integrated unit and chassis ground. <i>Connector & terminal</i> <i>(B281) No. 20 (+) — Chassis ground (-):</i>	Is the voltage 9 V or more?	Go to step 5.	Repair the open circuit of harness between body integrated unit and key warning switch.
5 CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND KEY LOCK SOLENOID. 1) Disconnect the connector key lock solenoid. 2) Measure the harness resistance between body integrated unit and the key lock solenoid. <i>Connector & terminal</i> <i>(B73) No. 5 — (B280) No. 3:</i>	Is the resistance 1 M Ω or more?	Repair the open circuit of harness between body integrated unit and key lock solenoid.	Go to step 6.
6 CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND KEY LOCK SOLENOID. Measure the harness resistance between the body integrated unit and chassis ground. <i>Connector & terminal</i> <i>(B280) No. 3 — Chassis ground:</i>	Is the resistance 1 Ω or more?	Go to step 7.	Repair the short of the harness between body integrated unit and key lock solenoid.
7 CHECK HARNESS BETWEEN KEY LOCK SOLENOID AND CHASSIS GROUND. Measure the resistance of harness between key lock solenoid and chassis ground. <i>Connector & terminal</i> <i>(B73) No. 6 — Chassis ground:</i>	Is the resistance less than 10 Ω ?	Go to step 8.	Repair open circuit or the poor contact of the harness between key lock solenoid and chassis ground.
8 CHECK KEY LOCK SOLENOID. Measure the resistance of key lock solenoid connector terminals. <i>Terminals</i> <i>No. 1 — No. 2:</i>	Is the resistance between 4 and 8 Ω ?	Go to step 9.	Replace the key lock solenoid.
9 CHECK HARNESS BETWEEN “P” RANGE SWITCH AND CHASSIS GROUND. Measure the resistance of harness between “P” range switch and chassis ground. <i>Connector & terminal</i> <i>(B117) No. 2 — Chassis ground:</i>	Is the resistance less than 1 Ω ?	Go to step 10.	Repair the short circuit of harness between “P” range switch and body integrated unit.

AT Shift Lock Control System

CONTROL SYSTEMS

Step	Check	Yes	No
10 CHECK HARNESS BETWEEN AT SHIFT LOCK CONTROL MODULE AND “P” RANGE SWITCH. 1) Disconnect the connector of “P” range switch. 2) Measure the resistance of harness between body integrated unit and “P” range switch. <i>Connector & terminal</i> <i>(B117) No. 2 — (B281) No. 6:</i>	Is the resistance 1 MΩ or more?	Repair the open circuit of harness between body integrated unit and “P” range switch.	Go to step 11.
11 CHECK HARNESS BETWEEN “P” RANGE SWITCH AND CHASSIS GROUND. Measure the resistance of harness between “P” range switch and chassis ground. <i>Connector & terminal</i> <i>(B117) No. 6 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Repair the open circuit of harness between “P” range switch and chassis ground.	Go to step 12.
12 CHECK “P” RANGE SWITCH. 1) Move the select lever to “P” range. 2) Measure the resistance between “P” range switch connector terminals. <i>Terminals</i> <i>No. 2 — No. 6:</i>	Is the resistance less than 1 Ω?	Go to step 13.	Replace the “P” range switch.
13 CHECK “P” RANGE SWITCH. 1) Set the select lever to other than “P” range. 2) Measure the resistance between “P” range switch connector terminals. <i>Terminals</i> <i>No. 2 — No. 6:</i>	Is the resistance 1 MΩ or more?	Go to step 14.	Replace the “P” range switch.
14 CHECK OUTPUT SIGNAL OF BODY INTEGRATED UNIT. 1) Disconnect all connectors. 2) Turn the ignition switch to ON. (engine OFF) 3) Move the select lever to “P” range. 4) Depress the brake pedal. 5) Measure the voltage between body integrated unit connector and chassis ground. <i>Connector & terminal</i> <i>(B280) No. 3 (+) — Chassis ground (-):</i>	Is the voltage 7.5 — 16 V?	Go to step 15.	Replace the body integrated unit.
15 CHECK POOR CONTACT.	Is there poor contact of the connector?	Repair the poor contact.	Replace the body integrated unit.

4. Select Lever

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.
- 3) Set the select lever to "N" range.
- 4) Lift-up the vehicle.
- 5) Remove the rear exhaust pipe and muffler.

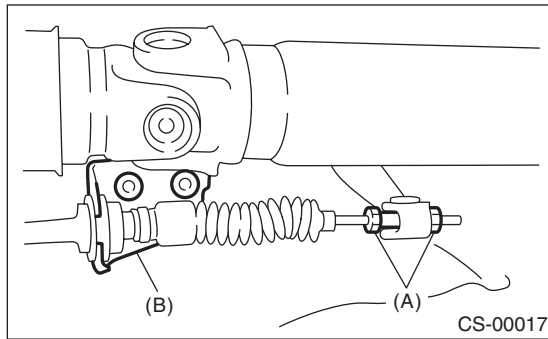
Non-turbo model

<Ref. to EX (H4SO)-8, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX (H4SO)-9, REMOVAL, Muffler.>

Turbo model

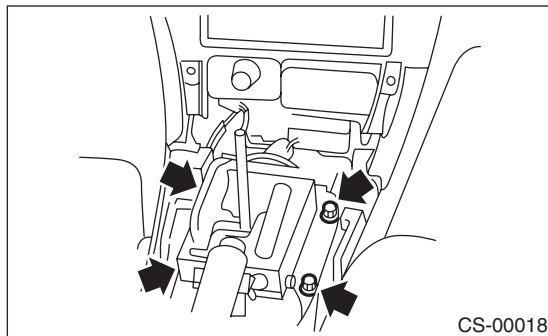
<Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-15, REMOVAL, Muffler.>

- 6) Disconnect the cable from range select lever and then remove the cable bracket.



- (A) Adjusting nut
(B) Cable bracket

- 7) Lower the vehicle.
- 8) Remove the console box. <Ref. to EI-38, REMOVAL, Console Box.>
- 9) Disconnect the connectors, and then remove the four bolts to take out the select lever assembly from vehicle body.

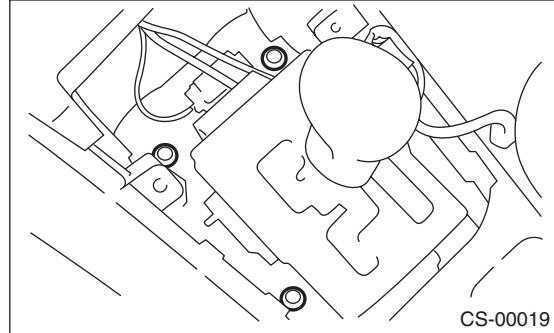


B: INSTALLATION

- 1) Mount the select lever onto the vehicle body.
- 2) Tighten the four bolts at the prescribed torque, then connect the connector.

Tightening torque:

13 N·m (1.3 kgf-m, 9.4 ft-lb)



- 3) Install the console box. <Ref. to EI-36, INSTALLATION, Glove Box.>
- 4) Set the select lever to "N" range.
- 5) Lift-up the vehicle.
- 6) Set the select lever to "N" range.
- 7) Insert the thread portion of the other inner cable and into connector hole of the select lever, and fix the other outer cable end to bracket.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

- 8) Adjust the select cable position. <Ref. to CS-27, ADJUSTMENT, Select Cable.>
- 9) After completion of fitting, make sure that the select lever operates smoothly all across the operating range.
- 10) Install the rear exhaust pipe and muffler.

Non-turbo model

<Ref. to EX (H4SO)-8, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX (H4SO)-9, INSTALLATION, Muffler.>

Turbo model

<Ref. to EX(H4DOTC)-14, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-15, INSTALLATION, Muffler.>

- 11) Inspect the following items. If the following inspection reveals problems, adjust the select cable and inhibitor switch. <Ref. to CS-27, ADJUSTMENT, Select Cable.> <Ref. to 4AT-47, ADJUSTMENT, Inhibitor Switch.>

- (1) Engine starts when the select lever is in "P" and "N" range, but not in other range.
- (2) Back-up light illuminates when the select lever is in the "R" range, but not in other range.
- (3) Select lever and indicator positions are matched.

Select Lever

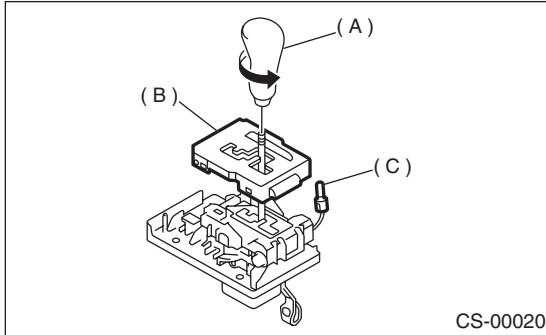
CONTROL SYSTEMS

C: DISASSEMBLY

- 1) Remove the packing.
- 2) Remove the grip.
- 3) Remove the indicator light, and then remove the indicator cover.

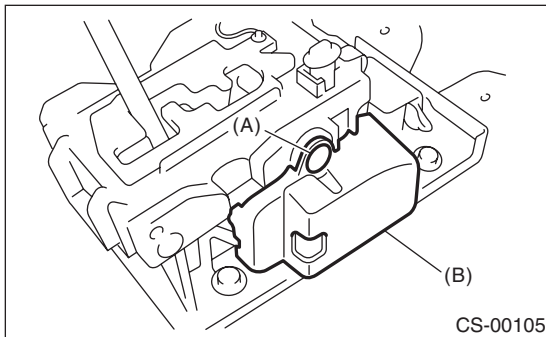
NOTE:

Be careful not to damage the indicator light during removal.



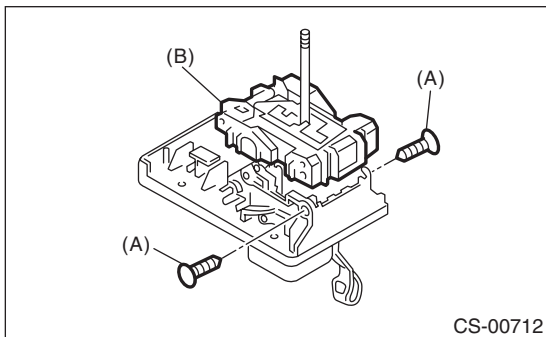
- (A) Grip
- (B) Indicator cover
- (C) Indicator light

- 4) Remove the blind.
- 5) Remove the cover.



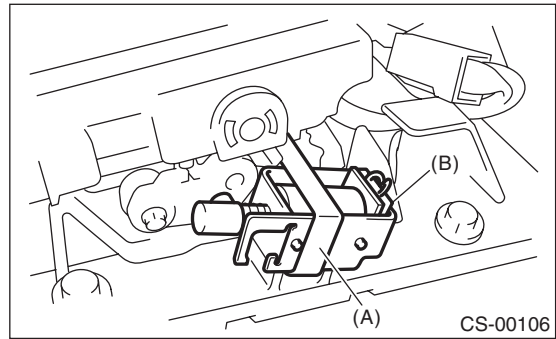
- (A) Clip
- (B) Cover

- 6) Remove the clips and then remove the guide plate.



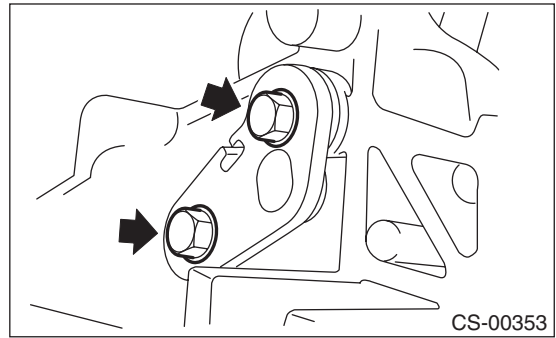
- (A) Clip
- (B) Guide plate

- 7) Remove the clamp and remove the shift lock solenoid.

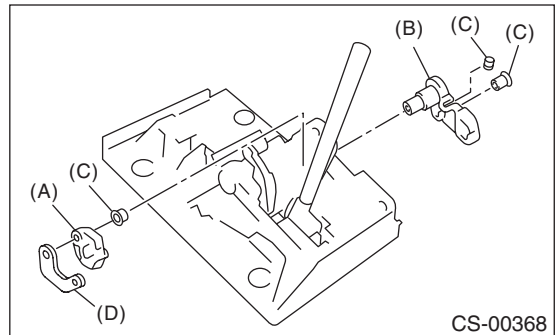


- (A) Clamp
- (B) Shift lock solenoid

- 8) Remove the bolts which secure the lock plate B.

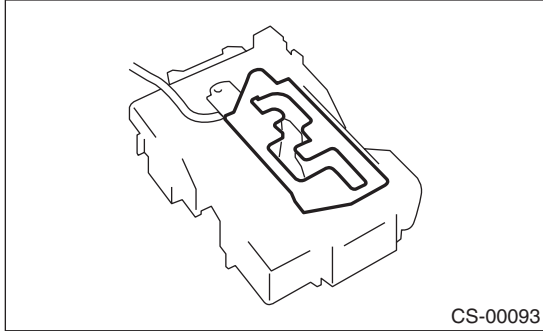


- 9) Remove the lock plates A, B, and C and the bushing.

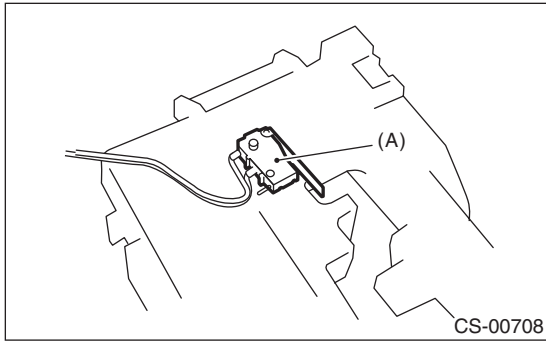


- (A) Lock plate A
- (B) Lock plate B
- (C) Bushing
- (D) Lock plate C

10) Remove the cushion plate.

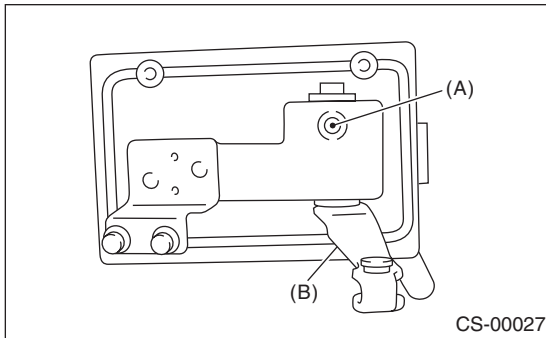


11) Remove the "P" range switch.



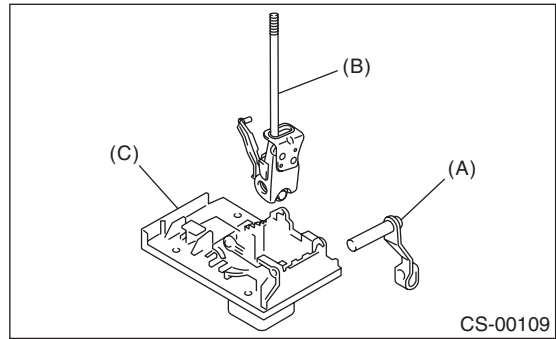
(A) "P" range switch

12) Remove the grommet and then extract the spring pin.



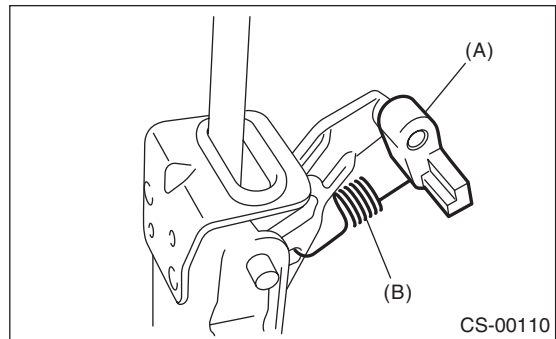
(A) Spring pin
(B) Select lever arm

13) Remove the select lever arm and then remove the select lever COMPL from the plate.



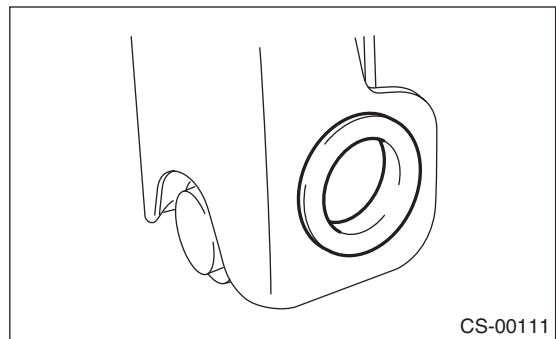
(A) Select lever arm
(B) Selector lever COMPL
(C) Plate

14) Remove the detent spring and remove the detent arm.



(A) Detent arm
(B) Detent spring

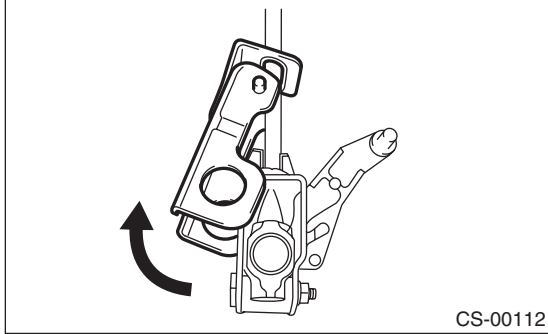
15) Remove the select lever COMPL bushing from bracket.



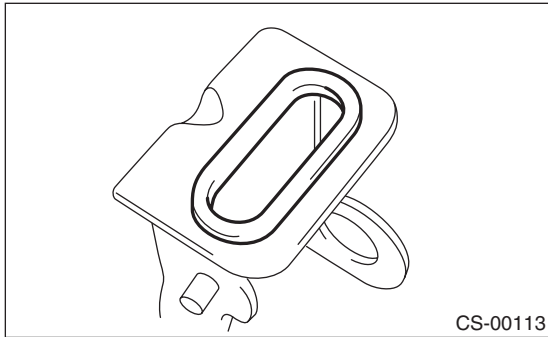
Select Lever

CONTROL SYSTEMS

16) Remove the bracket from select lever COMPL.



17) Remove the bushing from the bracket.



D: ASSEMBLY

- 1) Clean all the parts before assembly.
- 2) Apply grease [KOPR-KOTE (Part No. 003603001) or equivalent] to each part. <Ref. to CS-2, AT SELECT LEVER, COMPONENT, General Description.>

CAUTION:

Apply grease [SUNCALL GLO-244] to the axle of lock plate.

- 3) Assemble in the reverse order of disassembly.
- 4) After completion of fitting, transfer the select lever to the "1" range from "P" range, then check whether the select indicator and select lever match, and whether the pointer and position mark match and check the operating force.

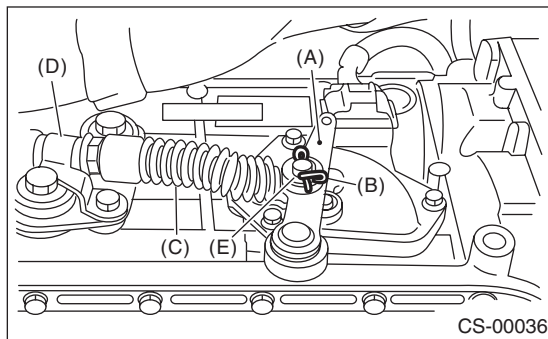
E: INSPECTION

- 1) Inspect the removed parts by comparing with new parts for deformation, damage and wear. Repair or replace if defective.
- 2) Confirm the select lever COMPL operating condition before assembling. Normal if it operates smoothly.

5. Select Cable

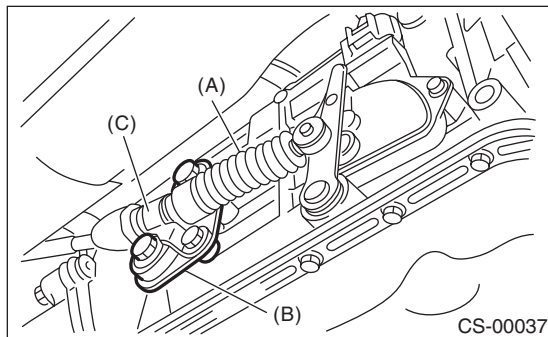
A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.
- 3) Prior to removal, set the lever to "N" range.
- 4) Lift-up the vehicle.
- 5) Remove the front and center exhaust pipes.
Non-turbo model
<Ref. to EX (H4SO)-4, REMOVAL, Front Exhaust Pipe.>
Turbo model
<Ref. to EX(H4DOTC)-6, REMOVAL, Front Exhaust Pipe.>
- 6) Remove the snap pin from the range select lever.



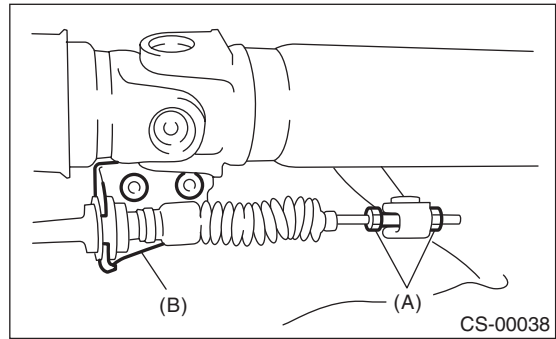
- (A) Select lever
- (B) Snap pin
- (C) Select cable
- (D) Clamp
- (E) Washer

- 7) Remove the plate assembly from the transmission case.



- (A) Select cable
- (B) Plate ASSY
- (C) Clamp

- 8) Disconnect the select cable from range select lever and then remove the cable bracket.



- (A) Adjusting nut
- (B) Cable bracket

- 9) Remove the select cable from plate assembly.

Select Cable

CONTROL SYSTEMS

B: INSTALLATION

1) Install the select cable to plate assembly.

Tightening torque:

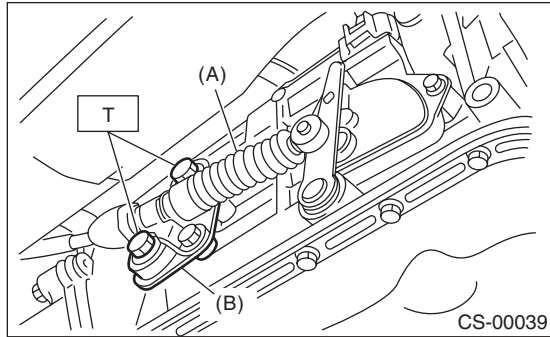
18 N·m (1.8 kgf-m, 13.0 ft-lb)

2) Install the select cable to the range select lever.

3) Install the plate assembly to the transmission.

Tightening torque:

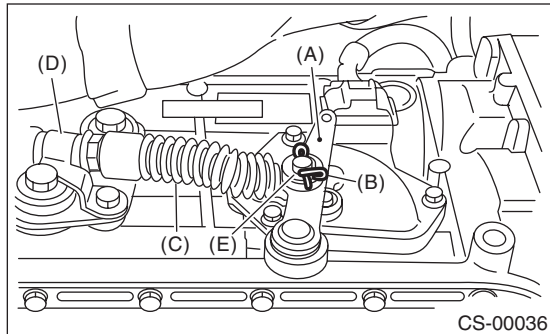
T: 24.5 N·m (2.5 kgf-m, 18.1 ft-lb)



(A) Select cable

(B) Plate ASSY

4) Install the washer and snap pin to range select lever.



(A) Select lever

(B) Snap pin

(C) Select cable

(D) Clamp

(E) Washer

5) Move the select lever to the "N" range, then adjust the select cable position. <Ref. to CS-27, ADJUSTMENT, Select Cable.>

6) Install the front and center exhaust pipe.

Non-turbo model

<Ref. to EX (H4SO)-5, INSTALLATION, Front Exhaust Pipe.>

Turbo model

<Ref. to EX(H4DOTC)-7, INSTALLATION, Front Exhaust Pipe.>

C: INSPECTION

Check the removed cable and replace if damaged, rusty or having problems.

1) Check the cable for smooth operation.

2) Check the inner cable for damage and rust.

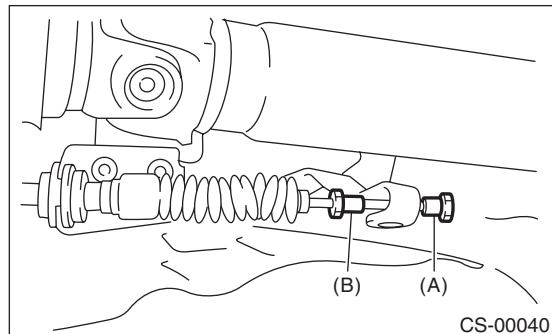
3) Check the outer cable for damage, bends and cracks.

4) Check the boot for damage, cracks and deterioration.

5) Move the select lever from "P" to "1" range. In each range, check that the contact of the detent is felt. If the detentes is not felt or the position pointer is improperly aligned, adjust the cable.

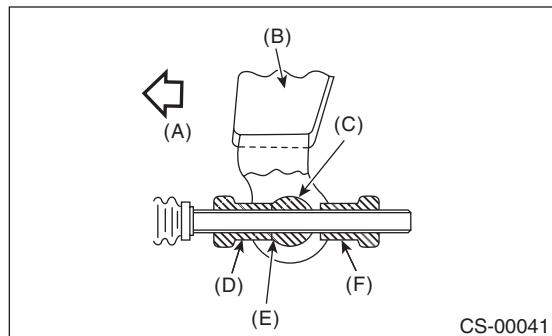
D: ADJUSTMENT

- 1) Set the vehicle on a lift.
- 2) Set the select lever to "N" range.
- 3) Lift-up the vehicle.
- 4) Remove the rear exhaust pipe and muffler.
- 5) Loosen the adjusting nuts on both sides.



- (A) Adjusting nut A
- (B) Adjusting nut B

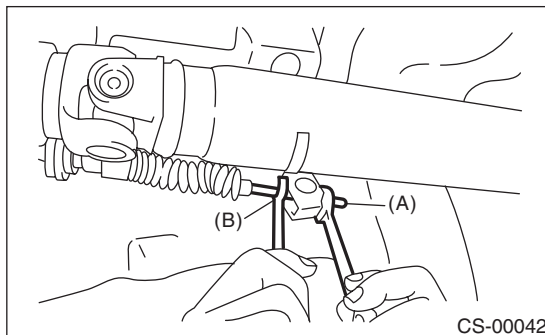
- 6) Turn the adjusting nut B until it lightly touches the connector.



- (A) Front side
- (B) Select lever
- (C) Connector
- (D) Adjusting nut B
- (E) Contact point
- (F) Adjusting nut A

- 7) Set a spanner wrench to adjusting nut B so that it does not rotate, and then tighten the adjusting nut A.

Tightening torque:
7.5 N·m (0.76 kgf·m, 5.5 ft·lb)



- (A) Adjusting nut A
- (B) Adjusting nut B

- 8) After completion of fitting, make sure that the select lever operates smoothly all across the operating range.
- 9) Install in the reverse order of removal.

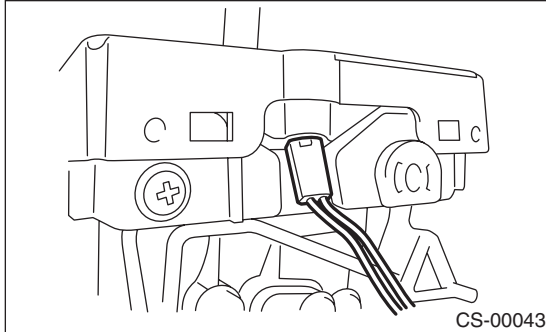
AT Shift Lock Solenoid and "P" Range Switch

CONTROL SYSTEMS

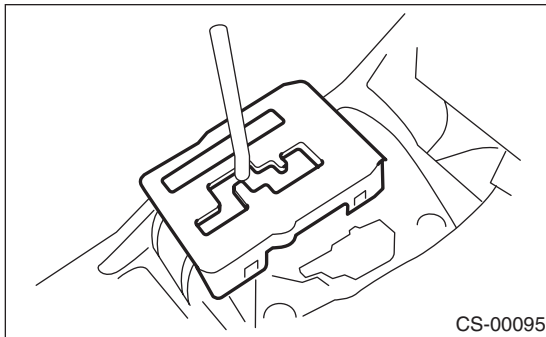
6. AT Shift Lock Solenoid and "P" Range Switch

A: REMOVAL

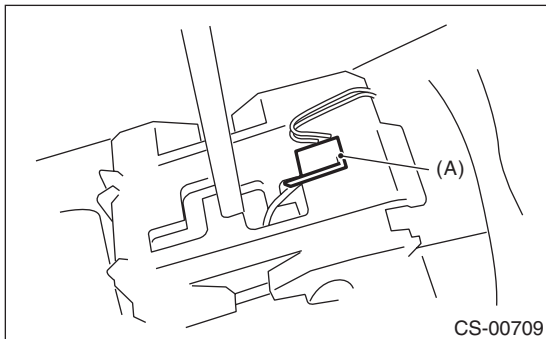
- 1) Disconnect the ground cable from the battery.
- 2) Remove the console box. <Ref. to EI-38, REMOVAL, Console Box.>
- 3) Disconnect the connector.
- 4) Remove the grip.
- 5) Remove the indicator valve from the indicator cover.



- 6) Remove the indicator cover.

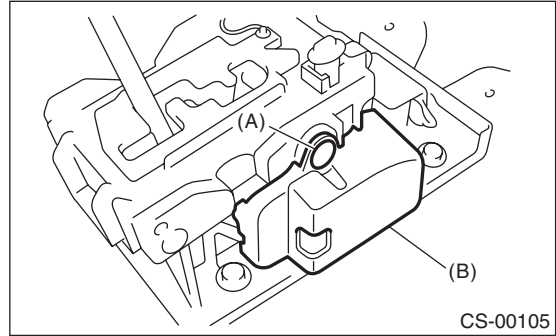


- 7) Remove the blind.
- 8) Remove the cushion.
- 9) Remove the "P" range switch.



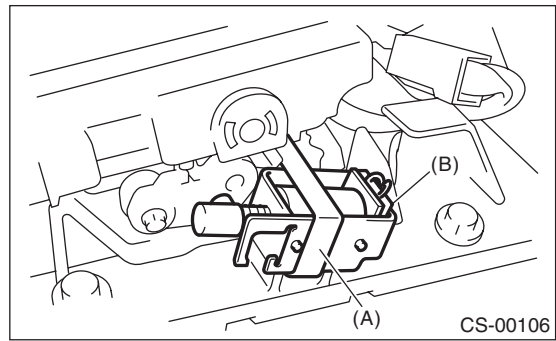
(A) "P" range switch

- 10) Remove the cover.



(A) Clip
(B) Cover

- 11) Remove the clamp and remove the shift lock solenoid.



(A) Clamp
(B) Shift lock solenoid

B: INSTALLATION

Install in the reverse order of removal.

AT Shift Lock Solenoid and “P” Range Switch

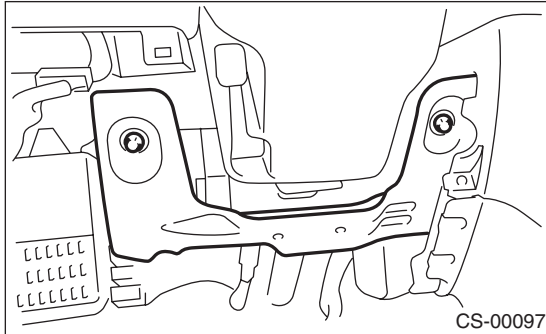
C: INSPECTION

Step	Check	Yes	No
1 CHECK SHIFT LOCK SOLENOID. Measure the resistance of shift lock solenoid connector terminals. <i>Terminals</i> <i>No. 4 — No. 5:</i>	Is the resistance between 20 and 40 Ω ?	Go to step 2.	Replace the shift lock solenoid and “P” range switch assembly.
2 CHECK SHIFT LOCK SOLENOID. Connect the battery to shift lock solenoid connector terminal, and then operate the solenoid. <i>Terminals</i> <i>No. 4 (+) — No. 5 (-):</i>	Does the shift lock solenoid operate normally?	Go to step 3.	Replace the shift lock solenoid and “P” range switch assembly.
3 CHECK “P” RANGE SWITCH. 1) Move the select lever to “P” range. 2) Measure the resistance between “P” range switch connector terminals.	Is the resistance less than 1 Ω ?	Go to step 4.	Replace the “P” range switch.
4 CHECK “P” RANGE SWITCH. 1) Set the select lever to other than “P” range. 2) Measure the resistance between “P” range switch connector terminals.	Is the resistance 1 M Ω or more?	Normal operation	Replace the “P” range switch.

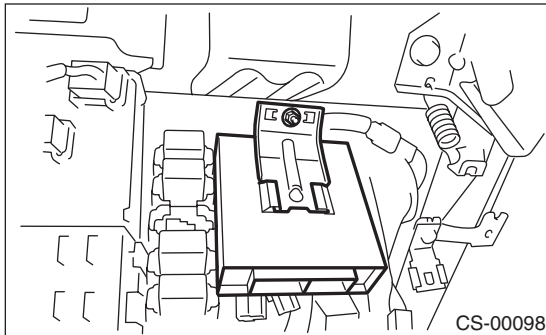
7. Body Integrated Unit

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the lower cover.
- 3) Remove the knee bolster.



- 4) Disconnect the connector from body integrated unit.
- 5) Remove the body integrated unit.



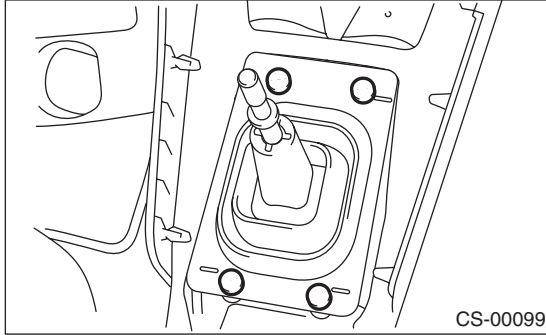
B: INSTALLATION

Install in the reverse order of removal.

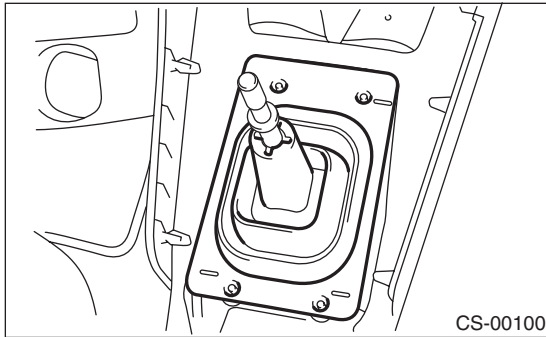
8. MT Gear Shift Lever

A: REMOVAL

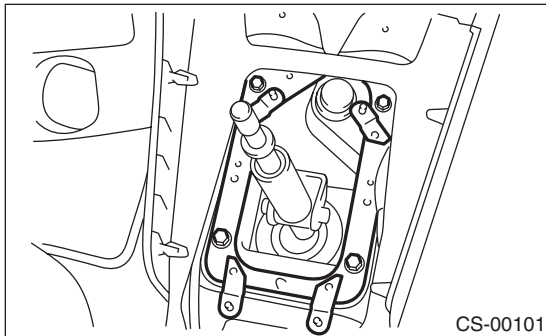
- 1) Set the vehicle on a lift.
- 2) Remove the gear shift knob.
- 3) Disconnect the ground cable from the battery.
- 4) Remove the console box. <Ref. to EI-38, REMOVAL, Console Box.>
- 5) Remove the clamp.



- 6) Remove the bushing and insulator assembly.

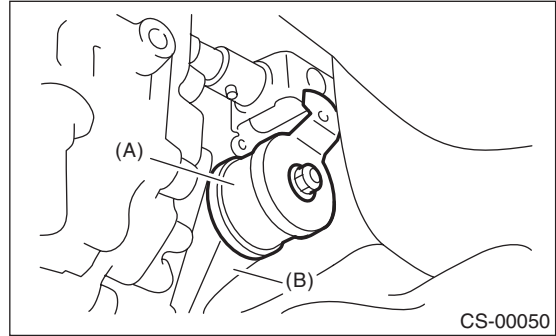


- 7) Remove the plate COMPL from vehicle body.



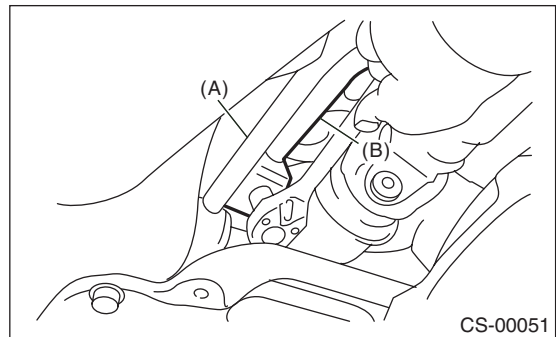
- 8) Lift-up the vehicle.
- 9) Remove the rear exhaust pipe and muffler.
Non-turbo model
<Ref. to EX (H4SO)-8, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX (H4SO)-9, REMOVAL, Muffler.>
Turbo model
<Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-15, REMOVAL, Muffler.>

- 10) Remove the stay from transmission bracket.



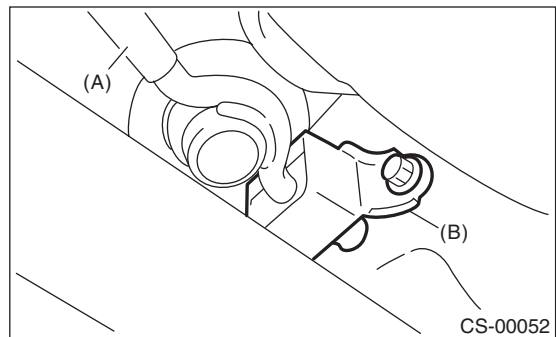
- (A) Stay
(B) Transmission bracket

- 11) Remove the rod from joint.



- (A) Stay
(B) Rod

- 12) Remove the cushion rubber from vehicle body.

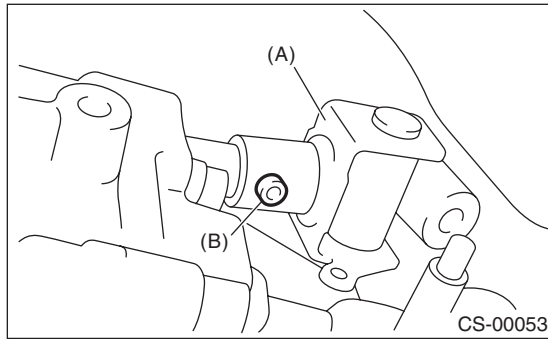


- (A) Stay
(B) Cushion rubber

MT Gear Shift Lever

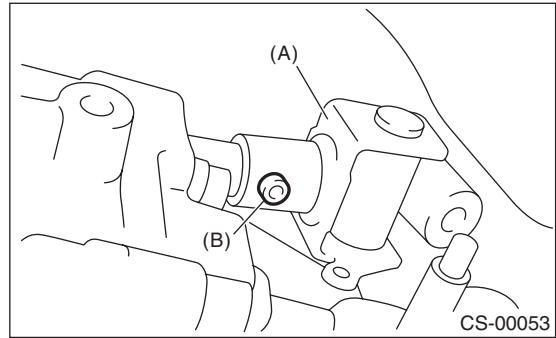
CONTROL SYSTEMS

13) Remove the spring pin, and then extract the joint.



- (A) Joint
- (B) Spring pin

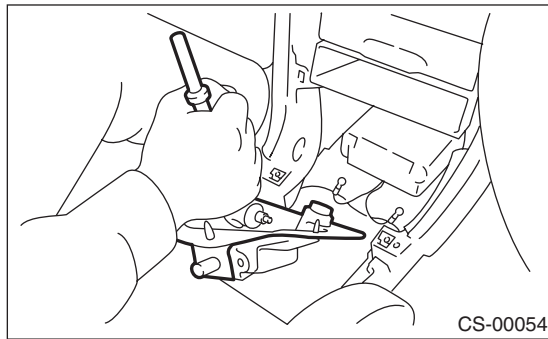
5) Insert the spring pin.



- (A) Joint
- (B) Spring pin

14) Lower the vehicle.

15) Remove the lever COMPL.



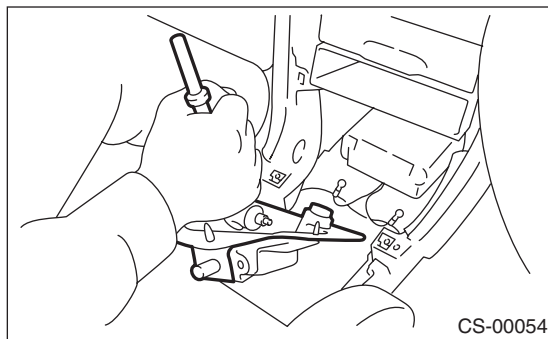
B: INSTALLATION

1) Install the joint to the transmission and secure with spring pin.

2) Insert the lever COMPL from room side.

NOTE:

After inserting the rod and stay, temporarily put them onto transmission mount.



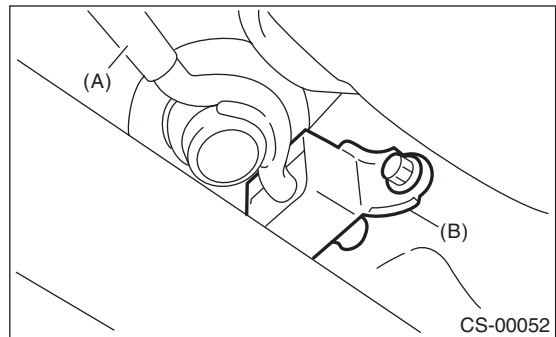
3) Lift-up the vehicle.

4) Install the joint to the shifter arm.

6) Mount the cushion rubber on the body.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

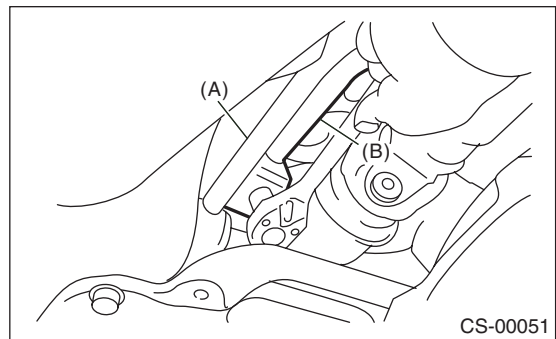


- (A) Stay
- (B) Cushion rubber

7) Connect the rod to the joint.

Tightening torque:

12 N·m (1.2 kgf-m, 8.9 ft-lb)

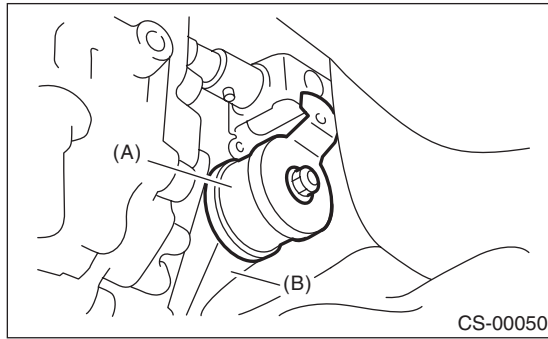


- (A) Stay
- (B) Rod

8) Connect the stay to the transmission bracket.

Tightening torque:

18 N·m (1.8 kgf·m, 13.0 ft·lb)



- (A) Stay
- (B) Transmission bracket

9) Install the rear exhaust pipe and muffler.

Non-turbo model

<Ref. to EX (H4SO)-8, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX (H4SO)-9, INSTALLATION, Muffler.>

Turbo model

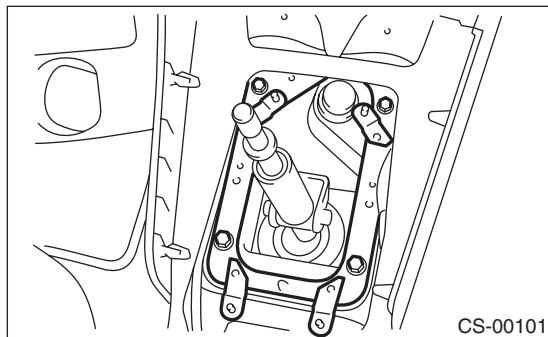
<Ref. to EX(H4DOTC)-14, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-15, INSTALLATION, Muffler.>

10) Lower the vehicle.

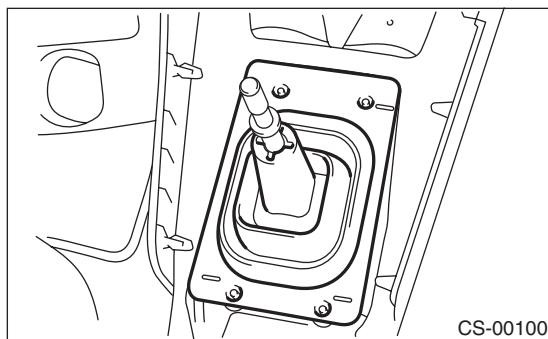
11) Install the plate COMPL to body.

Tightening torque:

7.5 N·m (0.76 kgf·m, 5.5 ft·lb)



12) Install the boot and insulator assembly to vehicle in the proper direction.

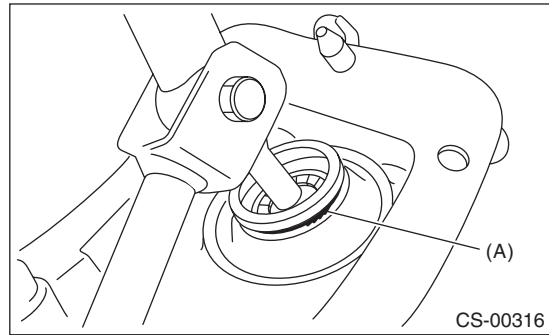


13) Install the clamp.

14) Install the console box. <Ref. to EI-38, INSTALLATION, Console Box.>

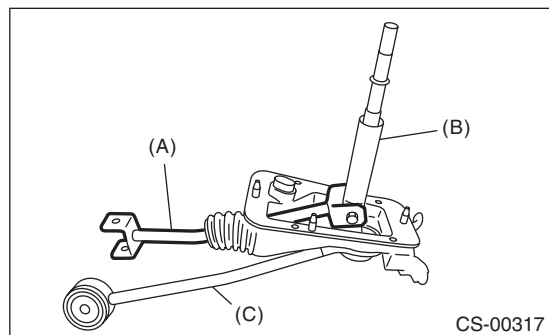
C: DISASSEMBLY

1) Remove the lock wires.



- (A) Lock wire

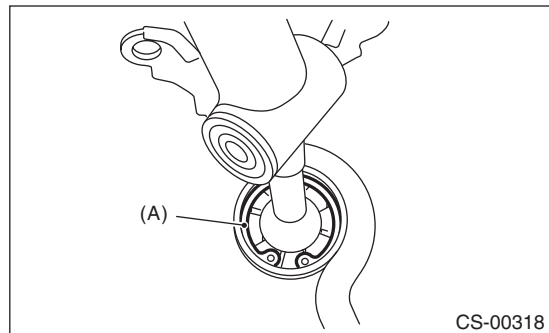
2) Remove the rod from lever.



- (A) Rod
- (B) Lever
- (C) Stay

3) Separate the rod and inner boot.

4) Remove the snap ring from the stay.

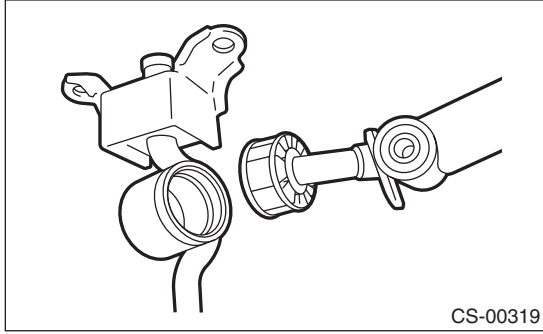


- (A) Snap ring

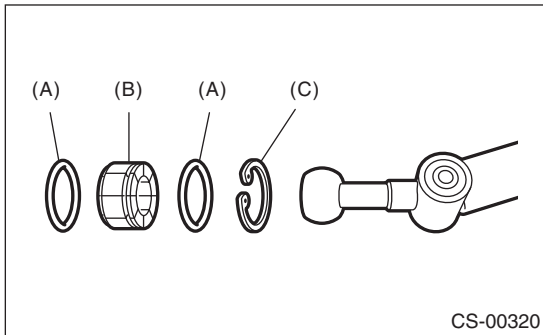
MT Gear Shift Lever

CONTROL SYSTEMS

5) Separate the gear shift lever and the stay.

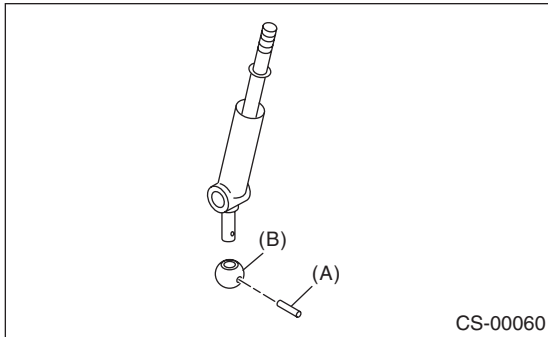


6) Remove the boot, bushing and snap ring from gear shift lever.



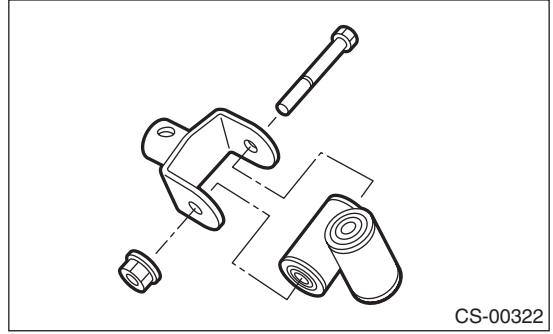
- (A) O-ring
- (B) Bushing
- (C) Snap ring

7) Remove the spring pin, and then remove the bushing and snap ring.



- (A) Spring pin
- (B) Bushing

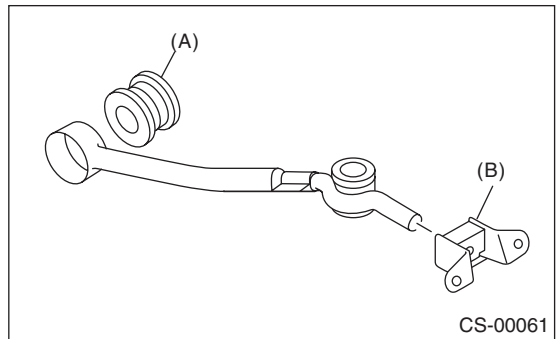
8) Remove the boss from the joint.



D: ASSEMBLY

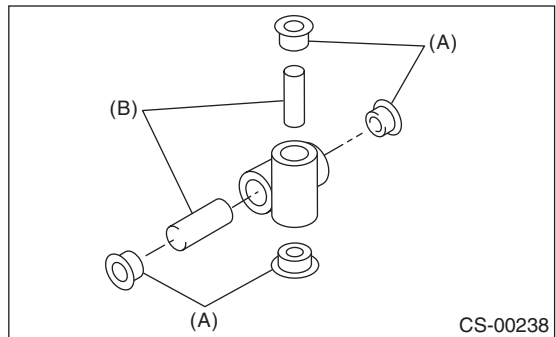
NOTE:

- Clean all the parts before assembly.
 - Apply grease [KOPR-KOTE (Part No. 003603001) or equivalent] to each part.
- 1) Mount the bushing and cushion rubber to the stay.



- (A) Bushing
- (B) Cushion rubber

2) Install the bushing and spacer to boss.

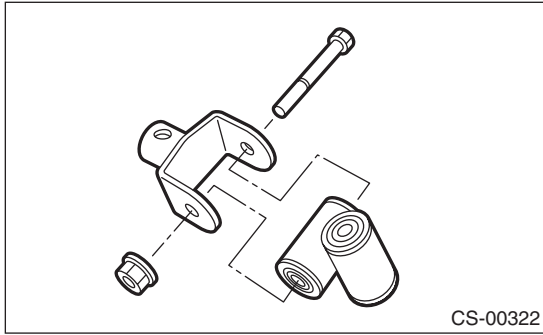


- (A) Bushing
- (B) Spacer

3) Using new self-locking nuts, install the boss to the joint.

Tightening torque:

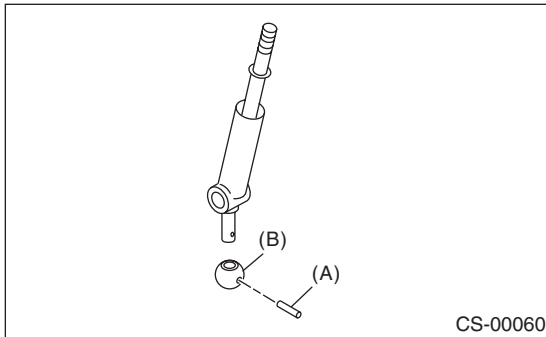
12 N·m (1.2 kgf-m, 8.9 ft-lb)



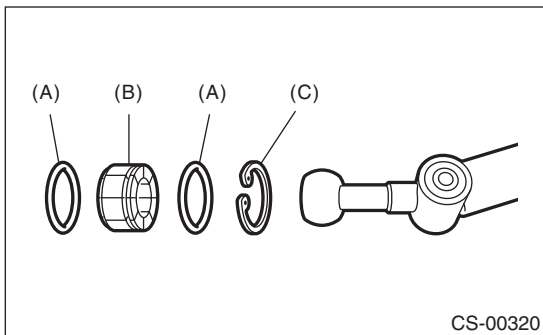
4) Install the snap ring to gear shift lever and install the bushing.

NOTE:

Apply grease to the bushing.

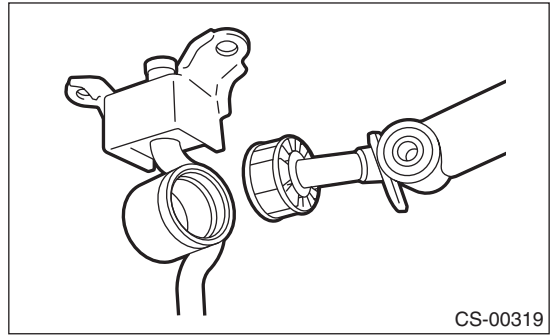


5) Apply grease to the bushing and O-ring, and then install to gear shift lever.

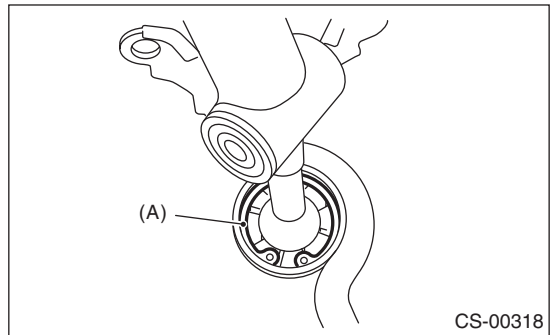


- (A) O-ring
- (B) Bushing
- (C) Snap ring

6) Apply sufficient grease into boss, and then install the gear shift lever to the stay.



7) Install the washer and snap ring.



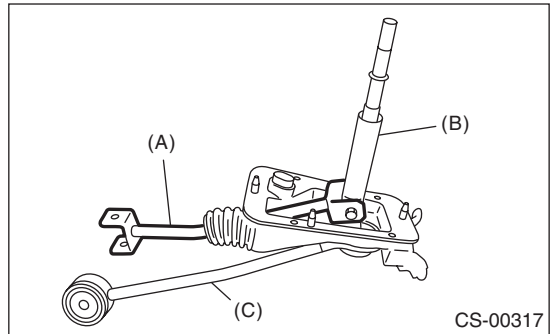
- (A) Snap ring

8) Insert the gear shift lever and rod into boot hole.

9) Install the rod.

Tightening torque:

12 N·m (1.2 kgf-m, 8.8 ft-lb)

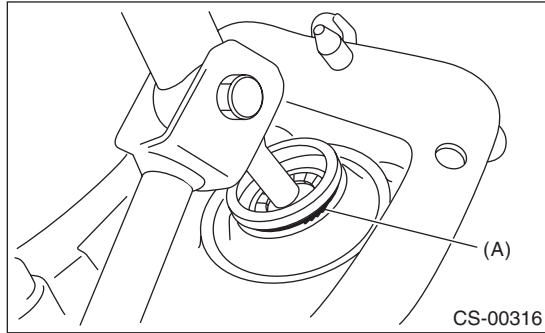


- (A) Rod
- (B) Lever
- (C) Stay

MT Gear Shift Lever

CONTROL SYSTEMS

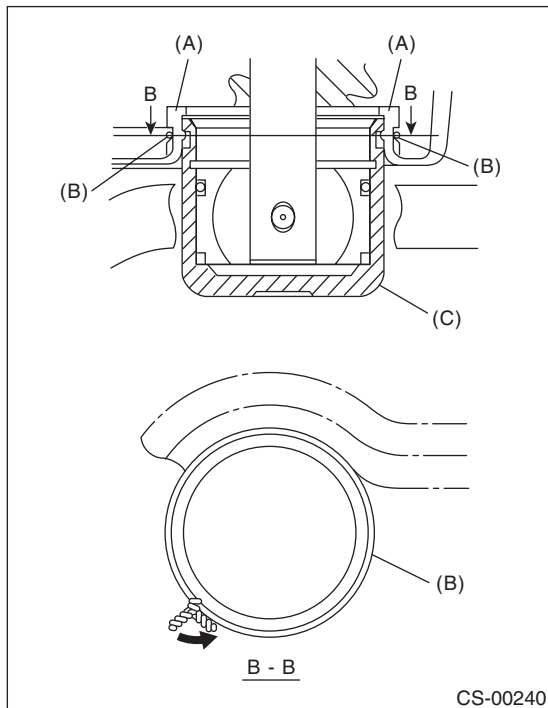
10) Install a new lock wire.



(A) Rod

NOTE:

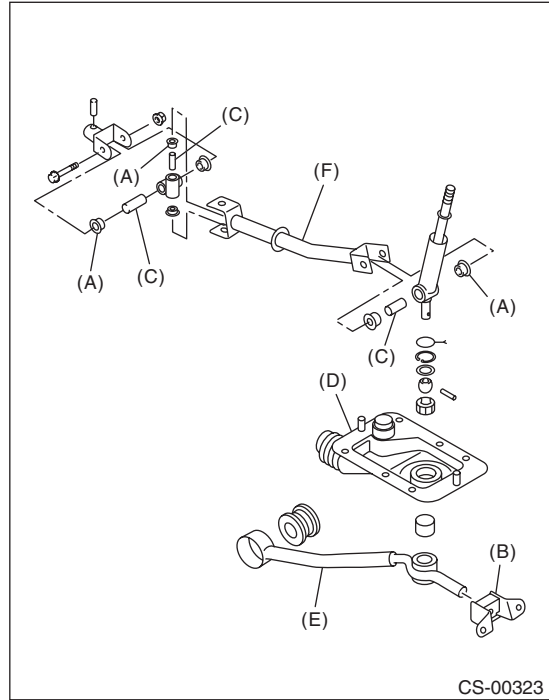
- Install the lock wire to the stay groove.
- Bend the extra wire to the same direction of lock wire winding.



(A) Inner boot
(B) Lock wire
(C) Stay

E: INSPECTION

1) Check the parts (bushing, cushion rubber, spacer, boot, stay and rod, etc.) for deformation, damage and wear. If necessary, repair or replace faulty parts. Compare the removed parts with new parts to judge if there are damages or not.

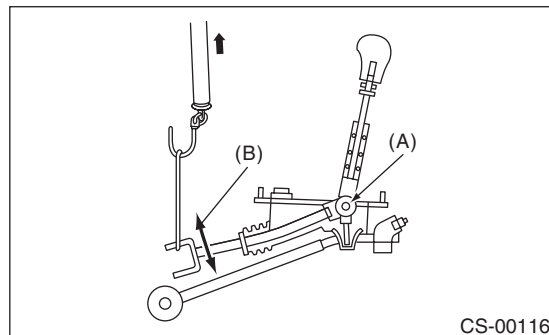


(A) Bushing
(B) Cushion rubber
(C) Spacer
(D) Boot
(E) Stay
(F) Rod

2) Check the swing torque of rod linked with the gear shift lever. If the torque exceeds the specifications, replace the bushing or retighten nuts.

Swing torque:

Less than 3.7 N (0.38 kgf, 0.84 lb)



(A) Pivot
(B) Swing torque

9. General Diagnostic Table

A: INSPECTION

Symptoms	Problem parts
Shift lock does not function.	<ul style="list-style-type: none"> • Stop light switch • Shift lock solenoid • Body integrated unit
Shift lock cannot be released.	<ul style="list-style-type: none"> • Stop light switch • Shift lock solenoid • Body integrated unit • Inhibitor switch
Key interlock does not function.	<ul style="list-style-type: none"> • Key warning switch • "P" range switch • Key lock solenoid • Body integrated unit
Key interlock cannot be released.	<ul style="list-style-type: none"> • Key warning switch • "P" range switch • Key lock solenoid • Body integrated unit
Starter does not run.	<ul style="list-style-type: none"> • Inhibitor switch • Select cable • Starter circuit
Back-up light does not illuminate.	<ul style="list-style-type: none"> • Inhibitor switch • Select cable • Back-up light circuit
Gear can be shifted from "N" to "R" during driving.	<ul style="list-style-type: none"> • Shift lock solenoid • TCM

General Diagnostic Table

CONTROL SYSTEMS

General Description

AUTOMATIC TRANSMISSION

1. General Description

A: SPECIFICATION

1. TORQUE CONVERTER CLUTCH

Model	Non-turbo	Turbo
Type	Symmetric, 3 element, single stage, 2 phase torque converter	
Stall torque ratio	2.05 — 2.35	
Nominal diameter	246 mm (9.69 in)	
Stall speed (at sea level)	2,200 — 2,700 rpm	2,700 — 3,200 rpm
One-way clutch	Sprague type one-way clutch	

2. OIL PUMP

Type	Parachoid constant-displacement pump	
Driving method	Driven by engine	
Number of teeth	Inner rotor	9
	Outer rotor	10

3. TRANSMISSION CONTROL ELEMENT

Type	4-forward, 1-reverse, double-row planetary gears
Multi-plate clutch	3 sets
Multi-plate brake	2 sets
One-way clutch (sprague type)	1 sets

4. TRANSMISSION GEAR RATIO

	Gear ratio
1st	2.785
2nd	1.545
3rd	1.000
4th	0.694
Rev.	2.272

5. PLANETARY GEAR AND PLATE

Model	Non-Turbo	Turbo
Number of front sun gear teeth	33	
Number of front pinion teeth	21	
Number of front internal gear teeth	75	
Number of rear sun gear teeth	42	
Number of rear pinion teeth	17	
Number of rear internal gear teeth	75	
Number of high clutch drive plates	4	5
Number of low clutch drive plates	5	7
Number of reverse clutch drive plates	2	
Number of drive plates for the 2-4 brake	3	4
Number of drive plates for low & reverse brake	5	7

6. SELECTOR POSITION

P (Park)	Transmission is in neutral, output member is immovable, engine start is possible
R (Reverse)	Transmission is in reverse.
N (Neutral)	Transmission is in neutral and engine start is possible
D (Drive)	Automatic gear change 1st gear ← → 2nd gear ← → 3rd gear ← → 4th gear
3 (3rd)	Automatic gear change 1st gear ← → 2nd gear ← → 3rd gear ← 4th gear
2 (2nd)	2nd gear is locked. (Deceleration is possible. 2nd gear ← 3rd gear ← 4th gear)
1 (1st)	1st gear is locked. (Deceleration is possible. 1st gear ← 2nd gear ← 3rd gear ← 4th gear)
Control method	Wire cable type

General Description

AUTOMATIC TRANSMISSION

7. HYDRAULIC CONTROL AND LUBRICATION

Type	Electronic/hydraulic control [4 forward gear changes made by electronic signals of vehicle speed and accelerator opening]	
Fluid	Recommended materials	SUBARU ATF HP
	Alternative	IDEMITSU: ATF HP Castrol: Transmax J Pennzoil Quaker State: Pennzoil ATF-J
Fluid capacity	9.3 — 9.6 ℓ (9.8 — 10.1 US qt, 8.2 — 8.4 Imp qt)	
Lubrication system	Forced feed lubrication with oil pump	
Oil	Automatic transmission fluid (see above)	

8. COOLING AND HARNESS

Cooling system	Liquid-cooler incorporated in radiator
Inhibitor switch	12 poles
Transmission harness	20 poles

11.RECOMMENDED GEAR OIL

Lubrication oil	
	<p>(1) Item</p> <p>(2) Front differential gear oil</p> <p>(3) API classification</p> <p>(4) SAE viscosity No. and applicable temperature</p>
Front differential oil capacity	1.1 — 1.3 ℓ (1.2 — 1.4 US qt, 1.0 — 1.1 Imp qt)

9. TRANSFER

Model	Non-turbo	Turbo	
Transfer type	Multi-plate transfer (MP-T)		Variable torque distribution (VTD)
Number of transfer clutch drives & driven plates	5	6	3
Control method	Electronic, hydraulic type		
Lubricant	Same automatic transmission fluid as used in the automatic transmission		
Reduction gear ratio	1.000 (53/53)		

10.FINAL REDUCTION GEAR

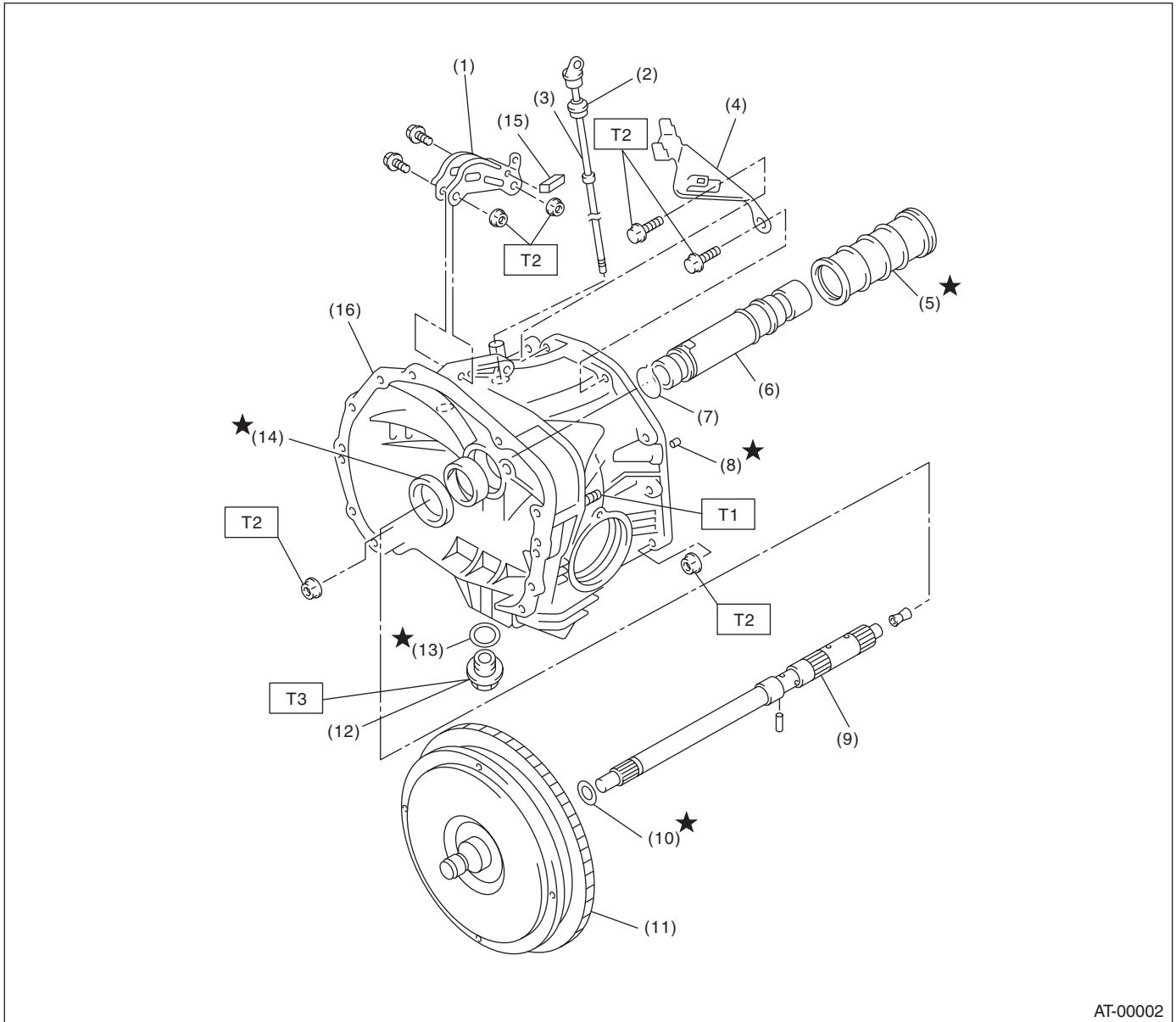
	Non-turbo	Turbo
Front final reduction gear ratio	4.444 (40/9)	4.111 (37/9)

General Description

AUTOMATIC TRANSMISSION

B: COMPONENT

1. TORQUE CONVERTER CLUTCH AND CASE



AT-00002

- | | | |
|----------------------------------|---------------------------------------|---------------------|
| (1) Pitching stopper bracket | (9) Input shaft | (16) Converter case |
| (2) O-ring | (10) O-ring | |
| (3) Differential oil level gauge | (11) Torque converter clutch ASSY | |
| (4) Stay | (12) Differential gear oil drain plug | |
| (5) Seal pipe | (13) Gasket | |
| (6) Oil pump shaft | (14) Oil seal | |
| (7) Clip | (15) Clip (Turbo model) | |
| (8) Rubber seal | | |

Tightening torque: N·m (kgf·m, ft·lb)

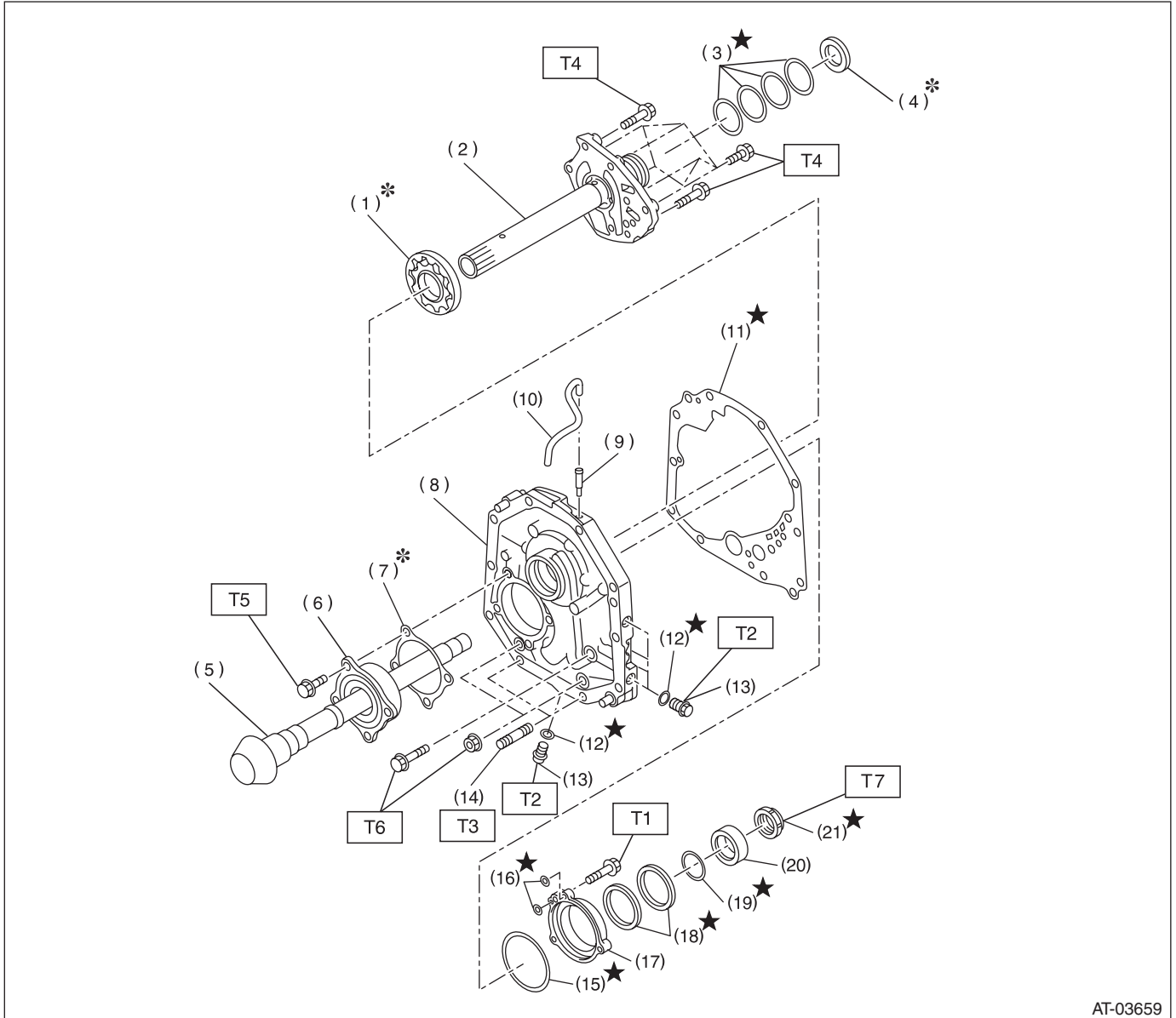
T1: 18 (1.8, 13.0)

T2: 41 (4.2, 30.4)

T3: 70 (7.2, 51.7) (Copper gasket)

44 (4.5, 32.5) (Aluminum gasket)

2. OIL PUMP



AT-03659

- | | | |
|---------------------------|--------------------------|---------------|
| (1) Oil pump rotor | (11) Gasket | (21) Lock nut |
| (2) Oil pump cover | (12) O-ring | |
| (3) Seal ring | (13) Test plug | |
| (4) Thrust needle bearing | (14) Stud bolt | |
| (5) Drive pinion shaft | (15) O-ring | |
| (6) Roller bearing | (16) O-ring | |
| (7) Drive pinion shim | (17) Oil seal retainer | |
| (8) Oil pump housing | (18) Oil seal | |
| (9) Nipple | (19) O-ring | |
| (10) Air breather hose | (20) Drive pinion collar | |

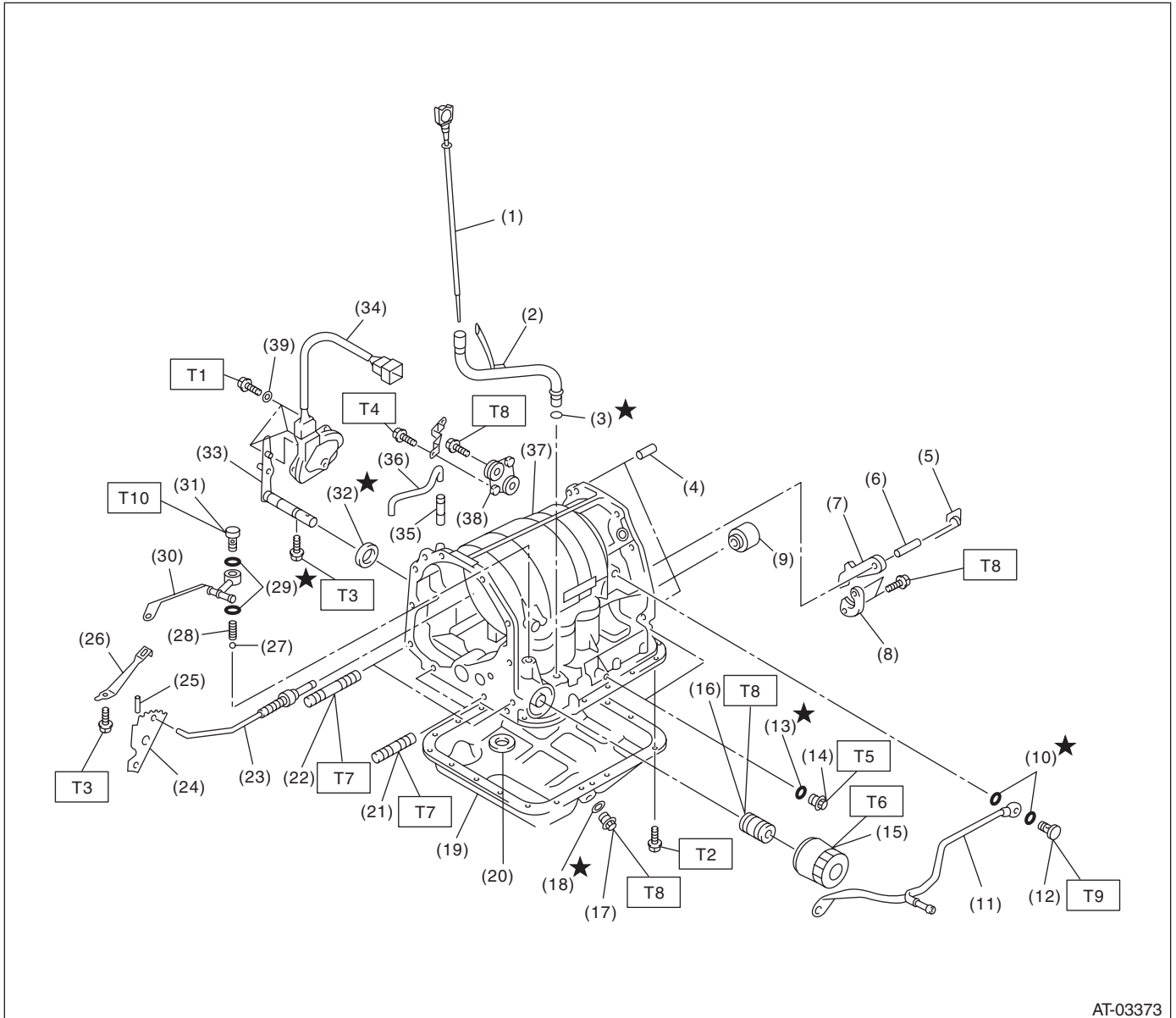
Tightening torque: N-m (kgf-m, ft-lb)

- | | |
|------------|-----------------------|
| T1: | 7 (0.7, 5.1) |
| T2: | 13 (1.3, 9.4) |
| T3: | 18 (1.8, 13.0) |
| T4: | 25 (2.5, 18.1) |
| T5: | 40 (4.1, 29.5) |
| T6: | 42 (4.3, 31) |
| T7: | 116 (11.8, 85) |

General Description

AUTOMATIC TRANSMISSION

3. TRANSMISSION CASE AND CONTROL DEVICE



AT-03373

General Description

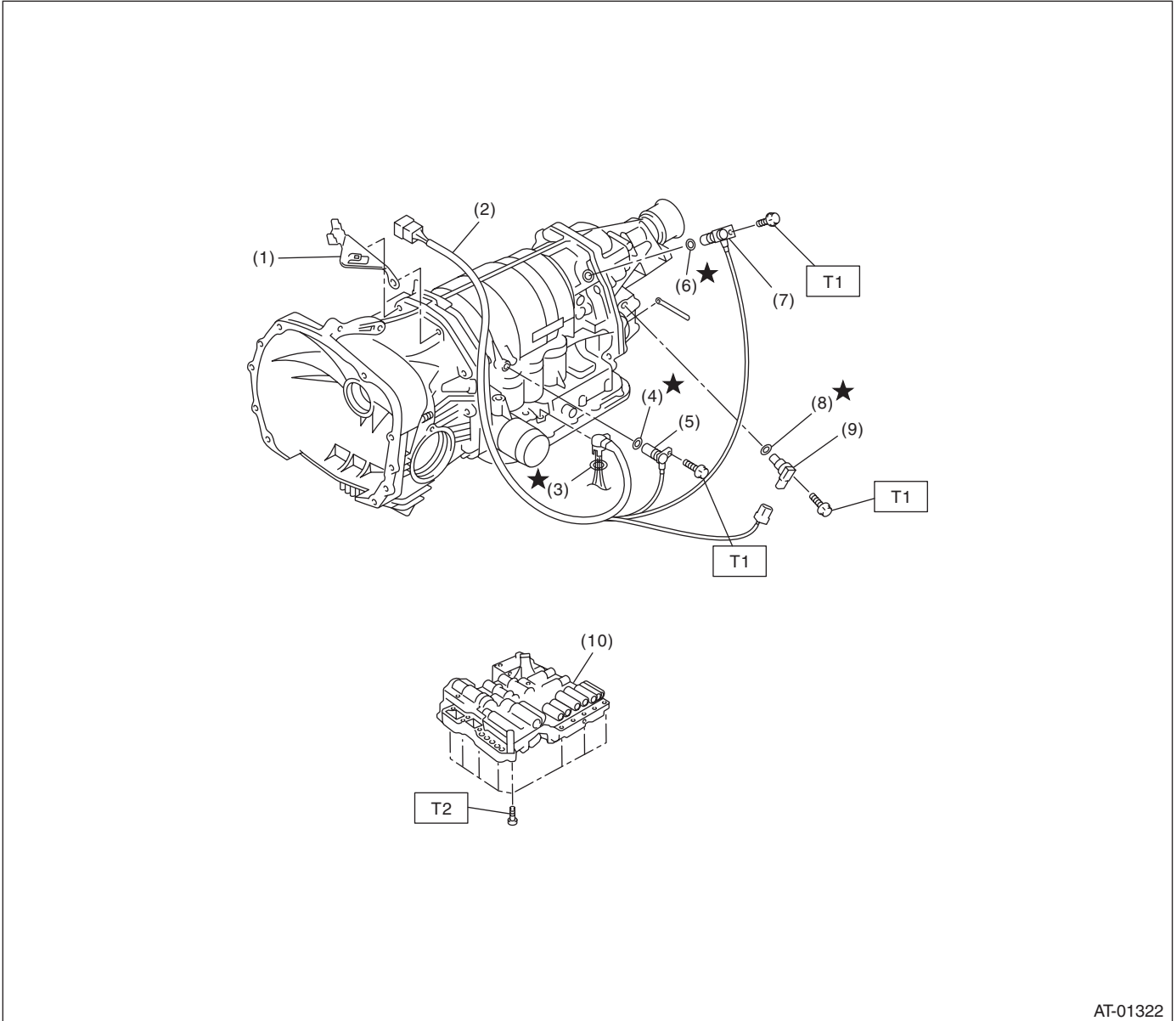
AUTOMATIC TRANSMISSION

(1) ATF level gauge	(18) Gasket	(35) Nipple
(2) Oil charge pipe	(19) Oil pan	(36) Air breather hose
(3) O-ring	(20) Magnet	(37) Transmission case
(4) Straight pin	(21) Stud bolt (short)	(38) Plate ASSY
(5) Return spring	(22) Stud bolt (long)	(39) Washer
(6) Shaft	(23) Parking rod	
(7) Parking pawl	(24) Manual plate	<i>Tightening torque: N·m (kgf·m, ft·lb)</i>
(8) Parking support	(25) Spring pin	<i>T1: 3.4 (0.35, 2.6)</i>
(9) Transfer clutch seal	(26) Detention spring	<i>T2: 5 (0.5, 3.6)</i>
(10) Gasket	(27) Ball	<i>T3: 6 (0.6, 4.4)</i>
(11) Inlet pipe	(28) Spring	<i>T4: 12 (1.2, 8.7)</i>
(12) Union screw	(29) Gasket	<i>T5: 13 (1.3, 10)</i>
(13) O-ring	(30) Outlet pipe	<i>T6: 14 (1.4, 10)</i>
(14) Test plug	(31) Union screw	<i>T7: 18 (1.8, 13)</i>
(15) Oil filter	(32) Oil seal	<i>T8: 25 (2.5, 18.1)</i>
(16) Oil filter stud bolt	(33) Range select lever	<i>T9: 40 (4.1, 29.5)</i>
(17) Drain plug (ATF)	(34) Inhibitor switch ASSY	<i>T10: 45 (4.6, 33.2)</i>

General Description

AUTOMATIC TRANSMISSION

4. CONTROL VALVE AND HARNESS ROUTING



AT-01322

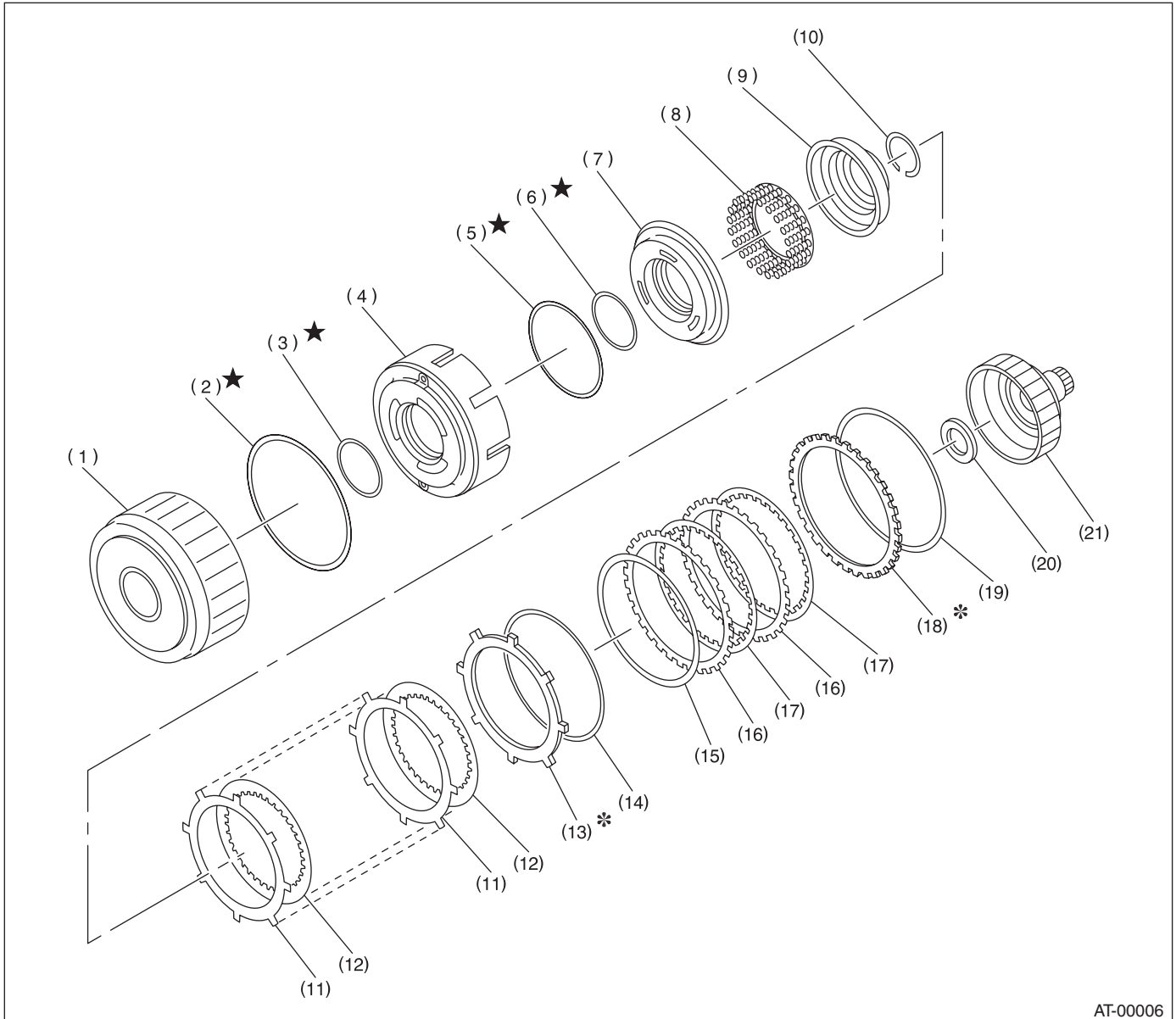
- | | |
|---|--------------------------------|
| (1) Stay | (6) O-ring |
| (2) Transmission harness ASSY | (7) Front vehicle speed sensor |
| (3) O-ring | (8) O-ring |
| (4) O-ring | (9) Rear vehicle speed sensor |
| (5) Torque converter turbine speed sensor | (10) Control valve body |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 7 (0.7, 5.1)

T2: 8 (0.8, 5.8)

5. HIGH CLUTCH AND REVERSE CLUTCH



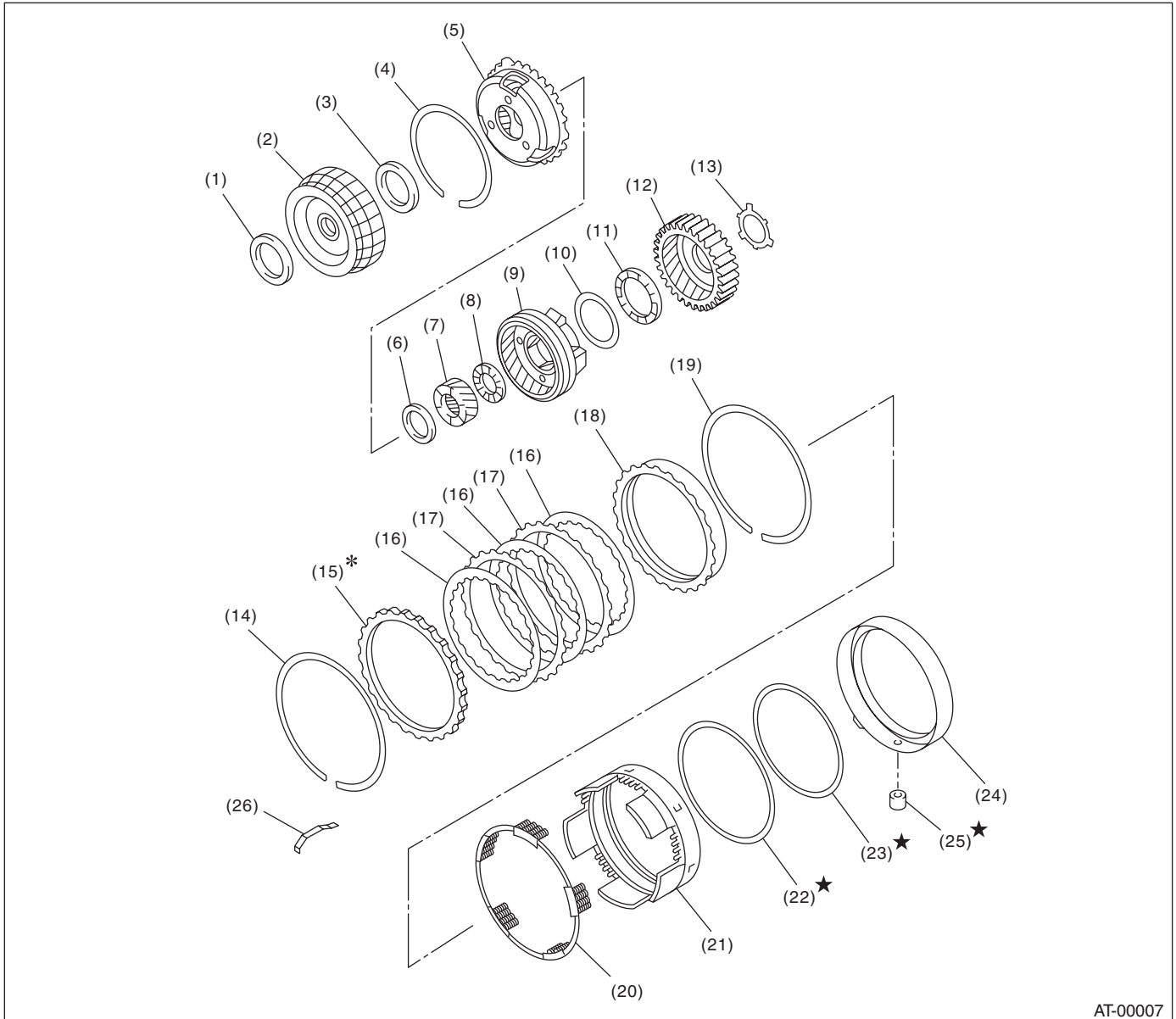
AT-00006

- | | | |
|---------------------------|----------------------|----------------------------|
| (1) High clutch drum | (8) Spring retainer | (15) Dish plate |
| (2) Lip seal | (9) Clutch cover | (16) Driven plate |
| (3) D-ring | (10) Snap ring | (17) Drive plate |
| (4) Reverse clutch piston | (11) Driven plate | (18) Retaining plate |
| (5) D-ring | (12) Drive plate | (19) Snap ring |
| (6) D-ring | (13) Retaining plate | (20) Thrust needle bearing |
| (7) High clutch piston | (14) Snap ring | (21) High clutch hub |

General Description

AUTOMATIC TRANSMISSION

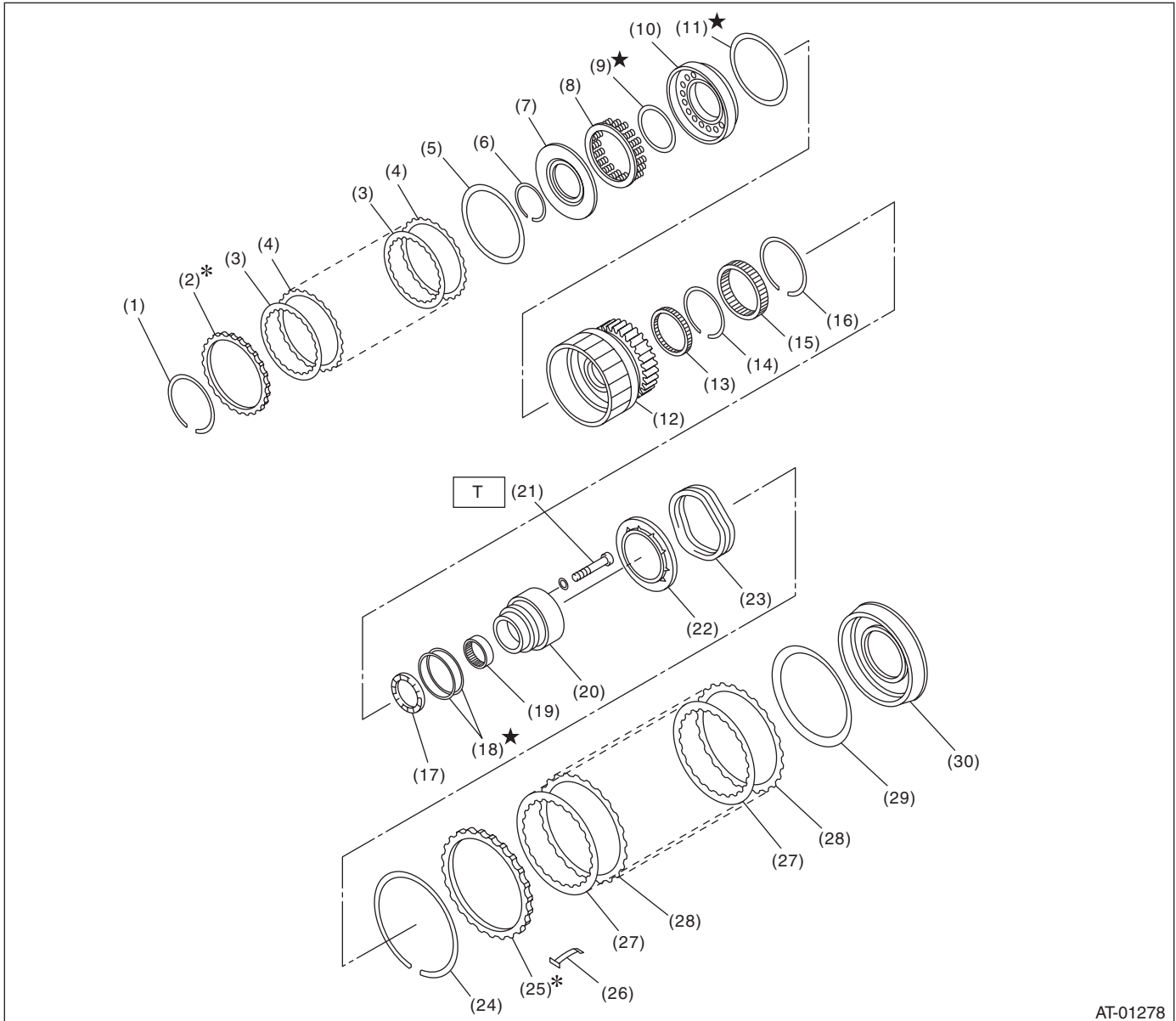
6. PLANETARY GEAR AND 2-4 BRAKE



AT-00007

- | | | |
|-----------------------------|----------------------------|--------------------------------|
| (1) Thrust needle bearing | (10) Washer | (19) Snap ring |
| (2) Front sun gear | (11) Thrust needle bearing | (20) 2-4 spring retainer |
| (3) Thrust needle bearing | (12) Rear internal gear | (21) 2-4 brake piston |
| (4) Snap ring | (13) Washer | (22) D-ring |
| (5) Front planetary carrier | (14) Snap ring | (23) D-ring |
| (6) Thrust needle bearing | (15) Retaining plate | (24) 2-4 brake piston retainer |
| (7) Rear sun gear | (16) Drive plate | (25) 2-4 brake seal |
| (8) Thrust needle bearing | (17) Driven plate | (26) Leaf spring |
| (9) Rear planetary carrier | (18) Pressure rear plate | |

7. LOW CLUTCH AND LOW & REVERSE BREAK



AT-01278

- | | | |
|------------------------|--------------------------------|---------------------------------|
| (1) Snap ring | (13) Needle bearing | (25) Retaining plate |
| (2) Retaining plate | (14) Snap ring | (26) Leaf spring |
| (3) Drive plate | (15) One-way clutch | (27) Drive plate |
| (4) Driven plate | (16) Snap ring | (28) Driven plate |
| (5) Dish plate | (17) Thrust needle bearing | (29) Dish plate |
| (6) Snap ring | (18) Seal ring | (30) Low & reverse brake piston |
| (7) Cover | (19) Needle bearing | |
| (8) Spring retainer | (20) One-way clutch inner race | |
| (9) D-ring | (21) Socket bolt | |
| (10) Low clutch piston | (22) Spring retainer | |
| (11) D-ring | (23) Return spring | |
| (12) Low clutch drum | (24) Snap ring | |

Tightening torque: N·m (kgf·m, ft·lb)

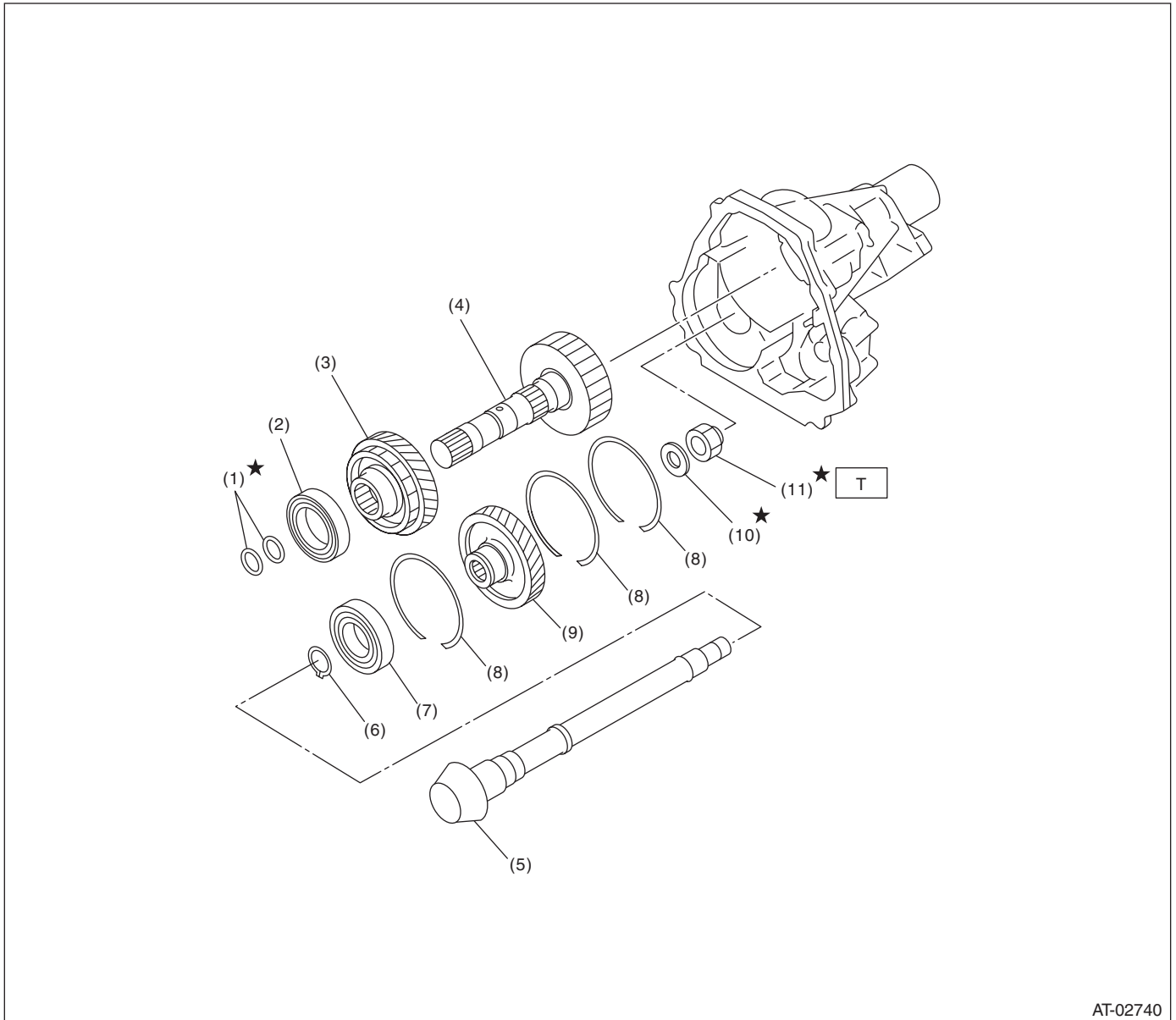
T: 25 (2.5, 18.1)

General Description

AUTOMATIC TRANSMISSION

8. REDUCTION GEAR

MP-T MODEL



AT-02740

- (1) Seal ring
- (2) Ball bearing
- (3) Reduction drive gear
- (4) Reduction drive shaft
- (5) Drive pinion shaft

- (6) Snap ring
- (7) Ball bearing
- (8) Snap ring
- (9) Reduction driven gear
- (10) Washer

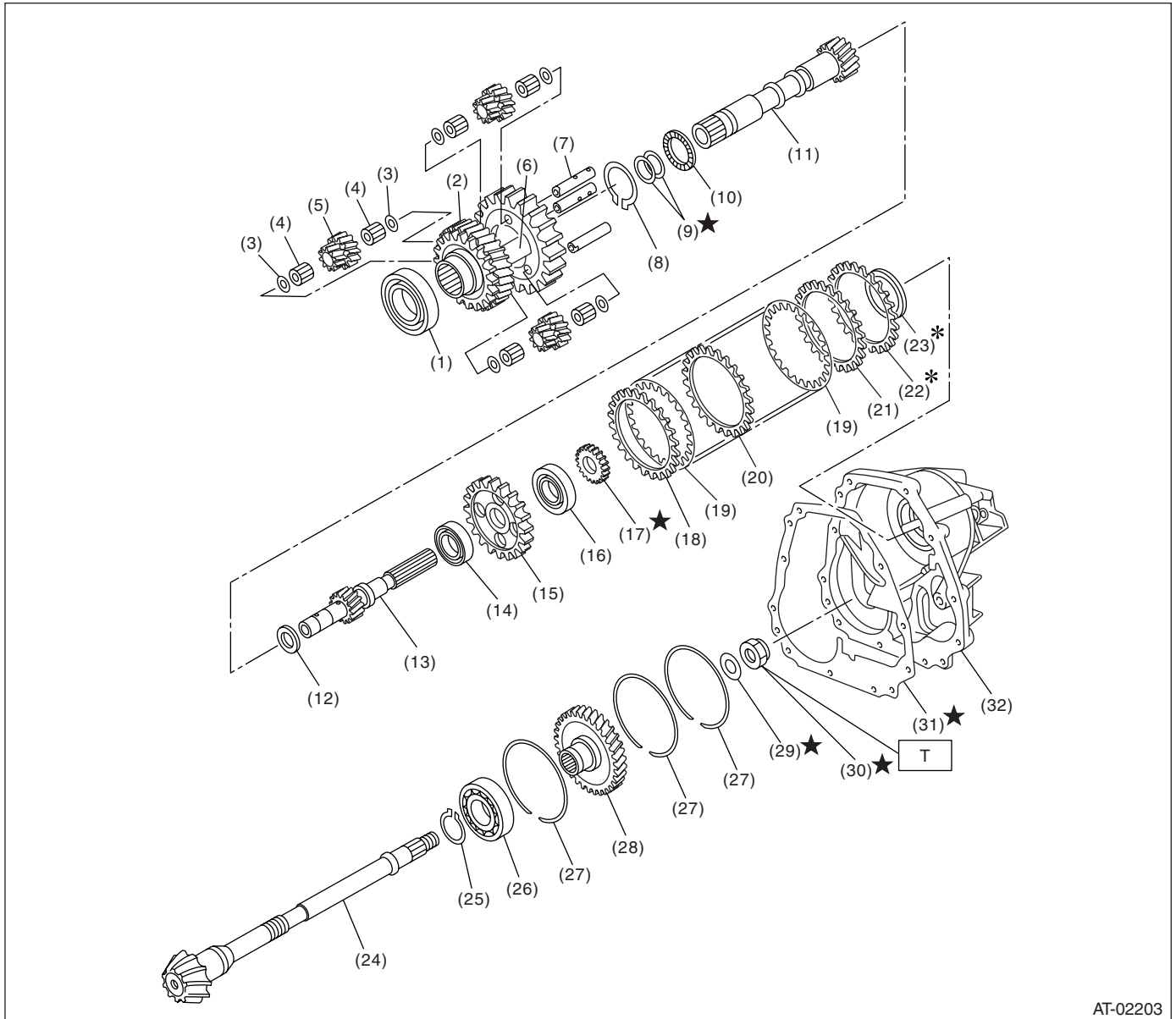
- (11) Lock nut

Tightening torque: N·m (kgf·m, ft·lb)
T: 100 (10.2, 73.8)

General Description

AUTOMATIC TRANSMISSION

VTD MODEL



AT-02203

- | | | |
|----------------------------|-----------------------------------|----------------------------|
| (1) Ball bearing | (13) Rear drive shaft | (25) Snap ring |
| (2) Reduction drive gear | (14) Ball bearing | (26) Ball bearing |
| (3) Washer | (15) Multi-plate clutch (LSD) hub | (27) Snap ring |
| (4) Needle bearing | (16) Ball bearing | (28) Reduction driven gear |
| (5) Pinion gear | (17) Revolution gear | (29) Lock washer |
| (6) Carrier | (18) Driven plate (Thick) | (30) Lock nut |
| (7) Planetary pinion shaft | (19) Drive plate | (31) Gasket |
| (8) Snap ring | (20) Driven plate (Thin) | (32) Extension case |
| (9) Seal ring | (21) Driven plate (Thick) | |
| (10) Thrust needle bearing | (22) Pressure plate | |
| (11) Intermediate shaft | (23) Rear drive shaft shim | |
| (12) Thrust washer | (24) Drive pinion shaft | |

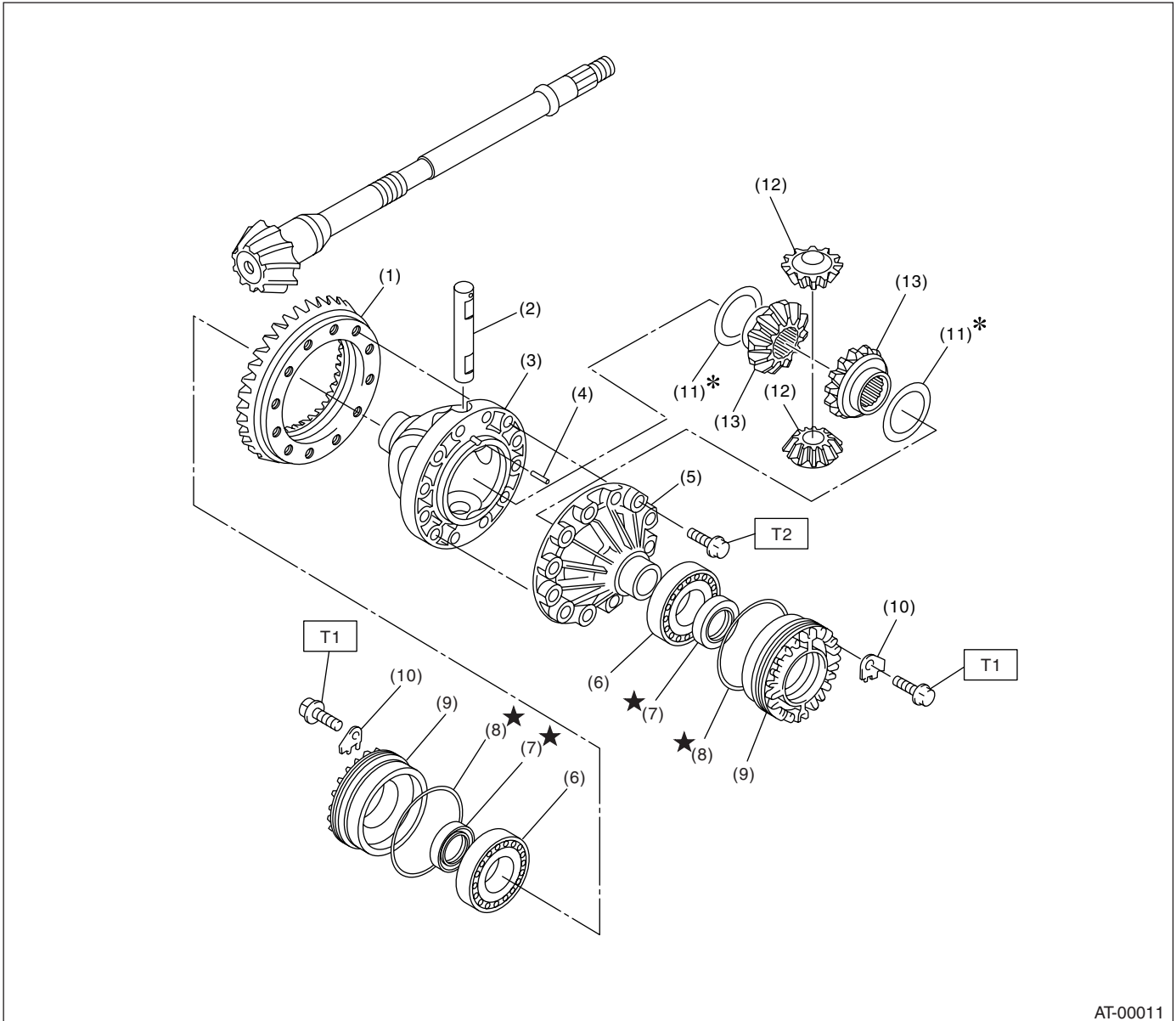
Tightening torque: N·m (kgf·m, ft·lb)

T: 100 (10.2, 73.8)

General Description

AUTOMATIC TRANSMISSION

9. DIFFERENTIAL GEAR



AT-00011

- | | | |
|----------------------------|--------------------------------|------------------------------|
| (1) Hypoid driven gear | (7) Oil seal | (13) Differential bevel gear |
| (2) Pinion shaft | (8) O-ring | |
| (3) Differential case (RH) | (9) Differential side retainer | |
| (4) Straight pin | (10) Lock plate | |
| (5) Differential case (LH) | (11) Washer | |
| (6) Taper roller bearing | (12) Differential bevel pinion | |

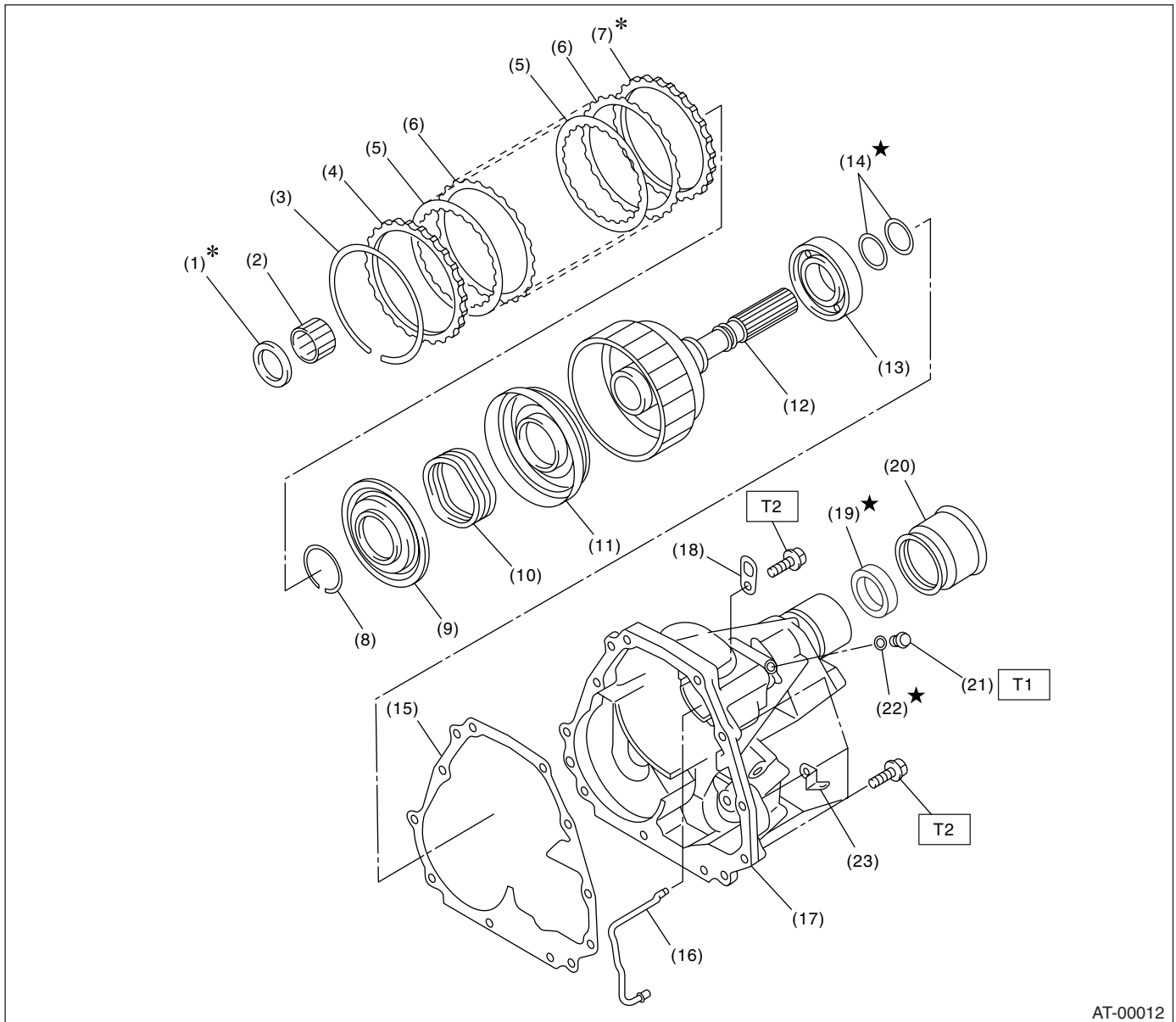
Tightening torque: N·m (kgf·m, ft·lb)

T1: 25 (2.5, 18.1)

T2: 62 (6.3, 45.6)

10. TRANSFER AND EXTENSION CASE

MP-T MODEL



AT-00012

- | | | |
|---------------------------------|-----------------------------|-------------------------|
| (1) Thrust needle bearing | (10) Return spring | (20) Dust cover |
| (2) Needle bearing | (11) Transfer clutch piston | (21) Test plug |
| (3) Snap ring | (12) Rear drive shaft | (22) O-ring |
| (4) Pressure plate | (13) Ball bearing | (23) Clip (Turbo model) |
| (5) Drive plate | (14) Seal ring | |
| (6) Driven plate | (15) Gasket | |
| (7) Pressure plate | (16) Transfer clutch pipe | |
| (8) Snap ring | (17) Extension case | |
| (9) Transfer clutch piston Seal | (18) Transmission hanger | |
| | (19) Oil seal | |

Tightening torque: N·m (kgf·m, ft·lb)

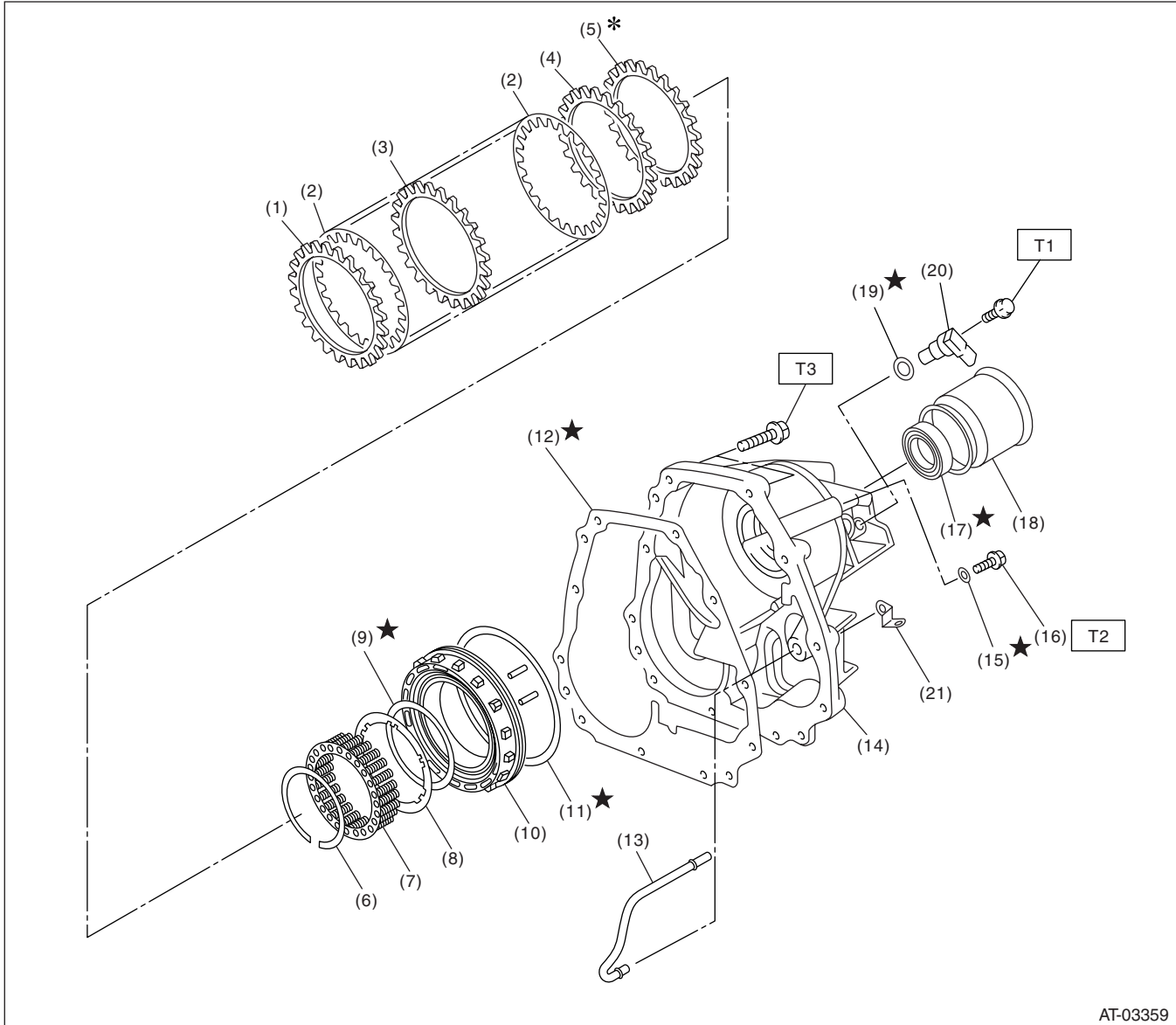
T1: 13 (1.3, 9.4)

T2: 25 (2.5, 18.1)

General Description

AUTOMATIC TRANSMISSION

VTD MODEL



AT-03359

- | | | |
|--------------------------|---|--------------------------------|
| (1) Driven plate (Thick) | (10) Multi-plate clutch (LSD) piston ASSY | (18) Dust cover |
| (2) Drive plate | (11) O-ring | (19) O-ring |
| (3) Driven plate (Thin) | (12) Gasket | (20) Rear vehicle speed sensor |
| (4) Driven plate (Thick) | (13) Multi-plate clutch (LSD) pipe | (21) Clip (Turbo model) |
| (5) Retaining plate | (14) Extension case | |
| (6) Snap ring | (15) O-ring | |
| (7) Spring retainer | (16) Test plug | |
| (8) Plate | (17) Oil seal | |
| (9) O-ring | | |

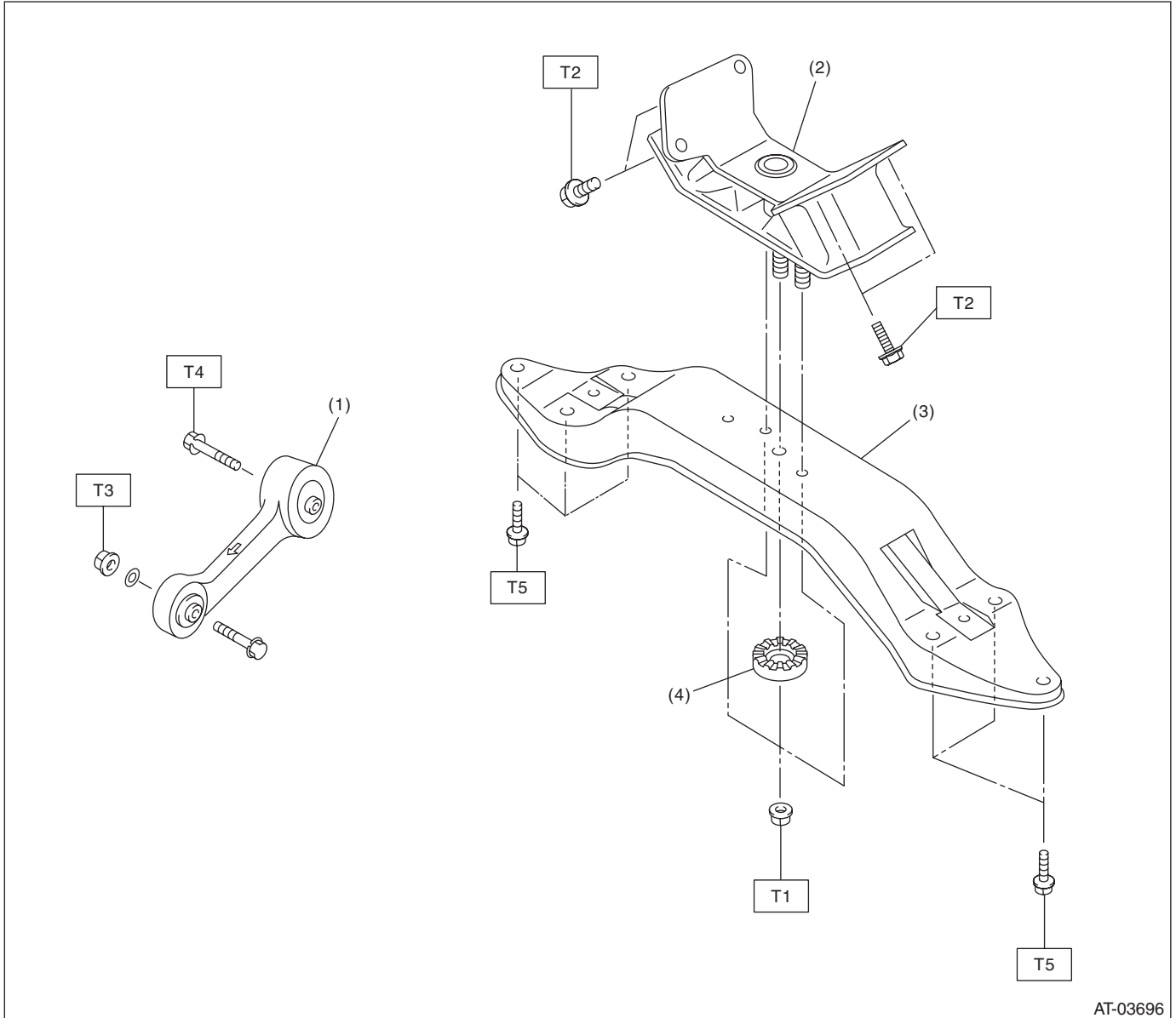
Tightening torque: N·m (kgf·m, ft·lb)

T1: 7 (0.7, 5.1)

T2: 13 (1.3, 9.4)

T3: 25 (2.5, 18.1)

11. TRANSMISSION MOUNTING



AT-03696

- (1) Pitching stopper
- (2) Rear cushion rubber
- (3) Transmission rear crossmember
- (4) Stopper

Tightening torque: N·m (kgf·m, ft·lb)

T1: 35 (3.6, 26)

T2: 39 (4.0, 29)

T3: 50 (5.1, 37)

T4: 58 (5.9, 43)

T5: 70 (7.1, 51)

General Description

AUTOMATIC TRANSMISSION

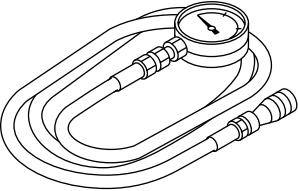
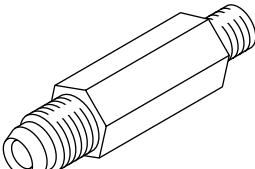
C: CAUTION

- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Do not place the oil pan with its inner side facing up until it is installed, to prevent intrusion of foreign matter into the valve body.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- When disassembling the case and other light alloy parts, use a plastic hammer to separate the case. Do not pry apart with screwdrivers or other tools.
- Be careful not to burn yourself, because each part on the vehicle is hot after running.
- Use SUBARU genuine gear oil, grease etc. or equivalent. Do not mix fluid, grease, etc. with that of another grade or from other manufacturers.

- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Apply gear oil or ATF onto sliding or revolving surfaces before installation.
- Replace deformed or damaged snap rings with new parts.
- Before installing O-rings or oil seals, apply sufficient amount of ATF fluid to avoid damage and deformation.
- Be careful not to incorrectly install or fail to install O-rings, snap rings and other such parts.
- Before securing a part on a vise, place a cushioning material such as wood blocks, aluminum plates, or shop cloth between the part and the vise.
- Avoid damaging the mating surface of the case.
- Before applying sealant, completely remove the old sealant.
- When disassembling the AT, be sure to use nylon gloves and paper towels. Do not use cloth gloves or waste cloth.

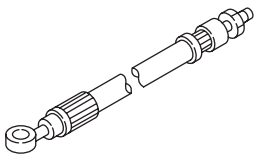
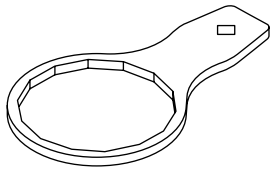
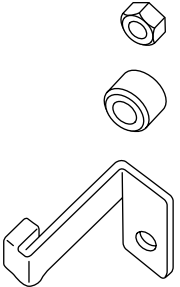
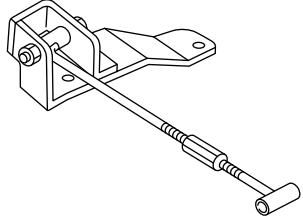
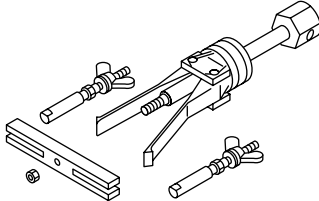
D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST-498575400</p>	498575400	OIL PRESSURE GAUGE ASSY	Used for measuring oil pressure.
 <p>ST-498897200</p>	498897200	OIL PRESSURE GAUGE ADAPTER	Used at the oil pump housing when measuring reverse clutch pressure and line pressure.

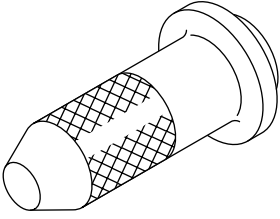
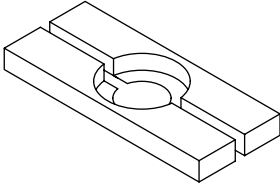
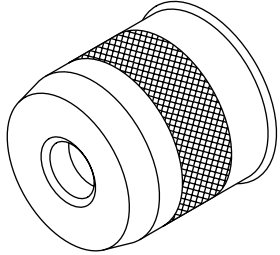
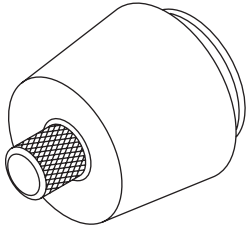
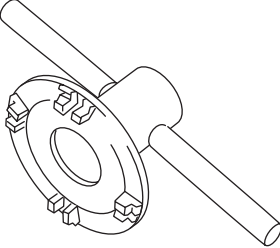
General Description

AUTOMATIC TRANSMISSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST-498897700</p>	498897700	OIL PRESSURE ADAPTER SET	Used for measuring the transfer clutch pressure.
 <p>ST-498545400</p>	498545400	OIL FILTER WRENCH	Used for removing and installing the ATF filter.
 <p>ST-498277200</p>	498277200	STOPPER SET	Used for removing and installing the automatic transmission assembly.
 <p>ST41099AC000</p>	41099AC000	ENGINE SUPPORT ASSY	Used for supporting the engine.
 <p>ST-398527700</p>	398527700	PULLER ASSY	<ul style="list-style-type: none"> • Used for removing the extension case roller bearing. • Used for removing the extension oil seal. • Used for removing the front differential side retainer bearing outer race. • Used for removing the front differential side retainer oil seal.

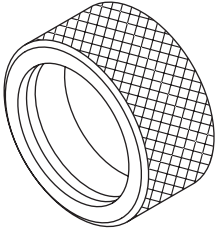
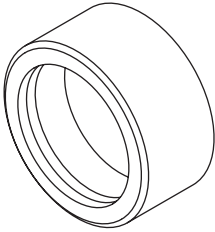
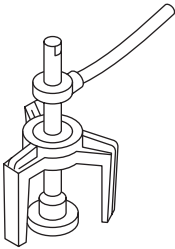
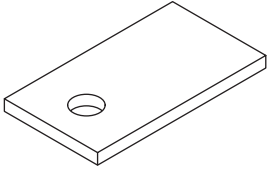
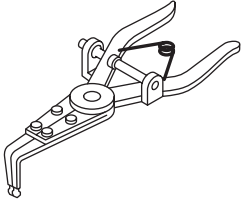
General Description

AUTOMATIC TRANSMISSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-498057300</p>	498057300	INSTALLER	Used for installing the extension oil seal.
 <p style="text-align: center;">ST-498077000</p>	498077000	REMOVER	Used for removing the differential taper roller bearing.
 <p style="text-align: center;">ST-499247400</p>	499247400	INSTALLER	<ul style="list-style-type: none"> • Used for installing the transfer outer snap ring. • Used with GUIDE (499257300).
 <p style="text-align: center;">ST-499257300</p>	499257300	SNAP RING OUTER GUIDE	<ul style="list-style-type: none"> • Used for installing the transfer outer snap ring. • Used with the INSTALLER (499247400).
 <p style="text-align: center;">ST18630AA010</p>	18630AA010	WRENCH COMPL RETAINER	<ul style="list-style-type: none"> • Used for removing and installing the differential side retainer. • WRENCH ASSEMBLY (499787000) can also be used.

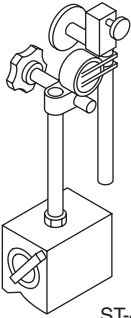
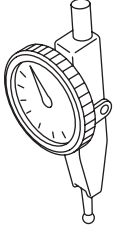
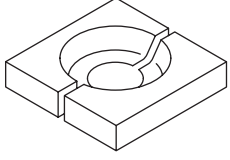
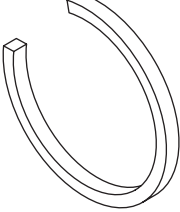
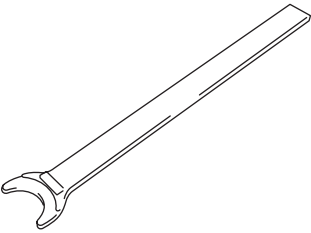
General Description

AUTOMATIC TRANSMISSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST-398437700</p>	398437700	DRIFT	Used for installing the torque converter case oil seal.
 <p>ST-398487700</p>	398487700	INSTALLER	Used for installing the front differential taper roller bearing.
 <p>ST-398673600</p>	398673600	COMPRESSOR	Used for removing and installing the clutch spring.
 <p>ST-498255400</p>	498255400	PLATE	Used for measuring the backlash of hypoid gear.
 <p>ST-399893600</p>	399893600	PLIERS	Used for removing and installing the clutch spring.

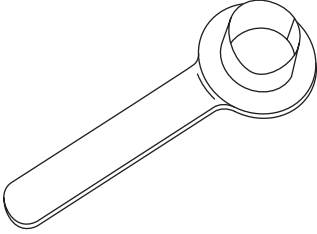
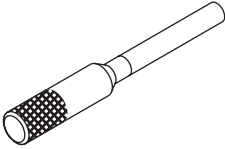
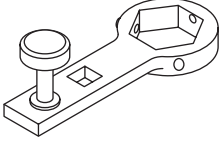
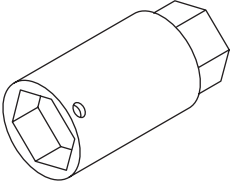
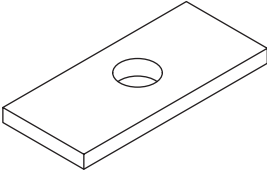
General Description

AUTOMATIC TRANSMISSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-498247001</p>	498247001	MAGNET BASE	<ul style="list-style-type: none"> • Used for measuring the gear backlash. • Used with the DIAL GAUGE (498247100).
 <p style="text-align: center;">ST-498247100</p>	498247100	DIAL GAUGE	<ul style="list-style-type: none"> • Used for measuring the gear backlash. • Used with the MAGNET BASE (498247001).
 <p style="text-align: center;">ST-498517000</p>	498517000	REPLACER	Used for removing the front roller bearing.
 <p style="text-align: center;">ST-398623600</p>	398623600	SEAT	Used for removing the spring of the transfer clutch piston.
 <p style="text-align: center;">ST28399SA000</p>	28399SA000	DRIVE SHAFT REMOVER	Used for removing the axle shaft.

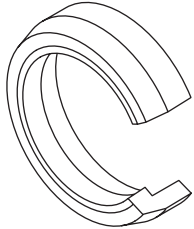
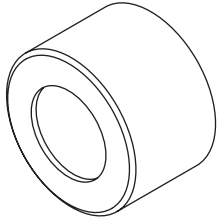
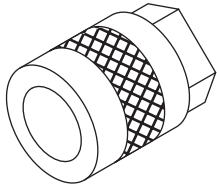
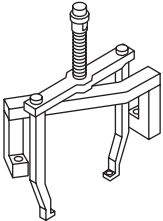
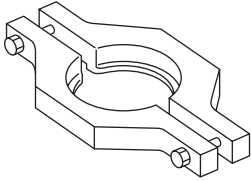
General Description

AUTOMATIC TRANSMISSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST28399SA010</p>	28399SA010	OIL SEAL PROTECTOR	Used for installing the axle shaft.
 <p>ST-499267300</p>	499267300	STOPPER PIN	Used for installing the inhibitor switch.
 <p>ST-499787700</p>	499787700	WRENCH	Used for removing and installing the drive pinion lock nut.
 <p>ST-499787500</p>	499787500	ADAPTER	Used for removing and installing the drive pinion lock nut.
 <p>ST-398643600</p>	398643600	GAUGE	Used for measuring the total end play, extension end play and drive pinion height.

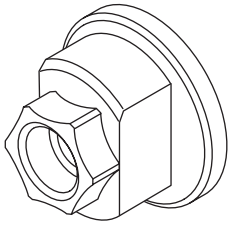
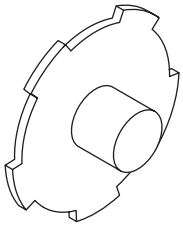
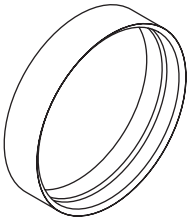
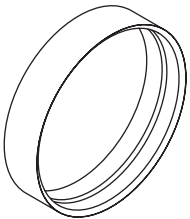
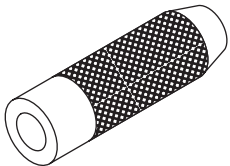
General Description

AUTOMATIC TRANSMISSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-498627100</p>	498627100	SEAT	Used for holding the low clutch piston retainer spring when installing snap ring.
 <p style="text-align: center;">ST-499577000</p>	499577000	GAUGE	Used for measuring the mating surface of the transmission to the end face of the reduction gear.
 <p style="text-align: center;">ST-499737000</p>	499737000	PULLER	Used for removing the reduction driven gear assembly.
 <p style="text-align: center;">ST-499737100</p>	499737100	PULLER SET	Used for removing the reduction drive gear assembly.
 <p style="text-align: center;">ST-498077600</p>	498077600	REMOVER	Used for removing the ball bearing.

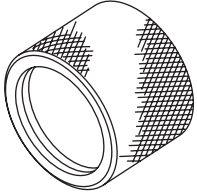
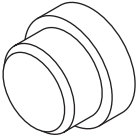
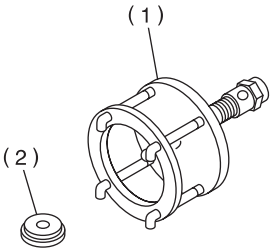
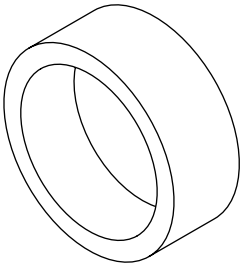
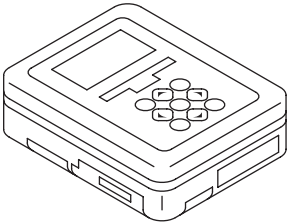
General Description

AUTOMATIC TRANSMISSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST-498937110</p>	498937110	HOLDER	Used for removing and installing the drive pinion lock nut.
 <p>ST-498677100</p>	498677100	COMPRESSOR	Used for installing the 2-4 brake snap ring.
 <p>ST-498437000</p>	498437000	HIGH CLUTCH PISTON GUIDE	Used for installing the high clutch piston.
 <p>ST-498437100</p>	498437100	LOW CLUTCH PISTON GUIDE	Used for installing the low clutch piston.
 <p>ST-899580100</p>	899580100	INSTALLER	Used for press-fitting the ball bearing of the transfer clutch.

General Description

AUTOMATIC TRANSMISSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST18675AA000</p>	18675AA000	DIFFERENTIAL SIDE OIL SEAL INSTALLER	Used for installing the differential side retainer oil seal.
 <p style="text-align: center;">ST-398497701</p>	398497701	SEAT	Used for installing the needle bearing.
 <p style="text-align: center;">ST-899524100</p>	899524100	PULLER SET	Used for bolt only. <ul style="list-style-type: none"> • Used with 499737100 PULLEY SET. • Used with 499737000 PULLER. (1) Puller (2) Cap
 <p style="text-align: center;">ST-398744300</p>	398744300	PISTON GUIDE	<ul style="list-style-type: none"> • Used for measuring the contact surface of the transmission mating surface to the multi-plate clutch end face. • For VTD model.
 <p style="text-align: center;">ST1B020XU0</p>	1B020XU0	SUBARU SELECT MONITOR KIT	Used for troubleshooting for the electrical system.

General Description

AUTOMATIC TRANSMISSION

2. GENERAL TOOL

TOOL NAME	REMARKS
Depth gauge	Used for measuring the transmission end play.
Thickness gauge	Used for measuring clearance of the clutch, brake and oil pump.
Micrometer	Used for measuring thickness of the drive pinion.
Spring balance	Used for measuring the starting torque of the drive pinion.
Circuit tester	Used for measuring resistance and voltage.
TORX® T70	Used for installing and removing the differential gear oil drain plug.
Push/pull gauge	Used for measuring each piston stroke.

Automatic Transmission Fluid

AUTOMATIC TRANSMISSION

2. Automatic Transmission Fluid

A: INSPECTION

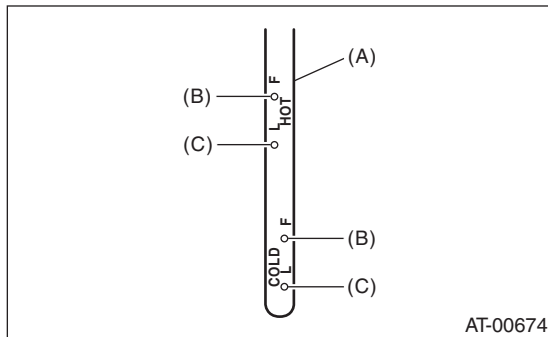
NOTE:

The level of ATF varies with fluid temperature. Pay attention to the ATF temperature when checking ATF level.

1) Raise the ATF temperature by driving a distance of 5 to 10 km (3 to 6 miles). Idle the engine to raise ATF temperature to 70 — 80°C (158 — 176°F) on the Subaru Select Monitor. <Ref. to 4AT(D)(diag)-14, READ CURRENT DATA, OPERATION, Subaru Select Monitor.>

2) Make sure the vehicle is level.

3) After slowly selecting all positions (P, R, N, D, 3, 2, 1), set the select lever in the “P” range. Idle the engine for 1-2 minutes, and measure the ATF level.



- (A) ATF level gauge
- (B) Upper level
- (C) Lower level

4) Make sure that ATF level is between the upper level and lower level on the HOT side.

If the ATF level is below the lower level, check for leaks in the transmission. If there are leaks, it is necessary to replace the gasket, oil seals, plugs, or repair other parts.

5) If the ATF level is below the mid level between upper and lower marks, add the recommended ATF until the fluid level is above mid level.

CAUTION:

- **Be careful not to exceed the upper level.**
- **Adding ATF up to the upper level when the transmission is cold will overfill the ATF. Do not fill beyond the upper level as overfilling can cause problems.**

6) Check the ATF level after raising ATF temperature to 70 — 80°C (158 — 176°F) by running the vehicle or by idling the engine again.

B: REPLACEMENT

- 1) Lift-up the vehicle.
- 2) Drain the ATF completely.

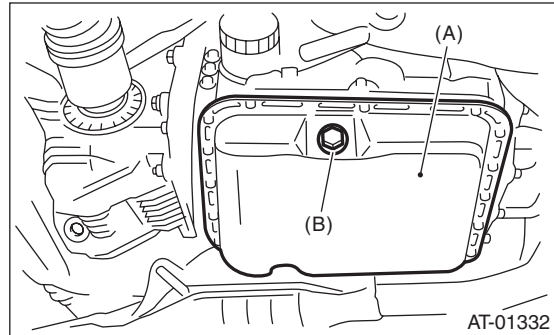
CAUTION:

After running the engine or after idling for a long time, the ATF is hot. Be careful not to burn yourself.

- 3) Replace the gasket with new one, and then tighten the drain plug (ATF).

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)



- (A) Oil pan
- (B) Drain plug (ATF)

- 4) Lower the vehicle.
- 5) Pour ATF from the oil charge pipe.

Recommended fluid:

SUBARU ATF HP

Substitute fluid:

IDEMITSU: ATF HP

Castrol: Transmax J

Pennzoil Quaker State: Pennzoil ATF-J

Capacity:

Fill with the same amount of ATF that was drained from drain plug hole.

Capacity when transmission is overhauled:

9.3 — 9.6 ℓ (9.8 — 10.1 US qt, 8.2 — 8.4 Imp qt)

- 6) Bleed the air of control valve.
<Ref. to 4AT-59, Air Bleeding of Control Valve.>
- 7) Check the level and leaks of ATF.
<Ref. to 4AT-28, INSPECTION, Automatic Transmission Fluid.>

C: CONDITION CHECK

NOTE:

When replacing ATF, check the inside condition of the transmission body by inspecting the drained ATF.

Fluid condition	Trouble and possible cause	Corrective action
Large amount of metallic pieces are found.	Excessive wear of the internal of the transmission body.	Replace ATF and check if AT operates correctly.
Thick and varnish-form fluid.	Burned clutch and etc.	Replace ATF and check AT itself and vehicle for faulty.
Clouded fluid or bubbles are found in fluid.	Water mixed in fluid.	Replace ATF and check the water entering point.

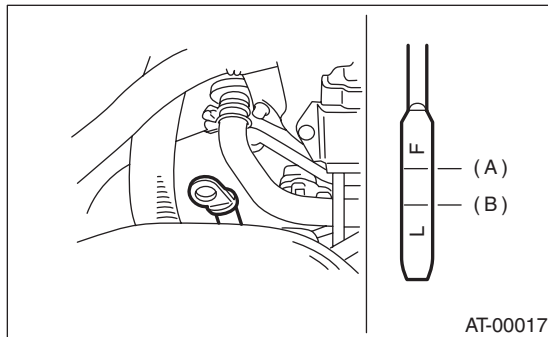
Differential Gear Oil

AUTOMATIC TRANSMISSION

3. Differential Gear Oil

A: INSPECTION

- 1) Park the vehicle on a level surface.
- 2) Remove the oil level gauge and wipe it clean.
- 3) Reinsert the level gauge all the way. Make sure the level gauge is inserted correctly and in the proper orientation.
- 4) Pull out the level gauge, and check the oil level. If the differential gear oil level is below "L" line, add oil to bring the level up to "F" line.
- 5) To prevent overfilling the differential gear oil, do not fill oil above the "F" line.



- (A) Upper level
(B) Lower level

B: REPLACEMENT

- 1) Lift-up the vehicle.
- 2) Remove the differential gear oil drain plug using TORX[®] BIT T70, and drain the differential gear oil completely.

CAUTION:

- Immediately after the vehicle has been running, the differential gear oil is very hot. Be careful not to burn yourself.
- Be careful not to spill differential gear oil on the exhaust pipe to prevent it from emitting smoke or causing a fire. If differential gear oil is spilled on the exhaust pipe, wipe it off completely.

- 3) Replace the gasket with a new one and tighten the differential oil drain plug using the TORX[®] BIT T70.

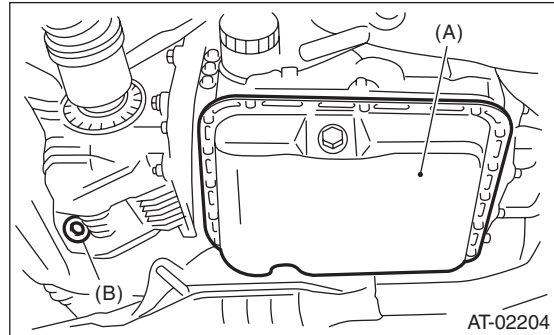
Tightening torque:

Copper gasket

70 N·m (7.2 kgf-m, 51.7 ft-lb)

Aluminum gasket

44 N·m (4.5 kgf-m, 32.5 ft-lb)



- (A) Oil pan
(B) Differential gear oil drain plug

- 4) Lower the vehicle.
- 5) Pour differential gear oil from the gauge hole into the differential.

Recommended gear oil:

<Ref. to 4AT-3, SPECIFICATION, General Description.>

Gear oil capacity:

1.1 — 1.3 ℓ (1.2 — 1.4 US qt, 1.0 — 1.1 Imp qt)

- 6) Check the level of differential gear oil.
<Ref. to 4AT-30, INSPECTION, Differential Gear Oil.>

4. Road Test

A: INSPECTION

1. GENERAL PRECAUTION

Road tests should be conducted to properly diagnose the condition of automatic transmission.

NOTE:

When performing the test, do not exceed the posted speed limit.

2. D RANGE SHIFT FUNCTION

Check shifting between 1st ↔ 2nd ↔ 3rd ↔ 4th while driving on normal city streets.

3. D RANGE SHIFT SHOCK

Check the shock level when shifting up during normal driving.

4. KICK-DOWN FUNCTION

Check kick-down for each gear. Check the shock level during kick-down at the same time.

5. ENGINE BRAKE OPERATION

- Drive in 4th gear of D range [50 — 60 km/h (31 — 37 MPH)], and shift down to D ↔ 3rd range to check the engine brake in 3rd gear.
- Drive in 3rd gear of 3 range [40 — 50 km/h (25 — 31 MPH)], and shift down from 3rd ↔ to 2nd range to check the engine brake in 2nd gear.
- Drive in 2nd gear of 2nd range [20 — 30 km/h (12 — 19 MPH)], and shift down from 2nd ↔ to 1st range to check the 1st gear engine brake.

6. LOCK-UP FUNCTION

- Check that rpm does not change sharply when the axle pedal is lightly depressed while driving in “D” range on flat roads at 60 km/h (37 MPH).
- Check slip lock-up with following procedure. Subaru Select Monitor is required for judgment.

Before starting the check, make sure that no DTC is displayed using the Subaru Select Monitor. If there is a DTC, perform the corrective action according to the DTC. Recheck to see that the DTC has been cleared, then start the slip lock-up check.

1) The check is to be performed on a flat and straight road or on a free roller.

NOTE:

- Slip lock-up will not operate when the vehicle is lifted up off of its wheels, since there is no surface resistance.
 - Even when checking on the free roller, the driving resistance will be slightly inadequate. It will be easier to check if the foot brake is stepped on lightly while performing the judgement.
- 2) Connect the Subaru Select Monitor.

3) Check the ATF temperature using the Subaru Select Monitor.

NOTE:

- Make sure that the ATF temperature is between 50 — 100°C (122 — 212°F).
 - If the temperature is low, warm-up the ATF by running the vehicle.
- 4) Start the engine, so that the lock-up duty can be read on the data display of the Subaru Select Monitor.
- 5) Drive the vehicle at a constant speed of 35 — 40 km/h (22 — 25 MPH).
- 6) Read the lock-up duty while vehicle is running.

Specification:

25 — 45%

NOTE:

The reading may be slightly lower on a free roller.

- Slip lock-up control is not operating when the lock-up duty is less than 5%, or when the lock-up duty goes down immediately after starting to rise. In these cases, improper ATF or deterioration of the ATF may be the cause. Check the amount of ATF or replace the fluid, then recheck.

7. P RANGE OPERATION

Stop the vehicle on an uphill grade of 5% or more and shift to the “P” range. Check that the vehicle does not move when the parking brake is released.

8. NOISE AND VIBRATION

Check for noise and vibration while driving and during shifting.

9. CLIMBING CONTROL FUNCTION

- Check that the gear remains in 3rd when going uphill.
- Check that the gear remains in 3rd when applying the brakes while going downhill.

10. TRANSFER CLUTCH

Check for tight corner braking phenomenon when the vehicle is moved forward with the steering fully turned.

11. OIL LEAKS

After the driving test, inspect for oil leaks.

Stall Test

AUTOMATIC TRANSMISSION

5. Stall Test

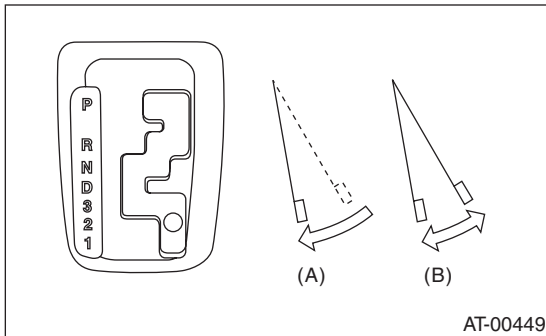
A: INSPECTION

NOTE:

The stall test is extremely important in diagnosing the condition of an automatic transmission and engine. It should be conducted to measure the engine stall speeds in the “R” and “2” ranges.

Purposes of the stall test:

- Operational check of the automatic transmission clutch
 - Operational check of the torque converter clutch
 - Engine performance check
- 1) Check that the throttle valve fully opens.
 - 2) Check that the engine oil level is correct.
 - 3) Check that the coolant level is correct.
 - 4) Check that the ATF level is correct.
 - 5) Check that the differential gear oil level is correct.
 - 6) Increase the ATF temperature to 70 to 80°C (158 to 176°F) by idling the engine for approximately 30 minutes (with select lever set to “N” or “P”).
 - 7) Place wheel chocks at the front and rear of all wheels and engage the parking brake.
 - 8) Move the manual linkage to ensure it operates properly, and shift the select lever to the “2” range.
 - 9) While forcibly depressing the foot brake pedal, gradually depress the accelerator pedal until the engine operates at full throttle.



(A) Brake pedal
(B) Accelerator pedal

10) When the engine speed stabilizes, quickly record the engine speed and release accelerator pedal.

11) Shift the select lever to “N” range, and cool down the engine by idling it for more than one minute.

12) If the stall speed in “2” range is higher than specifications, low clutch and 2-4 brake maybe slipping. To identify this, conduct the same test as above in “R” range.

13) Perform the stall tests with the select lever in “D” range.

NOTE:

- Do not continue the stall test for more than 5 seconds at a time (from closed throttle, fully open throttle to stall speed reading). Failure to follow this instruction will cause the engine oil and ATF to deteriorate and the clutch and brake to be adversely affected.
- Be sure to cool down the engine for at least one minute after each stall test with the select lever set in the “P” or “N” range and with the idle speed lower than 1,200 rpm.
- If the stall speed is higher than the specified range, attempt to finish the stall test in as short a time as possible, in order to prevent the automatic transmission from sustaining damage.

Stall speed (at sea level):

Non-turbo model

2,200 — 2,700 rpm

Turbo model

2,700 — 3,200 rpm

Stall speed (at sea level)	Range	Cause
Below specified value	2, R	<ul style="list-style-type: none"> • Throttle valve is not fully open • Engine malfunction • One-way clutch of the torque converter is slipping
Over specified value	D	<ul style="list-style-type: none"> • Line pressure too low • Low clutch slipping • One-way clutch malfunctioning
	R	<ul style="list-style-type: none"> • Line pressure too low • Reverse clutch slipping • Low & reverse brake slipping
	2	<ul style="list-style-type: none"> • Line pressure too low • Low clutch slipping • 2-4 brake slipping

6. Time Lag Test

A: INSPECTION

NOTE:

When the select lever is shifted while the engine is idling, there will be a certain time elapse or lag before shock is felt. This is used for checking the condition of the low clutch, reverse clutch, low & reverse brake and one-way clutch.

- Perform the test at normal operation fluid temperature of 70 — 80°C (158 — 176°F).
- Be sure to allow a one minute interval between tests.
- Make three measurements and take the average value.

1) Fully apply the parking brake.

2) Start the engine.

Check the idle speed (A/C OFF).

3) Shift the select lever from “N” to “D” range.

Using a stop watch, measure the time which takes from shifting the lever until the shock is felt.

Time lag: Less than 1.2 seconds

If “N” → “D” time lag is longer than specified:

- Line pressure too low
- Low clutch worn
- One-way clutch not operating properly
- D-ring worn

4) In the same manner, measure the time lag of “N” → “R”.

Time lag: Less than 1.5 seconds

If “N” → “R” time lag is longer than specified:

- Line pressure too low
- Reverse clutch worn
- Low & reverse brake worn
- D-ring worn

Line Pressure Test

AUTOMATIC TRANSMISSION

7. Line Pressure Test

A: MEASUREMENT

NOTE:

If the clutch or brake shows a signs of slipping or shift feel is not correct, check the line pressure.

- Excessive shock during up-shift or if shifting takes place at a higher point than for normal conditions, this may be due to the line pressure being too high.

- Slippage or inability to operate the vehicle may, in most cases, be due to insufficient oil pressure for the operation of clutch, brake or control valve.

1) Line pressure measurement (under no load):

(1) Before measuring line pressure, jack-up all the wheels.

(2) Maintain the ATF temperature at approx. 70 — 80°C (158 — 176°F) during measurement.

(ATF will reach the temperature above after idling the engine for approx. 30 minutes with the select lever in “N” or “P”.)

2) Line pressure measurement (under heavy load):

(1) Before measuring line pressure, apply both the foot and parking brakes with all wheels chocked (Same as for “stall” test conditions).

(2) Measure the line pressure when the select lever is in “R” and “2” with engine under stall conditions.

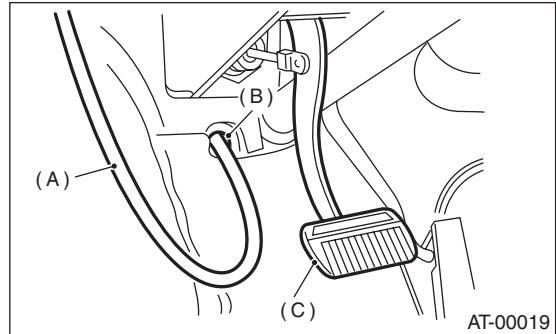
(3) Measure the line pressure within 5 seconds after shifting the select lever to each position. (If the line pressure needs to be measured again, allow the engine to idle and cool it down for more than 1 minute.)

(4) Maintain the ATF temperature at approx. 70 — 80°C (158 — 176°F) during measurement.

(ATF will reach the above temperature after idling the engine for approx. 30 minutes with the select lever in “N” or “P”.)

3) Temporarily attach the ST to a suitable place in the driver’s compartment, remove the blind plug located in front of the toe board and pass the hose of the ST to the engine compartment.

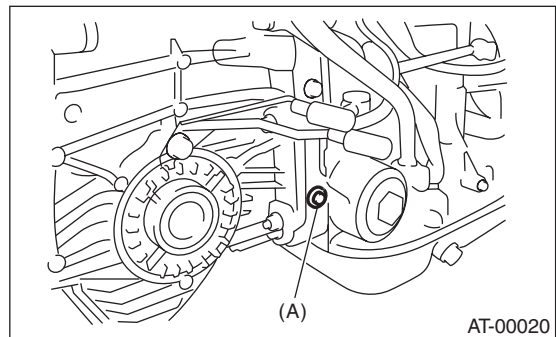
ST 498575400 OIL PRESSURE GAUGE ASSY



- (A) Pressure gauge hose
- (B) Hole in toe board (blank cap hole)
- (C) Brake pedal

4) Remove the test plug and install the ST instead.

ST 498897200 OIL PRESSURE GAUGE ADAPTER



- (A) Test plug

5) Connect the ST1 with ST2.

ST1 498897200 OIL PRESSURE GAUGE ADAPTER

ST2 498575400 OIL PRESSURE GAUGE ASSY

Line Pressure Test

AUTOMATIC TRANSMISSION

6) Open/close the throttle valve, and check for changes in duty ratio using the Subaru Select Monitor.

Standard line pressure			
Range position	Line pressure duty ratio (%)	Throttle position (%)	Line pressure kPa (kg/cm ² , psi)
2	25 — 35	100 (Full open)	1,000 — 1,300 (10.2 — 13.3, 145 — 189)
R	15 — 25	100 (Full open)	1,500 — 1,850 (15.3 — 18.9, 217 — 268)
D	35 — 43	0 (Fully closed)	500 — 800 (5.1 — 8.2, 73 — 116)

Transfer Clutch Pressure Test

AUTOMATIC TRANSMISSION

8. Transfer Clutch Pressure Test

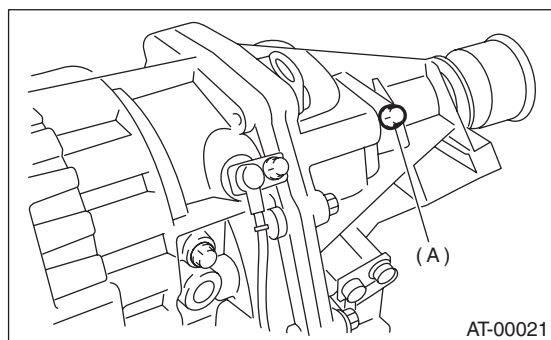
A: INSPECTION

Check the transfer clutch pressure in accordance with the following procedures, in the same manner as with line pressure. <Ref. to 4AT-34, Line Pressure Test.>

- ST 498897700 OIL PRESSURE ADAPTER SET
- ST 498575400 OIL PRESSURE GAUGE ASSY

NOTE:

Before setting in FWD mode test, install the spare fuse on FWD mode switch. (Only models with MP-T)



(A) Test plug

NOTE:

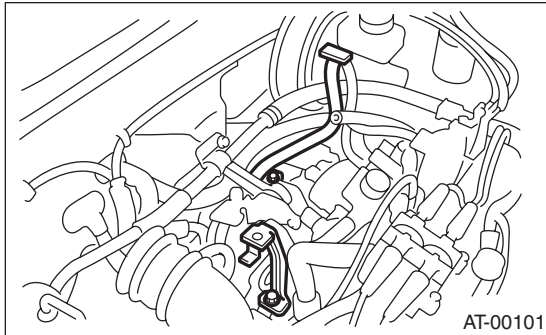
- If no oil pressure is produced or if it does not change in AWD mode, the transfer duty solenoid or the control valve body may be malfunctioning.
- If oil pressure is produced in FWD mode, there is the same problem as the AWD mode. (Only models with MP-T)

Range position	ON Duty ratio (%)	Throttle position (%)	Standard transfer clutch pressure kPa (kg/cm ² , psi)	
			AWD mode	FWD mode
2 (Hold switch ON)	95	Fully opened (100)	1,000 — 1,200 (10.2 — 12.2, 145 — 174)	—
	60	Adjust ON Duty ratio to 60%.	500 — 700 (5.1 — 7.1, 73 — 102)	—
	5	Fully closed (0)	—	0 (0, 0)
N or P	5	Fully closed (0)	0	—

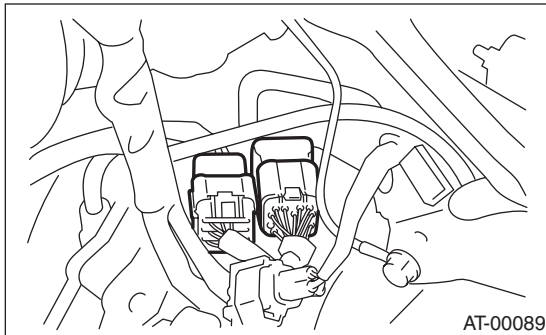
9. Automatic Transmission Assembly

A: REMOVAL

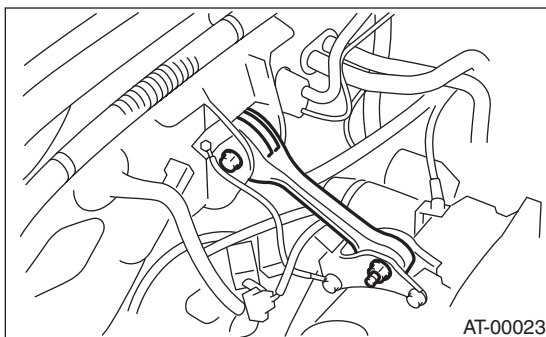
- 1) Set the vehicle on a lift.
- 2) Open the front hood and support with the hood stay.
- 3) Disconnect the ground cable from battery.
- 4) Remove the air intake chamber. (Non-turbo model)
<Ref. to IN (H4SO)-6, REMOVAL, Air Intake Chamber.>
- 5) Remove the intercooler. (Turbo model)
<Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 6) Remove the air cleaner case stay. (Non-turbo model)



- 7) Disconnect the following connectors.
 - (1) Transmission harness connectors



- (2) Transmission ground terminal
- 8) Remove the starter.
<Ref. to SC (H4SO)-6, REMOVAL, Starter.>
- 9) Remove the pitching stopper.

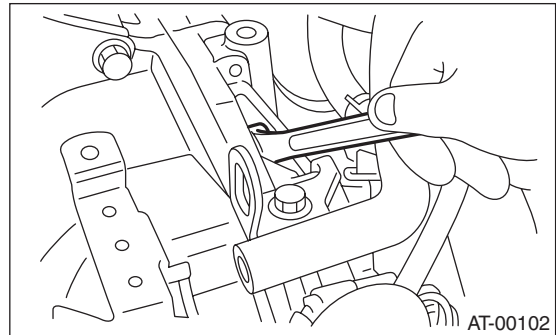


- 10) Separate the torque converter clutch assembly from drive plate.

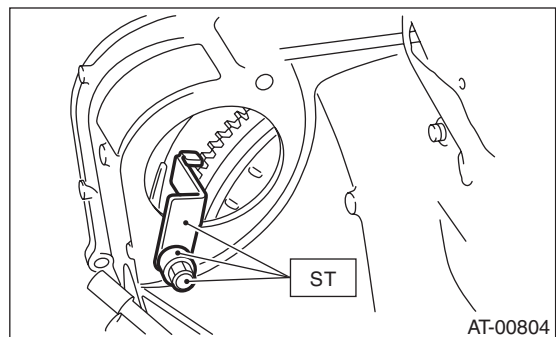
CAUTION:

- Be careful not to damage attachment bolts.
- Be careful not to drop bolts into the converter case.

- (1) Remove the V-belt covers.
- (2) Remove the service hole plug.
- (3) Remove the bolts which hold torque converter clutch assembly to drive plate.
- (4) Remove all the bolts by gradually rotating the crank sprocket to the same direction as the engine rotates.



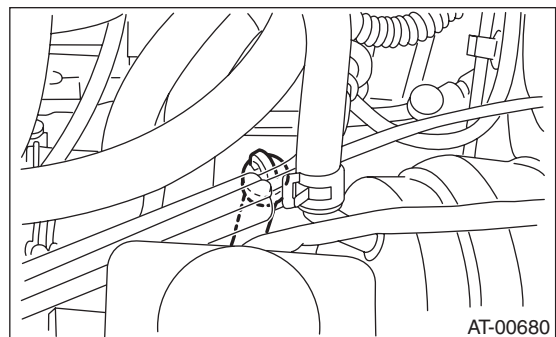
- 11) Install the ST to the converter case.
ST 498277200 STOPPER SET



- 12) Remove the ATF level gauge.

NOTE:

Plug the opening to prevent entry of foreign particles into transmission fluid.

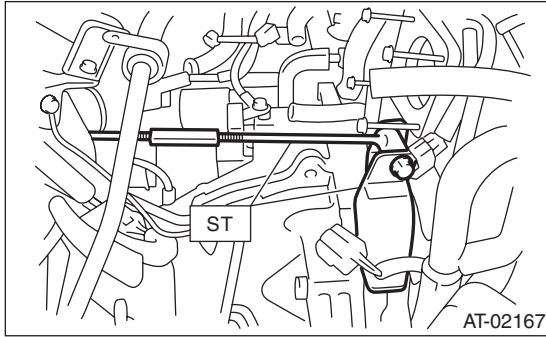


- 13) Remove the throttle body.
<Ref. to FU(H4SO)-12, REMOVAL, Throttle Body.>
- 14) Remove the pitching stopper bracket.

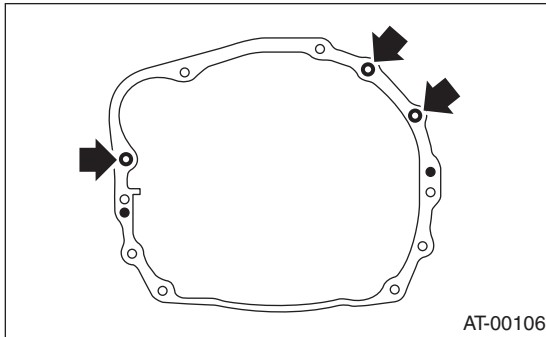
Automatic Transmission Assembly

AUTOMATIC TRANSMISSION

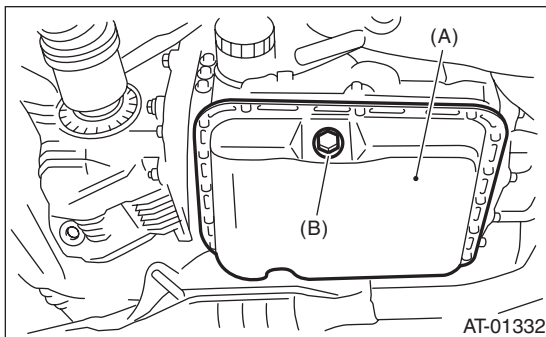
- 15) Set the ST.
ST 41099AC000 ENGINE SUPPORT ASSY



- 16) Remove the bolts which hold right upper side of transmission to engine.

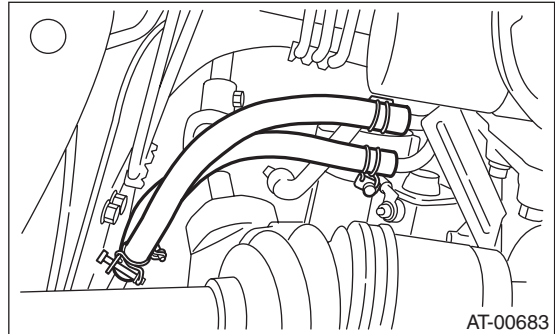


- 17) Lift-up the vehicle.
18) Remove the under cover.
19) Remove the front, center and rear exhaust pipes and the muffler. (Non-turbo model)
<Ref. to EX (H4SO)-4, REMOVAL, Front Exhaust Pipe.> <Ref. to EX (H4SO)-8, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX (H4SO)-9, REMOVAL, Muffler.>
20) Remove the center and rear exhaust pipes and the muffler. (Turbo model)
<Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.> <Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-15, REMOVAL, Muffler.>
21) Remove the drain plug (ATF) to drain ATF.

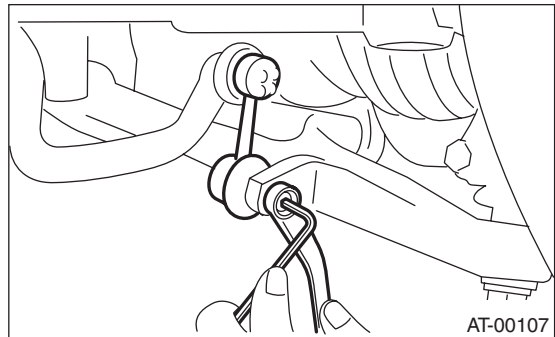


- (A) Oil pan
(B) Drain plug (ATF)

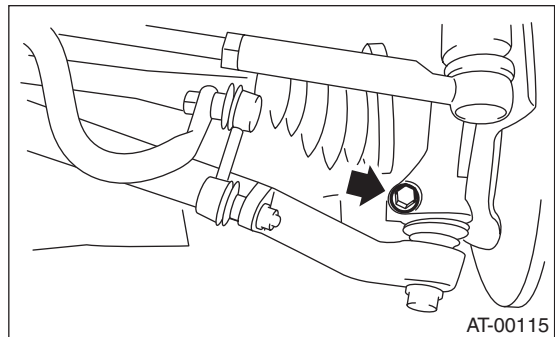
- 22) Disconnect the ATF cooler hoses from the pipes of transmission side, and remove the ATF level gauge guide.



- 23) Remove the propeller shaft.
<Ref. to DS-12, REMOVAL, Propeller Shaft.>
24) Remove the shift select cable.
<Ref. to CS-25, REMOVAL, Select Cable.>
25) Disconnect the stabilizer link from the transverse link.



- 26) Remove the bolt securing ball joint of the transverse link to housing.



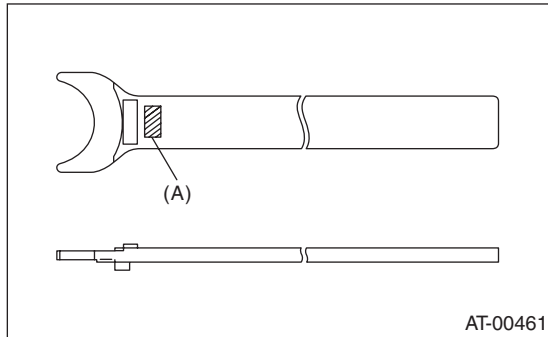
Automatic Transmission Assembly

AUTOMATIC TRANSMISSION

27) Pull out the front drive shaft from the transmission.

(1) Face the letters "AT" on the ST to the transmission side.

ST 28399SA000 DRIVE SHAFT REMOVER



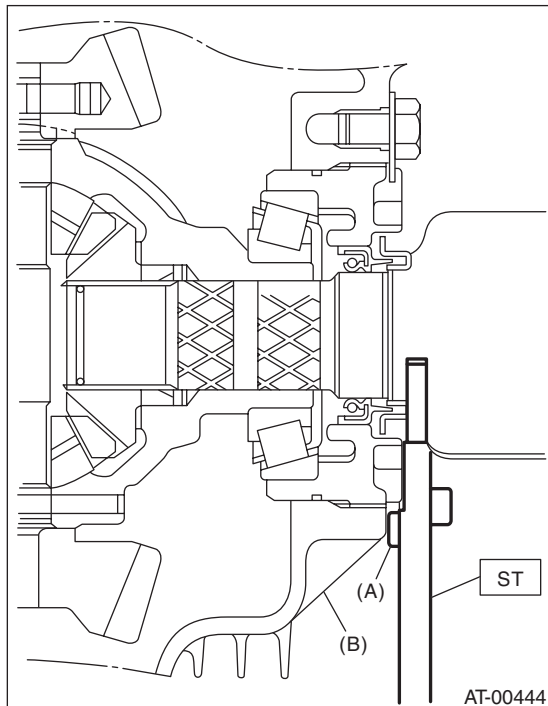
(A) Letters "AT"

(2) Insert the ST between the transmission and front drive shaft.

NOTE:

Set the protrusion of the ST to the torque converter clutch housing.

ST 28399SA000 DRIVE SHAFT REMOVER



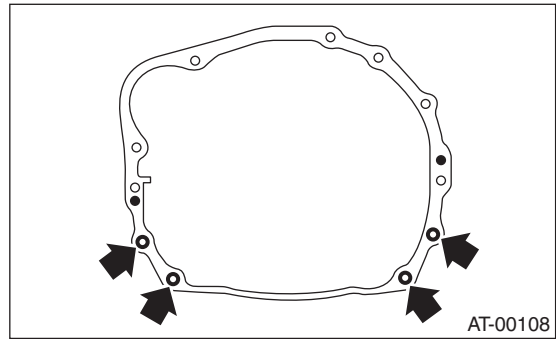
(A) Protrusion of the ST

(B) Converter case

(3) Hold the joint portion (AARi) of the front drive shaft by hand and extract the housing from the transmission by pressing it outside.

28) Remove the bolts which secure the housing cover.

29) Remove the bolts and nuts which hold lower side of transmission to engine.

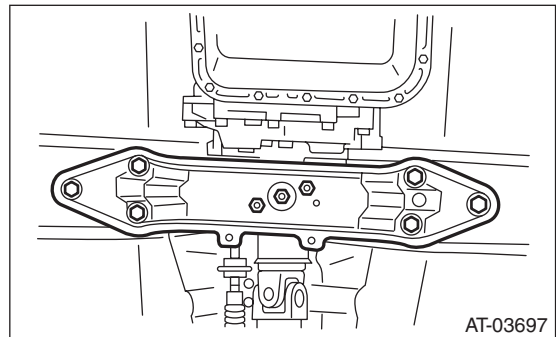


30) Place a transmission jack below the transmission.

NOTE:

Make sure that the support plates of transmission jack do not touch the oil pan.

31) Remove the transmission rear crossmember from the vehicle.

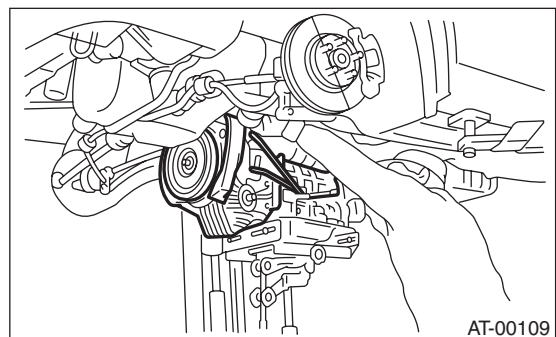


32) While lowering the transmission jack gradually, fully retract the engine support, and then tilt the engine rearward.

33) Remove the transmission.

NOTE:

Remove the transmission and torque converter as a single unit from engine.



34) Remove the rear cushion rubber from transmission.

Automatic Transmission Assembly

AUTOMATIC TRANSMISSION

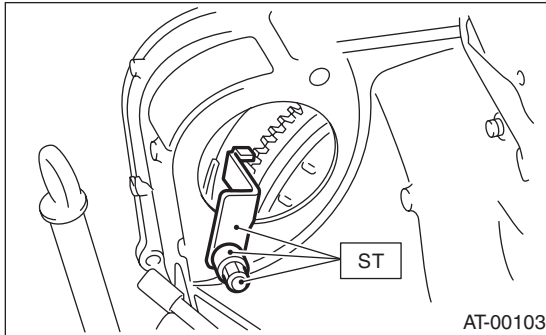
B: INSTALLATION

- 1) Replace the differential side oil seal with a new one. <Ref. to 4AT-46, REPLACEMENT, Differential Side Retainer Oil Seal.>
- 2) Install the rear cushion rubber to the transmission.

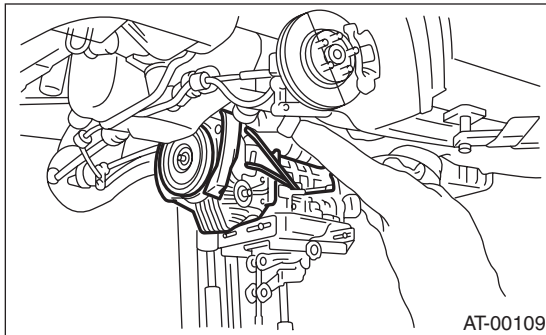
Tightening torque:

39 N·m (4.0 kgf·m, 29 ft·lb)

- 3) Install the ST to the converter case.
ST 498277200 STOPPER SET



- 4) Install the transmission onto the engine.
(1) Lift-up the transmission gradually using transmission jack.



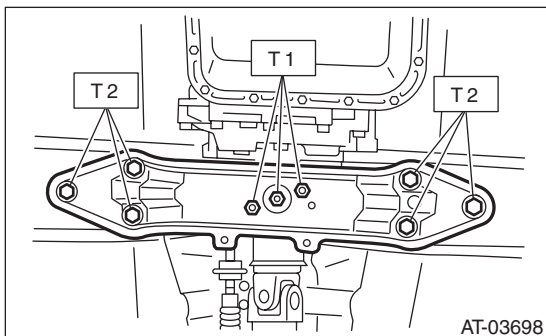
- (2) Insert the stud bolt on the engine side into the transmission bolt hole.
- (3) While lowering the transmission jack gradually, turn the screw of engine support, and then tilt the engine forward to join them together.

- 5) Install the transmission rear crossmember.

Tightening torque:

T1: 35 N·m (3.6 kgf·m, 26 ft·lb)

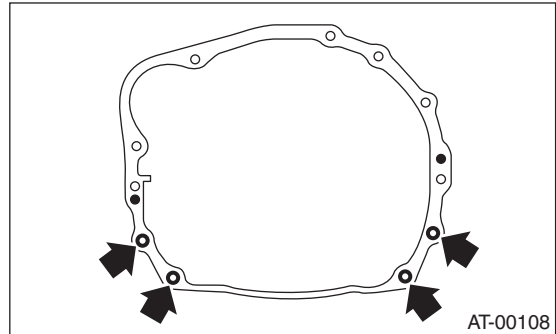
T2: 70 N·m (7.1 kgf·m, 51 ft·lb)



- 6) Remove the transmission jack.
- 7) Tighten the bolts and nuts which hold lower side of transmission to engine.

Tightening torque:

50 N·m (5.1 kgf·m, 36.9 ft·lb)



- 8) Tighten the bolt of the housing cover.
- 9) Lower the lift.
- 10) Connect the engine and transmission.
(1) Remove the ST from converter case.

NOTE:

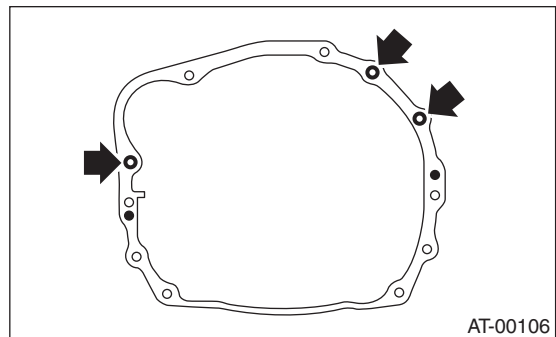
When removing the ST, be careful not to drop it into converter case.

ST 498277200 STOPPER SET

- (2) Tighten the bolts which hold the right upper side of the transmission to engine.

Tightening torque:

50 N·m (5.1 kgf·m, 36.9 ft·lb)



11) Install the torque converter clutch assembly to the drive plate.

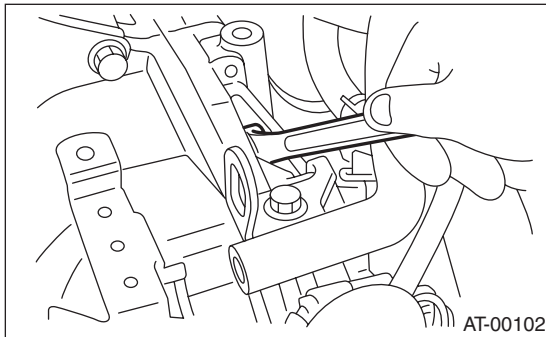
CAUTION:

- Be careful not to damage attachment bolts.
- Be careful not to drop bolts into the converter case.

- (1) Tighten the bolts which hold torque converter clutch assembly to the drive plate.
- (2) Tighten all the bolts by gradually rotating the crank sprocket to the same direction as the engine rotates.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)

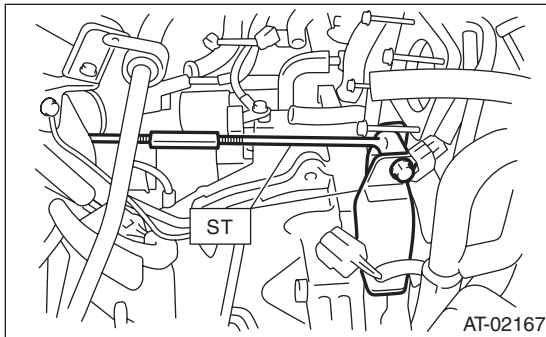


(3) Fit the plug to service hole.

12) Install the starter.

<Ref. to SC (H4SO)-6, INSTALLATION, Starter.>

13) Remove the ST.



14) Install the pitching stopper bracket.

Tightening torque:

41 N·m (4.2 kgf-m, 30.4 ft-lb)

15) Install the throttle body.

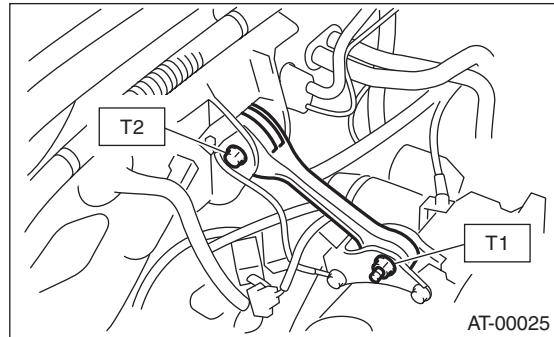
<Ref. to FU(H4SO)-12, INSTALLATION, Throttle Body.>

16) Attach the pitching stopper.

Tightening torque:

T1: 50 N·m (5.1 kgf-m, 37 ft-lb)

T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



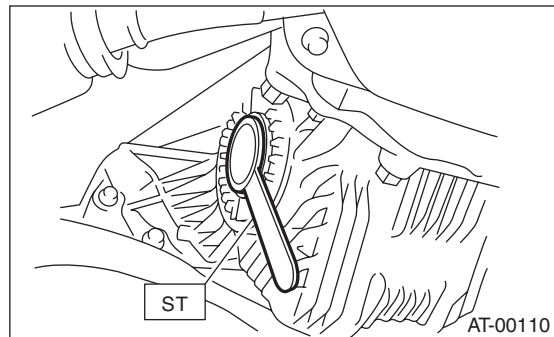
17) Lift-up the vehicle.

18) Replace the circlip of the front drive shaft with a new one.

19) Apply grease to the oil seal lip.

20) Install the ST to side retainer.

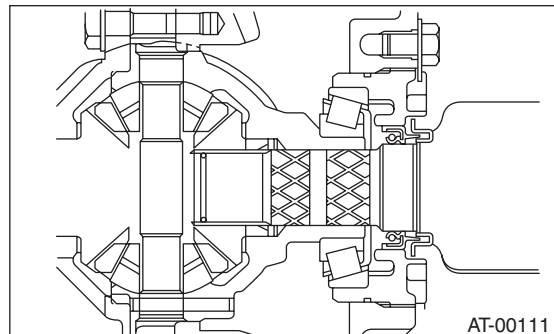
ST 28399SA010 OIL SEAL PROTECTOR



21) Align the spline portion of front drive shaft with the serration of the differential bevel gear to insert, and remove the ST.

ST 28399SA010 OIL SEAL PROTECTOR

22) Insert the front drive shaft into transmission securely by pressing the front housing.



23) Connect the ball joint to the front housing.

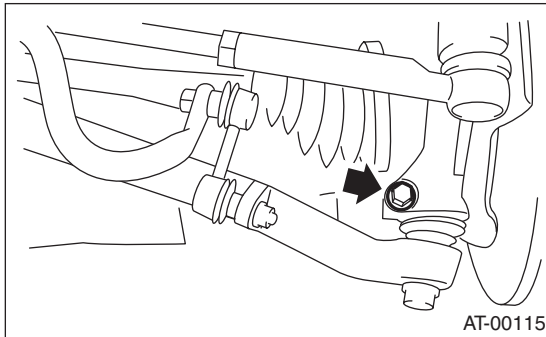
Automatic Transmission Assembly

AUTOMATIC TRANSMISSION

24) Tighten the attachment bolts.

Tightening torque:

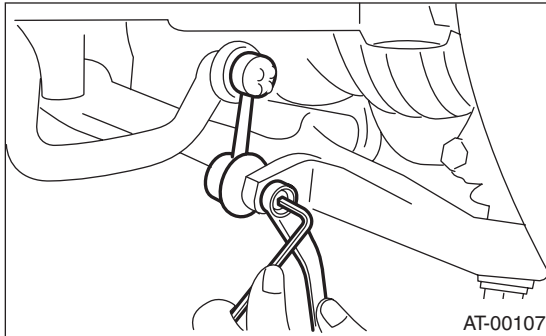
49 N·m (5.0 kgf·m, 36 ft·lb)



25) Attach the stabilizer link to the transverse link.

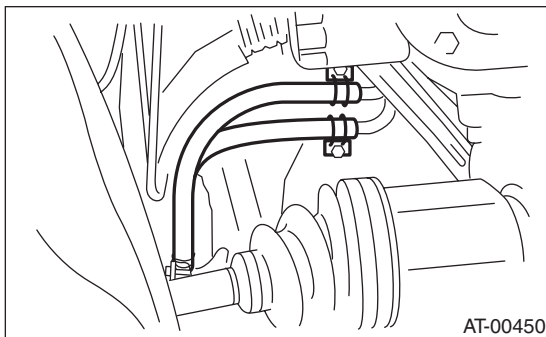
Tightening torque:

45 N·m (4.6 kgf·m, 33.2 ft·lb)



26) Install the shift select cable onto select lever.
<Ref. to CS-26, INSTALLATION, Select Cable.>

27) Connect the ATF cooler hoses to the pipe.



28) Install the ATF level gauge guide.

29) Install the propeller shaft.

<Ref. to DS-13, INSTALLATION, Propeller Shaft.>

30) Install the rear exhaust pipe and muffler assembly.

(Non-turbo model)

<Ref. to EX (H4SO)-8, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX (H4SO)-9, INSTALLATION, Muffler.>

(Turbo model)

<Ref. to EX(H4DOTC)-14, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-15, INSTALLATION, Muffler.>

31) Install the front and center exhaust pipe. (Non-turbo model)

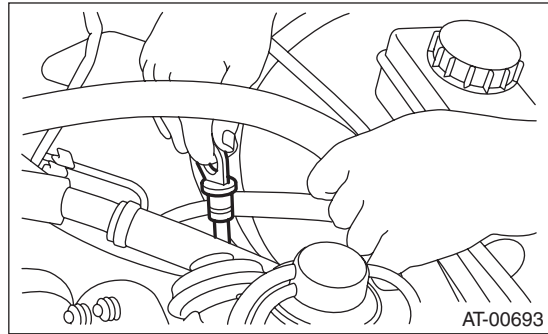
<Ref. to EX (H4SO)-5, INSTALLATION, Front Exhaust Pipe.>

32) Install the center exhaust pipe. (Turbo model)
<Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.>

33) Install the under cover.

34) Lower the lift.

35) Install the ATF level gauge.



36) Connect the following connectors.

(1) Transmission harness connectors

(2) Transmission ground terminal

37) Install the air cleaner case stay. (Non-turbo model)

Tightening torque:

16 N·m (1.6 kgf·m, 11.6 ft·lb)

38) Install the air intake chamber. (Non-turbo model)

<Ref. to IN (H4SO)-6, INSTALLATION, Air Intake Chamber.>

39) Install the intercooler. (Turbo model)

<Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

40) Connect the ground cable to the battery.

41) Pour ATF from the oil charge pipe. <Ref. to 4AT-28, Automatic Transmission Fluid.>

42) Check the ATF level. <Ref. to 4AT-28, Automatic Transmission Fluid.>

43) Lower the vehicle from lift.

44) Check the select lever operation.

<Ref. to 4AT-47, INSPECTION, Inhibitor Switch.>

45) Execute the learning control promotion.

<Ref. to 4AT(D)(diag)-15, FACILITATION OF LEARNING CONTROL, OPERATION, Subaru Select Monitor.>

46) Perform the road test.

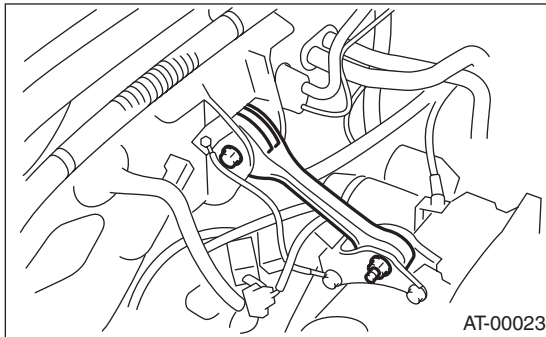
<Ref. to 4AT-31, Road Test.>

10. Transmission Mounting System

A: REMOVAL

1. PITCHING STOPPER

- 1) Disconnect the ground cable from battery.
- 2) Remove the air intake chamber. (Non-turbo model)
<Ref. to IN (H4SO)-6, REMOVAL, Air Intake Chamber.>
- 3) Remove the intercooler. (Turbo model)
<Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 4) Remove the pitching stopper.



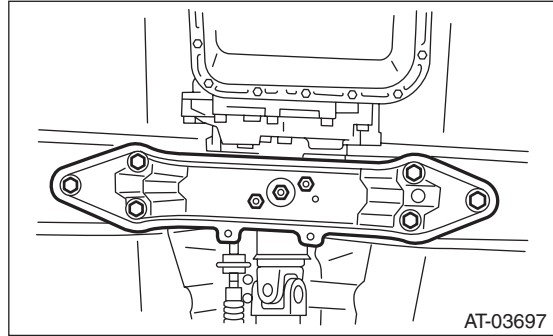
2. TRANSMISSION REAR CROSSMEMBER AND REAR CUSHION RUBBER

- 1) Disconnect the ground cable from battery.
- 2) Jack-up the vehicle and support it with rigid racks.
- 3) Remove the front, center, rear exhaust pipes and muffler. (Non-turbo model)
<Ref. to EX (H4SO)-4, REMOVAL, Front Exhaust Pipe.> <Ref. to EX (H4SO)-8, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX (H4SO)-9, REMOVAL, Muffler.>
- 4) Remove the center and rear exhaust pipe and muffler. (Turbo model)
<Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.> <Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-15, REMOVAL, Muffler.>
- 5) Set the transmission jack under transmission.

NOTE:

Make sure that the support plate of transmission jack does not touch the oil pan.

- 6) Remove the transmission rear crossmember.



- 7) Remove the rear cushion rubber.

B: INSTALLATION

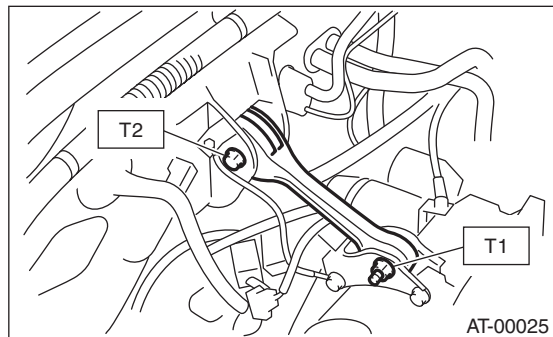
1. PITCHING STOPPER

- 1) Attach the pitching stopper.

Tightening torque:

T1: 50 N·m (5.1 kgf-m, 37 ft-lb)

T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



- 2) Install the air intake chamber. (Non-turbo model)
<Ref. to IN (H4SO)-6, INSTALLATION, Air Intake Chamber.>
- 3) Install the intercooler. (Turbo model)
<Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

Transmission Mounting System

AUTOMATIC TRANSMISSION

2. TRANSMISSION REAR CROSSMEMBER AND REAR CUSHION RUBBER

1) Install the rear cushion rubber.

Tightening torque:

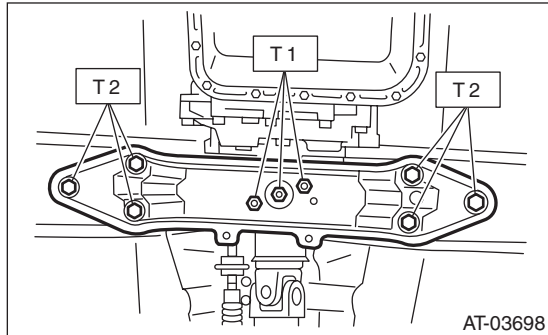
39 N·m (4.0 kgf·m, 29 ft·lb)

2) Install the transmission rear crossmember.

Tightening torque:

T1: 35 N·m (3.6 kgf·m, 26 ft·lb)

T2: 70 N·m (7.1 kgf·m, 51 ft·lb)



3) Remove the transmission jack.

4) Install the front, center and rear exhaust pipes, and the muffler. (Non-turbo model)

<Ref. to EX (H4SO)-5, INSTALLATION, Front Exhaust Pipe.> <Ref. to EX (H4SO)-8, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX (H4SO)-9, INSTALLATION, Muffler.>

5) Install the center, rear exhaust pipes and the muffler. (Turbo model)

<Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.> <Ref. to EX(H4DOTC)-14, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-15, INSTALLATION, Muffler.>

C: INSPECTION

Perform the following inspection procedures and repair or replace defective parts.

1. PITCHING STOPPER

Make sure that the pitching stopper is not bent or damaged. Check that there are no cracks, hardening or damage on rubber parts.

2. TRANSMISSION REAR CROSSMEMBER AND REAR CUSHION RUBBER

Make sure that the cross member is not bent or damaged. Check the cushion rubber for cracks, hardening or damage.

11.Extension Case Oil Seal

A: INSPECTION

Make sure that the ATF is not leaking from the transmission and propeller shaft joint. If there is leakage, replace the oil sea and check the propeller shaft. <Ref. to 4AT-45, REPLACEMENT, Extension Case Oil Seal.>

B: REPLACEMENT

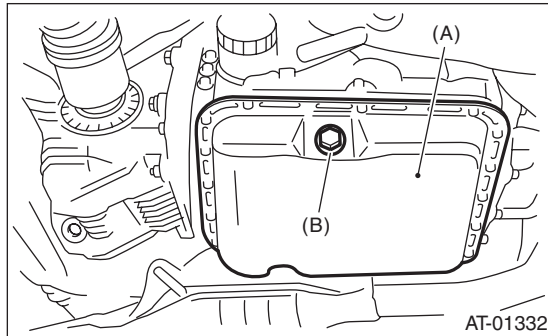
- 1) Clean the transmission exterior.
- 2) Drain the ATF completely.

NOTE:

Tighten the drain plug (ATF) after draining the ATF.

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)



- (A) Oil pan
- (B) Drain plug (ATF)

- 3) Remove the rear exhaust pipe and muffler. (Non-turbo model)
<Ref. to EX (H4SO)-8, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX (H4SO)-9, REMOVAL, Muffler.>
- (Turbo model)
<Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-15, REMOVAL, Muffler.>
- 4) Remove the propeller shaft. <Ref. to DS-12, REMOVAL, Propeller Shaft.>
- 5) Using the ST, remove the oil seal.
ST 398527700 PULLER ASSY
- 6) Using the ST, install the oil seal.
ST 498057300 INSTALLER
- 7) Install the propeller shaft. <Ref. to DS-13, INSTALLATION, Propeller Shaft.>

- 8) Install the rear exhaust pipe and muffler. (Non-turbo model)
<Ref. to EX (H4SO)-8, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX (H4SO)-9, INSTALLATION, Muffler.>
- (Turbo model)
<Ref. to EX(H4DOTC)-14, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-15, INSTALLATION, Muffler.>
- 9) Pour in ATF. <Ref. to 4AT-28, Automatic Transmission Fluid.>
- 10) Bleed the air of control valve. <Ref. to 4AT-59, Air Bleeding of Control Valve.>
- 11) Check the level and leaks of the ATF. <Ref. to 4AT-28, Automatic Transmission Fluid.>

Differential Side Retainer Oil Seal

AUTOMATIC TRANSMISSION

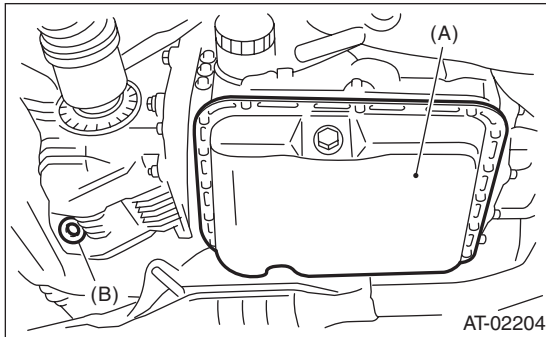
12. Differential Side Retainer Oil Seal

A: INSPECTION

Check for leakage of gear oil from differential side retainer oil seal part. If there is oil leakage, replace the oil seal and check the drive shaft.

B: REPLACEMENT

- 1) Lift-up the vehicle.
- 2) Remove the front exhaust pipe and center exhaust pipe.
(Non-turbo model)
<Ref. to EX (H4SO)-4, REMOVAL, Front Exhaust Pipe.>
(Turbo model)
<Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
- 3) Remove the differential gear oil drain plug, and drain the differential gear oil.



- (A) Oil pan
(B) Differential gear oil drain plug

- 4) Replace the gasket with a new one and tighten the differential oil drain plug.

Tightening torque:

Copper gasket

70 N·m (7.2 kgf·m, 51.7 ft·lb)

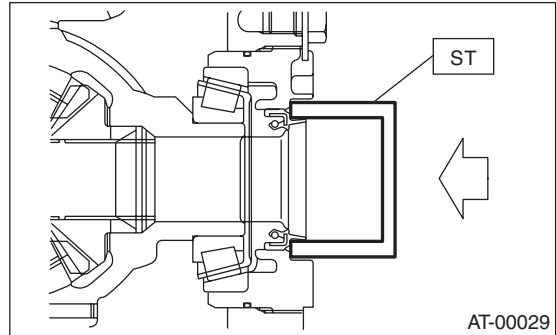
Aluminum gasket

44 N·m (4.5 kgf·m, 32.5 ft·lb)

- 5) Separate the front drive shaft from the transmission. <Ref. to DS-29, REMOVAL, Front Drive Shaft.>
- 6) Remove the differential side retainer oil seal using a screw driver wrapped with vinyl tape etc.

- 7) Using the ST, install the differential side retainer oil seal by lightly tapping with a hammer.

ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER



- 8) Apply oil to the oil seal lips.
- 9) Install the front drive shaft using the ST. <Ref. to DS-30, INSTALLATION, Front Drive Shaft.>
ST 28399SA010 OIL SEAL PROTECTOR
- 10) Install the front exhaust pipe and the center exhaust pipe.
(Non-turbo model)
<Ref. to EX (H4SO)-5, INSTALLATION, Front Exhaust Pipe.>
(Turbo model)
<Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.>
- 11) Lower the vehicle.
- 12) Pour differential gear oil into the gauge hole.

Recommended gear oil:

<Ref. to 4AT-3, SPECIFICATION, General Description.>

Gear oil capacity:

1.1 — 1.3 ℓ (1.3 — 1.4 US qt, 1.0 — 1.1 Imp qt)

- 13) Check the gear oil level. <Ref. to 4AT-30, INSPECTION, Differential Gear Oil.>

13. Inhibitor Switch

A: INSPECTION

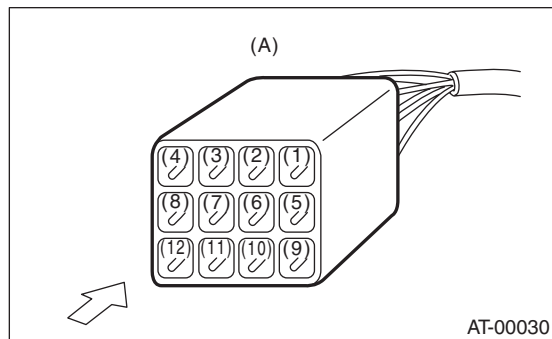
When the driving condition or starter motor operation is improper, first check the shift linkage for improper operation. If the shift linkage is functioning properly, check the inhibitor switch.

- 1) Disconnect the inhibitor switch connector.
- 2) Check continuity in inhibitor switch circuits with the select lever moved to each position.

NOTE:

- Also check that there is no continuity in ignition circuit when the select lever is in the “R”, “D”, “3”, “2” and “1” ranges.
- If the inhibitor switch does not operate, check for poor contact of the connector on transmission side.

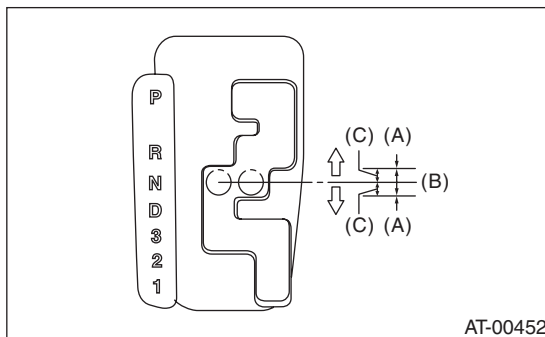
	Range	Pin No.
Signal sent to TCM	P	4 — 3
	R	4 — 2
	N	4 — 1
	D	4 — 8
	3	4 — 7
	2	4 — 6
	1	4 — 5
Ignition circuit	P/N	12 — 11
Back-up light circuit	R	10 — 9



(A) Inhibitor switch connector

3) Check if there is continuity at equal points when the select lever is turned 1.5° to the “R” and “D” ranges from the “N” range.

If there is continuity in only one direction or in other points, adjust the inhibitor switch. <Ref. to 4AT-47, ADJUSTMENT, Inhibitor Switch.>

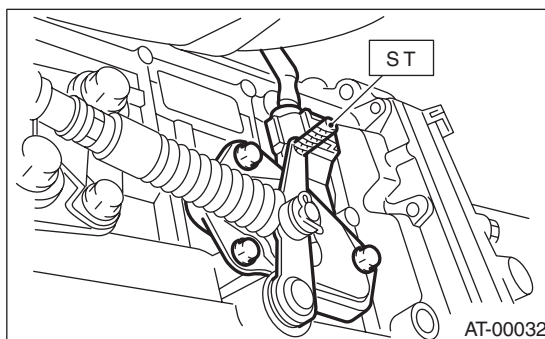


- (A) Continuity does not exist.
- (B) Continuity exists.
- (C) 1.5°

4) Repeat the above checks for the other ranges. If there are abnormalities, adjust the select cable. <Ref. to CS-27, ADJUSTMENT, Select Cable.>

B: ADJUSTMENT

- 1) Shift the select lever to “N” range.
- 2) Loosen the three inhibitor switch assembly securing bolts.
- 3) Insert the ST as vertical as possible into the holes in the inhibitor switch lever and switch body.
ST 499267300 STOPPER PIN



4) Tighten the three inhibitor switch assembly securing bolts.

Tightening torque:

3.4 N·m (0.35 kgf·m, 2.6 ft·lb)

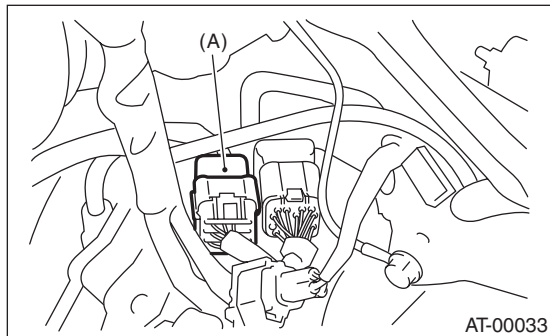
5) Repeat the inspections of the inhibitor switch. If the inhibitor switch is determined to be “faulty”, replace it. <Ref. to 4AT-47, INSPECTION, Inhibitor Switch.>

Inhibitor Switch

AUTOMATIC TRANSMISSION

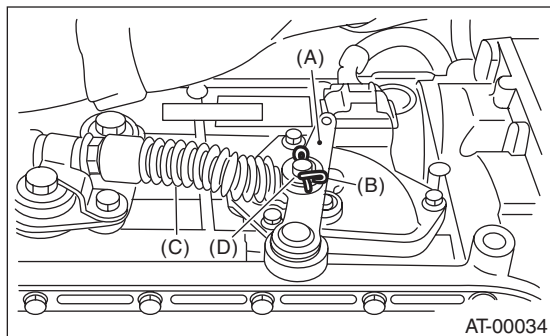
C: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Move the select lever to "N".
- 3) Remove the air intake chamber (non-turbo model).
<Ref. to IN (H4SO)-6, REMOVAL, Air Intake Chamber.>
- 4) Remove the inter cooler (Turbo model).
<Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 5) Disconnect the inhibitor switch connector.



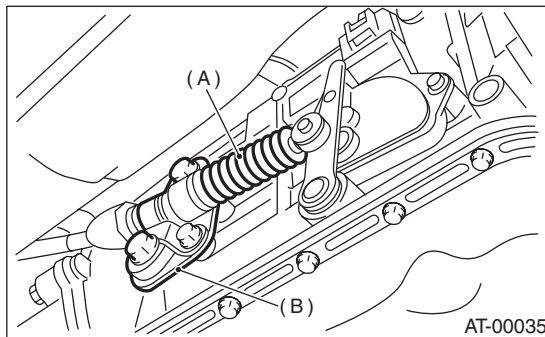
(A) Inhibitor switch connector

- 6) Remove the inhibitor switch connector from the stay.
- 7) Lift-up the vehicle.
- 8) Remove the front and center exhaust pipes.
(Non-turbo model)
<Ref. to EX (H4SO)-4, REMOVAL, Front Exhaust Pipe.>
(Turbo model)
<Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
- 9) Remove the snap pin and washer from the range select lever.



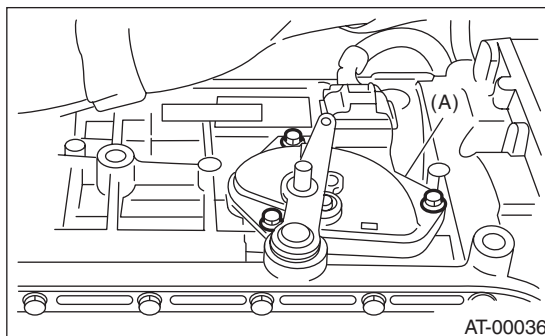
- (A) Range select lever
- (B) Snap pin
- (C) Select cable
- (D) Washer

- 10) Remove the plate assembly from the transmission case.



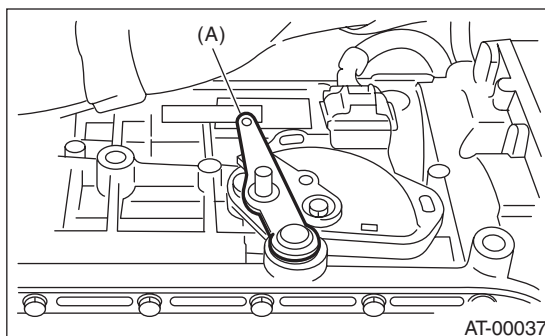
- (A) Select cable
- (B) Plate ASSY

- 11) Remove the bolt.



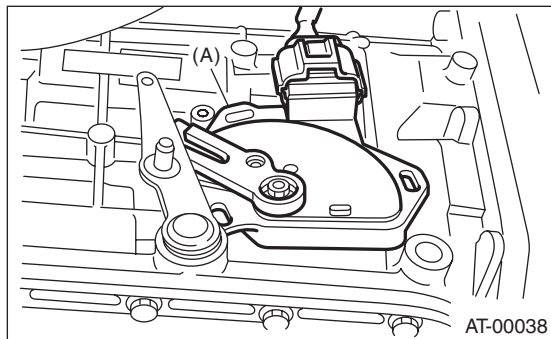
(A) Inhibitor switch ASSY

- 12) Move the range select lever to the parking position (left side).



(A) Range select lever

13) Remove the inhibitor switch assembly from the transmission.

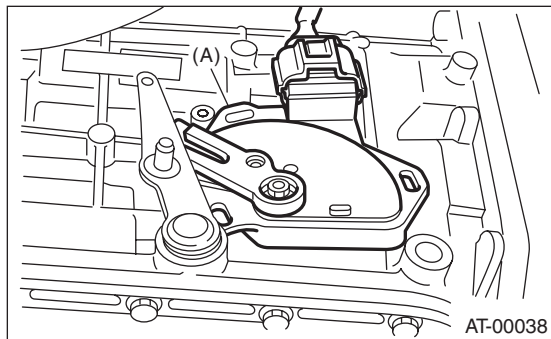


(A) Inhibitor switch ASSY

14) Disconnect the inhibitor switch harness connector from the inhibitor switch.

D: INSTALLATION

- 1) Connect the inhibitor switch harness connector to the inhibitor switch.
- 2) Install the inhibitor switch assembly to the transmission case.



(A) Inhibitor switch ASSY

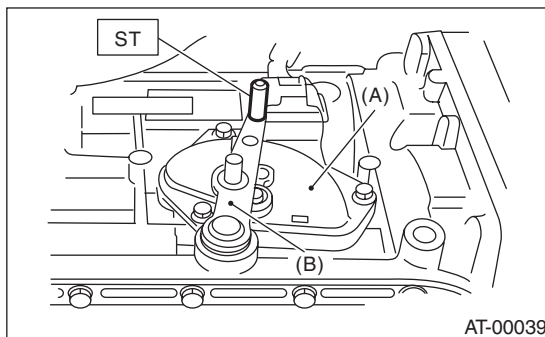
3) Move the range select lever to the neutral position.

4) Using the ST, tighten the bolts of the inhibitor switch.

ST 499267300 STOPPER PIN

Tightening torque:

3.4 N·m (0.36 kgf·m, 2.6 ft·lb)



(A) Inhibitor switch ASSY

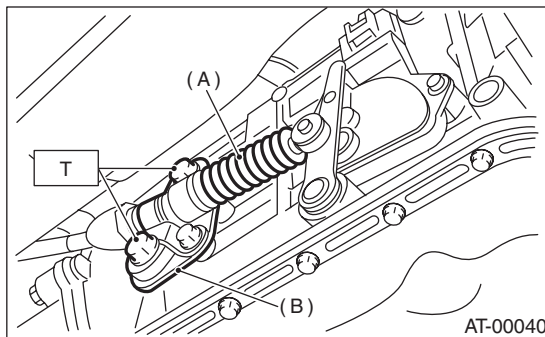
(B) Range select lever

5) Install the select cable to the range select lever.

6) Install the plate assembly to the transmission.

Tightening torque:

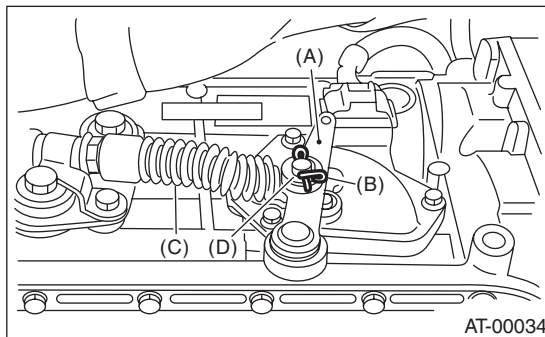
T: 25 N·m (2.5 kgf·m, 18.1 ft·lb)



(A) Select cable

(B) Plate ASSY

7) Install the washer and snap pin to the range select lever.



(A) Range select lever

(B) Snap pin

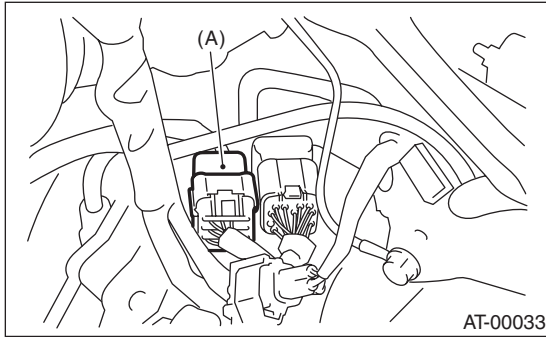
(C) Select cable

(D) Washer

Inhibitor Switch

AUTOMATIC TRANSMISSION

- 8) Install the front and center exhaust pipe. (Non-turbo model)
<Ref. to EX (H4SO)-5, INSTALLATION, Front Exhaust Pipe.>
- 9) Install the center exhaust pipe. (Turbo model)
<Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.>
- 10) Lower the vehicle.
- 11) Install the inhibitor switch connector to the stay.
- 12) Connect the inhibitor switch connector.



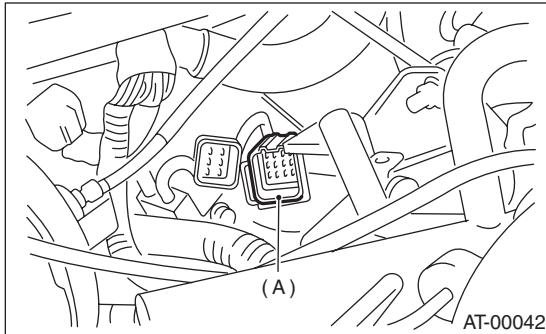
(A) Inhibitor switch connector

- 13) Install the air intake chamber. (Non-turbo model)
<Ref. to IN (H4SO)-6, INSTALLATION, Air Intake Chamber.>
- 14) Install the intercooler. (Turbo model)
<Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>
- 15) Inspect the inhibitor switch. <Ref. to 4AT-47, INSPECTION, Inhibitor Switch.>

14. Front Vehicle Speed Sensor

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Remove the air intake chamber. (Non-turbo model)
<Ref. to IN (H4SO)-6, REMOVAL, Air Intake Chamber.>
- 4) Remove the intercooler. (Turbo model)
<Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 5) Disconnect the transmission connector.



(A) Transmission connector

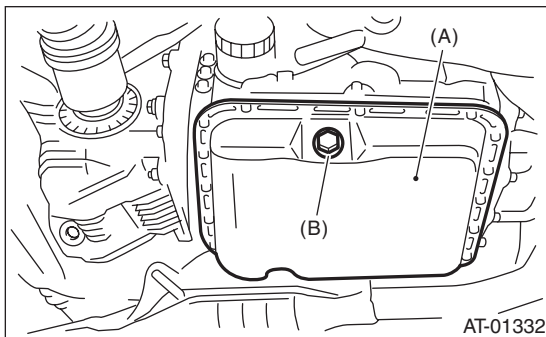
- 6) Remove the pitching stopper. <Ref. to 4AT-43, REMOVAL, Transmission Mounting System.>
- 7) Remove the transmission connector from stay.
- 8) Lift-up the vehicle.
- 9) Clean the transmission exterior.
- 10) Drain the ATF completely.

NOTE:

Tighten the drain plug (ATF) after draining the ATF.

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)



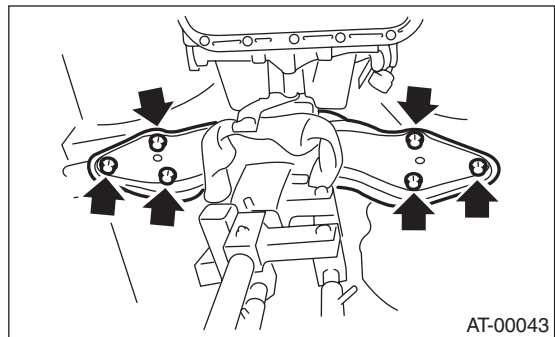
- (A) Oil pan
- (B) Drain plug (ATF)
- (C) Differential gear oil drain plug

- 11) Remove the front, center and rear exhaust pipes and the muffler. (Non-turbo model)
<Ref. to EX (H4SO)-4, REMOVAL, Front Exhaust Pipe.> <Ref. to EX (H4SO)-8, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX (H4SO)-9, REMOVAL, Muffler.>
- 12) Remove the center and rear exhaust pipes and the muffler. (Turbo model)
<Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.> <Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-15, REMOVAL, Muffler.>
- 13) Remove the propeller shaft. <Ref. to DS-12, REMOVAL, Propeller Shaft.>
- 14) Place the transmission jack under the transmission.

NOTE:

Make sure that the support plate of transmission jack does not touch the oil pan.

- 15) Remove the transmission rear crossmember bolt.



- 16) Lower the transmission jack.

NOTE:

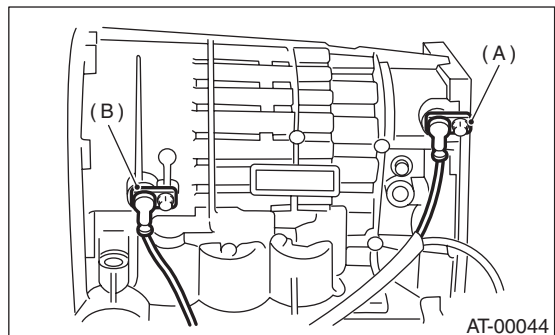
Do not separate the transmission jack and transmission.

- 17) Remove the ATF cooler inlet and outlet pipes.

NOTE:

When removing the outlet pipe, do not lose the ball and spring used with retaining screw.

- 18) Remove the front vehicle speed sensor and torque converter turbine speed sensor.

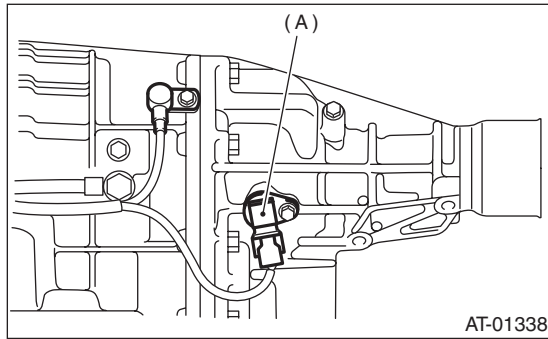


- (A) Front vehicle speed sensor
- (B) Torque converter turbine speed sensor

Front Vehicle Speed Sensor

AUTOMATIC TRANSMISSION

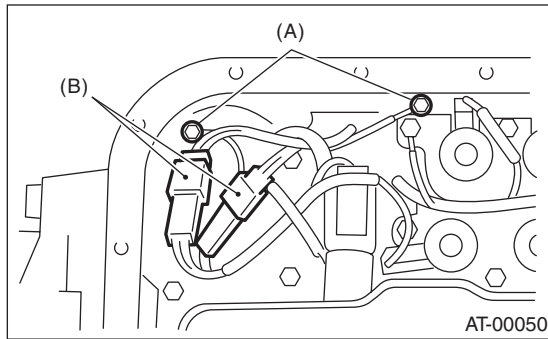
19) Disconnect the connector from the rear vehicle speed sensor.



(A) Rear vehicle speed sensor

20) Remove the oil pan.

21) Disconnect the control valve connector and the grounding cable.

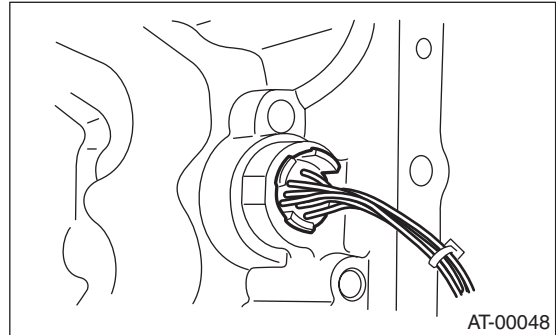


(A) Transmission ground cable
(B) Control valve connector

22) Remove the transmission harness assembly.

B: INSTALLATION

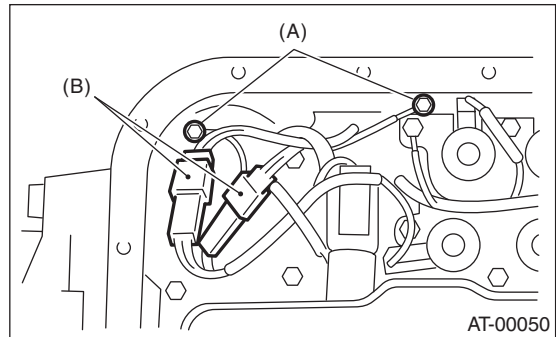
1) Pass the transmission harness assembly through the hole in transmission case.



2) Connect the control valve connector and the grounding cable.

Tightening torque:

8 N·m (0.8 kgf·m, 5.8 ft·lb)

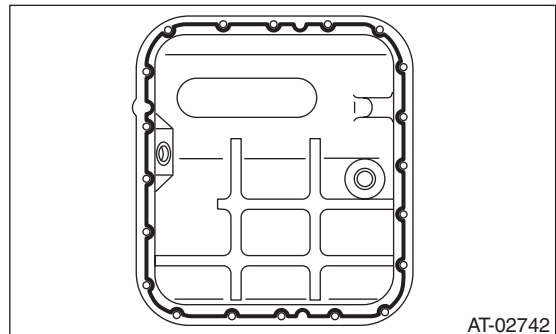


(A) Transmission ground cable
(B) Control valve connector

3) Apply proper amount of liquid gasket to the entire oil pan mating surface.

Liquid gasket:

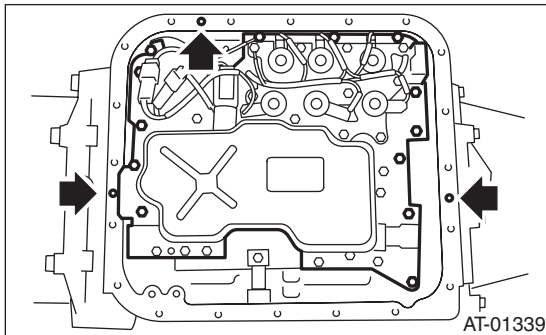
Three bond 1217B (Part No. K0877YA020) or equivalent



4) Fill the 3 holes aside from the bolt holes in the transmission case, with liquid gasket.

Liquid gasket:

Three bond 1217B (Part No. K0877YA020) or equivalent



5) Install the oil pan by equally tightening the bolts.

Tightening torque:

5 N·m (0.5 kgf-m, 3.6 ft-lb)

6) Install the front vehicle speed sensor and torque converter turbine speed sensor.

Tightening torque:

7 N·m (0.7 kgf-m, 5.1 ft-lb)

7) Connect the connector to the rear vehicle speed sensor.

8) Install the ATF cooler inlet and outlet pipes.

NOTE:

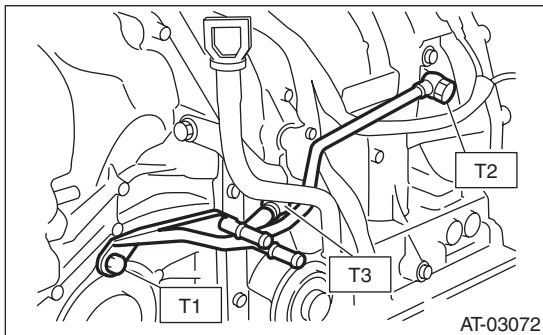
Use a new copper washer.

Tightening torque:

T1: 25 N·m (2.5 kgf-m, 18.1 ft-lb)

T2: 40 N·m (4.1 kgf-m, 29.5 ft-lb)

T3: 45 N·m (4.6 kgf-m, 33.2 ft-lb)



9) Install the transmission rear crossmember bolt.

Tightening torque:

70 N·m (7.1 kgf-m, 51 ft-lb)

10) Install the propeller shaft. <Ref. to DS-13, INSTALLATION, Propeller Shaft.>

11) Install the front, center and rear exhaust pipes, and the muffler. (Non-turbo model)

<Ref. to EX (H4SO)-5, INSTALLATION, Front Exhaust Pipe.> <Ref. to EX (H4SO)-8, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX (H4SO)-9, INSTALLATION, Muffler.>

12) Install the center, rear exhaust pipes and the muffler. (Turbo model)

<Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.> <Ref. to EX(H4DOTC)-14, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-15, INSTALLATION, Muffler.>

13) Lower the vehicle.

14) Install the transmission connector to the stay.

15) Attach the pitching stopper. <Ref. to 4AT-43, INSTALLATION, Transmission Mounting System.>

16) Install the air intake chamber. (Non-turbo model)

<Ref. to IN (H4SO)-6, INSTALLATION, Air Intake Chamber.>

17) Install the intercooler. (Turbo model)

<Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

18) Pour in ATF.

<Ref. to 4AT-28, Automatic Transmission Fluid.>

19) Bleed the air of control valve.

<Ref. to 4AT-59, Air Bleeding of Control Valve.>

20) Check the level and leaks of the ATF.

<Ref. to 4AT-28, Automatic Transmission Fluid.>

21) Execute the learning control promotion.

<Ref. to 4AT(D)(diag)-15, FACILITATION OF LEARNING CONTROL, OPERATION, Subaru Select Monitor.>

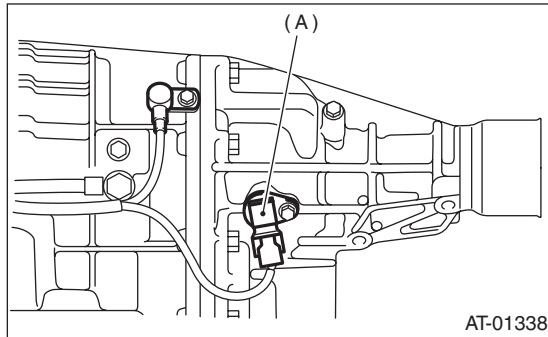
Rear Vehicle Speed Sensor

AUTOMATIC TRANSMISSION

15.Rear Vehicle Speed Sensor

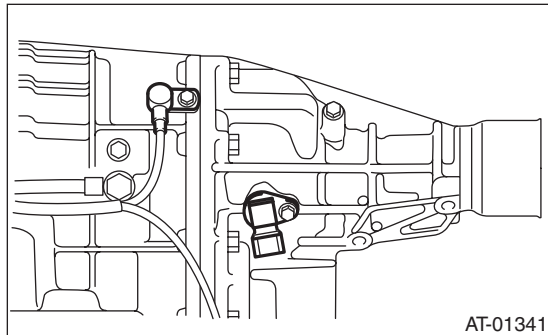
A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Lift-up the vehicle.
- 4) Disconnect the connector from the rear vehicle speed sensor.



(A) Rear vehicle speed sensor

- 5) Remove the rear vehicle speed sensor.



B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Replace O-ring with a new one.

Tightening torque:

7 N·m (0.7 kgf·m, 5.1 ft·lb)

16. Torque Converter Turbine Speed Sensor

A: REMOVAL

When removing the torque converter turbine speed sensor, refer to "Front Vehicle Speed Sensor".
<Ref. to 4AT-51, REMOVAL, Front Vehicle Speed Sensor.>

B: INSTALLATION

When installing the torque converter turbine speed sensor, refer to "Front Vehicle Speed Sensor".
<Ref. to 4AT-52, INSTALLATION, Front Vehicle Speed Sensor.>

Control Valve Body

AUTOMATIC TRANSMISSION

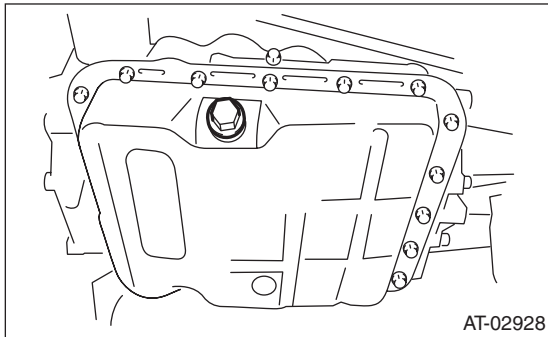
17. Control Valve Body

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from battery.
- 3) Lift-up the vehicle.
- 4) Clean the transmission exterior.
- 5) Remove the drain plug (ATF) and gasket to drain ATF.

CAUTION:

The ATF will be extremely hot after driving. Be careful not to receive burns.



- 6) Replace the gasket with new one, and then tighten the drain plug (ATF).

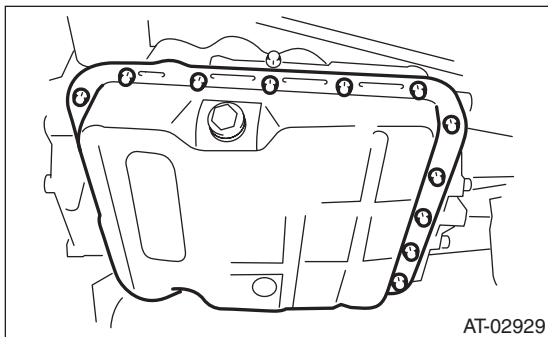
Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)

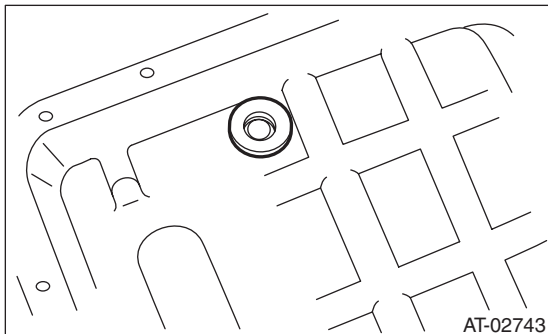
- 7) Remove the oil pan.

NOTE:

Be careful not to allow foreign matter such as dust or dirt to enter the oil pan.



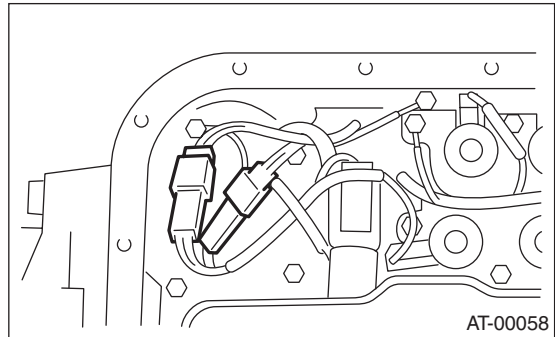
- 8) Remove the magnet.



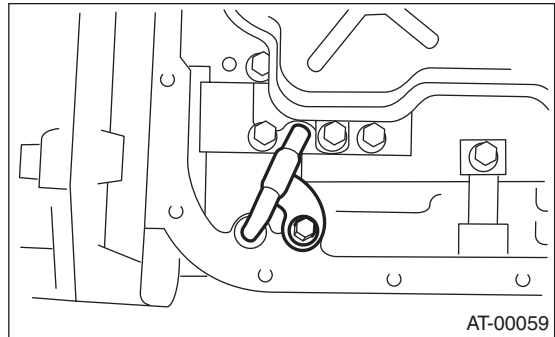
- 9) Clean the magnet.

- 10) Completely remove the remaining liquid gasket on the transmission case and oil pan.

- 11) Remove the control valve connector.



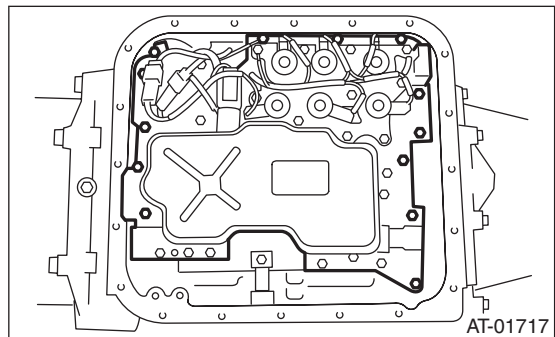
- 12) Remove the ATF cooler pipe.



- 13) Remove the control valve body.

NOTE:

The control valve body is replaced as an assembly only, because it is a non-disassembly part.

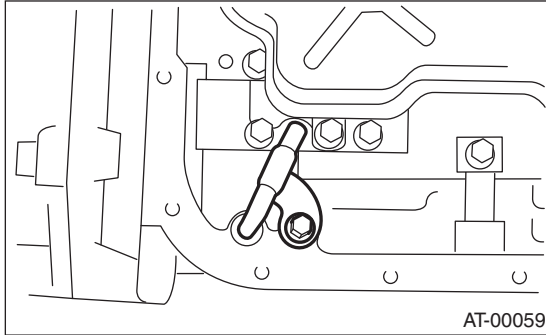


B: INSTALLATION

- 1) Check the control valve body for dust and other foreign matter.
- 2) Temporarily assembly the control valve body to transmission then install the oil cooler pipe.

Tightening torque:

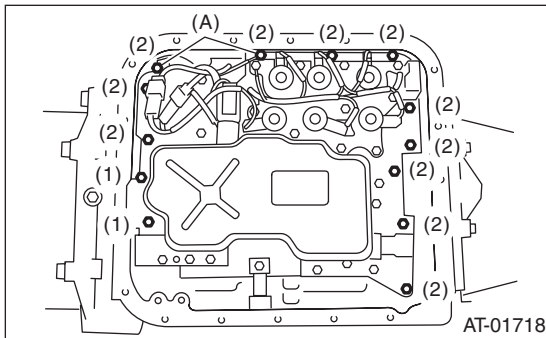
8 N·m (0.8 kgf·m, 5.8 ft-lb)



- 3) Tighten the bolts equally.

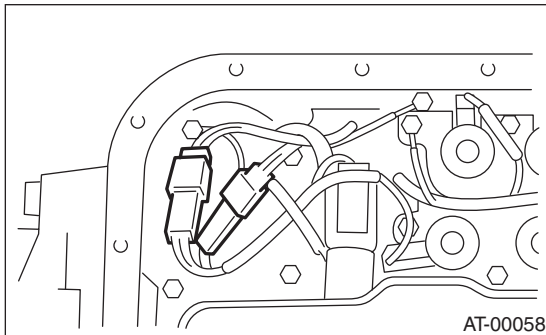
Tightening torque:

8 N·m (0.8 kgf·m, 5.8 ft-lb)

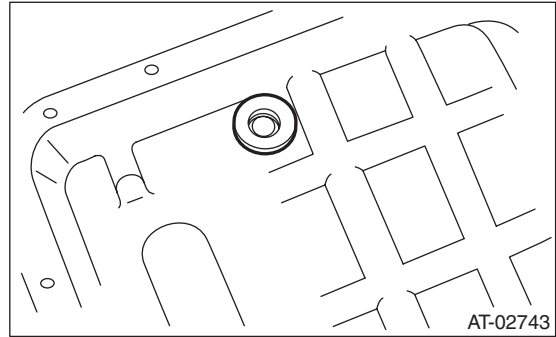


- (A) Transmission ground
- Bolt length mm (in)
- (1) 35 (1.38)
- (2) 30 (1.18)

- 4) Connect the control valve connector.



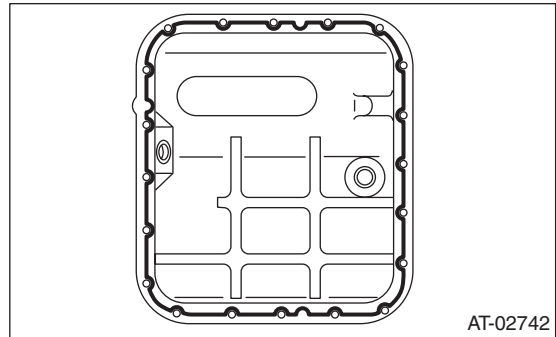
- 5) Attach the magnet at the specified position of the oil pan.



- 6) Apply proper amount of liquid gasket to the entire oil pan mating surface.

Liquid gasket:

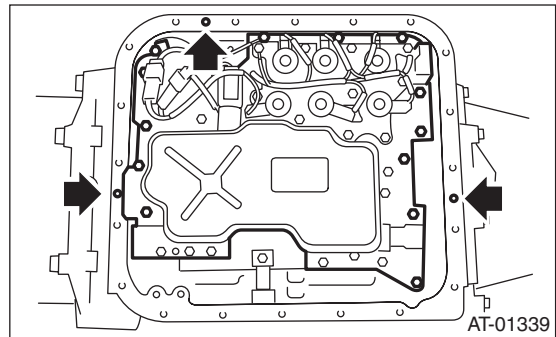
Three bond 1217B (Part No. K0877YA020) or equivalent



- 7) Fill the 3 holes aside from the bolt holes in the transmission case, with liquid gasket.

Liquid gasket:

Three bond 1217B (Part No. K0877YA020) or equivalent



- 8) Install the oil pan by equally tightening the bolts.

Tightening torque:

5 N·m (0.5 kgf·m, 3.6 ft-lb)

Control Valve Body

AUTOMATIC TRANSMISSION

9) Fill ATF from the oil charge pipe.

Recommended fluid:

SUBARU ATF HP

Substitute fluid:

IDEMITSU: ATF HP

Castrol: Transmax J

Pennzoil Quaker State: Pennzoil ATF-J

Capacity:

Fill with the same amount of fluid that was drained from the drain plug hole.

10) Bleed the air of control valve body. <Ref. to 4AT-59, Air Bleeding of Control Valve.>

11) Check the ATF level. <Ref. to 4AT-28, Automatic Transmission Fluid.>

12) Execute the learning control promotion. <Ref. to 4AT(D)(diag)-15, FACILITATION OF LEARNING CONTROL, OPERATION, Subaru Select Monitor.>

C: INSPECTION

Make sure there are no holes, bending damage or other foreign materials on each parts.

18. Air Bleeding of Control Valve

A: PROCEDURE

- 1) Operate the vehicle with the select lever moved to "P" range and parking brake applied.
- 2) Connect the Subaru Select Monitor to the vehicle.
- 3) Make sure there is no trouble code using the Subaru Select Monitor.
- 4) Using the Subaru Select Monitor, check that the ATF temperature is less than 60°C (140°F). <Ref. to 4AT(D)(diag)-14, READ CURRENT DATA, OPERATION, Subaru Select Monitor.>
- 5) Close the Subaru Select Monitor.
- 6) Turn the ignition switch to OFF.
- 7) Move the select lever to "R" range.
- 8) Depress the brake pedal fully until the air bleeding is completed.
- 9) Turn the ignition switch ON.
- 10) Move the select lever to "P" range, and then wait for more than 3 seconds.
- 11) Move the select lever to "R" range, and then wait for more than 3 seconds.
- 12) Move the select lever to "N" range, and then wait for more than 3 seconds.
- 13) Move the select lever to "D" range, and then wait for more than 3 seconds.
- 14) Move the select lever to "N" range, and then wait for more than 3 seconds.
- 15) Slowly depress the accelerator pedal fully open.
- 16) Slowly release the accelerator pedal to full close.
- 17) Start the engine.
- 18) Shift the select lever to "D" range.
- 19) Run the Subaru Select Monitor.
- 20) Select {Each System Check} in the Main Menu of the Subaru Select Monitor.
- 21) On the System Selection Menu display screen, select "Transmission". Air bleed of the control valve will start in the transmission. At this time, the AT oil temperature warning light in the combination meter start blinking at 2 Hz. When the AT oil temperature warning light does not blink, repeat the procedures from step 4).
- 22) Air bleed of the control valve is finished when the AT oil temperature warning light in the combination meter changes from blinking at 2 Hz to 0.5 Hz.

NOTE:

If the AT oil temperature warning light changes from blinking at 2 Hz to 4 Hz during the air bleed, repeat the procedure from step 4).

- 23) Move the select lever to the "N" range, and then turn the ignition switch OFF.

- 24) Move the select lever to the "P" range, and then finish the air bleed.

19.ATF Filter

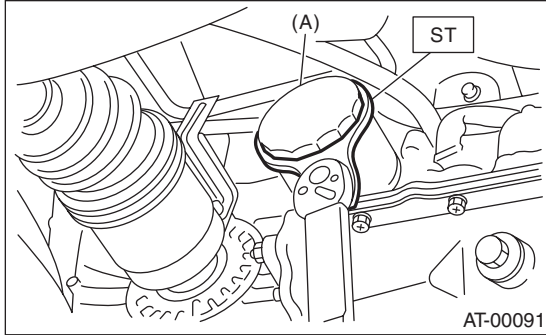
A: REMOVAL

NOTE:

The ATF filter is maintenance free.

- 1) Lift-up the vehicle.
- 2) Using the ST, remove the ATF filter.

ST 498545400 OIL FILTER WRENCH



(A) ATF filter

B: INSTALLATION

- 1) Apply a thin coat of ATF to the oil seal part of new ATF filter.
- 2) Install the ATF filter. Turn it by hand, being careful not to damage oil seal.
- 3) Tighten the ATF filter using ST.

Calculate the ATF filter tightening torque using following formula.

$$T2 = L2 / (L1 + L2) \times T1$$

T1: 14 N·m (1.4 kgf-m, 10.1 ft-lb)

[Required torque setting]

T2: Tightening torque

L1: ST length 78 mm (3.07 in)

L2: Torque wrench length

Example:

Torque wrench length mm (in)	Tightening torque N·m (kgf-m, ft-lb)
100 (3.94)	7.7 (0.79, 5.7)
150 (5.91)	9.0 (0.92, 6.7)
200 (7.87)	9.8 (1.0, 7.2)

NOTE:

Align the ST with the torque wrench while tightening the ATF filter.

ST 498545400 OIL FILTER WRENCH

- 4) Fill ATF.
- 5) Inspect the level of ATF. <Ref. to 4AT-28, Automatic Transmission Fluid.>

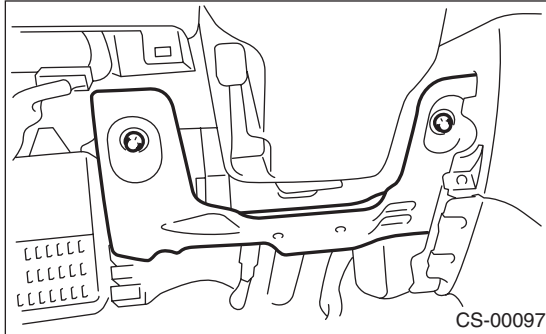
C: INSPECTION

- Replace the part if any damage is found in the inspection.
- Check for rust, holes, ATF leaks or other damage.

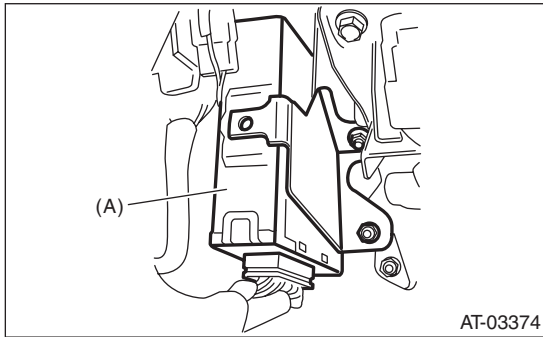
20. Transmission Control Module (TCM)

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the lower cover and then disconnect the connector.
- 3) Remove the knee bolster.



- 4) Disconnect the connector from TCM.



(A) Transmission control module (TCM)

- 5) Remove the TCM.

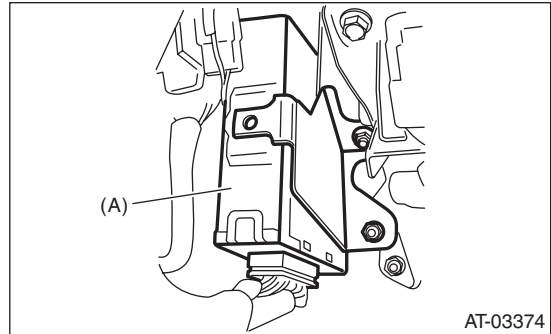
B: INSTALLATION

- 1) Install the TCM.

Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

- 2) Connect the connector to TCM.



(A) Transmission control module (TCM)

- 3) Install in the reverse order of removal.
- 4) Execute the learning control promotion. <Ref. to 4AT(D)(diag)-15, FACILITATION OF LEARNING CONTROL, OPERATION, Subaru Select Monitor.>

ATF Cooler Pipe and Hose

AUTOMATIC TRANSMISSION

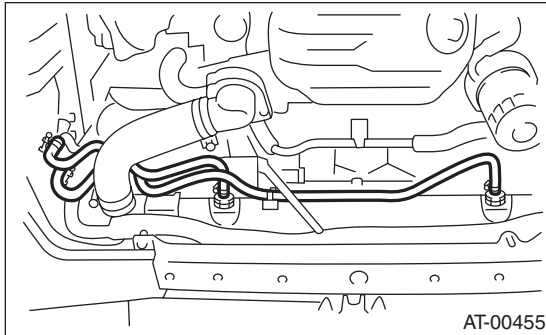
21. ATF Cooler Pipe and Hose

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Remove the battery and washer tank.
- 3) Lift-up the vehicle.
- 4) Remove the under cover.
- 5) Disconnect the ATF cooler hose from the radiator. (Turbo model)<Ref. to CO(H4SO)-28, TURBO MODEL, REMOVAL, Radiator.>
- 6) Disconnect the ATF cooler hose from the radiator. (Non-turbo model)

NOTE:

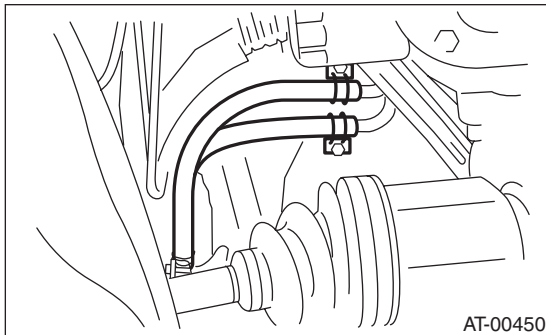
- Do not use a screwdriver or other pointed tools.
- If it is hard to remove the hose, wrap the hose with cloth to prevent from damaging it, and while turning with pliers, pull straight out by hand.



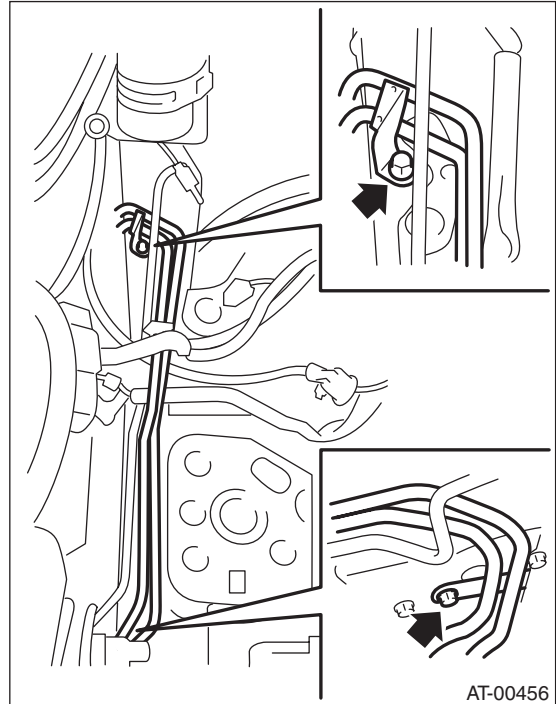
- 7) Disconnect the ATF cooler hoses from the pipes.

NOTE:

- Do not use a screwdriver or other pointed tools.
- If it is hard to remove the hose, wrap the hose with cloth to prevent from damaging it, and while turning with pliers, pull straight out by hand.



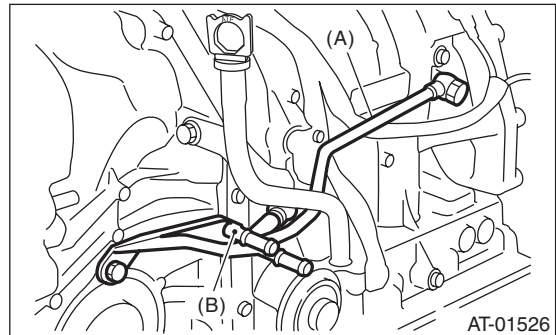
- 8) Disconnect the ATF cooler pipe from frame.



- 9) Remove the ATF cooler inlet and outlet pipes.

NOTE:

When separating the outlet pipe, do not lose the ball and spring used with retaining screw.



- (A) ATF cooler inlet pipe
(B) ATF cooler outlet pipe

B: INSTALLATION

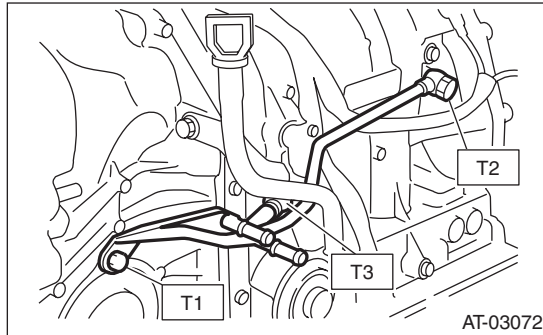
1) Install the ATF cooler inlet and outlet pipes with the new washer.

Tightening torque:

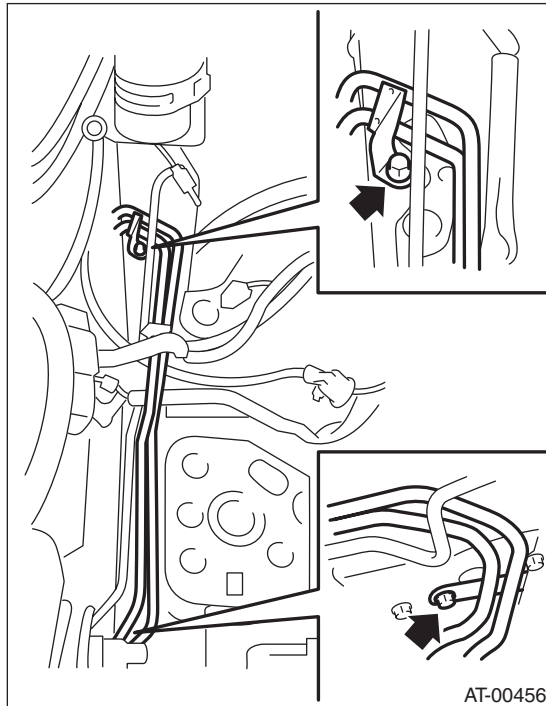
T1: 25 N·m (2.5 kgf·m, 18.1 ft·lb)

T2: 40 N·m (4.1 kgf·m, 29.5 ft·lb)

T3: 45 N·m (4.6 kgf·m, 33.2 ft·lb)



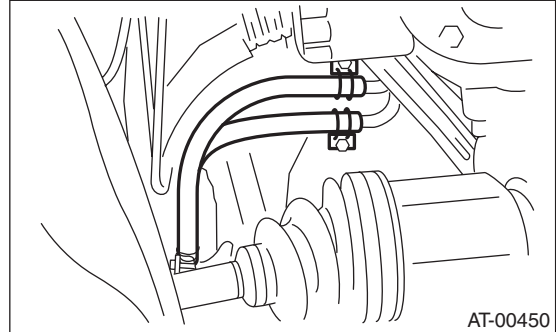
2) Install the ATF cooler pipe to frame.



3) Connect the ATF cooler hose to the pipe on the transmission side.

NOTE:

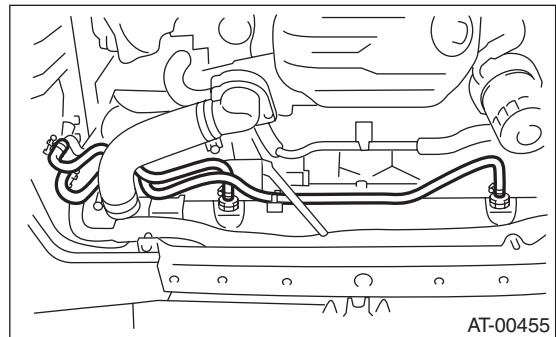
- Install so that the hose is not folded over, excessively bent or twisted.
- Insert the hose to the specified position.



4) Connect the ATF cooler hose to the pipe on the radiator side. (Non-turbo model)

NOTE:

- Install so that the hose is not folded over, excessively bent or twisted.
- Insert the hose to the specified position.



5) Connect the ATF cooler hose to the pipe on the radiator side. (Turbo model) <Ref. to CO(H4SO)-31, TURBO MODEL, INSTALLATION, Radiator.>

6) Install the under cover.

7) Install the battery and washer tank.

8) Fill ATF. <Ref. to 4AT-28, Automatic Transmission Fluid.>

NOTE:

Make sure there are no ATF leaks in joints between the transmission, radiator, pipes, and hoses.

ATF Cooler Pipe and Hose

AUTOMATIC TRANSMISSION

C: INSPECTION

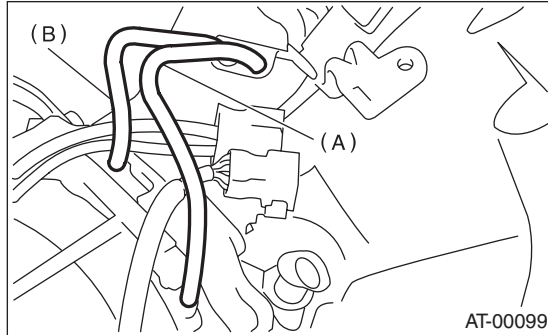
Repair or replace any faulty hoses, pipes, clamps, and washers found in the inspection below.

- 1) Check for ATF leaks in joints between the transmission, radiator, pipes, and hoses.
- 2) Check the clamp for deformation.
- 3) Lightly bend the hose and check for cracks in the surface and other damage.
- 4) Pinch the hose with your fingers and check for poor elasticity. Also check for poor elasticity in the parts where the clamp was installed by pressing with your fingernail.
- 5) Check for peeling, cracks, and deformation at the tip of the hose.

22. Air Breather Hose

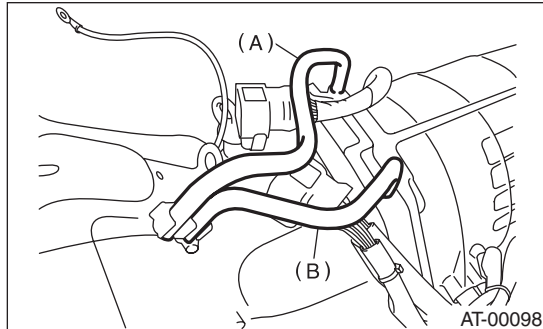
A: REMOVAL

- 1) Remove the air intake chamber. (Non-turbo model)
<Ref. to IN (H4SO)-6, REMOVAL, Air Intake Chamber.>
- 2) Remove the intercooler. (Turbo model)
<Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 3) Disconnect the air breather hose.
 - Non-turbo model



- (A) Air breather hose (Transmission case)
- (B) Air breather hose (Oil pump housing)

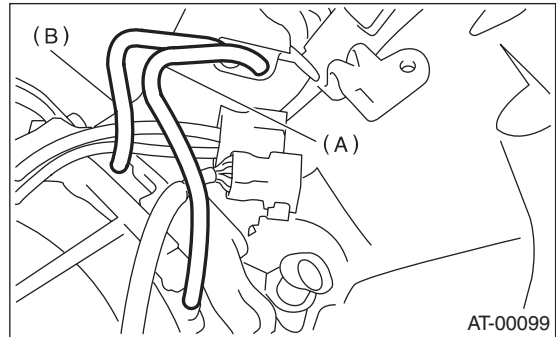
- Turbo model



- (A) Air breather hose (Transmission case)
- (B) Air breather hose (Oil pump housing)

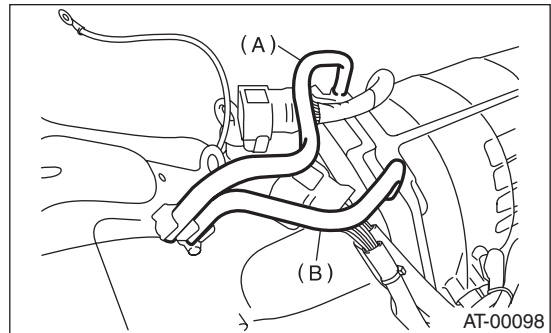
B: INSTALLATION

- 1) Install the air breather hose.
 - Non-turbo model



- (A) Air breather hose (Transmission case)
- (B) Air breather hose (Oil pump housing)

- Turbo model



- (A) Air breather hose (Transmission case)
- (B) Air breather hose (Oil pump housing)

- 2) Install the air intake chamber. (Non-turbo model)
<Ref. to IN (H4SO)-6, INSTALLATION, Air Intake Chamber.>
- 3) Install the intercooler. (Turbo model)
<Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

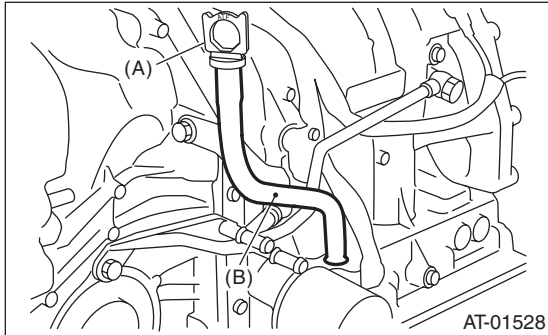
C: INSPECTION

Make sure the hose is not cracked or clogged.

23.Oil Charge Pipe

A: REMOVAL

- 1) Remove the air intake chamber. (Non-turbo model)
<Ref. to IN (H4SO)-6, REMOVAL, Air Intake Chamber.>
- 2) Remove the intercooler. (Turbo model)
<Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 3) Remove the oil charge pipe, and then remove the O-ring from the flange side.



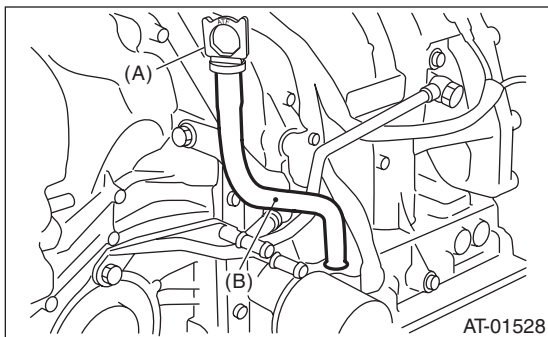
- (A) ATF level gauge
- (B) Oil charge pipe

B: INSTALLATION

- 1) Install the oil charge pipe with a new O-ring.

Tightening torque:

41 N·m (4.2 kgf·m, 30.4 ft·lb)



- (A) ATF level gauge
- (B) Oil charge pipe

- 2) Install the air intake chamber. (Non-turbo model)
<Ref. to IN (H4SO)-6, INSTALLATION, Air Intake Chamber.>
- 3) Install the intercooler. (Turbo model)
<Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

C: INSPECTION

Make sure the oil charge pipe is not deformed or damaged.

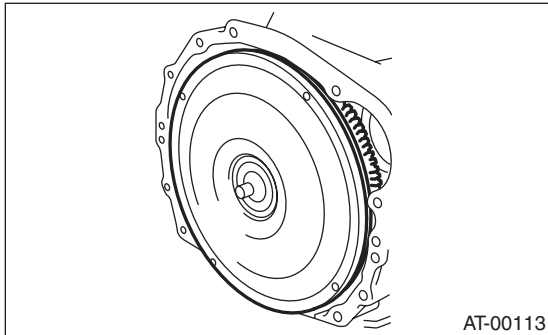
24. Torque Converter Clutch Assembly

A: REMOVAL

- 1) Remove the transmission assembly from vehicle body. <Ref. to 4AT-37, REMOVAL, Automatic Transmission Assembly.>
- 2) Pull out the torque converter assembly and oil pump shaft horizontally.

NOTE:

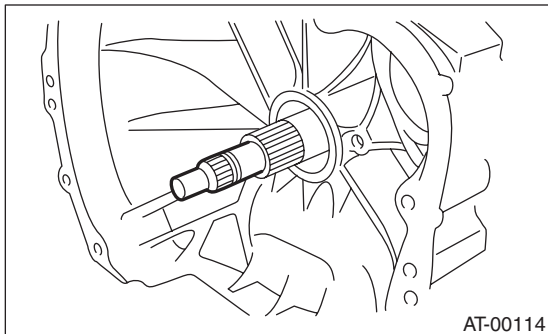
Do not scratch the inner surface of the bushing in oil pump shaft.



- 3) Remove the input shaft.

NOTE:

When the torque converter clutch assembly is removed, the input shaft will also come off.



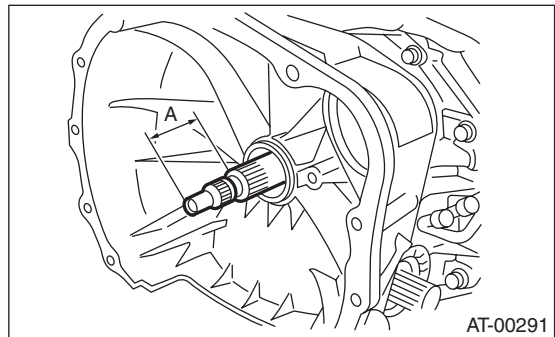
- 4) Remove the clip from torque converter clutch assembly.

B: INSTALLATION

- 1) Install the clip to the converter case.
- 2) Install the oil pump shaft to the torque converter clutch assembly, and then make sure the clip is secured on the groove.
- 3) Insert the input shaft while rotating it lightly by hand, and then check the amount of protrusion.

Normal protrusion A:

50 — 55 mm (1.97 — 2.17 in)

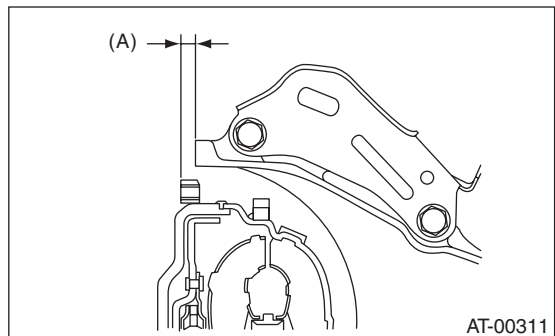


- 4) While holding the torque converter clutch assembly by hand, carefully install it to the torque converter case. Take care not to damage the bushing. Do not allow the oil pump shaft bushing to touch the starter shaft part of the oil pump cover inappropriately.

- 5) Turn the oil pump shaft lightly by hand to engage the spline securely, and then check the converter case and torque converter clutch assembly dimension A.

Dimension A:

2.7 — 2.9 mm (0.106 — 0.114 in)



(A) Dimension A

- 6) Install the transmission assembly to the vehicle. <Ref. to 4AT-40, INSTALLATION, Automatic Transmission Assembly.>

C: INSPECTION

Make sure the ring gear and protrusion of the torque converter clutch end are not deformed or damaged.

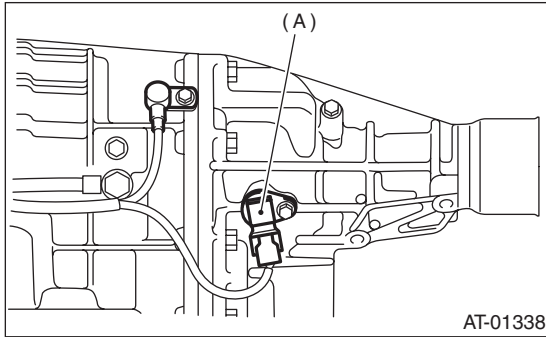
Extension Case

AUTOMATIC TRANSMISSION

25.Extension Case

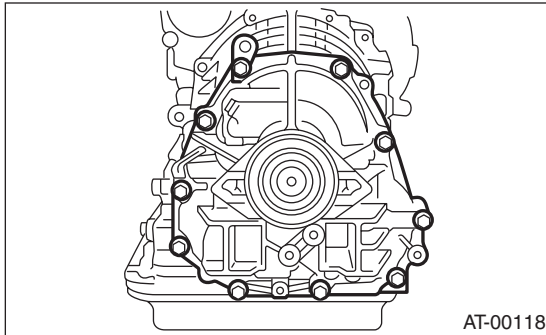
A: REMOVAL

- 1) Remove the transmission assembly.
<Ref. to 4AT-37, REMOVAL, Automatic Transmission Assembly.>
- 2) Remove the rear vehicle speed sensor.



(A) Rear vehicle speed sensor

- 3) Separate the transmission case and extension case section.



B: INSTALLATION

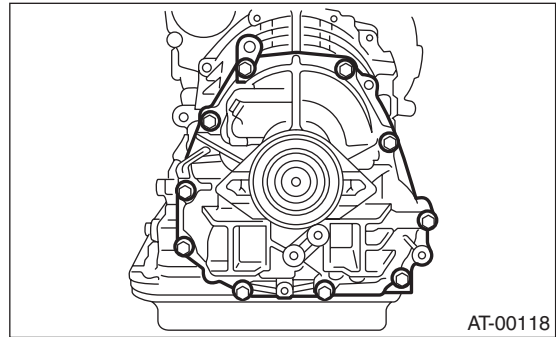
- 1) Apply vaseline to the selected thrust needle bearing, and install to the reduction drive gear end surface. <Ref. to 4AT-76, ADJUSTMENT, Transfer Clutch.>

NOTE:

- Install the thrust needle bearing in the correct direction.
- 2) Install a new gasket.
 - 3) Install the extension case to transmission case.
 - 4) Tighten bolts to secure the extension case.

Tightening torque:

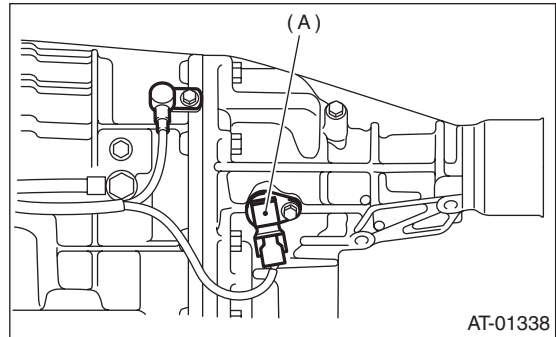
25 N·m (2.5 kgf·m, 18.1 ft-lb)



- 5) Install the rear vehicle speed sensor.

Tightening torque:

7 N·m (0.7 kgf·m, 5.1 ft-lb)



(A) Rear vehicle speed sensor

- 6) Install the transmission assembly.
<Ref. to 4AT-40, INSTALLATION, Automatic Transmission Assembly.>

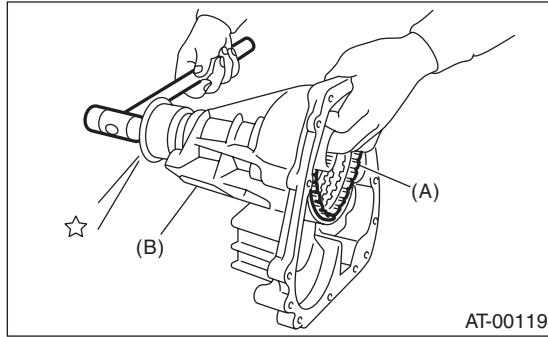
C: DISASSEMBLY

1. MP-T MODEL

1) Take out the transfer clutch assembly by lightly tapping the end of rear drive shaft with a plastic hammer.

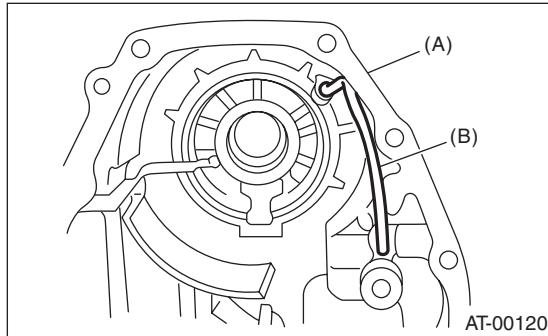
NOTE:

Be careful not to damage the oil seal of the extension.



- (A) Extension case
- (B) Transfer clutch assembly

2) Remove the transfer clutch pipe without bending the pipe.



- (A) Extension case
- (B) Transfer clutch pipe

- 3) Remove the dust cover from extension case.
- 4) Remove the oil seal from the extension case.

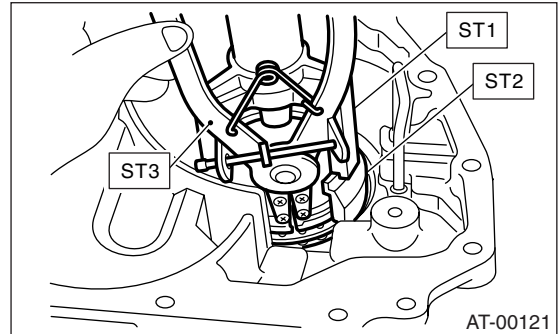
2. VTD MODEL

1) Extract the circlip with ST1, ST2 and ST3 and the press.

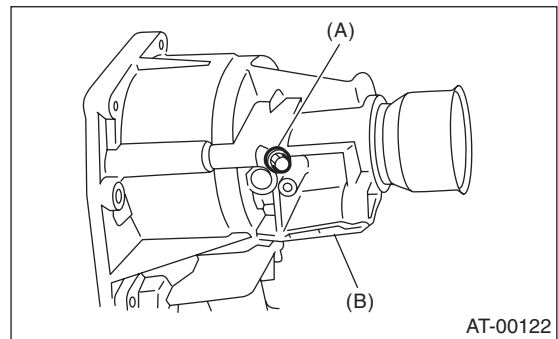
ST1 398673600 COMPRESSOR

ST2 498627100 SEAT

ST3 398663600 PLIERS

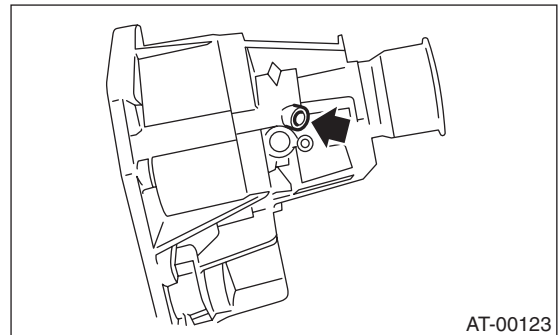


2) Remove the test plug.



- (A) Test plug
- (B) Extension case

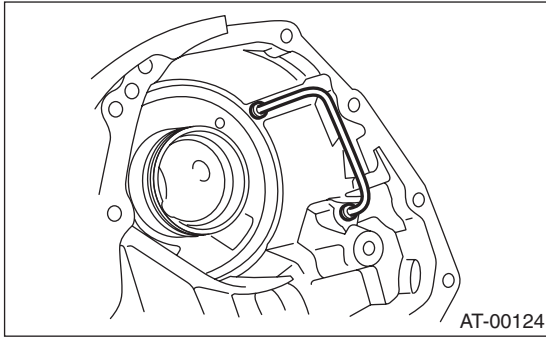
3) Remove the clutch piston using compressed air.



Extension Case

AUTOMATIC TRANSMISSION

- 4) Remove the transfer clutch pipe without bending the pipe.

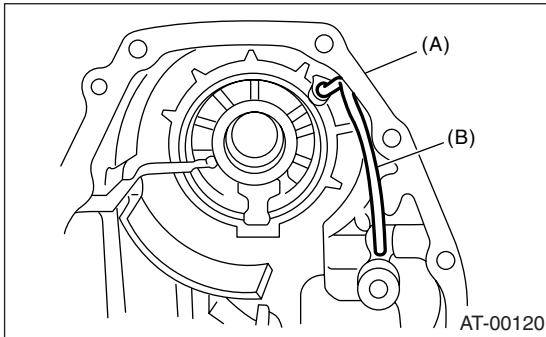


- 5) Remove the dust cover from extension case.
- 6) Remove the oil seal from the extension case.

D: ASSEMBLY

1. MP-T MODEL

- 1) Press-fit the new oil seal using ST and the press. ST 498057300 INSTALLER
- 2) Press-fit the dust cover.
- 3) Install the transfer clutch pipe to the extension case without bending the pipe.

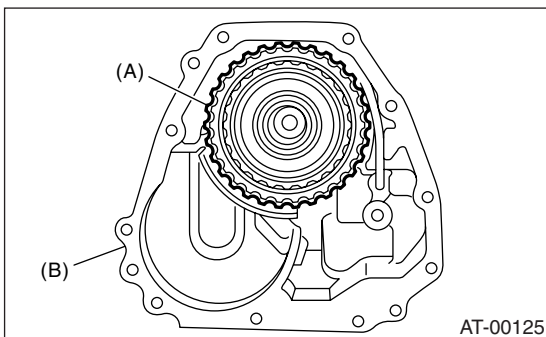


- (A) Extension case
(B) Transfer clutch pipe

- 4) Install the transfer clutch assembly to the case.

NOTE:

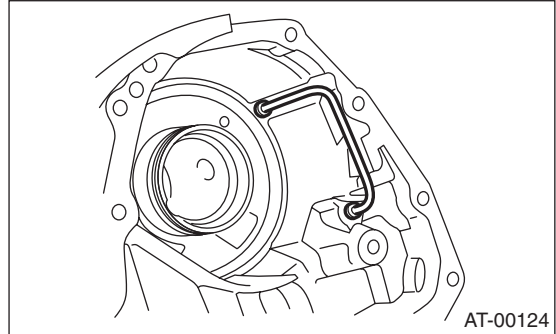
- Be careful not to damage the seal ring.
- Press-fit the transfer clutch assembly to bottom of bearing shoulder completely.



- (A) Transfer clutch assembly
(B) Extension case

2. VTD MODEL

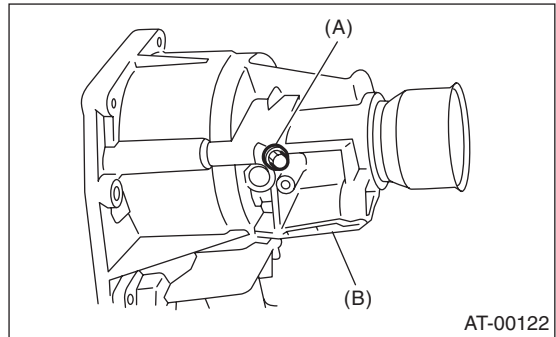
- 1) Press-fit the new oil seal using ST and the press. ST 498057300 INSTALLER
- 2) Press-fit the dust cover.
- 3) Install the transfer clutch pipe to the extension case without bending the pipe.



- 4) Install the test plug.

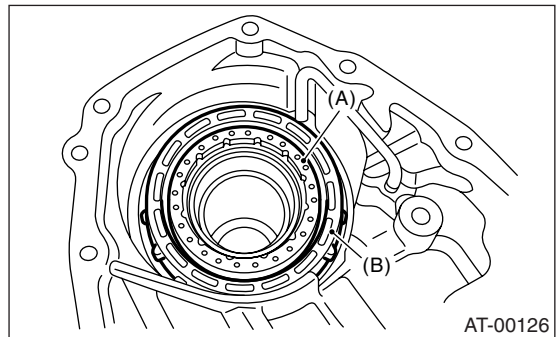
Tightening torque:

13 N·m (1.3 kgf-m, 9.4 ft-lb)



- (A) Test plug
(B) Extension case

- 5) Insert the multi-plate clutch, drive plate, driven plate and spring retainer.



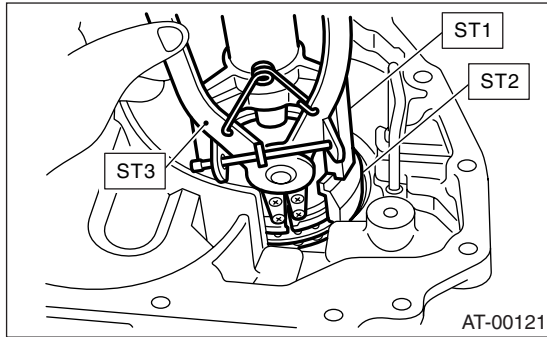
- (A) Spring retainer
(B) Multi-plate clutch (LSD) piston ASSY

6) Install the circlip using ST1, ST2 and ST3.

ST1 398673600 COMPRESSOR

ST2 498627100 SEAT

ST3 398663600 PLIERS



E: INSPECTION

- Use an air compressor to check that the transfer pipe and extension case routes are not clogged and are not leaking.
- Inspect the extension end play, and adjust it to be within the standard value. <Ref. to 4AT-76, ADJUSTMENT, Transfer Clutch.>

(Model with MP-T)

<Ref. to 4AT-76, MP-T MODEL, ADJUSTMENT, Transfer Clutch.>

(Model with VDC)

<Ref. to 4AT-76, VTD MODEL, ADJUSTMENT, Transfer Clutch.>

Transfer Clutch

AUTOMATIC TRANSMISSION

26. Transfer Clutch

A: REMOVAL

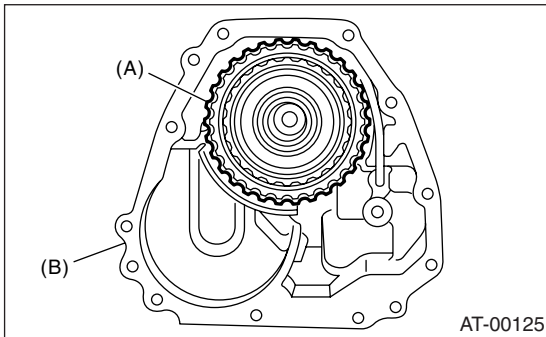
1) Remove the transmission assembly from vehicle body. <Ref. to 4AT-37, REMOVAL, Automatic Transmission Assembly.>

2) Remove the extension case, and take out the transfer clutch assembly. <Ref. to 4AT-68, REMOVAL, Extension Case.> <Ref. to 4AT-69, DISASSEMBLY, Extension Case.>

B: INSTALLATION

1) Select the thrust needle bearing. <Ref. to 4AT-76, ADJUSTMENT, Transfer Clutch.>

2) Install the transfer clutch assembly to the case.

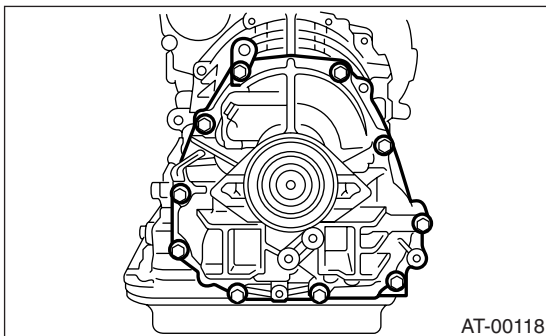


(A) Transfer clutch assembly
(B) Extension case

3) Tighten the bolts to secure the case.

Tightening torque:

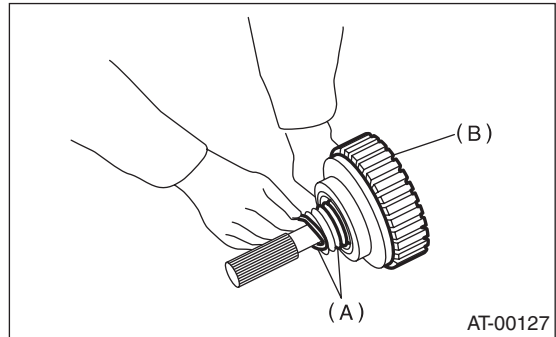
25 N·m (2.5 kgf·m, 18.1 ft·lb)



4) Install the transmission assembly to the vehicle. <Ref. to 4AT-40, INSTALLATION, Automatic Transmission Assembly.>

C: DISASSEMBLY

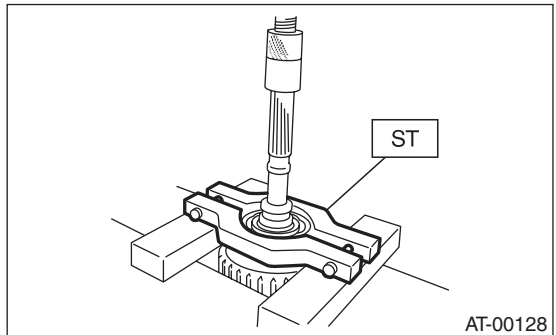
1) Remove the seal ring.



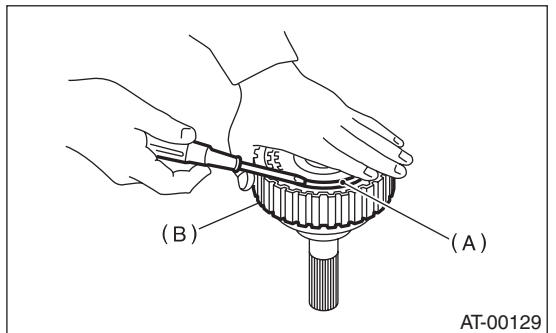
(A) Seal ring
(B) Rear drive shaft

2) Remove the ball bearing using the ST and the press.

ST 498077600 REMOVER



3) Use a flat tip screwdriver to remove the snap ring, and then take out the pressure plate, retaining plate, drive plate and driven plate.



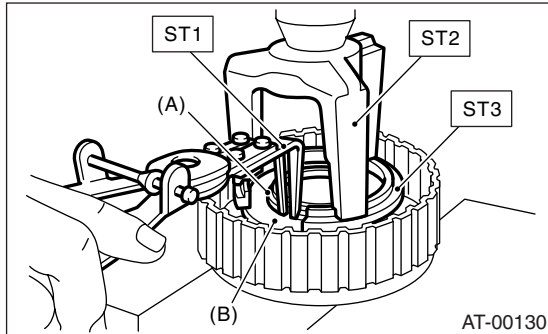
(A) Snap ring
(B) Rear drive shaft

Transfer Clutch

AUTOMATIC TRANSMISSION

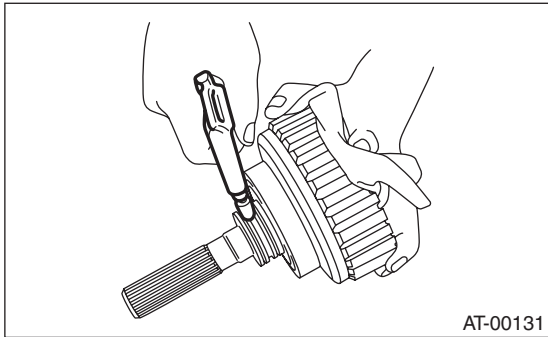
4) Using the ST1, ST2 and ST3, remove the snap ring, then take out the return spring and transfer clutch piston seal.

ST1 399893600 PLIERS
ST2 398673600 COMPRESSOR
ST3 398623600 SEAT



(A) Snap ring
(B) Transfer clutch piston seal

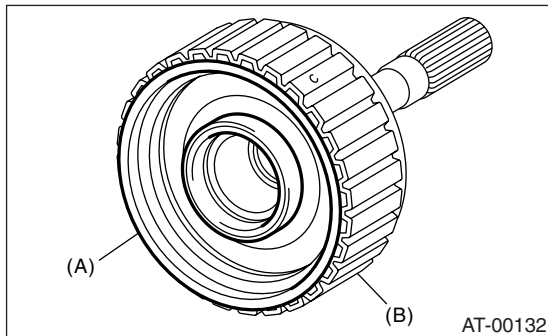
5) Use an air compressor to blow compressed air from the rear drive shaft to remove the transfer clutch piston.



AT-00131

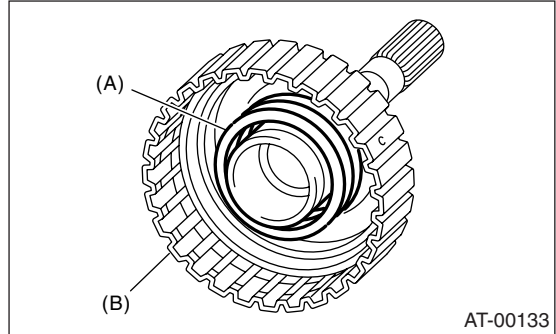
D: ASSEMBLY

1) Install the transfer clutch piston.



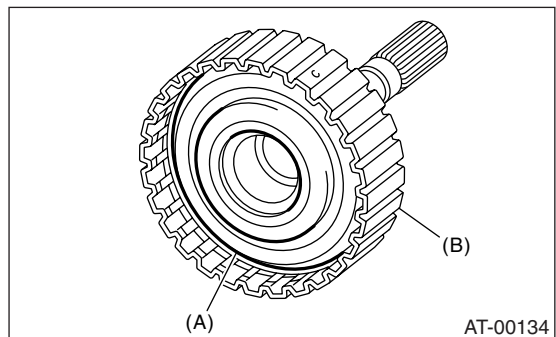
(A) Transfer clutch piston
(B) Rear drive shaft

2) Install the return spring to transfer clutch piston.



(A) Return spring
(B) Rear drive shaft

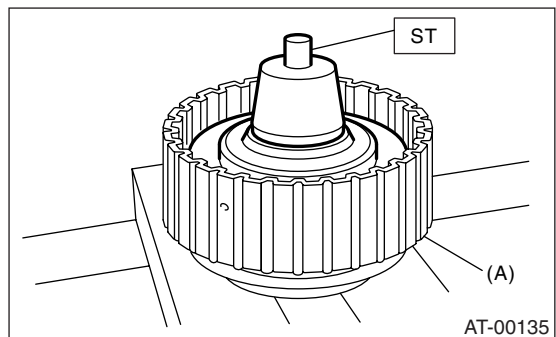
3) Install the transfer clutch piston seal.



(A) Transfer clutch piston seal
(B) Rear drive shaft

4) Attach the ST to the rear drive shaft.

ST 499257300 SNAP RING OUTER GUIDE

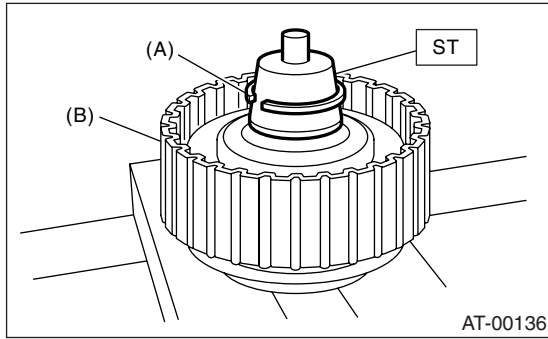


(A) Rear drive shaft

Transfer Clutch

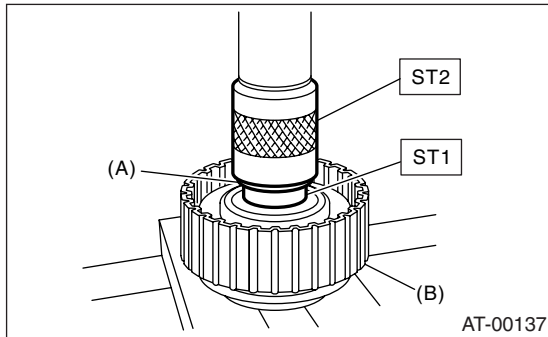
AUTOMATIC TRANSMISSION

5) Install the snap ring to the ST.
ST 499257300 SNAP RING OUTER GUIDE



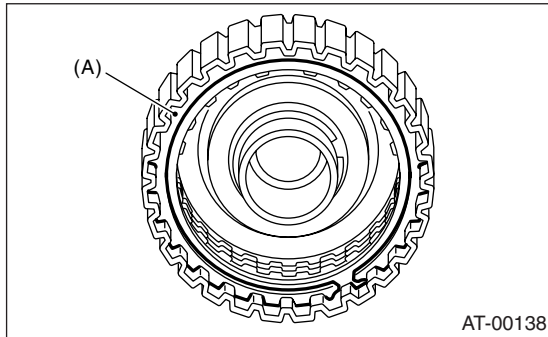
(A) Snap ring
(B) Transfer clutch

6) Install the snap ring to the rear drive shaft using ST1 and ST2.
ST1 499257300 SNAP RING OUTER GUIDE
ST2 499247400 INSTALLER



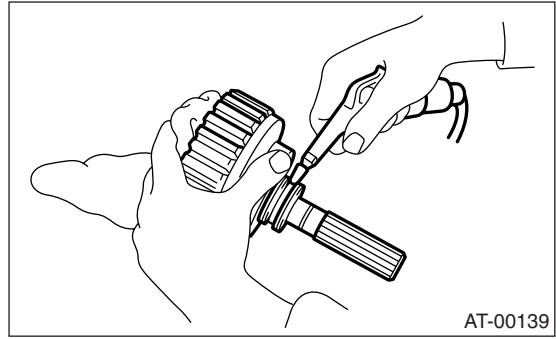
(A) Snap ring
(B) Transfer clutch

7) Install the drive plate, driven plate, pressure plate, retaining plate and snap ring.



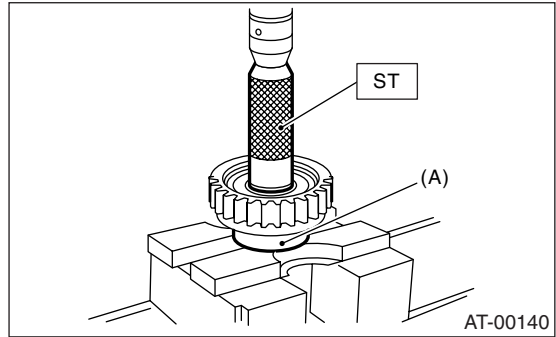
(A) Snap ring

8) Use an air compressor to apply compressed air to see if the assembled parts move smoothly.



9) Check clearance between the snap ring and pressure plate. <Ref. to 4AT-75, INSPECTION, Transfer Clutch.>

10) Press-fit new ball bearing using ST.
ST 899580100 INSTALLER

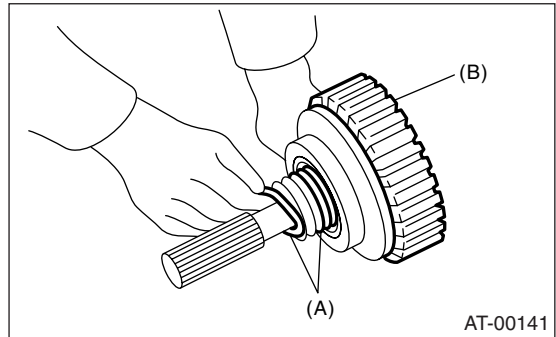


(A) Ball bearing

11) Apply vaseline to a new seal ring and attach to the seal ring groove of the rear drive shaft.

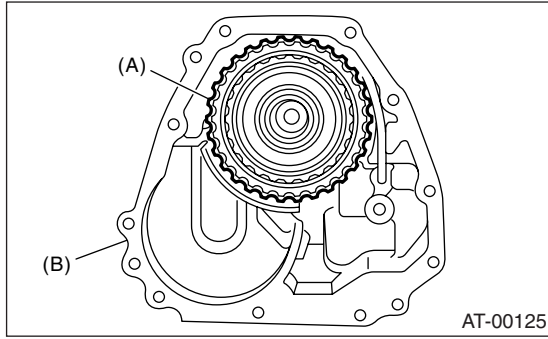
NOTE:

While installing the seal ring, not to stretch the seal ring excessively.



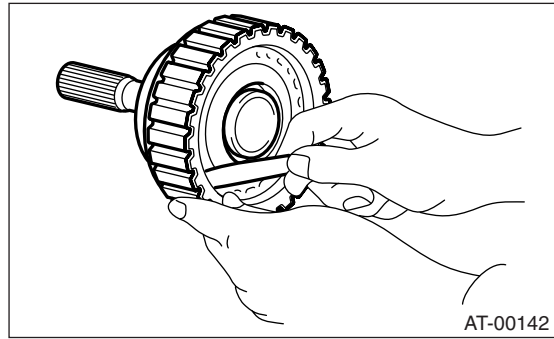
(A) Seal ring
(B) Rear drive shaft

12) Install the transfer clutch assembly while taking care not to damage the seal ring.



(A) Transfer clutch assembly
(B) Extension case

Limit thickness:
1.6 mm (0.063 in)



E: INSPECTION

- Inspect the drive plate surface for wear and damage.
- Make sure the snap ring is not worn and the return spring has no permanent distortion, damage, or deformation.
- Inspect the D-ring for damage.
- Inspect the extension end play, and adjust it to be within the standard value.

MP-T MODEL <Ref. to 4AT-76, MP-T MODEL, ADJUSTMENT, Transfer Clutch.>

VTD MODEL <Ref. to 4AT-76, VTD MODEL, ADJUSTMENT, Transfer Clutch.>

1) Check clearance between the snap ring and pressure plate.

2) Before measuring clearance, place same thickness shims on both sides to prevent the pressure plate from tilting.

3) If the clearance exceeds the service limits, replace the driven plate and select and adjust the retaining plate to be within the initial standard value.

Initial standard:

0.7 — 1.1 mm (0.028 — 0.043 in)

Retaining plate	
Part No.	Thickness mm (in)
31593AA151	3.3 (0.130)
31593AA161	3.7 (0.146)
31593AA171	4.1 (0.161)
31593AA181	4.5 (0.177)

4) Check for tight corner braking phenomenon when the vehicle is moved forward with the steering fully turned. If tight corner braking occurs, perform the following procedures.

(1) With the steering wheel held at fully turned position, drive the vehicle in "D" range and with vehicle speed at approx. 5 km/h (3 MPH) in both clockwise and counterclockwise directions for approx. ten times each, while repeating acceleration and braking intermittently.

(2) If the tight corner braking phenomenon still persists, drive the vehicle again in a circle for several laps.

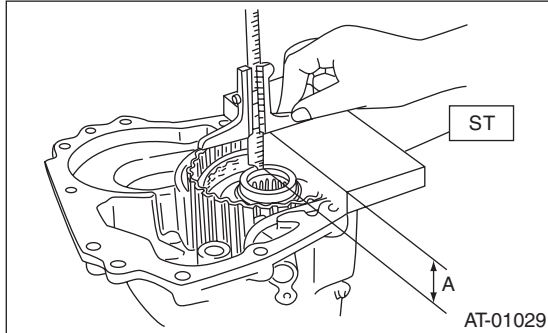
Transfer Clutch

AUTOMATIC TRANSMISSION

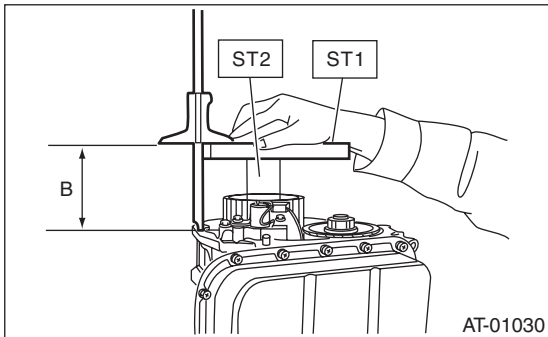
F: ADJUSTMENT

1. MP-T MODEL

- 1) Measure the distance "A" from the end of ST to the rear drive shaft using ST.
 ST 398643600 GAUGE



- 2) Measure the distance "B" from the transmission case end to the end of ST using ST1 and ST2.
 ST1 398643600 GAUGE
 ST2 499577000 GAUGE



- 3) Calculation formula:

$$T = A - B + 35.4 \text{ mm}$$

$$[T = A - B + 1.3937 \text{ in}]$$

T: Thrust needle bearing thickness

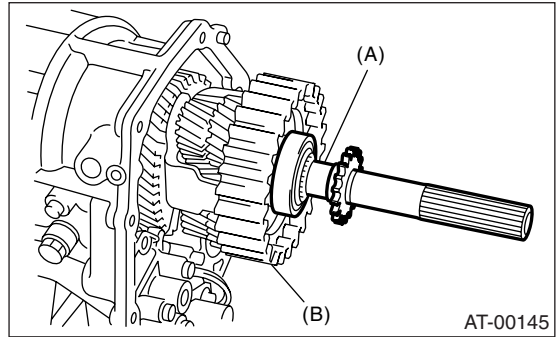
A: Distance from the end of the ST to end of rear drive shaft

B: Distance from the end of the transmission case to the end of the ST

Thrust needle bearing	
Part No.	Thickness mm (in)
806536020	3.8 (0.150)
806535030	4.0 (0.157)
806535040	4.2 (0.165)
806535050	4.4 (0.173)
806535060	4.6 (0.181)
806535070	4.8 (0.189)
806535090	5.0 (0.197)

2. VTD MODEL

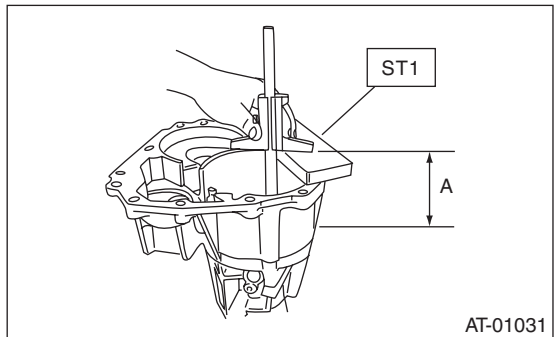
- 1) Insert the rear drive shaft into the reduction drive gear and center differential assembly.



(A) Rear drive shaft

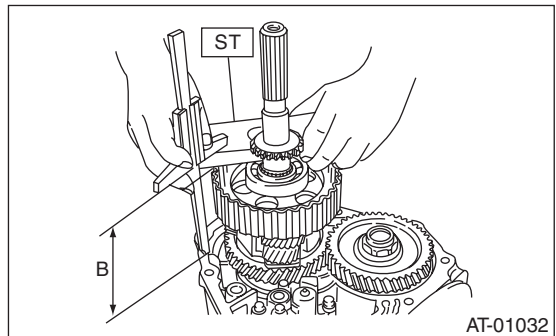
(B) Center differential carrier

- 2) Using the ST, measure the distance "L" from the end of the ST to the rear drive shaft ball bearing outer ring contact surface.
 ST 398643600 GAUGE



A Measured value

- 3) Measure the distance "B" from the transmission case mating surface to the end surface of the ST using the ST.
 ST 398643600 GAUGE



B Measured value

4) Calculation formula:

Calculate "T":

When the clearance is 0.05 mm (0.0020 in), select up to four adjusting shims from the table, according to the clearance value.

When clearance is 0.05 mm (0.0020 in)

$$T = A - B + 0.40 \text{ mm}$$

$$[T = A - B + 0.0157 \text{ in}]$$

When clearance is 0.25 mm (0.0098 in)

$$T = A - B + 0.20 \text{ mm}$$

$$[T = A - B + 0.0079 \text{ in}]$$

T: Shim clearance

A: Distance from the end of extension case to the rear drive shaft ball bearing outer ring contact surface

B: Distance from the end of the transmission case to the end of the ST

T: Shim thickness

0.05 — 0.25 mm (0.0020 — 0.0098 in)

Adjustment shim	
Part No.	Thickness mm (in)
33281AA001	0.2 (0.008)
33281AA011	0.5 (0.020)

Multi-plate Clutch

AUTOMATIC TRANSMISSION

27. Multi-plate Clutch

A: REMOVAL

Remove the multi-plate clutch following the same instructions as for the extension case. <Ref. to 4AT-68, REMOVAL, Extension Case.>

B: INSTALLATION

Install the multi-plate clutch following the same instructions as for the extension case. <Ref. to 4AT-68, INSTALLATION, Extension Case.>

C: INSPECTION

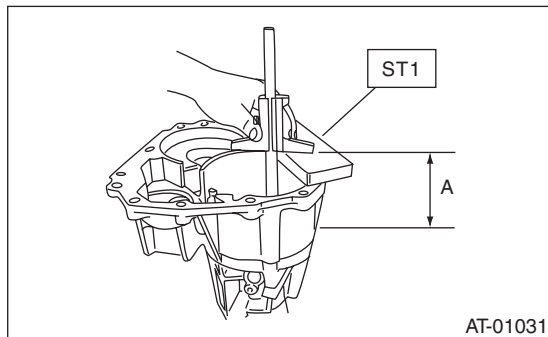
- Inspect the drive plate facing for wear and damage.
- Make sure the snap ring is not worn and the return spring has no permanent distortion, damage, or deformation.
- Inspect the D-ring for damage.
- Measure the clearance of the multi-plate clutch and check if it does not exceed the limit thickness. <Ref. to 4AT-78, ADJUSTMENT, Multi-plate Clutch.>

D: ADJUSTMENT

1) Install the drive plate and driven plate to the center differential carrier.

2) Measure the distance "A" from the end of ST to the multi plate clutch piston using ST.

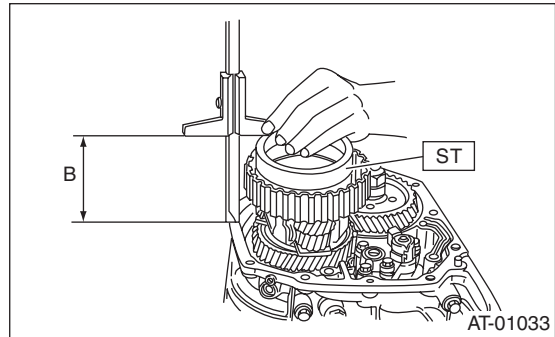
ST 398643600 GAUGE



A Measured value

3) Using the ST, measure the height "B" from the transmission case mating surface to end of ST.

ST 398744300 PISTON GUIDE



B Measured value

4) Calculation formula:

$$T = A - B + 0.45 \text{ mm}$$

$$[T = A - B + 0.0177 \text{ in}]$$

Initial standard:

0.2 — 0.6 mm (0.008 — 0.024 in)

Limit thickness:

1.6 mm (0.063 in)

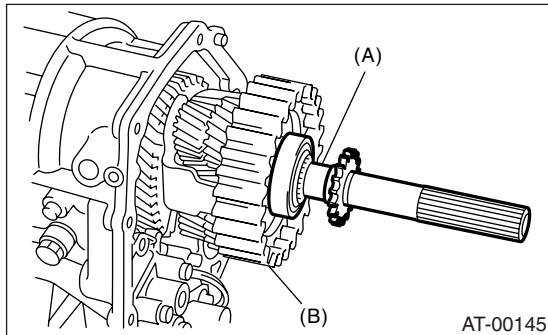
If the clearance exceeds the limit thickness, replace the plate set (drive and driven plate). Select a multi-plate clutch piston driven plate that will bring clearance within the default standard value.

Driven plate	
Part No.	Thickness mm (in)
31589AA041	1.6 (0.063)
31589AA050	2.0 (0.079)
31589AA060	2.4 (0.094)
31589AA070	2.8 (0.110)

28.Rear Drive Shaft

A: REMOVAL

- 1) Remove the transmission assembly from vehicle body. <Ref. to 4AT-37, REMOVAL, Automatic Transmission Assembly.>
- 2) Remove the rear wheel speed sensor, and separate the extension case from transmission case. <Ref. to 4AT-68, REMOVAL, Extension Case.>
- 3) Pull out the rear driveshaft from center differential assembly.



- (A) Rear drive shaft
(B) Center differential carrier

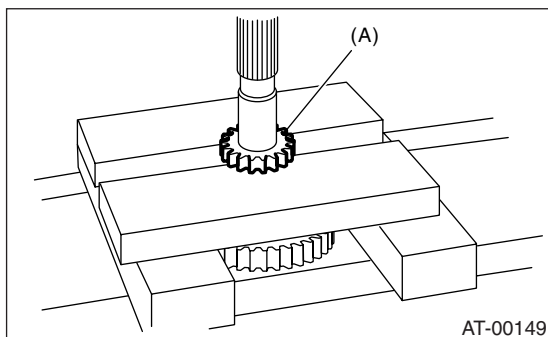
- 4) Remove the drive plate and driven plate.

B: INSTALLATION

- 1) Select the shim. <Ref. to 4AT-76, VTD MODEL, ADJUSTMENT, Transfer Clutch.>
- 2) Install drive plate and driven plate.
- 3) Insert the rear driveshaft into the center differential assembly.
- 4) Join the transmission case and the extension case, and then install the rear vehicle speed sensor. <Ref. to 4AT-68, INSTALLATION, Extension Case.>
- 5) Install the transmission assembly to the vehicle. <Ref. to 4AT-40, INSTALLATION, Automatic Transmission Assembly.>

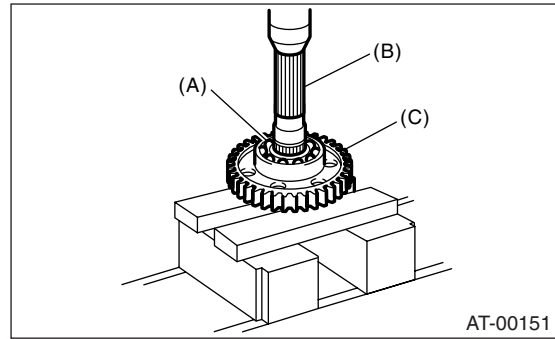
C: DISASSEMBLY

- 1) Using a press, remove the revolution gear.



- (A) Revolution gear

- 2) Using a press, remove the front and rear side ball bearings and clutch hub.



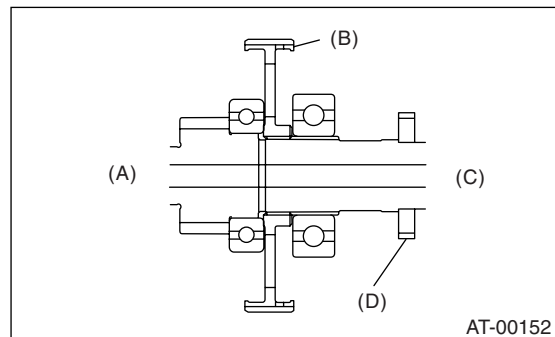
- (A) Rear ball bearing
(B) Rear drive shaft
(C) Clutch hub

D: ASSEMBLY

Assemble in the reverse order of disassembly.

NOTE:

- Use new ball bearings and revolution gear.
- Make sure the clutch hub is facing the correct direction.



- (A) Front side
(B) Clutch hub
(C) Rear side
(D) Revolution gear

E: INSPECTION

- Make sure there are no holes, cutting damage or other foreign materials on each parts.
- Inspect the extension end play, and adjust it to within the standard value. <Ref. to 4AT-76, VTD MODEL, ADJUSTMENT, Transfer Clutch.>

Reduction Driven Gear

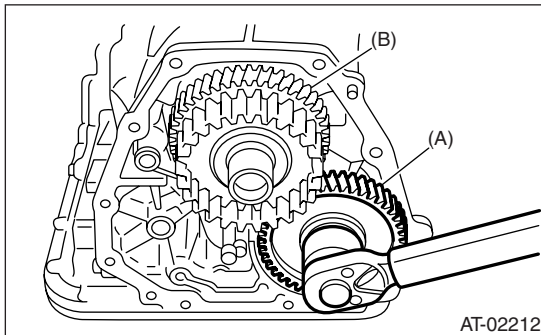
AUTOMATIC TRANSMISSION

29.Reduction Driven Gear

A: REMOVAL

1. MP-T MODEL

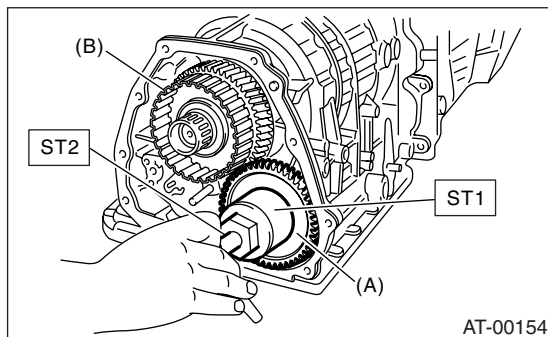
- 1) Remove the transmission assembly from vehicle body. <Ref. to 4AT-37, REMOVAL, Automatic Transmission Assembly.>
- 2) Remove the rear wheel speed sensor, and separate the extension case from transmission case. <Ref. to 4AT-68, REMOVAL, Extension Case.>
- 3) Set the select lever to "P" range.
- 4) Lift the crimped section, and then remove the lock nut.



- (A) Reduction driven gear
(B) Reduction drive gear

- 5) Using the ST1 and ST2, extract the reduction driven gear assembly.

ST1 499737000 PULLER
ST2 899524100 PULLER SET

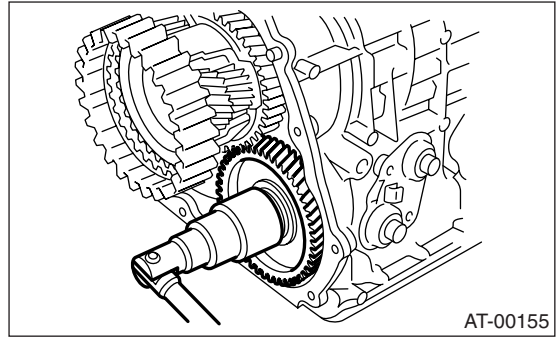


- (A) Reduction driven gear assembly
(B) Reduction drive gear assembly

2. VTD MODEL

- 1) Remove the transmission assembly from vehicle body. <Ref. to 4AT-37, REMOVAL, Automatic Transmission Assembly.>
- 2) Remove the rear wheel speed sensor, and separate the extension case from transmission case. <Ref. to 4AT-68, REMOVAL, Extension Case.>
- 3) Remove the rear drive shaft. <Ref. to 4AT-79, REMOVAL, Rear Drive Shaft.>
- 4) Set the select lever to "P" range.

- 5) Lift the crimped section, and then remove the lock nut.



- 6) Using the ST1 and ST2, extract the reduction driven gear.

ST1 499737000 PULLER
ST2 899524100 PULLER SET

- 7) Pull out the center differential assembly. <Ref. to 4AT-84, REMOVAL, Center Differential Carrier.>

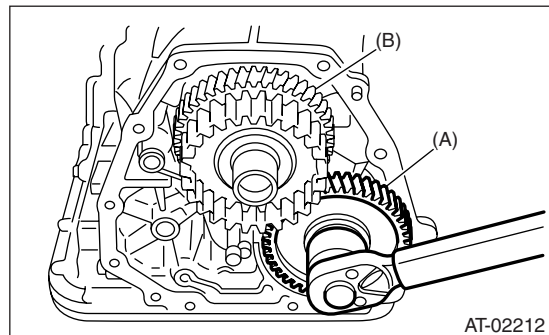
B: INSTALLATION

1. MP-T MODEL

- 1) Set the select lever to "P" range.
- 2) Using a plastic hammer, install the reduction driven gear assembly and the new washer, and tighten the new lock nut.

Tightening torque:

100 N·m (10.2 kgf·m, 73.8 ft·lb)



- (A) Reduction driven gear assembly
(B) Reduction drive gear assembly

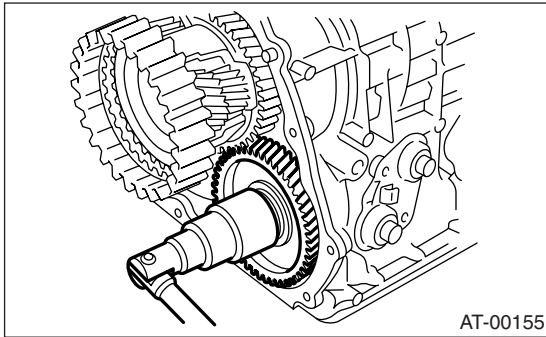
- 3) After tightening, stake the lock nut securely.
- 4) Join the transmission case and the extension case, and then install the rear vehicle speed sensor. <Ref. to 4AT-68, INSTALLATION, Extension Case.>
- 5) Install the transmission assembly to the vehicle. <Ref. to 4AT-40, INSTALLATION, Automatic Transmission Assembly.>

2. VTD MODEL

- 1) Set the select lever to "P" range.
- 2) Use a plastic hammer to install reduction driven gear assembly.
- 3) Use a plastic hammer to install the center differential.
- 4) Install new self-locking nut and washer.

Tightening torque:

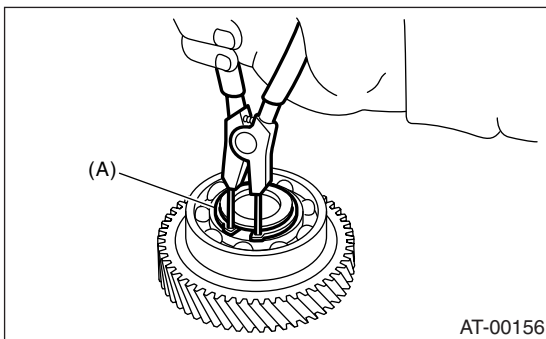
100 N·m (10.2 kgf-m, 73.8 ft-lb)



- 5) After tightening, stake the lock nut securely.
- 6) Insert the rear driveshaft assembly. <Ref. to 4AT-79, INSTALLATION, Rear Drive Shaft.>
- 7) Join the transmission case and the extension case, and then install the rear vehicle speed sensor. <Ref. to 4AT-68, INSTALLATION, Extension Case.>
- 8) Install the transmission assembly to the vehicle. <Ref. to 4AT-40, INSTALLATION, Automatic Transmission Assembly.>

C: DISASSEMBLY

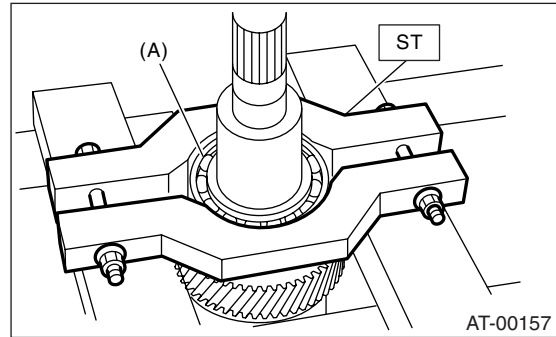
- 1) Remove the snap ring from reduction driven gear.



(A) Snap ring

- 2) Remove the ball bearing from reduction driven gear using ST.

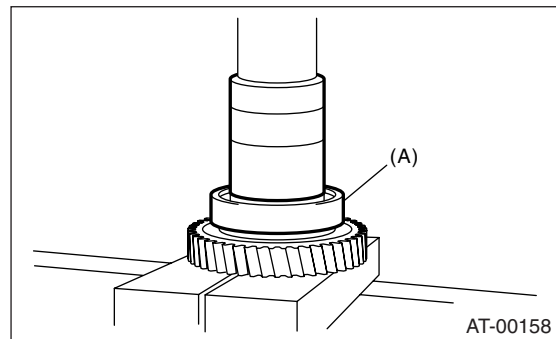
ST 498077600 REMOVER



(A) Ball bearing

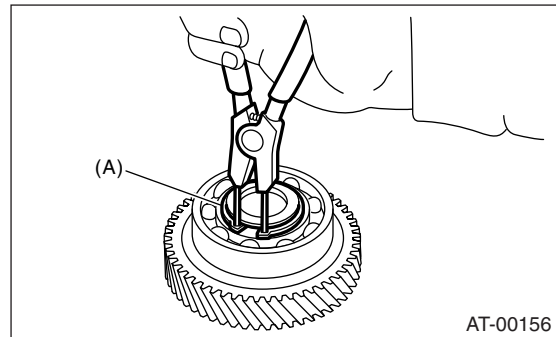
D: ASSEMBLY

- 1) Install the new ball bearing to reduction driven gear using press.



(A) Ball bearing

- 2) Install the snap ring to reduction driven gear.



(A) Snap ring

E: INSPECTION

Make sure the ball bearing and gear is not deformed or damaged.

Reduction Drive Gear

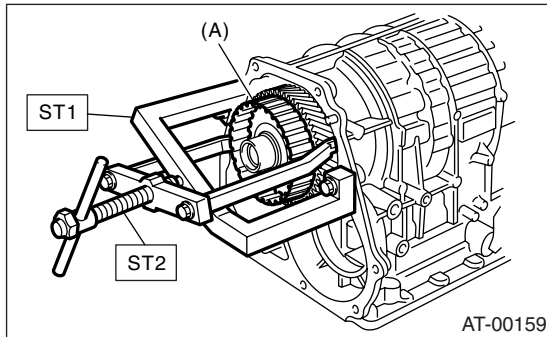
AUTOMATIC TRANSMISSION

30.Reduction Drive Gear

A: REMOVAL

- 1) Remove the transmission assembly from vehicle body. <Ref. to 4AT-37, REMOVAL, Automatic Transmission Assembly.>
- 2) Remove the rear wheel speed sensor, and separate the extension case from transmission case. <Ref. to 4AT-68, REMOVAL, Extension Case.>
- 3) Remove the reduction driven gear. <Ref. to 4AT-80, REMOVAL, Reduction Driven Gear.>
- 4) Using the ST, extract the reduction drive gear assembly.

ST1 499737100 PULLER SET
ST2 899524100 PULLER SET



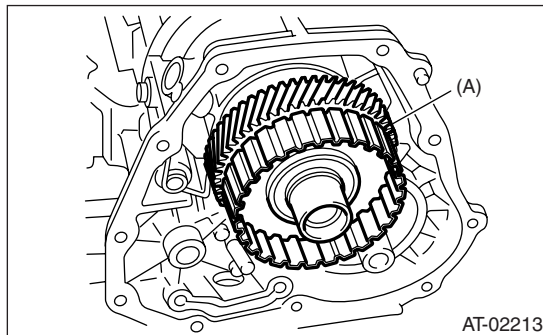
(A) Reduction drive gear assembly

B: INSTALLATION

- 1) Install the reduction drive gear assembly.

NOTE:

Press-fit it to the bottom of bearing shoulder completely.

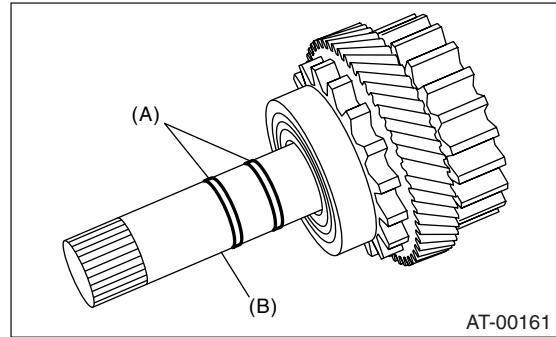


(A) Reduction drive gear assembly

- 2) Install the reduction driven gear. <Ref. to 4AT-80, INSTALLATION, Reduction Driven Gear.>
- 3) Join the transmission case and the extension case, and then install the rear vehicle speed sensor. <Ref. to 4AT-68, INSTALLATION, Extension Case.>
- 4) Install the transmission assembly to the vehicle. <Ref. to 4AT-40, INSTALLATION, Automatic Transmission Assembly.>

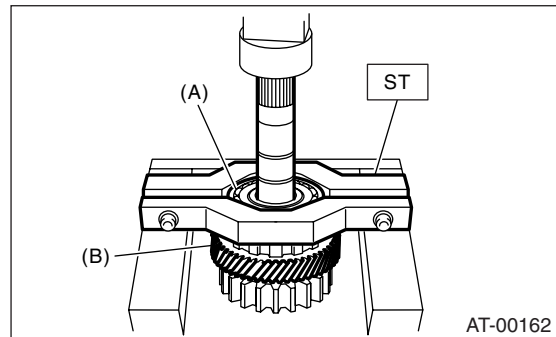
C: DISASSEMBLY

- 1) Take out the seal ring.



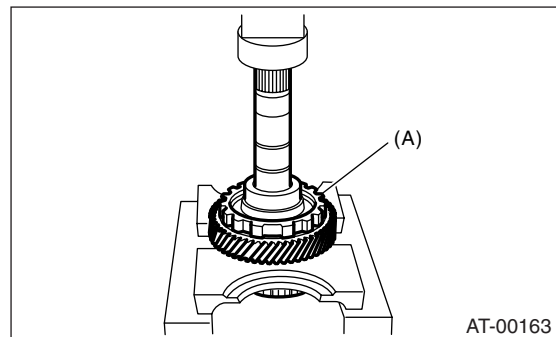
(A) Seal ring
(B) Reduction drive shaft

- 2) Remove the ball bearing using ST.
ST 498077600 REMOVER



(A) Ball bearing
(B) Reduction drive gear

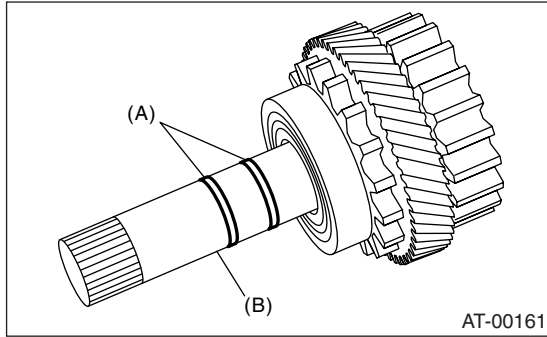
- 3) Apply vaseline to the outer surface of seal ring and shaft groove.



(A) Reduction drive gear

D: ASSEMBLY

- 1) Press-fit the reduction drive gear to shaft.
- 2) Press-fit the new ball bearing into reduction drive gear.
- 3) Apply vaseline to the outer surface of new seal ring and shaft groove.
- 4) Install the seal ring.



- (A) Seal ring
(B) Reduction drive shaft

E: INSPECTION

- Rotate the bearing by hand, make sure it rotates smoothly.
- Make sure there are no holes, bending damage or other foreign materials on each parts.
- Inspect the extension end play, and adjust it to the standard value. <Ref. to 4AT-76, ADJUSTMENT, Transfer Clutch.>

Center Differential Carrier

AUTOMATIC TRANSMISSION

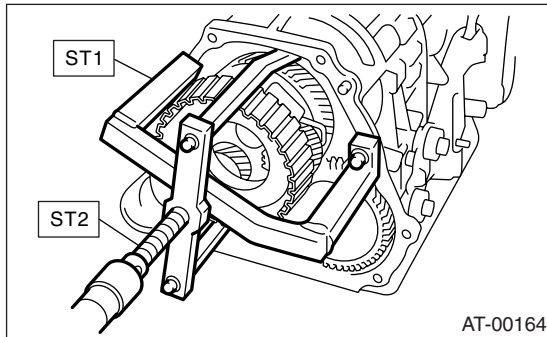
31.Center Differential Carrier

A: REMOVAL

- 1) Remove the transmission assembly from vehicle body. <Ref. to 4AT-37, REMOVAL, Automatic Transmission Assembly.>
- 2) Remove the rear wheel speed sensor, and separate the extension case from transmission case. <Ref. to 4AT-68, REMOVAL, Extension Case.>
- 3) Extract the rear drive shaft. <Ref. to 4AT-79, REMOVAL, Rear Drive Shaft.>
- 4) Using the special tools, pull out the center differential carrier assembly.

ST1 499737100 PULLER

ST2 899524100 PULLER SET



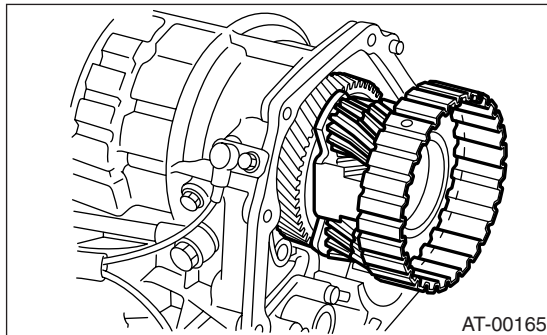
- 5) Pull out the shim(s) from transmission case.

B: INSTALLATION

- 1) Install the center differential assembly with shim.

NOTE:

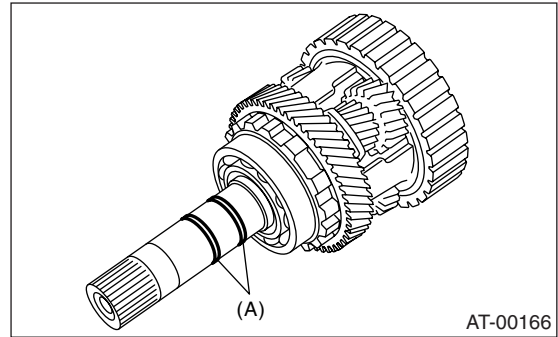
Press-fit it to the bottom of bearing shoulder completely.



- 2) Insert the rear driveshaft assembly. <Ref. to 4AT-79, INSTALLATION, Rear Drive Shaft.>
- 3) Join the transmission case and the extension case, and then install the rear vehicle speed sensor. <Ref. to 4AT-68, INSTALLATION, Extension Case.>
- 4) Install the transmission assembly to the vehicle. <Ref. to 4AT-40, INSTALLATION, Automatic Transmission Assembly.>

C: DISASSEMBLY

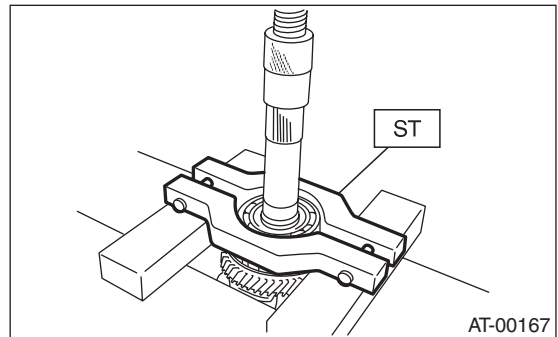
- 1) Remove the seal ring.



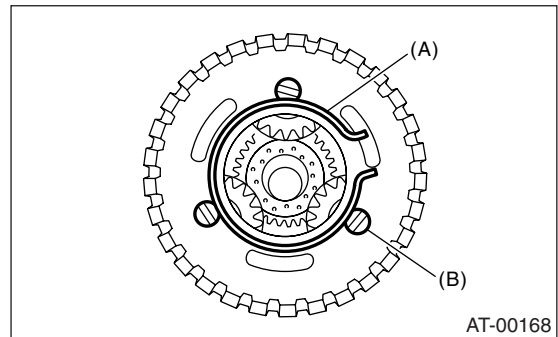
(A) Seal ring

- 2) Using a press and ST, remove the ball bearing.

ST 498077600 REMOVER



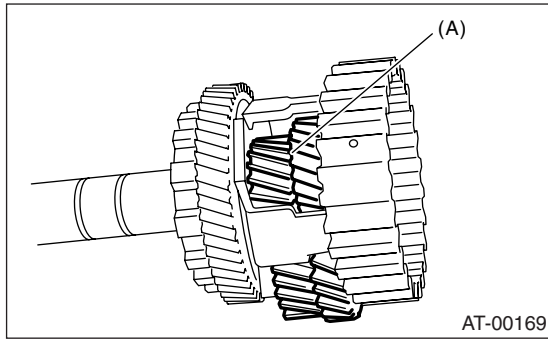
- 3) Remove the snap ring, and pull out the shaft from center differential assembly.



(A) Snap ring

(B) Shaft

- 4) Remove the thrust washers, pinion gears and washers from center differential assembly.



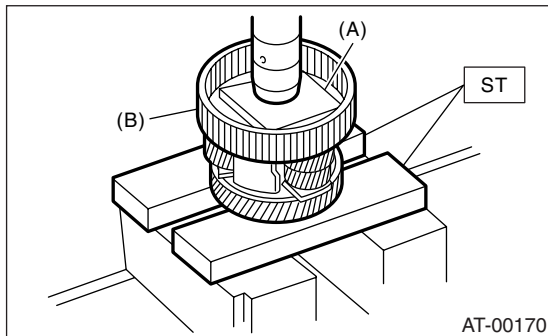
(A) Pinion gear

- 5) Pull out the intermediate shaft and thrust bearing.

D: ASSEMBLY

- 1) Install the thrust washer onto intermediate shaft.
- 2) Install the thrust bearing onto intermediate shaft.
- 3) Install the pinion gears and washers.
- 4) Insert the shaft into the center differential assembly.
- 5) Install the snap ring.
- 6) Using a press, install a new ball bearing into the center differential assembly.

ST 498077000 REMOVER



(A) Plate
(B) Center differential carrier

- 7) Apply vaseline onto the seal ring outer surface and shaft grooves.
- 8) Install a new seal ring.

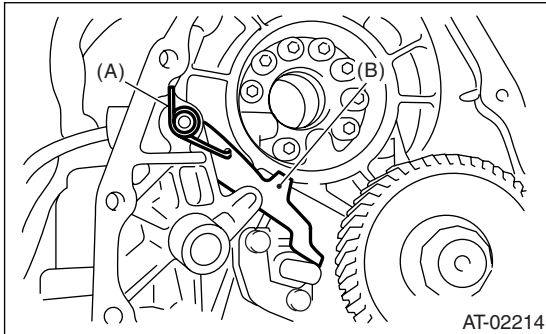
E: INSPECTION

- Make sure there are no holes, cutting damage or other foreign materials on each parts.
- Inspect the extension end play, and adjust it to within the standard value. <Ref. to 4AT-76, VTD MODEL, ADJUSTMENT, Transfer Clutch.>

32. Parking Pawl

A: REMOVAL

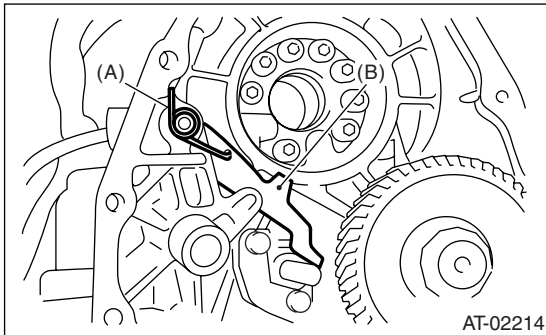
- 1) Remove the transmission assembly from vehicle body. <Ref. to 4AT-37, REMOVAL, Automatic Transmission Assembly.>
- 2) Remove the rear wheel speed sensor, and separate the extension case from transmission case. <Ref. to 4AT-68, REMOVAL, Extension Case.>
- 3) Remove the reduction drive gear. <Ref. to 4AT-82, REMOVAL, Reduction Drive Gear.>
- 4) Remove the parking pawl, return spring and shaft.



- (A) Return spring
- (B) Parking pawl

B: INSTALLATION

- 1) Install the parking pawl, return spring and shaft.



- (A) Return spring
- (B) Parking pawl

- 2) Install the reduction drive gear. <Ref. to 4AT-82, INSTALLATION, Reduction Drive Gear.>
- 3) Install the rear vehicle speed sensor and extension case. <Ref. to 4AT-68, INSTALLATION, Extension Case.>
- 4) Install the transmission assembly to the vehicle. <Ref. to 4AT-40, INSTALLATION, Automatic Transmission Assembly.>

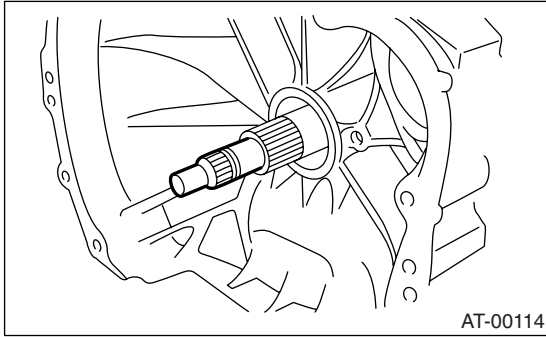
C: INSPECTION

Check the tab of parking pawl on reduction gear for wear or other damage.

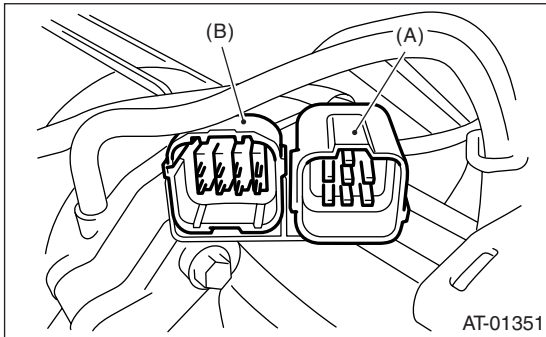
33. Converter Case

A: REMOVAL

- 1) Remove the transmission assembly from vehicle body. <Ref. to 4AT-37, REMOVAL, Automatic Transmission Assembly.>
- 2) Pull out the torque converter clutch assembly. <Ref. to 4AT-67, REMOVAL, Torque Converter Clutch Assembly.>
- 3) Remove the input shaft.



- 4) Lift-up the lever on the rear side of transmission harness connector, and then disconnect it from the stay.
- 5) Disconnect the inhibitor switch connector from the stay.



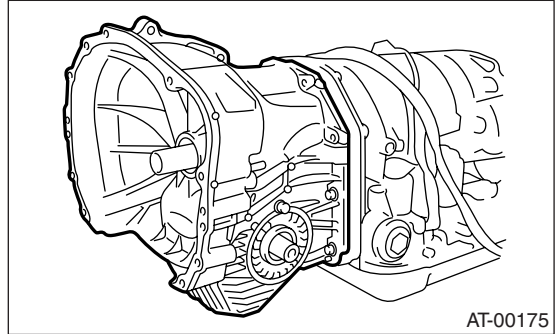
- (A) Transmission harness ASSY
(B) Inhibitor switch harness

- 6) Remove the air breather hose. <Ref. to 4AT-65, REMOVAL, Air Breather Hose.>
- 7) Remove the oil charge pipe. <Ref. to 4AT-66, REMOVAL, Oil Charge Pipe.>
- 8) Remove the ATF cooler inlet and outlet pipes. <Ref. to 4AT-62, REMOVAL, ATF Cooler Pipe and Hose.>

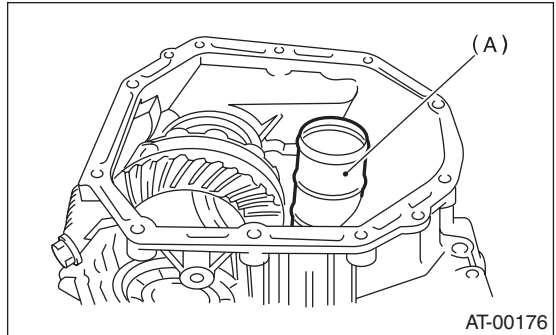
- 9) Remove the converter case alignment bolt, and then separate the transmission case and converter case by lightly tapping with a plastic hammer.

NOTE:

- Be careful not to damage the oil seal and bushing in the converter case with the oil pump cover.
- Do not loosen the rubber seal.



- 10) Remove the seal pipe.

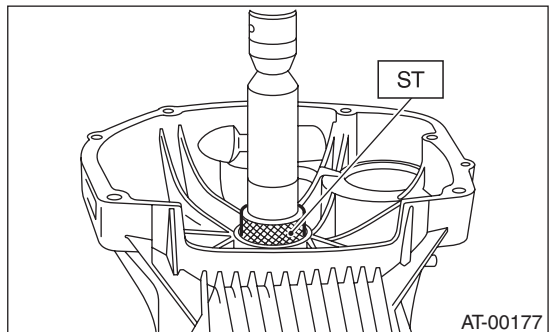


- (A) Seal pipe

- 11) Remove the differential assembly. <Ref. to 4AT-101, REMOVAL, Front Differential Assembly.>
- 12) Remove the oil seal from converter case.

B: INSTALLATION

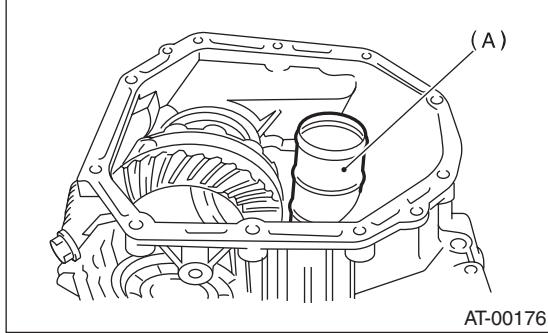
- 1) Check the appearance of each component and clean them.
 - 2) Press-fit the new oil seal to converter case using ST.
- ST 398437700 DRIFT



Converter Case

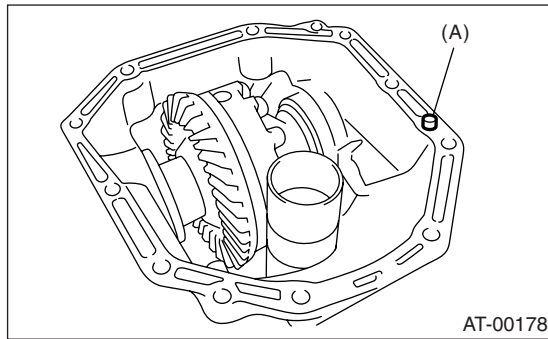
AUTOMATIC TRANSMISSION

- 3) Install the differential assembly to the case. <Ref. to 4AT-101, INSTALLATION, Front Differential Assembly.>
- 4) Install the right and left side retainers. <Ref. to 4AT-105, ADJUSTMENT, Front Differential Assembly.>
- 5) Install new seal pipe to converter case.



(A) Seal pipe

- 6) Install new rubber pipe to converter case.

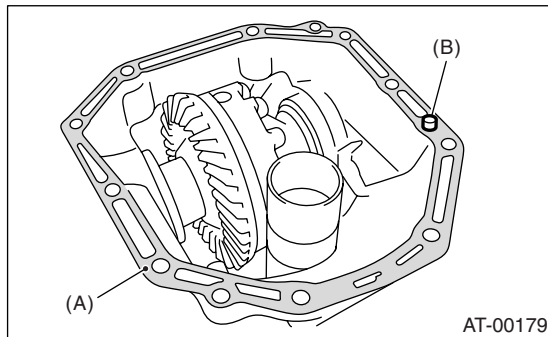


(A) Rubber seal

- 7) Apply proper amount of liquid gasket to the entire matching surface of converter case.

Liquid gasket:

Three bond 1215 (Part No. 004403007) or equivalent

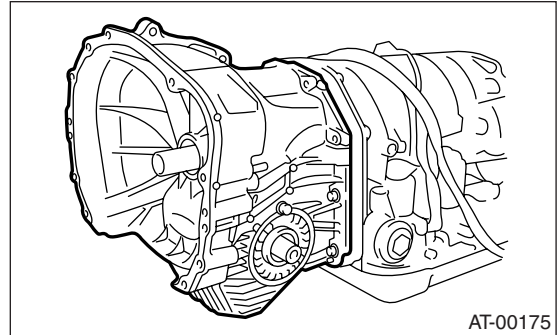


(A) Three bond 1215
(B) Rubber seal

- 8) Install the converter case assembly without damaging bushing and oil seal.

Tightening torque:

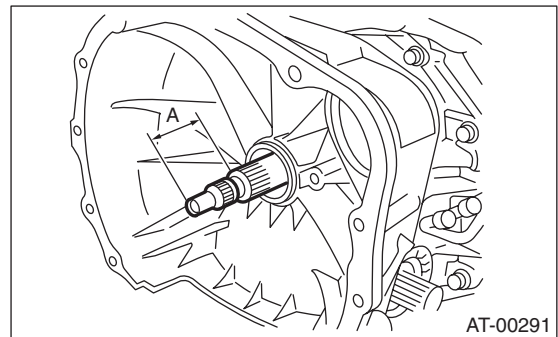
41 N·m (4.2 kgf-m, 30.4 ft-lb)



- 9) Insert the inhibitor switch connector and transmission connector to the stay.
- 10) Install the air breather hose. <Ref. to 4AT-65, INSTALLATION, Air Breather Hose.>
- 11) Install the ATF cooler pipe. <Ref. to 4AT-63, INSTALLATION, ATF Cooler Pipe and Hose.>
- 12) Install the oil charge pipe along with the O-ring. <Ref. to 4AT-66, INSTALLATION, Oil Charge Pipe.>
- 13) Insert the input shaft while rotating it lightly by hand, and then check the amount of protrusion.

Normal protrusion A:

50 — 55 mm (1.97 — 2.17 in)



- 14) Install the torque converter clutch assembly. <Ref. to 4AT-67, INSTALLATION, Torque Converter Clutch Assembly.>
- 15) Install the transmission assembly to the vehicle. <Ref. to 4AT-40, INSTALLATION, Automatic Transmission Assembly.>

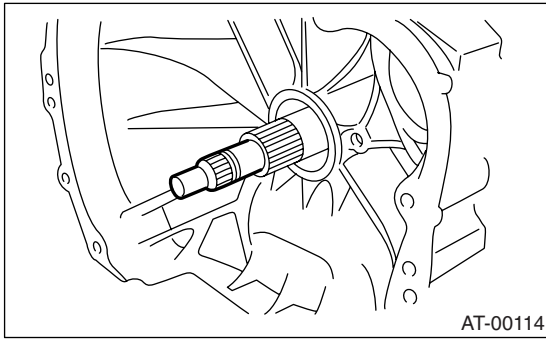
C: INSPECTION

Measure the backlash, and then adjust it within standard values. <Ref. to 4AT-98, ADJUSTMENT, Drive Pinion Shaft Assembly.>

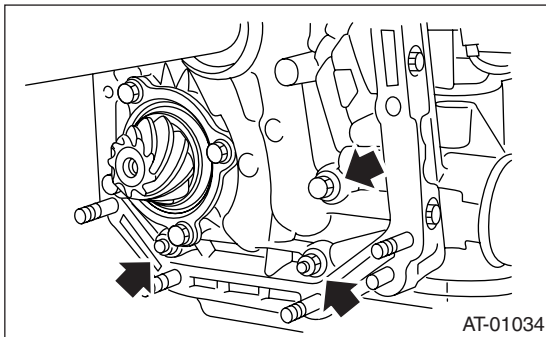
34. Oil Pump Housing

A: REMOVAL

- 1) Remove the transmission assembly from vehicle body. <Ref. to 4AT-37, REMOVAL, Automatic Transmission Assembly.>
- 2) Pull out the torque converter clutch assembly. <Ref. to 4AT-67, REMOVAL, Torque Converter Clutch Assembly.>
- 3) Remove the input shaft.



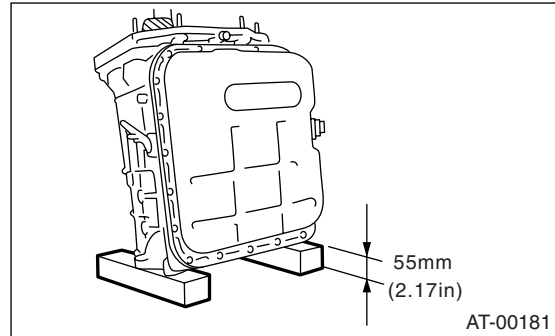
- 4) Lift-up the lever on the rear side of transmission harness connector, and then disconnect it from the stay.
- 5) Disconnect the inhibitor switch connector from the stay.
- 6) Remove the oil charge pipe. <Ref. to 4AT-66, REMOVAL, Oil Charge Pipe.>
- 7) Remove the ATF cooler inlet and outlet pipes. <Ref. to 4AT-62, REMOVAL, ATF Cooler Pipe and Hose.>
- 8) Separate the converter case and transmission case. <Ref. to 4AT-87, REMOVAL, Converter Case.>
- 9) Separate the transmission case and extension case section. <Ref. to 4AT-68, REMOVAL, Extension Case.>
- 10) Remove the reduction drive gear. <Ref. to 4AT-82, REMOVAL, Reduction Drive Gear.>
- 11) Remove the reduction driven gear. <Ref. to 4AT-80, REMOVAL, Reduction Driven Gear.>
- 12) Loosen the oil pump housing mounting bolts.



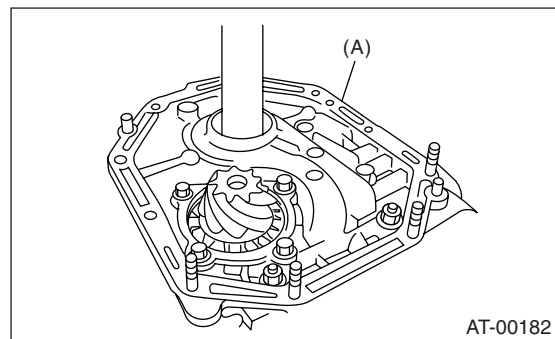
- 13) Place two wooden blocks on the workbench, and stand the transmission case with the rear end facing down.

NOTE:

- Be careful not to scratch the rear mating surface of transmission case.
- Check the height of the wooden blocks to avoid damaging the parking rod protruding from the mating surface, and the drive pinion.



- 14) Remove the oil pump housing and adjusting thrust washer.



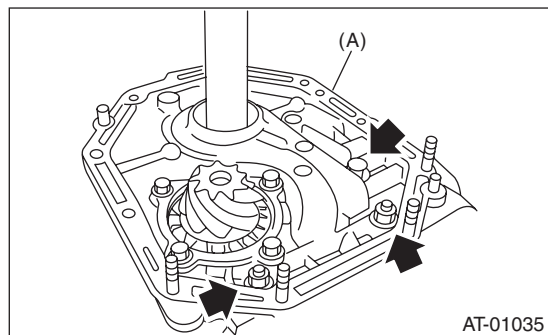
(A) Oil pump housing

B: INSTALLATION

- 1) Secure the oil pump housing with two nuts and a bolt.

Tightening torque:

42 N·m (4.3 kgf-m, 31 ft-lb)

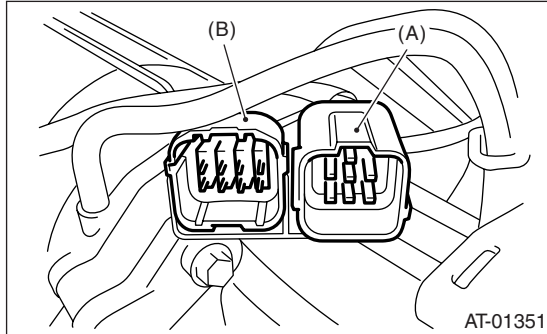


(A) Oil pump housing

Oil Pump Housing

AUTOMATIC TRANSMISSION

- 2) Install the converter case to the transmission case. <Ref. to 4AT-67, INSTALLATION, Torque Converter Clutch Assembly.>
- 3) Install the reduction driven gear. <Ref. to 4AT-80, INSTALLATION, Reduction Driven Gear.>
- 4) Install the reduction drive gear. <Ref. to 4AT-82, INSTALLATION, Reduction Drive Gear.>
- 5) Join the transmission case and the extension case. <Ref. to 4AT-68, INSTALLATION, Extension Case.>
- 6) Insert the inhibitor switch and transmission connector to the stay.

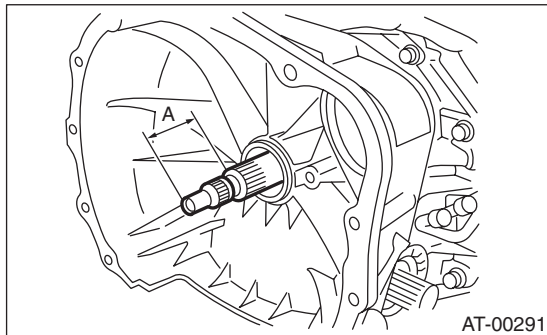


- (A) Transmission harness ASSY
- (B) Inhibitor switch harness

- 7) Install the ATF cooler pipe. <Ref. to 4AT-63, INSTALLATION, ATF Cooler Pipe and Hose.>
- 8) Install the oil charge pipe along with the O-ring. <Ref. to 4AT-66, INSTALLATION, Oil Charge Pipe.>
- 9) Insert the input shaft while rotating it lightly by hand, and then check the amount of protrusion.

Normal protrusion A:

50 — 55 mm (1.97 — 2.17 in)

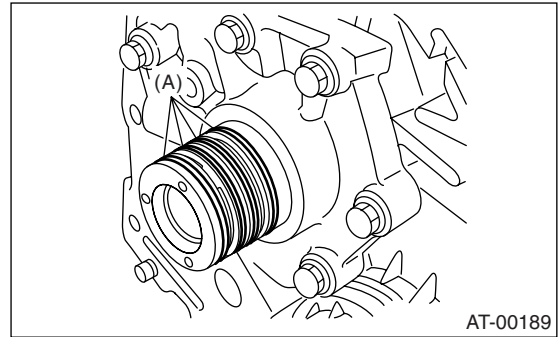


- 10) Install the torque converter clutch assembly. <Ref. to 4AT-67, INSTALLATION, Torque Converter Clutch Assembly.>
- 11) Install the transmission assembly to the vehicle. <Ref. to 4AT-40, INSTALLATION, Automatic Transmission Assembly.>

C: DISASSEMBLY

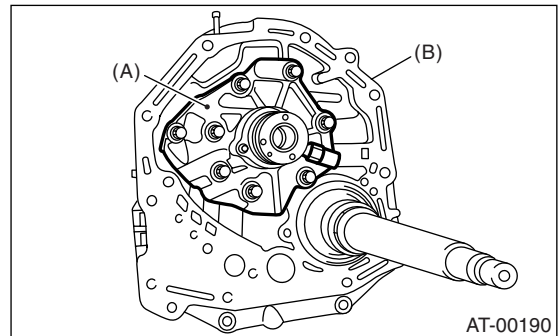
1. OIL PUMP COVER

- 1) Remove the four seal rings.



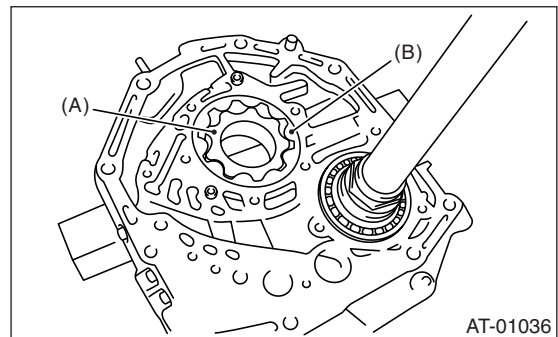
- (A) Seal ring

- 2) Remove the installation bolt. Then remove the cover by lightly tapping the end of starter shaft.



- (A) Oil pump cover
- (B) Oil pump housing

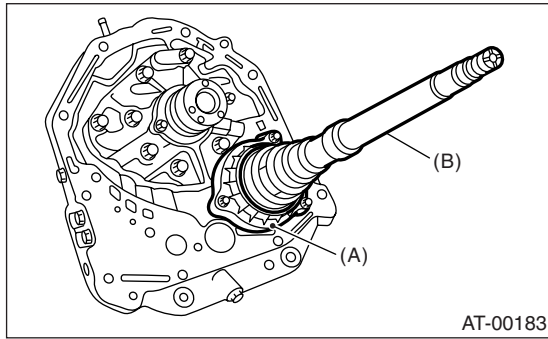
- 3) Remove the oil pump inner and outer rotors.



- (A) Oil pump rotor inner rotor
- (B) Oil pump outer rotor

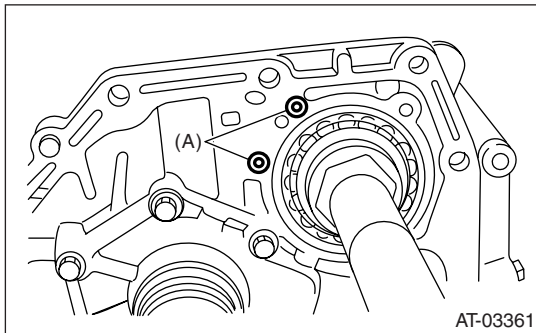
2. OIL SEAL RETAINER

1) Remove the oil seal retainer.



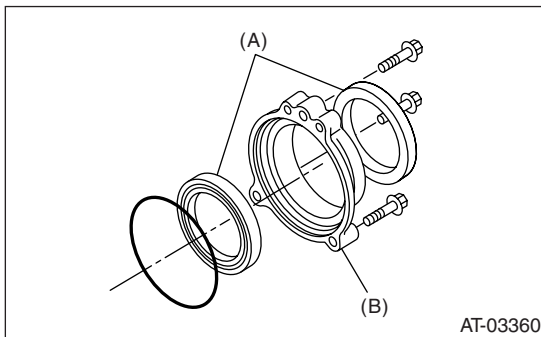
- (A) Oil seal retainer
- (B) Drive pinion shaft

2) Remove the O-ring.



- (A) O-ring

3) Remove the oil seal from the oil seal retainer.

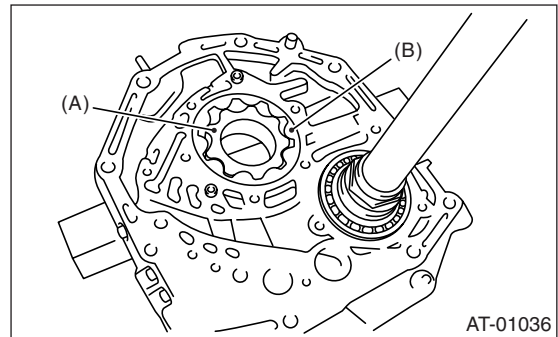


- (A) Oil seal
- (B) Oil seal retainer

D: ASSEMBLY

1. OIL PUMP COVER

1) Install the oil pump rotor assembly to oil pump housing.

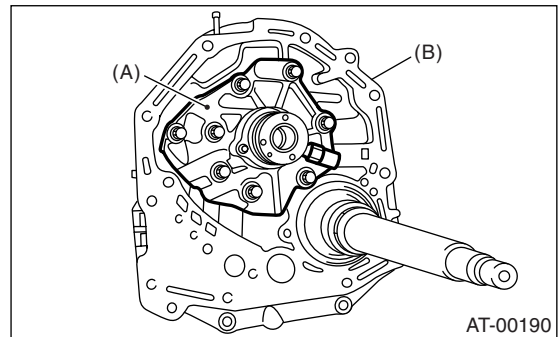


- (A) Oil pump rotor inner rotor
- (B) Oil pump outer rotor

2) Align both pivots with the pivot holes of the cover, and then install the oil pump cover while being careful not to apply excessive force to the pivots.

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)



- (A) Oil pump cover
- (B) Oil pump housing

3) After assembling, turn the oil pump shaft to check for smooth rotation of rotor.

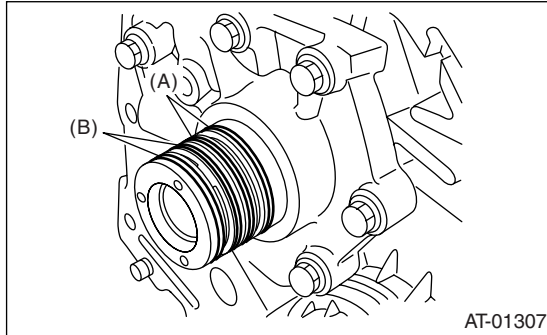
Oil Pump Housing

AUTOMATIC TRANSMISSION

4) Install the oil seal retainer and new seal rings. After installing, adjust the tooth contact with the drive pinion backlash. <Ref. to 4AT-93, ADJUSTMENT, Oil Pump Housing.>

NOTE:

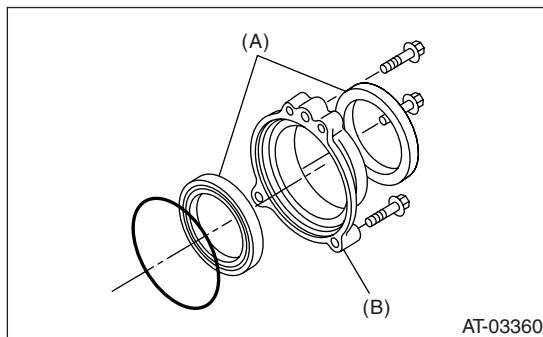
There are two types of seals. They are identified by color. Install at the proper positions by referring to the figure.



- (A) Seal ring (Black)
- (B) Seal ring (Brown)

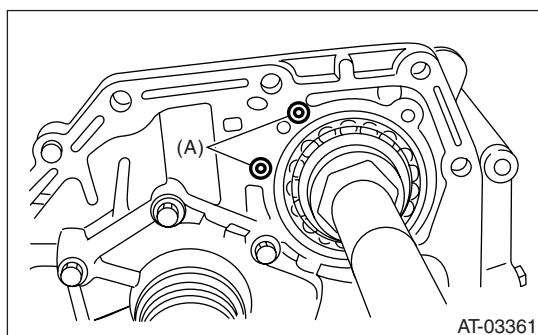
2. OIL SEAL RETAINER

1) Install two new oil seals to the oil seal retainer in the proper direction using the ST.
ST 499247300 INSTALLER



- (A) Oil seal
- (B) Oil seal retainer

2) Apply ATF to a new O-ring and then install it to the oil seal retainer.

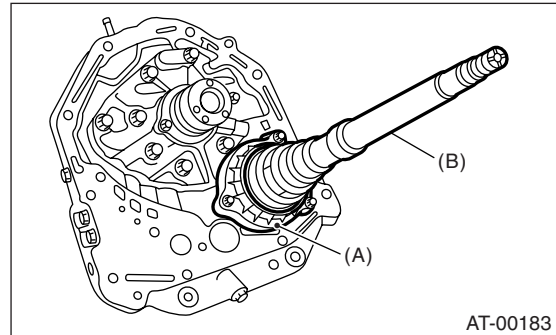


- (A) O-ring

3) Install the oil seal being careful not to damage oil seal lip, and secure it using three bolts.

Tightening torque:

7 N·m (0.7 kgf·m, 5.1 ft·lb)



- (A) Oil seal retainer
- (B) Drive pinion shaft

E: INSPECTION

1) Check the seal ring and oil seal for breaks and damage.

2) Check other parts for dents or faults.

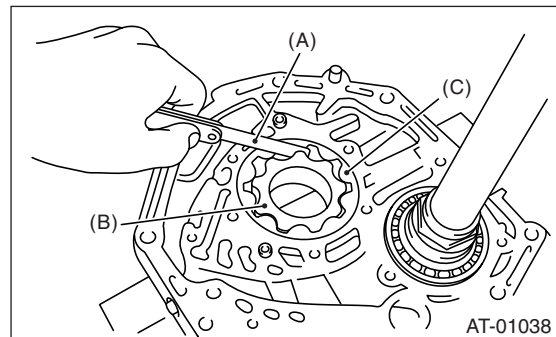
3) Oil pump rotor assembly selection

(1) Tip clearance

Install the oil pump inner rotor and outer rotor to the oil pump. With rotor gears facing each other, measure the crest-to-crest clearance.

Tip clearance:

0.02 — 0.15 mm (0.0008 — 0.0059 in)



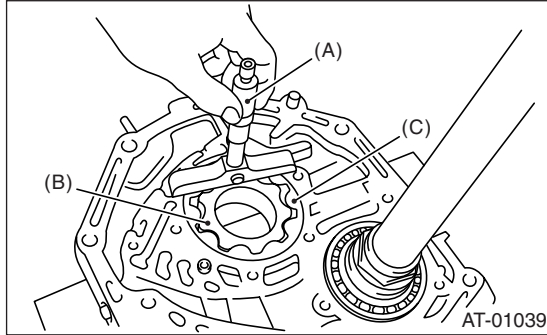
- (A) Thickness gauge
- (B) Oil pump rotor inner rotor
- (C) Oil pump rotor outer rotor

(2) Side clearance

Set a depth gauge to the oil pump housing, then measure the oil pump housing-to-oil pump rotor clearance.

Side clearance:

0.02 — 0.04 mm (0.0008 — 0.0016 in)



- (A) Depth gauge
- (B) Oil pump rotor inner rotor
- (C) Oil pump outer rotor

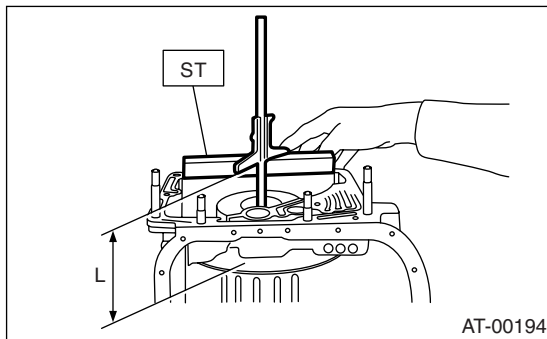
(3) If the depth and side clearance are out of specification, replace the oil pump rotor assembly.

Oil pump rotor assembly	
Part No.	Thickness mm (in)
15008AA060	11.37 — 11.38 (0.4476 — 0.4480)
15008AA070	11.38 — 11.39 (0.4480 — 0.4484)
15008AA080	11.39 — 11.40 (0.4484 — 0.4488)

Inspect the total end play, and adjust it to be within the standard value. <Ref. to 4AT-93, ADJUSTMENT, Oil Pump Housing.>

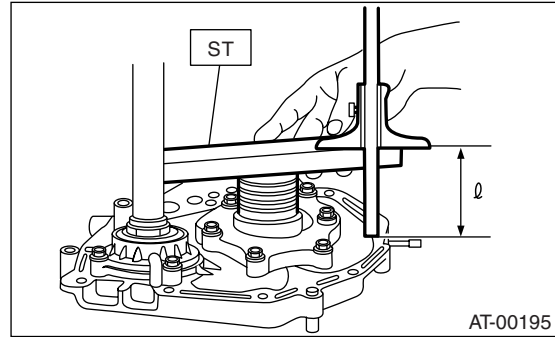
F: ADJUSTMENT

1) Measure the distance “L” from the end of ST to the high clutch drum concave section using the ST. ST 398643600 GAUGE



2) Measure the distance from the oil pump housing mating surface to the end surface of the ST using the ST.

ST 398643600 GAUGE

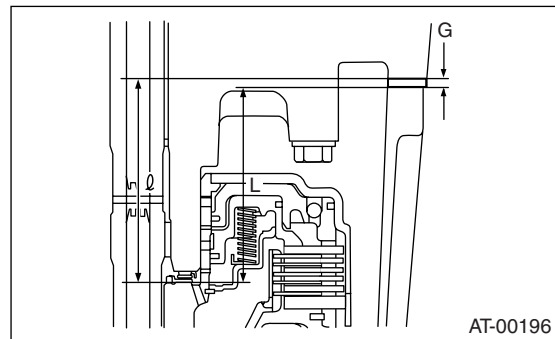


3) Calculation of total end play

Select the suitable thrust needle bearing from the table below so that clearance C will be within 0.25 to 0.55 mm (0.0098 to 0.0217 in).

$$C = (L + G) - l$$

C	Clearance between concave section of high clutch and end of clutch drum support
L	Distance from the transmission case mating surface to concave portion of high clutch
G	Gasket thickness [0.28 mm (0.0110 in)]
l	Height from the oil pump housing mating surface to the upper surface of the cover for the oil pump having the thrust needle bearing.



Thrust needle bearing	
Part No.	Thickness mm (in)
806528050	4.1 (0.161)
806528060	4.3 (0.169)
806528070	4.5 (0.177)
806528080	4.7 (0.185)
806528090	4.9 (0.193)
806528100	5.1 (0.201)

4) After completing the end play adjustment, insert the bearing race in the high clutch race. Apply vaseline to install the thrust needle bearing to oil pump cover.

Oil Pump Housing

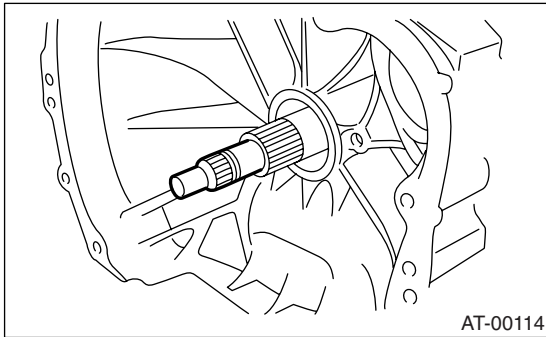
AUTOMATIC TRANSMISSION

- 5) After correctly installing the new gasket to the case mating surface, carefully install the oil pump housing assembly. Be careful to avoid hitting the drive pinion against the inside of case.
- 6) Install both parts with dowel pins aligned. Make sure there is no clearance at the mating surface.

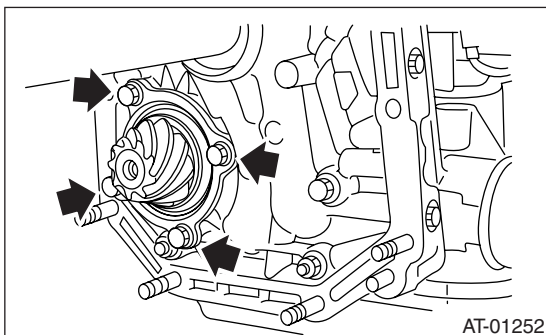
35. Drive Pinion Shaft Assembly

A: REMOVAL

- 1) Remove the transmission assembly from vehicle body. <Ref. to 4AT-37, REMOVAL, Automatic Transmission Assembly.>
- 2) Pull out the torque converter clutch assembly. <Ref. to 4AT-67, REMOVAL, Torque Converter Clutch Assembly.>
- 3) Remove the input shaft.



- 4) Lift-up the lever on the rear side of transmission harness connector, and then disconnect it from the stay.
- 5) Disconnect the inhibitor switch connector from the stay.
- 6) Disconnect the air breather hose. <Ref. to 4AT-65, REMOVAL, Air Breather Hose.>
- 7) Remove the oil charge pipe. <Ref. to 4AT-66, REMOVAL, Oil Charge Pipe.>
- 8) Remove the ATF cooler inlet and outlet pipes. <Ref. to 4AT-62, REMOVAL, ATF Cooler Pipe and Hose.>
- 9) Separate the converter case and transmission case. <Ref. to 4AT-87, REMOVAL, Converter Case.>
- 10) Separate the transmission case and extension case section. <Ref. to 4AT-68, REMOVAL, Extension Case.>
- 11) Remove the reduction drive gear. <Ref. to 4AT-82, REMOVAL, Reduction Drive Gear.>
- 12) Remove the reduction driven gear. <Ref. to 4AT-80, REMOVAL, Reduction Driven Gear.>
- 13) Remove the drive pinion shaft mounting bolt and remove the drive shaft assembly from oil pump housing.



B: INSTALLATION

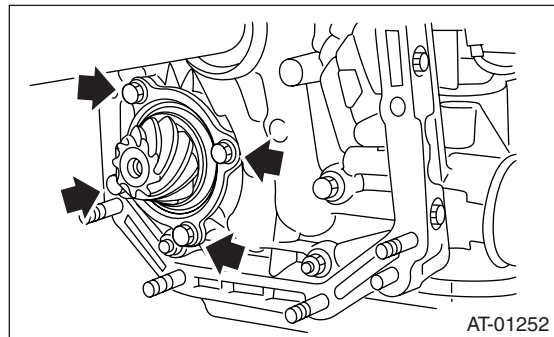
- 1) Assemble the drive pinion assembly to the oil pump housing.

NOTE:

- Be careful not to bend the shim.
- Be careful not to press-fit the pinion into housing bore.

Tightening torque:

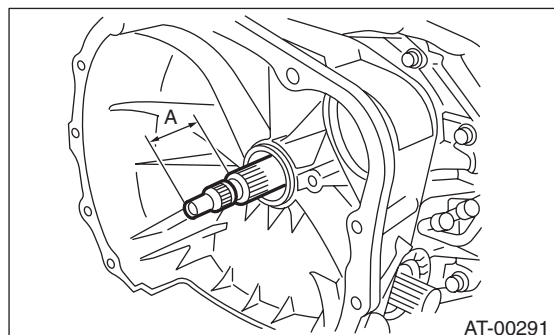
40 N·m (4.1 kgf·m, 29.5 ft·lb)



- 2) Join the converter case with the transmission case. <Ref. to 4AT-87, INSTALLATION, Converter Case.>
- 3) Install the reduction driven gear. <Ref. to 4AT-80, INSTALLATION, Reduction Driven Gear.>
- 4) Install the reduction drive gear. <Ref. to 4AT-82, INSTALLATION, Reduction Drive Gear.>
- 5) Join the transmission case and the extension case. <Ref. to 4AT-68, INSTALLATION, Extension Case.>
- 6) Insert the inhibitor switch and transmission connector to the stay.
- 7) Install the air breather hose. <Ref. to 4AT-65, INSTALLATION, Air Breather Hose.>
- 8) Install the ATF cooler inlet and outlet pipes. <Ref. to 4AT-63, INSTALLATION, ATF Cooler Pipe and Hose.>
- 9) Install the oil charge pipe along with the O-ring.
- 10) Insert the input shaft while rotating it lightly by hand, and then check the amount of protrusion.

Normal protrusion A:

50 — 55 mm (1.97 — 2.17 in)



Drive Pinion Shaft Assembly

AUTOMATIC TRANSMISSION

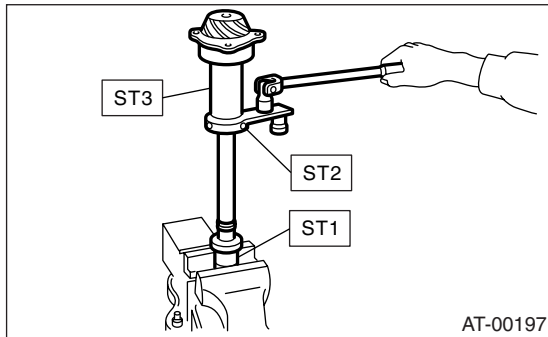
11) Install the torque converter clutch assembly.
<Ref. to 4AT-67, INSTALLATION, Torque Converter Clutch Assembly.>

12) Install the transmission assembly to the vehicle. <Ref. to 4AT-40, INSTALLATION, Automatic Transmission Assembly.>

C: DISASSEMBLY

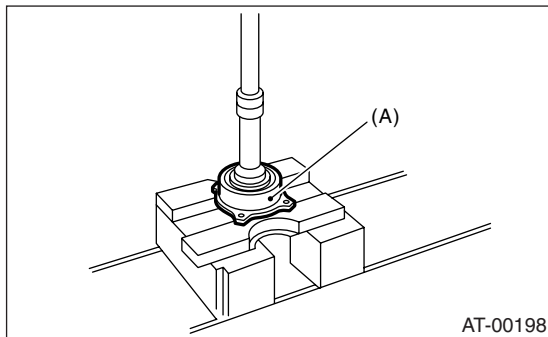
1) Lift the crimped part of the locknut, and then remove the lock nut while holding the rear spline part of the drive pinion shaft using ST1 and ST2. Pull out the drive pinion collar.

ST1 498937110 HOLDER
ST2 499787700 WRENCH
ST3 499787500 ADAPTER



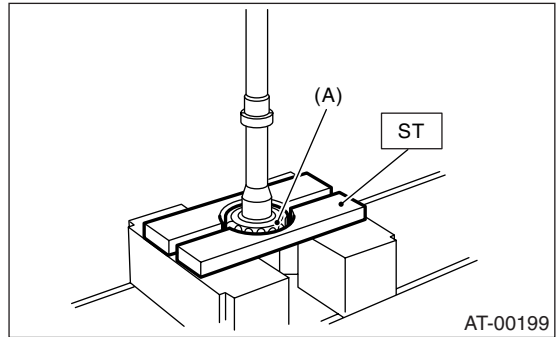
2) Remove the O-ring.

3) Separate the roller bearing and outer race from the drive pinion shaft using a press.



(A) Outer race

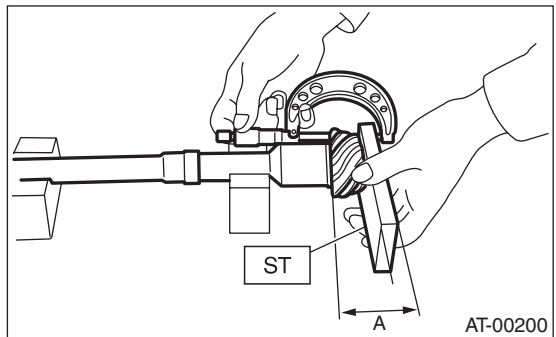
4) Separate the front roller bearing from the drive pinion shaft using a press and the ST.
ST 498517000 REPLACER



(A) Front roller bearing

D: ASSEMBLY

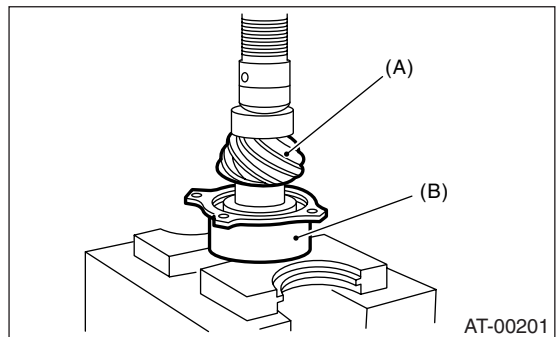
1) Measure the dimension "A" of drive pinion shaft.
ST 398643600 GAUGE



2) Using a press, press-fit the new roller bearing into the specified position.

NOTE:

If excessive force is applied to roller bearing, the roller bearing will not turn easily.



(A) Drive pinion shaft

(B) Roller bearing

3) After fitting a new O-ring to the drive pinion shaft, attach the drive pinion collar to the drive pinion shaft.

4) Install the lock washer to drive pinion shaft in the proper direction.

Drive Pinion Shaft Assembly

AUTOMATIC TRANSMISSION

5) Tighten the new lock nuts using ST1, ST2 and ST3.

Calculate the lock washer and lock nut specifications using following formula.

$$T2 = L2 / (L1 + L2) \times T1$$

T1: 116 N·m (11.8 kgf·m, 85.3 ft·lb)

[Required torque setting]

T2: Tightening torque

L1: ST2 length 0.072 m (2.83 in)

L2: Torque wrench length

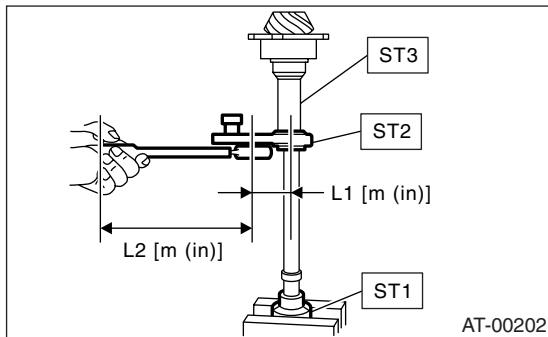
Example:

Torque wrench length m (in)	Tightening torque N·m (kgf·m, ft·lb)
0.4 (15.75)	98 (10.0, 72.3)
0.45 (17.72)	100 (10.2, 73.5)
0.5 (19.69)	101 (10.3, 74.6)
0.55 (21.65)	102 (10.4, 75.4)

ST1 498937110 Holder
ST2 499787700 WRENCH
ST3 499787500 Adapter

NOTE:

Attach ST2 to torque wrench as straight as possible.



6) Measure the starting torque of the bearing. Make sure the starting torque is within the specified range. If the torque is not within specified range, replace the roller bearing.

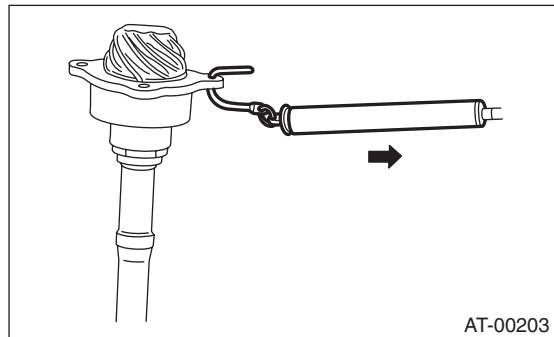
Starting torque:

MP-T model

7.6 — 38.1 N (0.776 — 3.88 kgf, 1.7 — 8.6 lb)

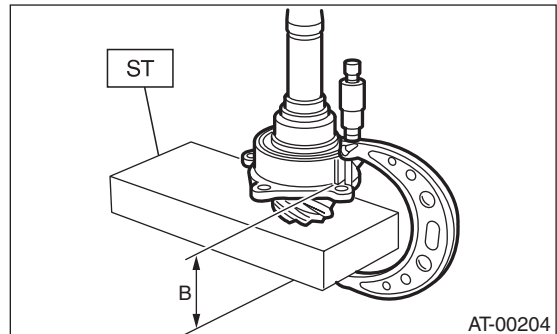
VTD model

6.8 — 47.5 N (0.69 — 4.84 kgf, 1.52 — 10.67 lb)



7) Crimp the locknut in 2 locations.

8) Measure dimension "B" of drive pinion shaft
ST 398643600 GAUGE



9) Calculate the thickness "t" (mm) of the drive pinion shim.

$$t = 6.5 \pm 0.0625 - (B - A)$$

10) Select three or less shims from following table.

Drive pinion shim	
Part No.	Thickness mm (in)
31451AA050	0.150 (0.0059)
31451AA060	0.175 (0.0069)
31451AA070	0.200 (0.0079)
31451AA080	0.225 (0.0089)
31451AA090	0.250 (0.0098)
31451AA100	0.275 (0.0108)

E: INSPECTION

- Make sure that all component parts are free of scratches, holes and other faults.
- Adjust the tooth alignment. <Ref. to 4AT-98, ADJUSTMENT, Drive Pinion Shaft Assembly.>

Drive Pinion Shaft Assembly

AUTOMATIC TRANSMISSION

F: ADJUSTMENT

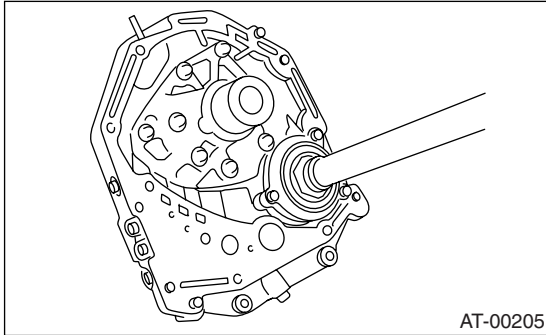
- 1) Remove the liquid gasket from the mating surface completely.
- 2) Install the oil pump housing assembly to the converter case, and secure them by tightening the four bolts evenly.

NOTE:

Use an old gasket or aluminum washer to prevent damaging the mating surface of the housing.

Tightening torque:

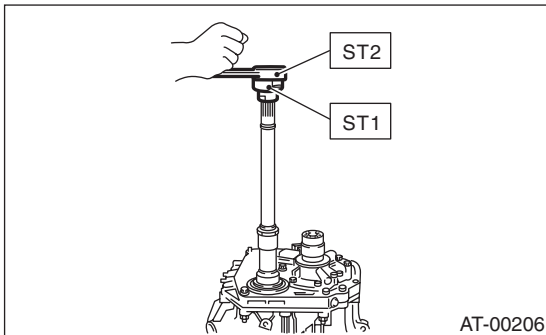
41 N·m (4.2 kgf-m, 30.4 ft-lb)



- 3) Rotate the drive pinion a few times using ST1 and ST2.

ST1 498937110 Holder

ST2 499787700 WRENCH



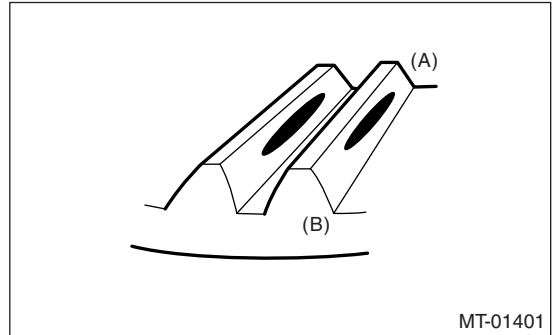
- 4) Adjust the drive pinion and hypoid driven gear backlash. <Ref. to 4AT-105, ADJUSTMENT, Front Differential Assembly.>

5) Apply red lead evenly to the surfaces of three or four teeth on hypoid driven gear. Rotate the drive pinion back and forward several times. Remove the oil pump housing, and check the teeth contact pattern.

If the teeth contact is inappropriate, adjust the backlash or thickness of the shim. <Ref. to 4AT-105, ADJUSTMENT, Front Differential Assembly.>

- Correct tooth contact

Check item: Tooth contact surface is slightly shifted toward the toe side under a no-load condition. (When driving, it moves towards the heel side.)

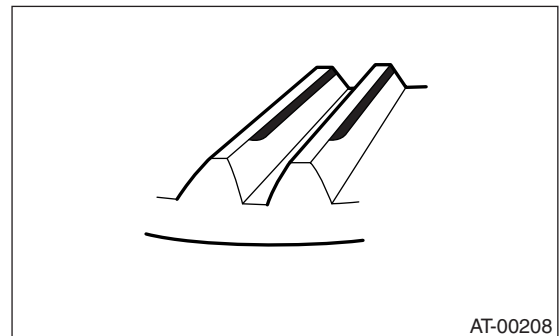


(A) Toe side

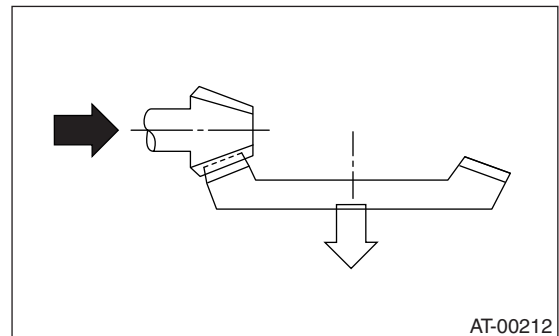
(B) Heel side

- Face contact

Checking item: Backlash is too large.
Contact pattern



Corrective action: Increase thickness of drive pinion height adjusting washer in order to bring the drive pinion shaft closer to the hypoid driven gear.



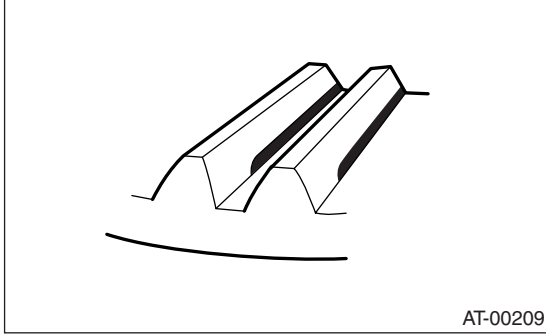
Drive Pinion Shaft Assembly

AUTOMATIC TRANSMISSION

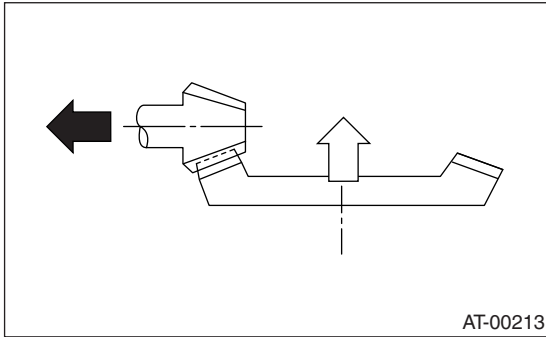
- Flank contact

Inspection item: Backlash is too small.

Contact pattern



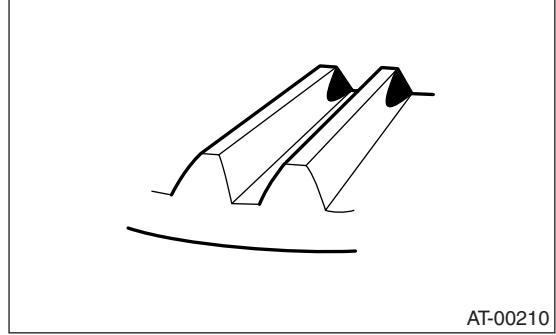
Corrective action: Reduce the thickness of pinion height adjusting washer according to the procedure to move the drive pinion shaft away from the hypoid driven gear.



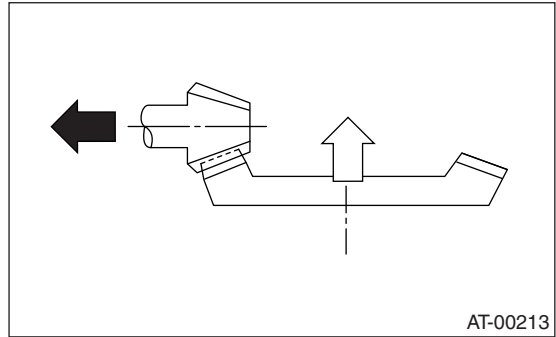
- Toe contact (inside contact)

Inspection item: Contact area is too small.

Contact pattern



Corrective action: Reduce the thickness of pinion height adjusting washer according to the procedure for moving the drive pinion shaft away from the hypoid driven gear.



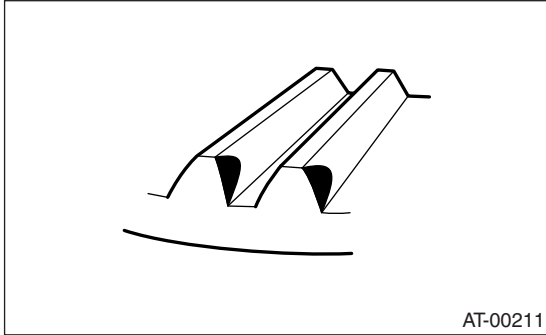
Drive Pinion Shaft Assembly

AUTOMATIC TRANSMISSION

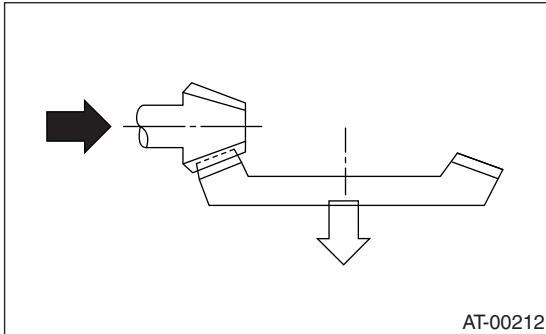
- Heel contact (outside end contact)

Inspection item: Contact area is too small.

Contact pattern



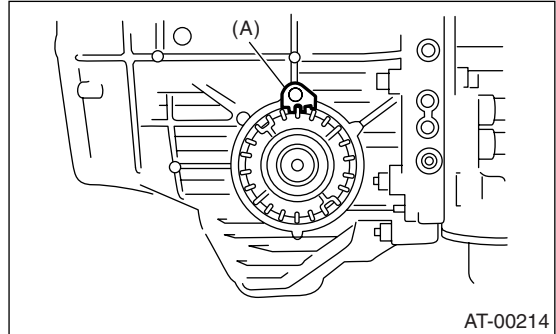
Corrective action: Increase thickness of drive pinion height adjusting washer in order to bring the drive pinion shaft closer to the hypoid driven gear.



- 6) If tooth contact is correct, mark the differential side retainer position and loosen it. After fitting a new O-ring and oil seal, screw in the differential side retainer to the marked position. Tighten the lock plate with specified torque.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)

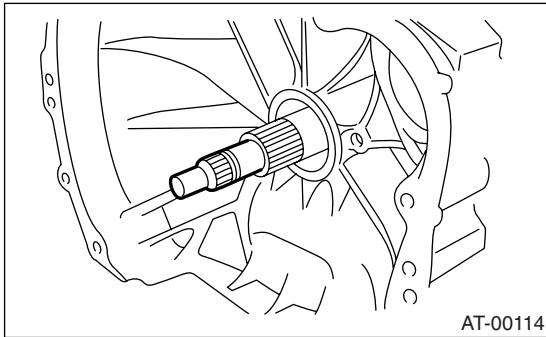


(A) Lock plate

36. Front Differential Assembly

A: REMOVAL

- 1) Remove the transmission assembly from vehicle body. <Ref. to 4AT-37, REMOVAL, Automatic Transmission Assembly.>
- 2) Pull out the torque converter clutch assembly. <Ref. to 4AT-67, REMOVAL, Torque Converter Clutch Assembly.>
- 3) Remove the input shaft.



- 4) Lift-up the lever on the rear side of transmission harness connector, and then disconnect it from the stay.
- 5) Disconnect the inhibitor switch from the stay.
- 6) Remove the oil charge pipe. <Ref. to 4AT-66, REMOVAL, Oil Charge Pipe.>
- 7) Remove the ATF cooler inlet and outlet pipes. <Ref. to 4AT-62, REMOVAL, ATF Cooler Pipe and Hose.>
- 8) Separate the converter case from the transmission case. <Ref. to 4AT-87, REMOVAL, Converter Case.>
- 9) Remove the seal pipe.
- 10) Remove the differential side retainers using ST.

NOTE:

Hold the differential case assembly by hand to avoid damaging the retainer mounting hole of the converter case.

ST 18630AA010 WRENCH COMPL RETAINER

NOTE:

WRENCH ASSEMBLY (499787000) can also be used.

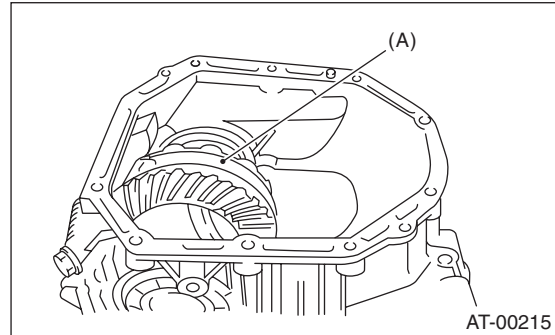
- 11) Remove the differential assembly while being careful not to damage the attachment part of retainer.

B: INSTALLATION

- 1) Install the differential assembly to the torque converter clutch case.

NOTE:

Do not damage the inside of the torque converter clutch case (particularly the mating surface of the differential side retainer).



(A) Differential ASSY

- 2) Install the O-ring to the left and right side differential side retainer.

- 3) Using the ST, install the side retainer. <Ref. to 4AT-101, INSTALLATION, Front Differential Assembly.>

ST 18630AA010 WRENCH COMPL RETAINER

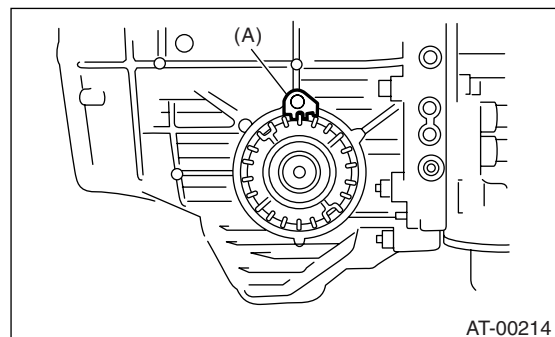
NOTE:

WRENCH ASSEMBLY (499787000) can also be used.

- 4) Adjust the backlash of the front differential. <Ref. to 4AT-105, ADJUSTMENT, Front Differential Assembly.>
- 5) Install the lock plate.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)

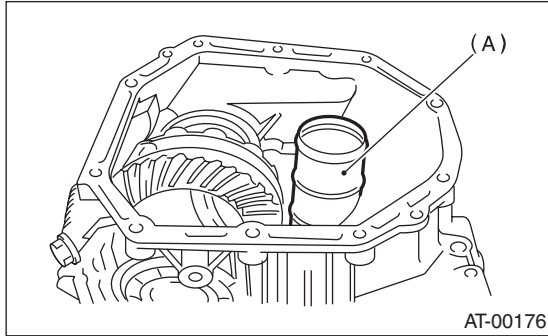


(A) Lock plate

Front Differential Assembly

AUTOMATIC TRANSMISSION

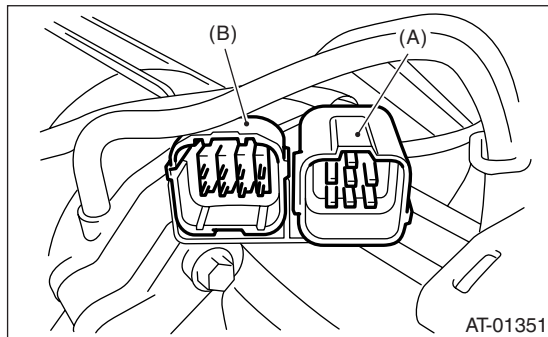
6) Install new seal pipe to converter case.



(A) Seal pipe

7) Install the converter case to the transmission case. <Ref. to 4AT-87, INSTALLATION, Converter Case.>

8) Insert the inhibitor switch and transmission connector to the stay.



(A) Transmission harness ASSY

(B) Inhibitor switch harness

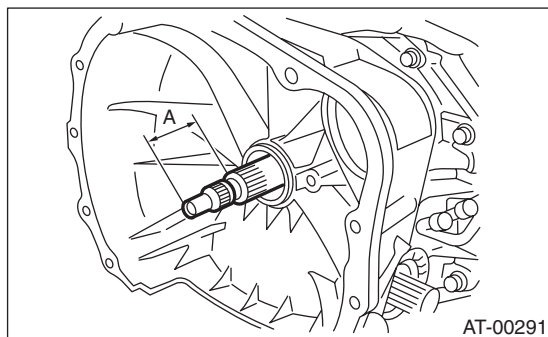
9) Install the ATF cooler pipe. <Ref. to 4AT-63, INSTALLATION, ATF Cooler Pipe and Hose.>

10) Install the oil charge pipe along with the O-ring. <Ref. to 4AT-66, INSTALLATION, Oil Charge Pipe.>

11) Insert the input shaft while rotating it lightly by hand, and then check the amount of protrusion.

Normal protrusion A:

50 — 55 mm (1.97 — 2.17 in)



12) Install the torque converter clutch assembly. <Ref. to 4AT-67, INSTALLATION, Torque Converter Clutch Assembly.>

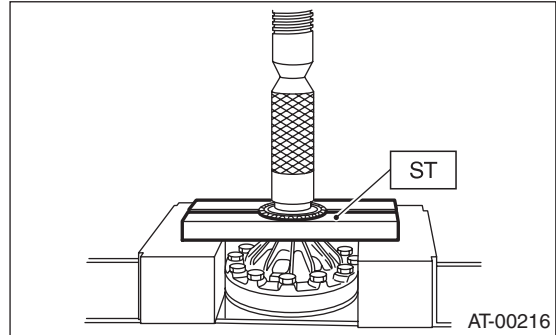
13) Install the transmission assembly to the vehicle. <Ref. to 4AT-40, INSTALLATION, Automatic Transmission Assembly.>

C: DISASSEMBLY

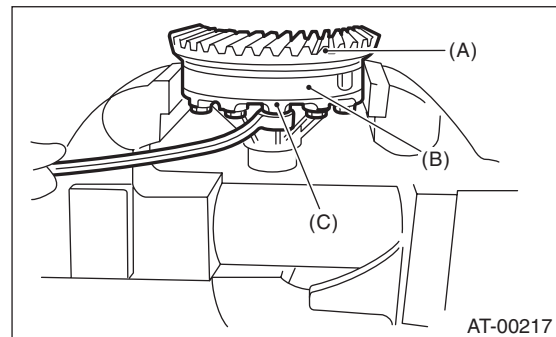
1. DIFFERENTIAL CASE ASSEMBLY

1) Remove the taper roller bearing using the ST and a press.

ST 498077000 REMOVER



2) Secure the case in a vise and remove the hypoid driven gear tightening bolts. Then separate the hypoid driven gear into the differential case (RH) and the differential case (LH).

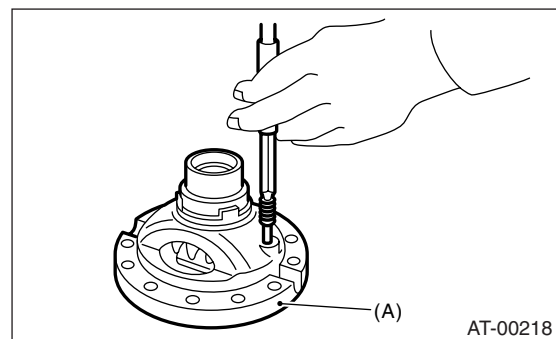


(A) Hypoid driven gear

(B) Differential case (RH)

(C) Differential case (LH)

3) Pull out the straight pin and pinion shaft, and then remove the differential bevel gear, washer and differential bevel pinion.



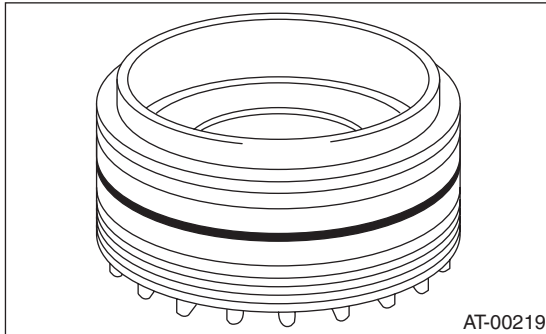
(A) Differential case (RH)

2. DIFFERENTIAL SIDE RETAINER

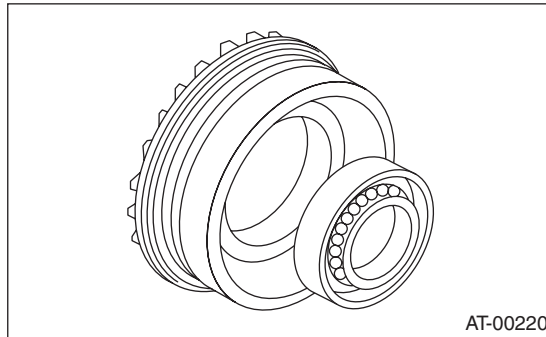
NOTE:

After adjusting the drive pinion backlash and tooth contact, remove and install the oil seal and O-ring.

1) Remove the O-ring.

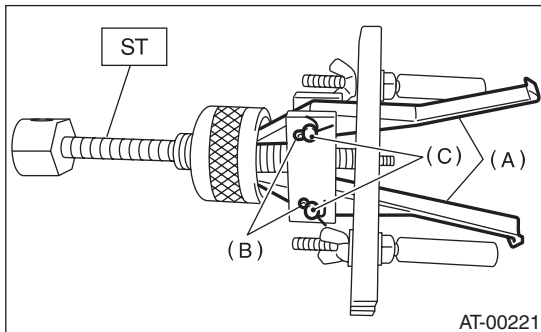


2) Remove the oil seal.



3) Remove the split pin, and then remove the claw.

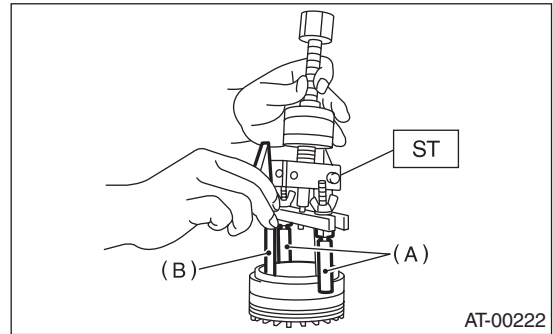
ST 398527700 PULLER ASSY



- (A) Claw
- (B) Split pin
- (C) Pin

4) Attach two claws to the outer race, and set the ST to the differential side retainer.

ST 398527700 PULLER ASSY



- (A) Shaft
- (B) Claw

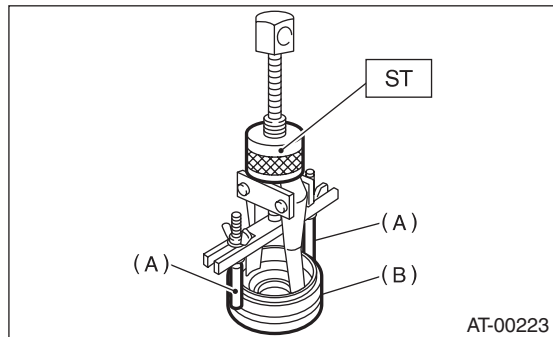
5) Restore the removed claws to original position, and install the pin and split pin.

6) Hold the shaft of ST to avoid removing from differential side retainer, and then remove the bearing outer race.

ST 398527700 PULLER ASSY

NOTE:

Replace the bearing inner and outer races as a single unit.



- (A) Shaft
- (B) Differential side retainer

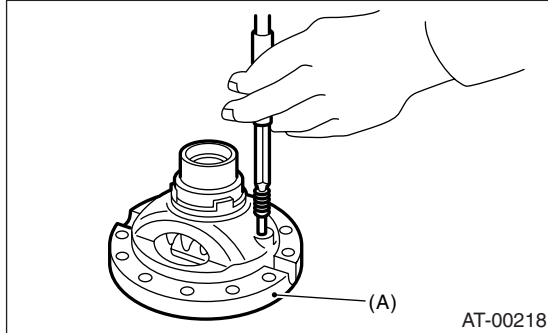
Front Differential Assembly

AUTOMATIC TRANSMISSION

D: ASSEMBLY

1. DIFFERENTIAL CASE ASSEMBLY

- 1) Install the washer, differential bevel gear and differential bevel pinion in the differential case (RH). Insert the pinion shaft.
- 2) Attach the straight pin in the reverse direction.

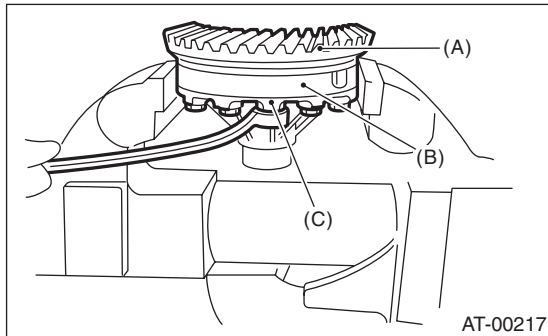


(A) Differential case (RH)

- 3) Install the washer and differential bevel gear to differential case (LH). Put the differential case (RH) on the case, and then assemble the two cases.
- 4) Install the hypoid driven gear and secure by tightening the bolt.

Tightening torque:

62 N·m (6.3 kgf-m, 45.6 ft-lb)



- (A) Hypoid driven gear
- (B) Differential case (RH)
- (C) Differential case (LH)

- 5) Measurement of backlash (Selection of washer)
 - (1) Install the SUBARU genuine axle shaft to differential case.

Part No. 38415AA070Axle shaft

- (2) Measure the gear backlash using ST1 and ST2, and then insert ST2 from the access window of the case.

ST1 498247001 MAGNET BASE

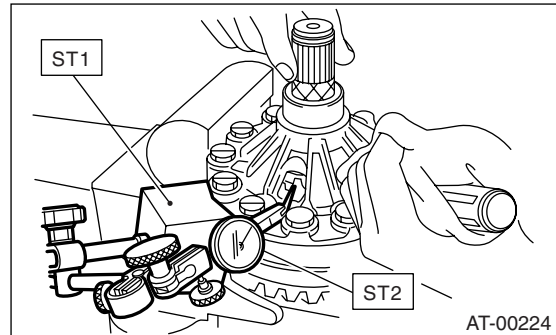
ST2 498247100 DIAL GAUGE

NOTE:

- Measure the backlash by placing the differential bevel pinion tooth against two differential bevel gear teeth.
- Fix the differential bevel pinion gear in place with a screwdriver or similar tool when measuring.

Standard:

0.13 — 0.18 mm (0.0051 — 0.0071 in)

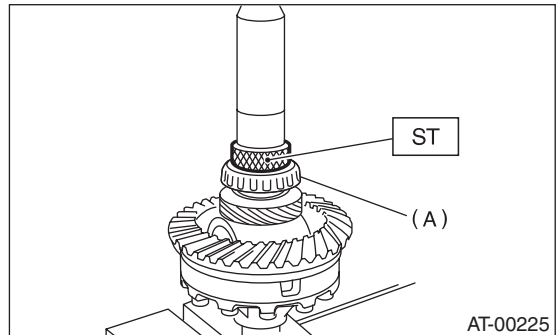


- (3) If the backlash is out of specification, select a washer from the table below.

Washer	
Part No.	Thickness mm (in)
803038021	0.95 (0.037)
803038022	1.00 (0.039)
803038023	1.05 (0.041)

- 6) Using the ST, install the taper roller bearing.

ST 398487700 INSTALLER

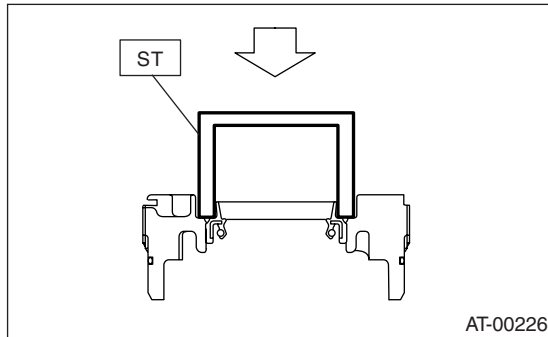


(A) Taper roller bearing

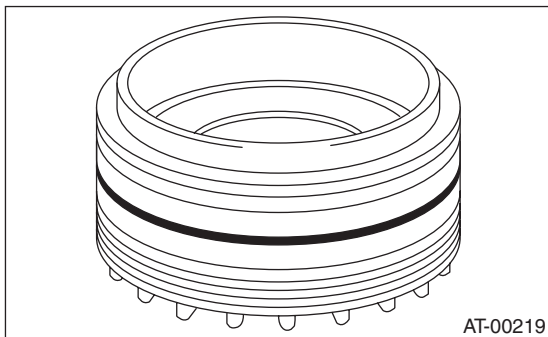
2. DIFFERENTIAL SIDE RETAINER

- 1) Install the bearing outer race to the differential side retainer.
- 2) Install a new oil seal using the ST and a plastic hammer.

ST 18675AA000 DIFFERENTIAL OIL SEAL INSTALLER



- 3) Install a new O-ring.



E: INSPECTION

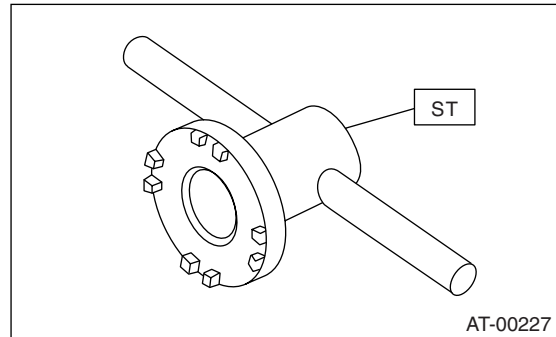
- Check each component for scratches, damage or other faults.
 - Measure the backlash, and then adjust it to be within specification.
- <Ref. to 4AT-105, ADJUSTMENT, Front Differential Assembly.>

F: ADJUSTMENT

- 1) Using the ST, screw-in the differential side retainer until light contact is felt.
- ST 18630AA010 WRENCH COMPL RETAINER

NOTE:

- Screw-in the RH side slightly deeper than the LH side.
- WRENCH ASSEMBLY (499787000) can also be used.



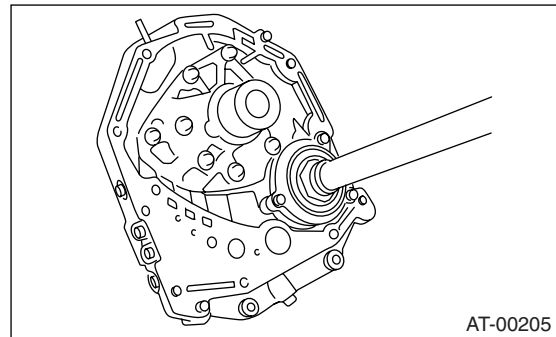
- 2) Remove the oil pump housing.
- 3) Remove the liquid gasket from the mating surface completely.
- 4) Install the oil pump housing assembly to the converter case, and secure them by tightening the four bolts evenly.

NOTE:

Use an old gasket or aluminum washer to prevent damaging the mating surface of the housing.

Tightening torque:

41 N·m (4.2 kgf·m, 30.4 ft·lb)



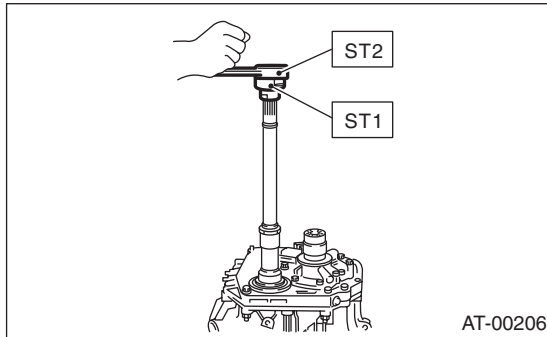
Front Differential Assembly

AUTOMATIC TRANSMISSION

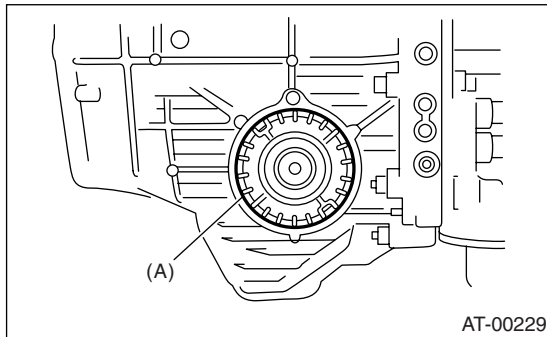
5) Rotate the drive pinion a few times using ST1 and ST2.

ST1 498937110 HOLDER

ST2 499787700 WRENCH

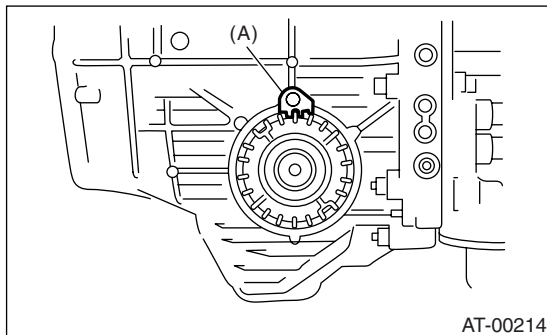


6) Tighten the differential side retainer LH until contact is felt while rotating the shaft. Then loosen the differential side retainer RH. Keep tightening the differential side retainer LH, and loosening the retainer RH until the pinion shaft no longer turns. This is the “zero” state.



(A) Differential side retainer

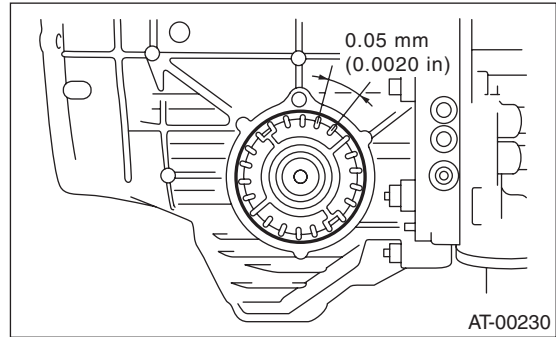
7) After the “zero” state is established, back off the differential side retainer LH 3 notches and secure it with the lock plate. Then back off the differential side retainer RH and retighten until it stops. Rotate the drive pinion 2 or 3 times. Tighten the differential side retainer RH 1-3/4 notches further. This sets the preload. Finally, secure the differential side retainer with the lock plate.



(A) Lock plate

NOTE:

Turning the differential side retainer by one notch changes the backlash about 0.05 mm (0.0020 in).



8) Turn the drive pinion a few times with ST1 and check to see if the backlash is within the specified value, using ST2, ST3, ST4 and ST5.

ST1 499787700 WRENCH

ST2 498247001 MAGNET BASE

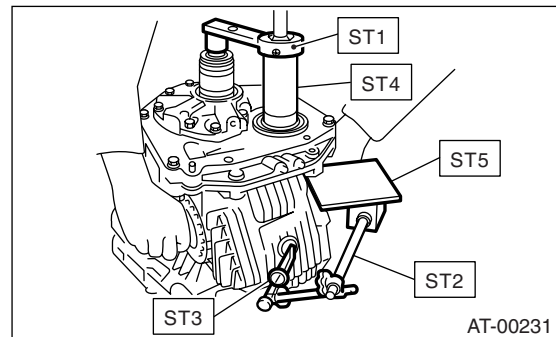
ST3 498247100 DIAL GAUGE

ST4 499787500 ADAPTER

ST5 498255400 PLATE

Backlash:

0.13 — 0.18 mm (0.0051 — 0.0071 in)

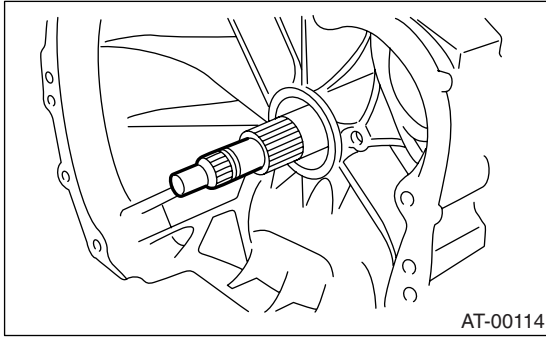


9) Adjust the teeth contact of the front differential and drive shaft. <Ref. to 4AT-98, ADJUSTMENT, Drive Pinion Shaft Assembly.>

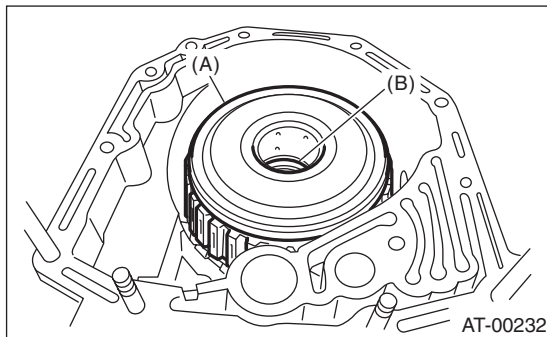
37.AT Main Case

A: REMOVAL

- 1) Remove the transmission assembly from vehicle body. <Ref. to 4AT-37, REMOVAL, Automatic Transmission Assembly.>
- 2) Pull out the torque converter clutch assembly. <Ref. to 4AT-67, REMOVAL, Torque Converter Clutch Assembly.>
- 3) Remove the input shaft.

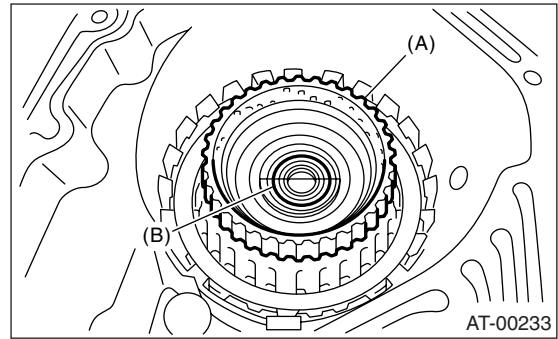


- 4) Lift-up the lever on the rear side of transmission harness connector, and then disconnect it from the stay.
- 5) Disconnect the inhibitor switch connector from the stay.
- 6) Disconnect the air breather hose.
- 7) Remove the oil charge pipe. <Ref. to 4AT-66, REMOVAL, Oil Charge Pipe.>
- 8) Remove the ATF cooler inlet and outlet pipes. <Ref. to 4AT-62, REMOVAL, ATF Cooler Pipe and Hose.>
- 9) Separate the converter case from the transmission case. <Ref. to 4AT-87, REMOVAL, Converter Case.>
- 10) Remove the oil pump housing. <Ref. to 4AT-89, REMOVAL, Oil Pump Housing.>
- 11) Take out the high clutch and reverse clutch assembly and thrust needle bearing.



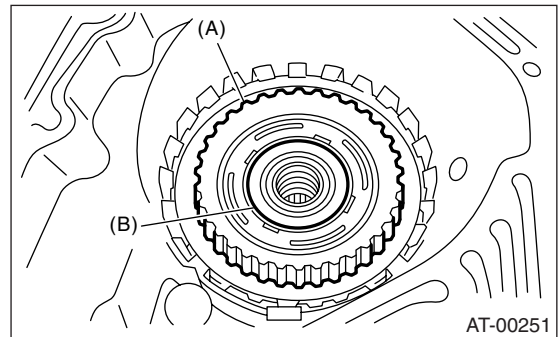
- (A) High clutch and reverse clutch ASSY
- (B) Thrust needle bearing

- 12) Take out the high clutch hub and thrust needle bearing.



- (A) High clutch hub
- (B) Thrust needle bearing

- 13) Take out the front sun gear and thrust needle bearing.

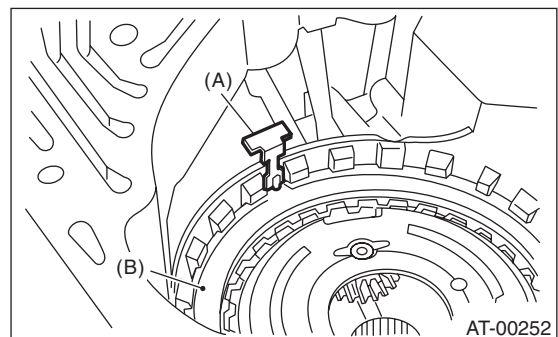


- (A) Front sun gear
- (B) Thrust needle bearing

- 14) Pull out the leaf spring of the 2-4 brake while taking care not to bend the spring.

NOTE:

Remove it while pressing down on the lower leaf spring.

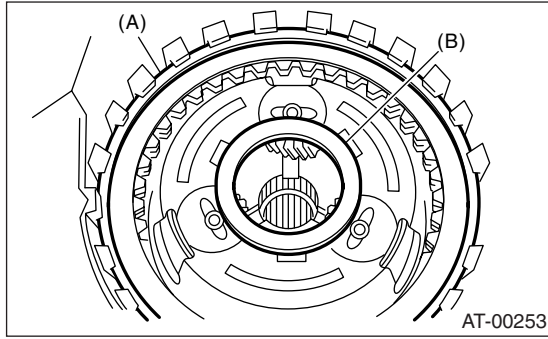


- (A) Leaf spring
- (B) Retaining plate

AT Main Case

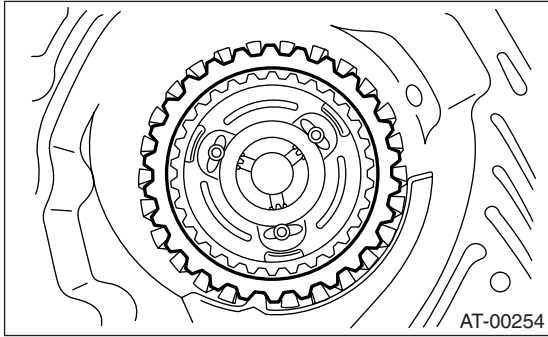
AUTOMATIC TRANSMISSION

15) Remove the snap ring and thrust needle bearing.

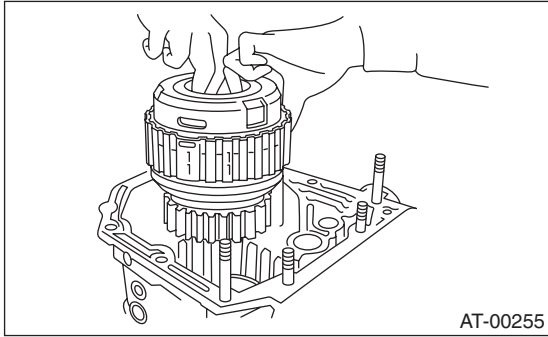


- (A) Snap ring
- (B) Thrust needle bearing

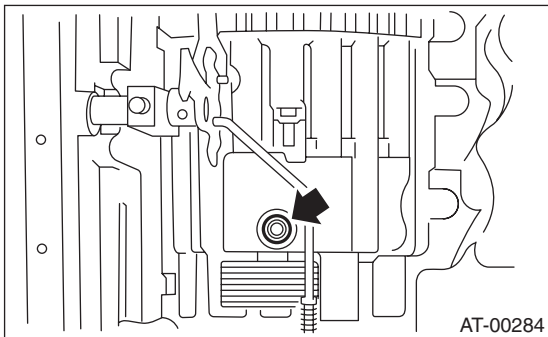
16) Take out the retaining plate of the 2-4 brake, drive plate and driven plate.



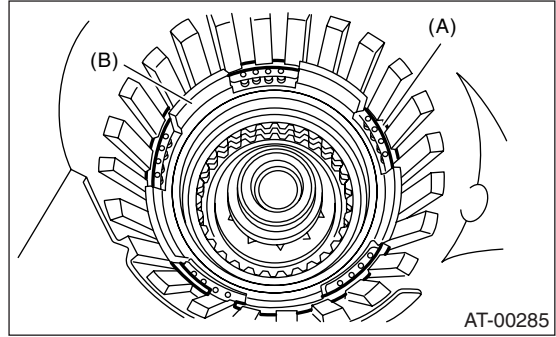
17) Take out the thrust needle bearing, planetary gear assembly and low clutch assembly.



18) Remove the 2-4 brake seal.

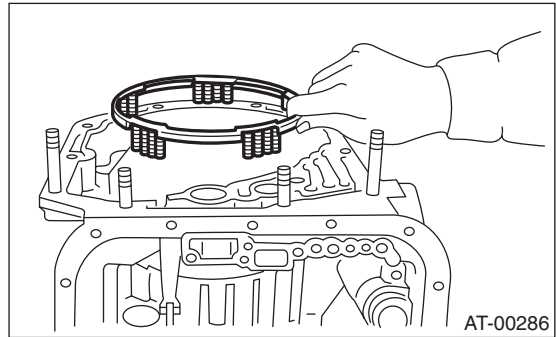


19) Remove the snap ring.

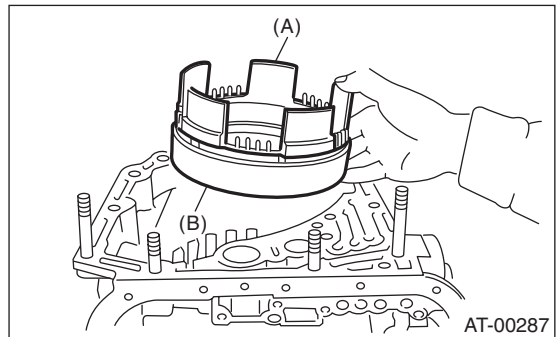


- (A) Snap ring
- (B) 2-4 brake piston

20) Take out the 2-4 brake spring retainer.

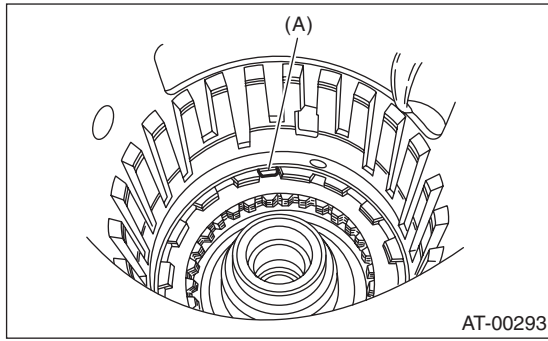


21) Remove the 2-4 brake piston and 2-4 brake piston retainer while taking care not to damage them.



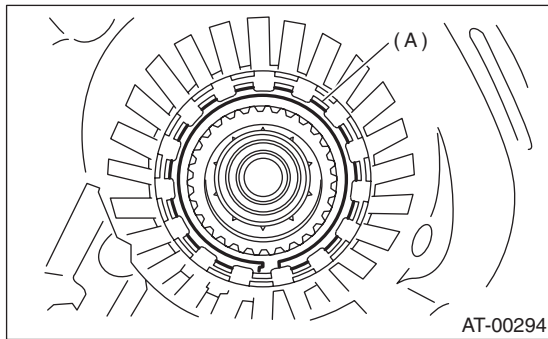
- (A) 2-4 brake piston
- (B) 2-4 brake piston retainer

22) Pull out the low & reverse brake leaf spring without bending it.



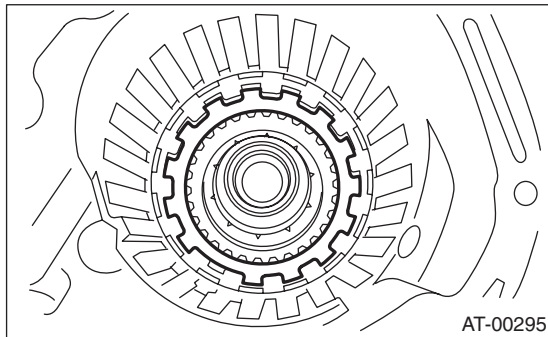
(A) Leaf spring

23) Remove the snap ring.

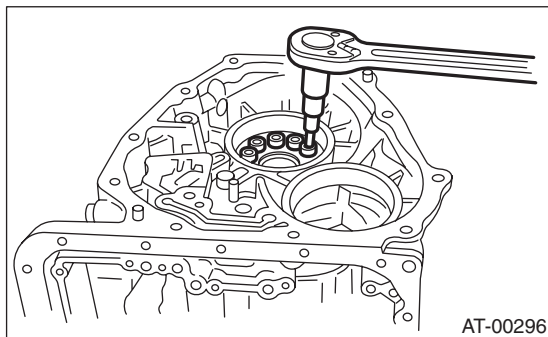


(A) Snap ring

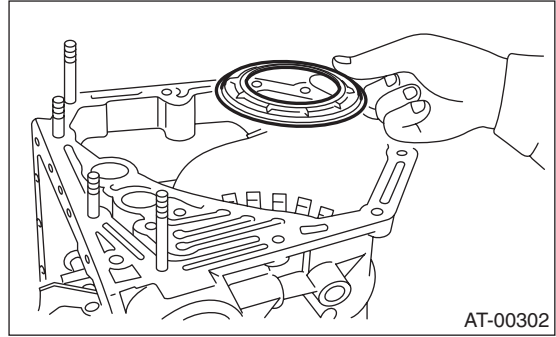
24) Take out the low & reverse brake retaining plate, drive plate, driven plate and dish plate.



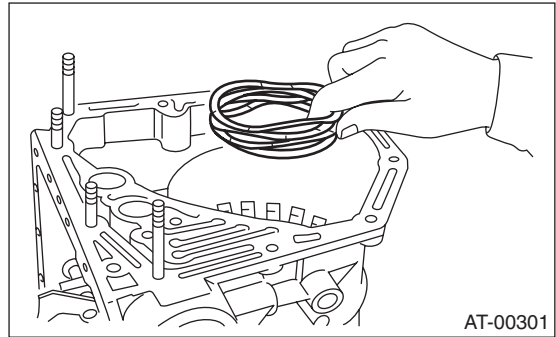
25) Turn the transmission case upside down, and then take out the socket bolts while holding the one-way clutch inner race by hand.



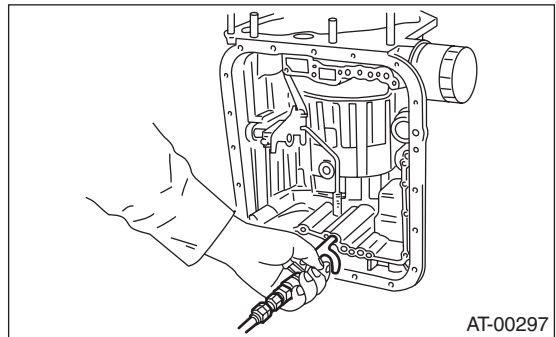
26) Remove the spring retainer.



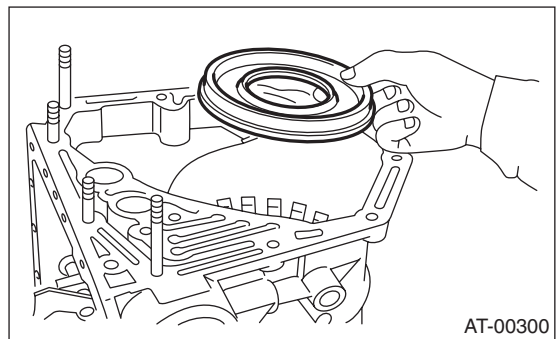
27) Take out the return spring.



28) Apply compressed air.



29) Take out the low & reverse brake piston.



AT Main Case

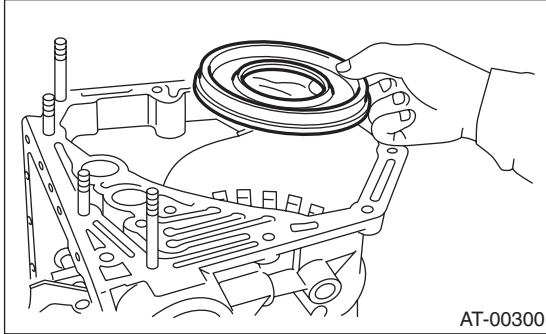
AUTOMATIC TRANSMISSION

B: INSTALLATION

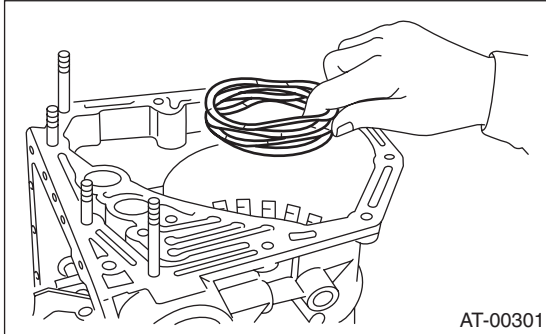
1) Apply ATF to the lips and install the low & reverse piston.

NOTE:

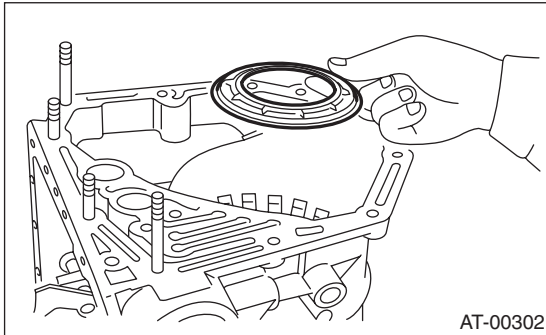
Do not let the lip seal be damaged.



2) Install the return spring.



3) Install the spring retainer.

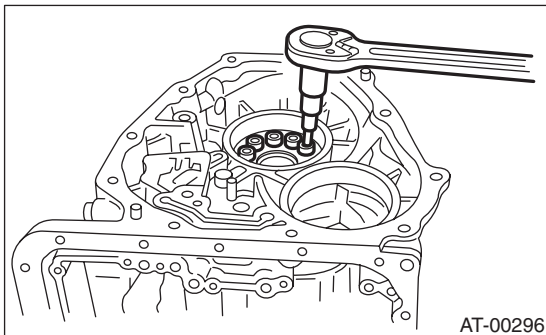


4) Install the one-way clutch inner race.

5) Tighten the socket head bolts evenly from the rear side of transmission case.

Tightening torque:

25 N·m (2.5 kgf·m, 18.1 ft·lb)



6) Place the front side of transmission body up.

7) Install the thrust needle bearing.

8) Place the dish plate, driven plate, drive plate and retaining plate neatly in this order on surface table.

9) Set the micro gauge to clutch, and read its scale.

NOTE:

The value, which is read in the gauge at this time, is zero point.

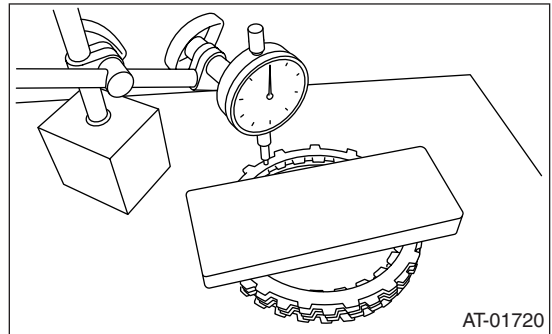
10) Scale and record the weight "Z" of a flat board which will be put on retaining plate.

NOTE:

- Use a stiff board which does not bend against load as a flat board to be put on retaining plate.

- Use a flat board of its weight less than 8.5 kg (18.7 lb).

11) Put the flat board on retaining plate.



12) Using the following formula, read the push/pull gage, and calculate "N".

$$N = 8.5 \text{ kg (18.7 lb)} - Z$$

N: Value indicated on push/pull gauge

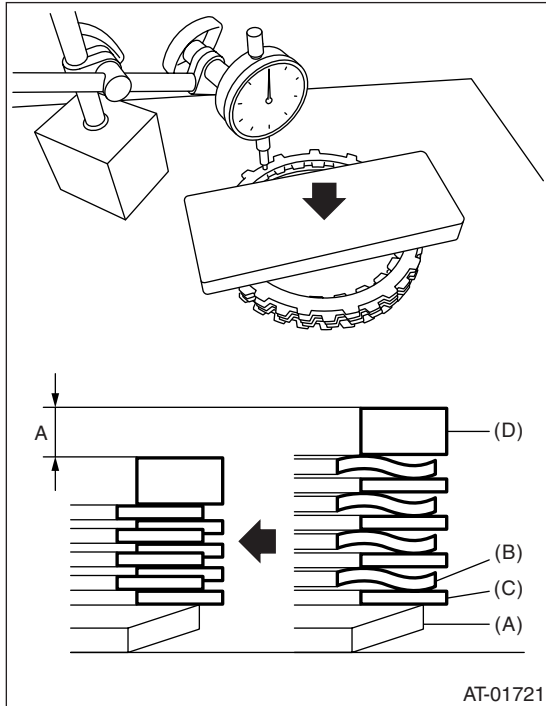
8.5 kg (18.7 lb) : Load applied to clutch plate

Z: Flat board weight

13) Press the center of retaining plate by applying a force of N using push/pull gauge, and then measure and record the height A. Measure at three locations or more spaced by equal distances and take the average value.

NOTE:

If measuring in three locations, measure every 120°. If in four locations, measure every 90°.

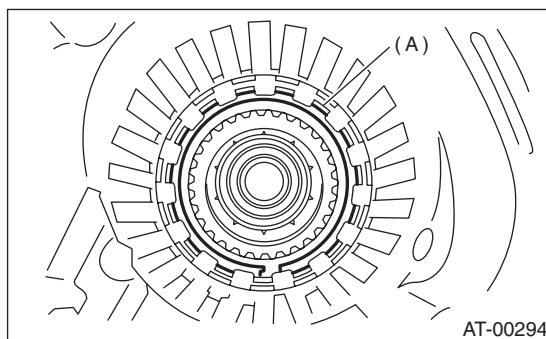


- (A) Dish plate
- (B) Driven plate
- (C) Drive plate
- (D) Retaining plate

14) Installation of the low & reverse brake:
Install the dish plate, driven plate, drive plate and retaining plate, and then secure them with a snap ring.

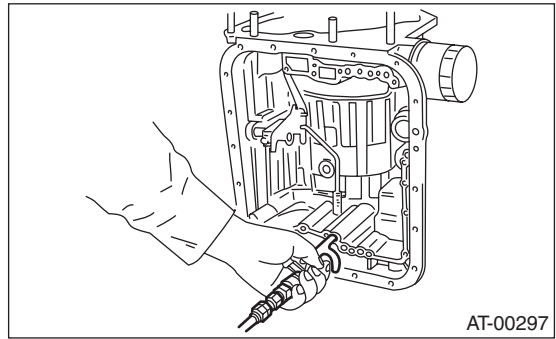
NOTE:

Pay attention to the orientation of the dish plate.



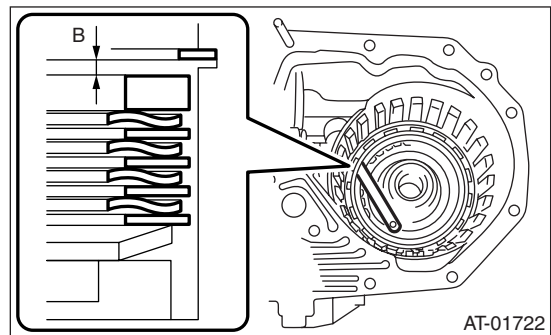
- (A) Snap ring

15) Apply compressed air intermittently to check for operation.



16) Measure the clearance.

(1) Place same thickness shims on both sides to prevent plate from tilting, then measure and record the clearance B.



AT Main Case

AUTOMATIC TRANSMISSION

(2) Piston stroke calculation

Calculate with A and B dimensions recorded before. If the calculated value exceeds the service limit, replace the drive plate with a new one and select and adjust the retaining plate to be within the default specification values.

$$T = A + B$$

T: Piston stroke

A: Amount of drive plate compression

B: Clearance between retaining plate and snap ring

Turbo model

Initial standard:

2.7 — 3.2 mm (0.106 — 0.126 in)

Limit thickness:

3.9 mm (0.153 in)

Non-turbo model

Initial standard:

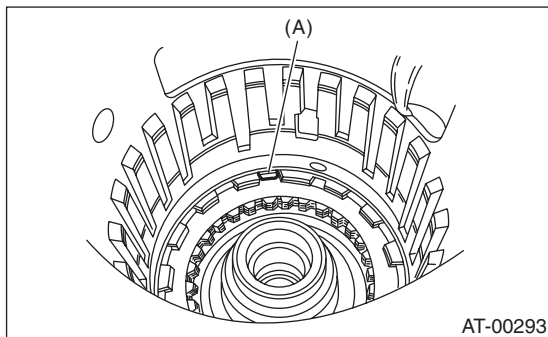
2.15 — 2.65 mm (0.085 — 0.104 in)

Limit thickness:

2.95 mm (0.116 in)

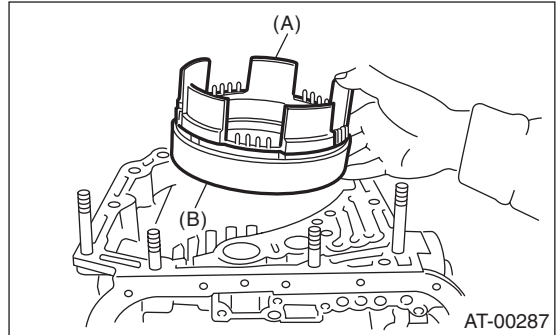
Retaining plate	
Part No.	Thickness mm (in)
31667AA320	4.1 (0.161)
31667AA330	4.4 (0.173)
31667AA340	4.7 (0.185)
31667AA350	5.0 (0.197)
31667AA360	5.3 (0.209)
31667AA370	5.6 (0.220)
31667AA380	5.9 (0.232)

17) Install the leaf spring of the low & reverse brake.



(A) Leaf spring

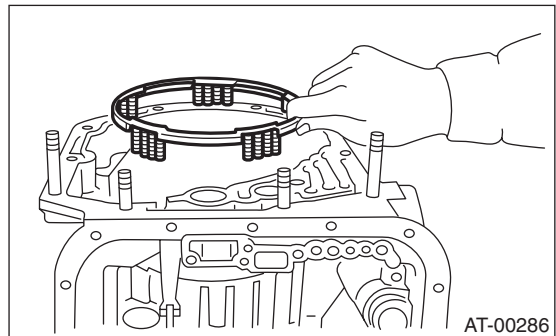
18) Install the 2-4 brake piston and 2-4 brake retainer by aligning the hole of the 2-4 brake retainer with the hole on the transmission case.



(A) 2-4 brake piston

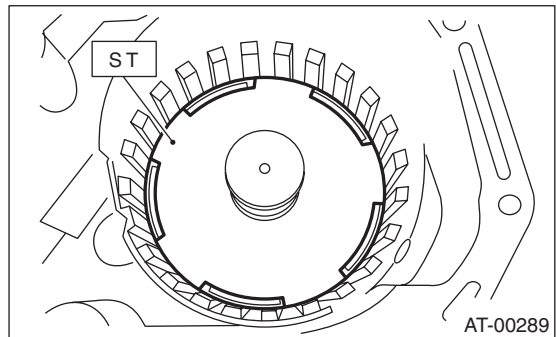
(B) 2-4 brake piston retainer

19) Install 2-4 brake piston spring retainer to the transmission case.



20) Position the snap ring in the transmission. Using ST, press the snap ring into the specified location.

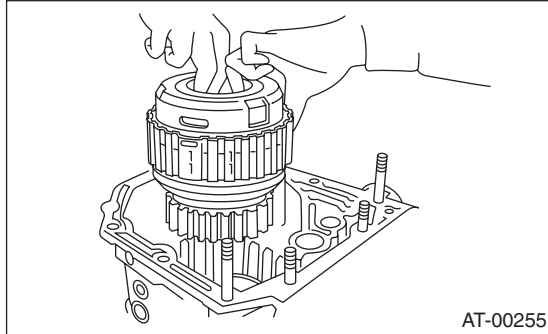
ST 498677100 COMPRESSOR



21) Install the planetary gear and low clutch assembly to the transmission case.

NOTE:

Install carefully while rotating the low clutch and planetary gear assembly slowly, paying special attention not to damage the seal ring.



22) Measure the amount of drive plate compression and record that value. (Non-turbo model)

- (1) Place the dish plate, driven plate, drive plate and retaining plate neatly in this order on surface table.
- (2) Set the micro gauge to clutch, and read its scale.

NOTE:

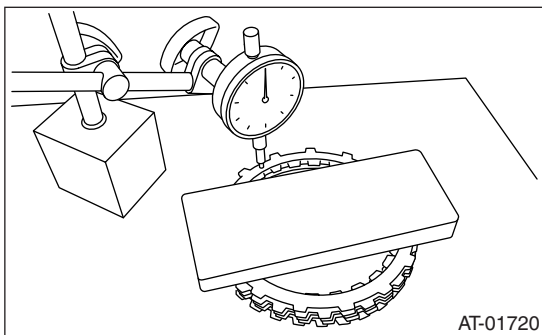
The value, which is read in the gauge at this time, is zero point.

- (3) Scale and record the weight "Z" of a flat board which will be put on retaining plate.

NOTE:

- Use a stiff board which does not bend against load as a flat board to be put on retaining plate.
- Use a flat board of its weight less than 10.2 kg (22.5 lb).

- (4) Put the flat board on retaining plate.



(5) Using the following formula, read the push/pull gauge, and calculate "N".

$$N = 10.2 \text{ kg (22.5 lb)} - Z$$

N: Value indicated on push/pull gauge

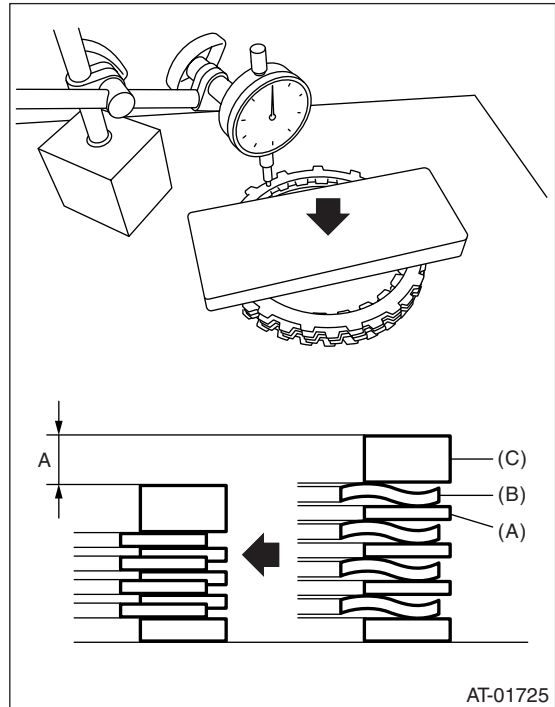
10.2 kg (22.5 lb) : Load applied to clutch plate

Z: Flat board weight

(6) Press the center of retaining plate by applying a force of N using push/pull gauge, and then measure and record the height A. Measure at three locations or more spaced by equal distances and take the average value.

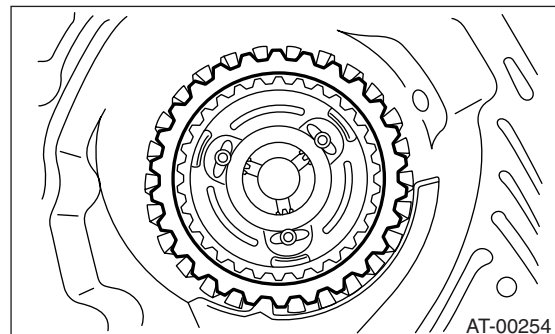
NOTE:

If measuring in three locations, measure every 120°. If measuring in four locations, measure every 90°.



- (A) Drive plate
- (B) Driven plate
- (C) Retaining plate

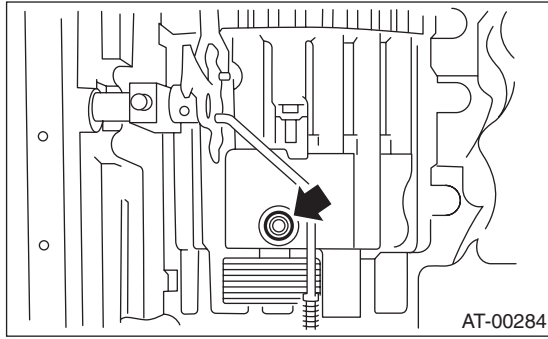
23) Install the pressure rear plate, 2-4 brake drive plate, driven plate, retaining plate and snap ring.



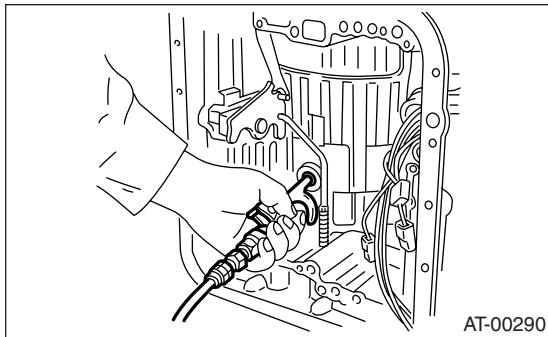
AT Main Case

AUTOMATIC TRANSMISSION

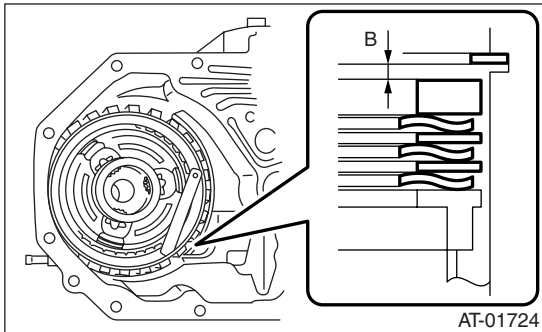
24) Install a new 2-4 brake seal to transmission case.



25) After all 2-4 brake component parts have been installed, blow in air intermittently and confirm the operation of brake.



26) Check the piston stroke. (Non-turbo model)
 (1) Measure the clearance B between the retaining plate and snap ring.



(2) Piston stroke calculation

Calculate with A and B dimensions recorded before. If the service limits from the calculation formula are exceeded, replace the drive plate and select and adjust the retaining plate to be within standard values.

$$T = A + B$$

T: Piston stroke

A: Amount of drive plate compression

B: Clearance between retaining plate and snap ring

Initial standard:

1.7 — 2.1 mm (0.067 — 0.083 in)

Limit thickness:

2.3 mm (0.091 in)

Retaining plate	
Part No.	Thickness mm (in)
31567AA991	5.6 (0.220)
31567AB001	5.8 (0.228)
31567AB011	6.0 (0.236)
31567AB021	6.2 (0.244)
31567AB031	6.4 (0.252)
31567AB041	6.6 (0.260)

27) Measure the clearance between the retaining plate and snap ring. (Turbo model)

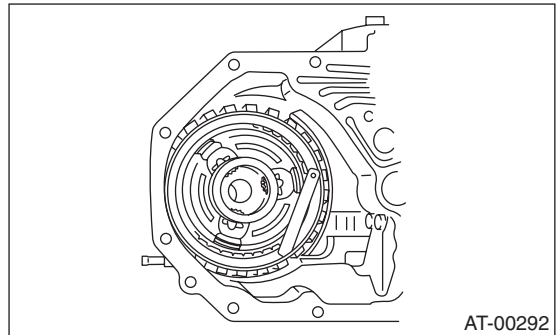
If the clearance exceeds the service limits, replace the driven plate and select and adjust the retaining plate so that the clearance is within default standard values.

Initial standard:

0.8 — 1.2 mm (0.031 — 0.047 in)

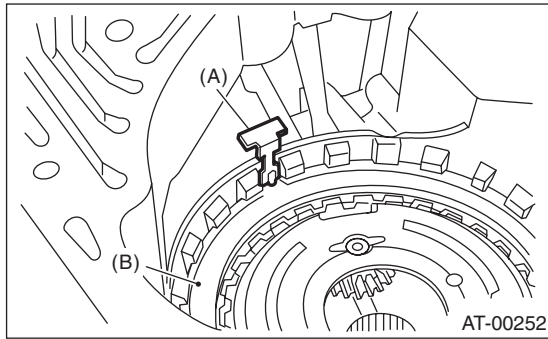
Limit thickness:

1.5 mm (0.059 in)



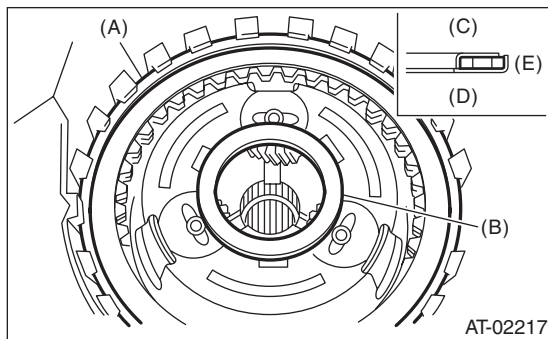
Retaining plate	
Part No.	Thickness mm (in)
31567AA991	5.6 (0.220)
31567AB001	5.8 (0.228)
31567AB011	6.0 (0.236)
31567AB021	6.2 (0.244)
31567AB031	6.4 (0.252)
31567AB041	6.6 (0.260)

28) Be careful not to mistake the location of the leaf spring to be installed.



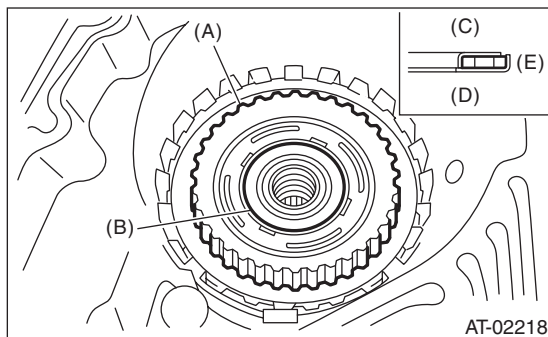
- (A) Leaf spring
- (B) Retaining plate

29) Install the thrust needle bearing in the correct direction.



- (A) Snap ring
- (B) Thrust needle bearing
- (C) Upside
- (D) Downside
- (E) Outside

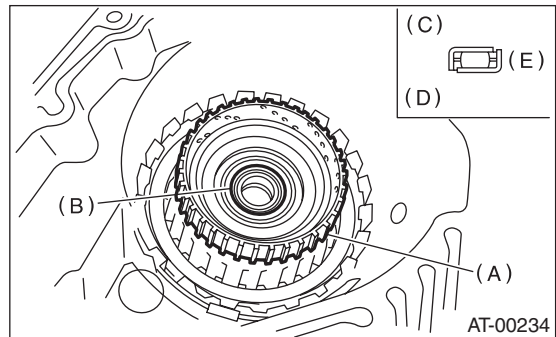
30) Install the front sun gear and the thrust needle bearing.



- (A) Front sun gear
- (B) Thrust needle bearing
- (C) Upside
- (D) Downside
- (E) Outside

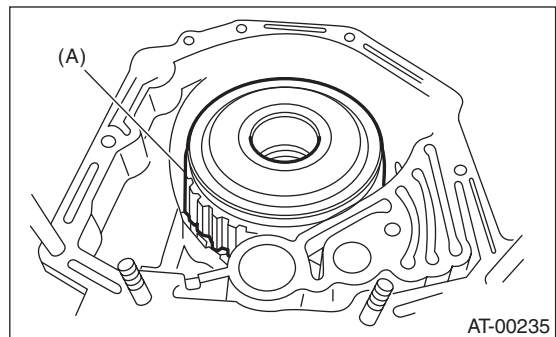
31) Apply vaseline, then attach the thrust needle bearing to the high clutch hub. Install the high clutch hub by correctly engaging the splines of the front planetary carrier.

32) Install the thrust needle bearing in the correct direction.



- (A) High clutch hub
- (B) Thrust needle bearing
- (C) Upside
- (D) Downside
- (E) Outside

33) Install the high clutch assembly and reverse clutch assembly.



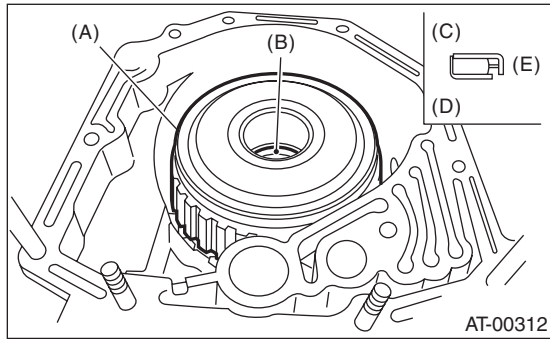
- (A) High clutch and reverse clutch ASSY

34) Adjust the total end play. <Ref. to 4AT-93, ADJUSTMENT, Oil Pump Housing.>

AT Main Case

AUTOMATIC TRANSMISSION

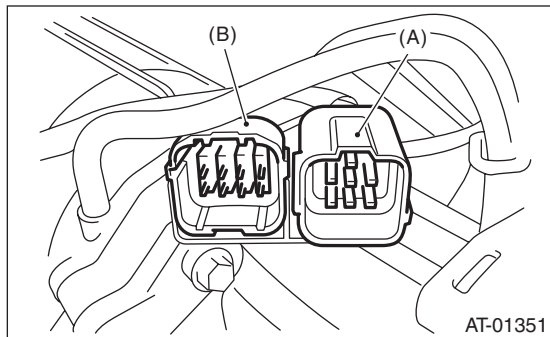
35) Install the thrust needle bearing in the correct direction.



- (A) High clutch and reverse clutch ASSY
- (B) Thrust needle bearing
- (C) Upside
- (D) Downside
- (E) Outside

36) Install the converter case assembly to the transmission case assembly. <Ref. to 4AT-87, INSTALLATION, Converter Case.>

37) Insert the inhibitor switch and transmission connector to the stay.



- (A) Transmission harness
- (B) Inhibitor switch harness

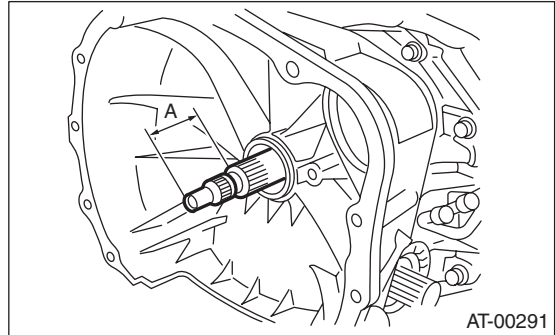
38) Install the air breather hose. <Ref. to 4AT-65, INSTALLATION, Air Breather Hose.>

39) Install the ATF cooler pipe. <Ref. to 4AT-63, INSTALLATION, ATF Cooler Pipe and Hose.>

40) Install the oil charge pipe along with the O-ring. <Ref. to 4AT-66, INSTALLATION, Oil Charge Pipe.>

41) Insert the input shaft while rotating it lightly by hand, and then check the amount of protrusion.

Normal protrusion A:
50 — 55 mm (1.97 — 2.17 in)



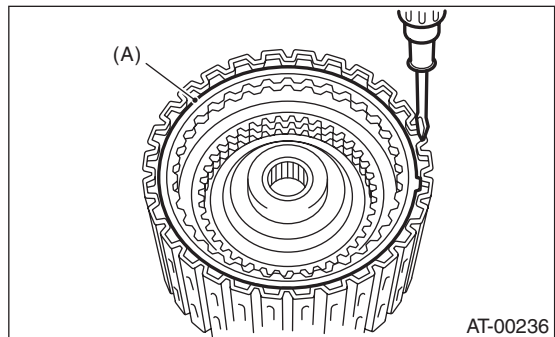
42) Install the torque converter clutch assembly. <Ref. to 4AT-67, INSTALLATION, Torque Converter Clutch Assembly.>

43) Install the transmission assembly to the vehicle. <Ref. to 4AT-40, INSTALLATION, Automatic Transmission Assembly.>

C: DISASSEMBLY

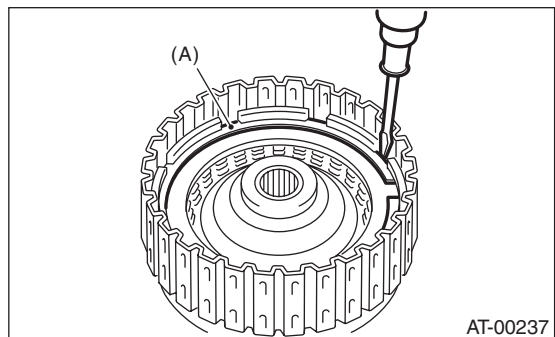
1. HIGH CLUTCH AND REVERSE CLUTCH

1) Remove the snap ring, and then take out the retaining plate, drive plate and driven plate.



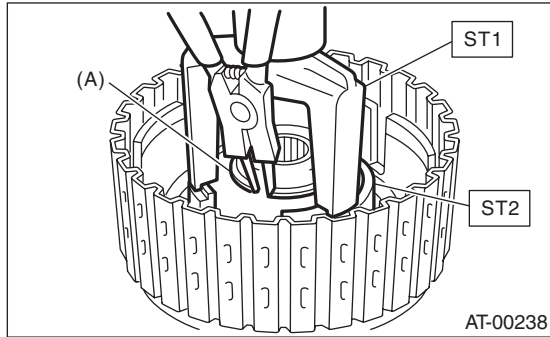
- (A) Snap ring

2) Remove the snap ring, and then take out the retaining plate, drive plate and driven plate.



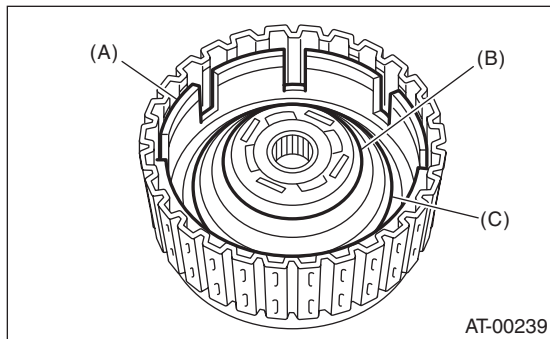
- (A) Snap ring

- 3) Using the ST1 and ST2, remove the snap ring.
 ST1 398673600 COMPRESSOR
 ST2 498627100 SEAT



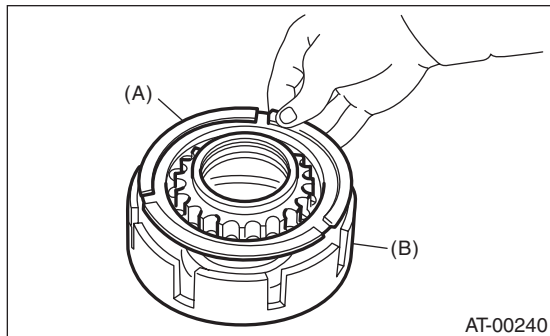
(A) Snap ring

- 4) Take out the clutch cover, spring retainer, high clutch piston and reverse clutch piston.



(A) Reverse clutch piston
 (B) Clutch cover
 (C) Return spring

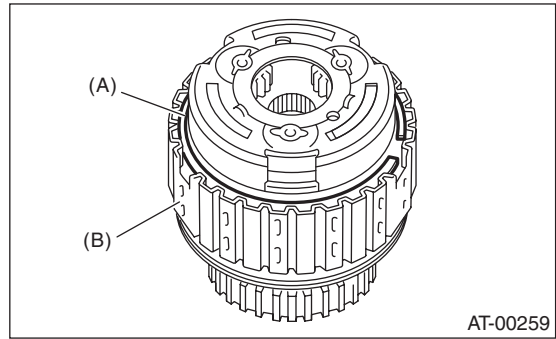
- 5) Remove the D-ring and lip seal from the high clutch piston and reverse clutch piston.



(A) High clutch piston
 (B) Reverse clutch piston

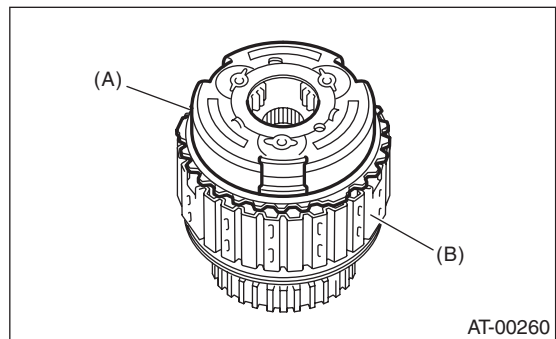
2. PLANETARY GEAR AND LOW CLUTCH

- 1) Remove the snap ring from low clutch drum.



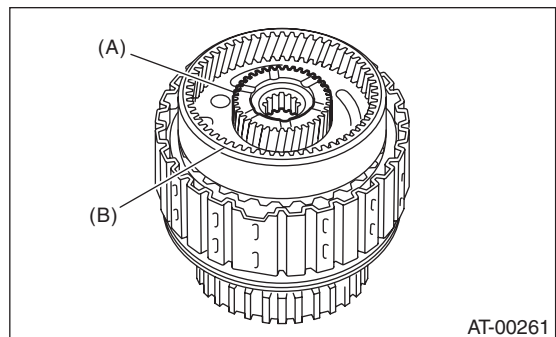
(A) Snap ring
 (B) Low clutch drum

- 2) Take out the front planetary carrier.



(A) Front planetary carrier
 (B) Low clutch drum

- 3) Take out the rear sun gear.

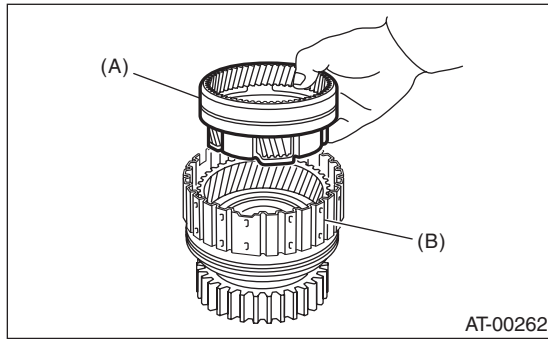


(A) Rear sun gear
 (B) Rear planetary carrier

AT Main Case

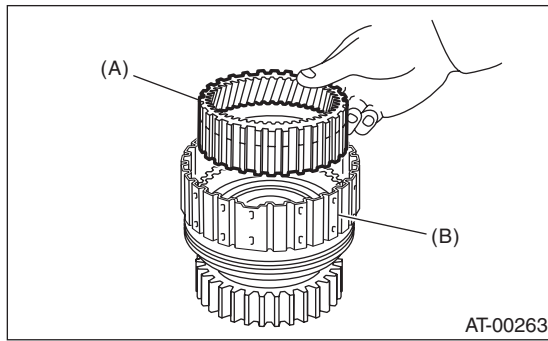
AUTOMATIC TRANSMISSION

4) Take out the rear planetary carrier, washer and thrust needle bearing.



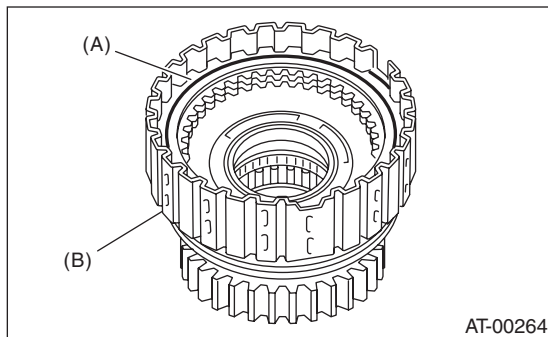
(A) Rear planetary carrier
(B) Low clutch drum

5) Take out the rear internal gear.



(A) Rear internal gear
(B) Low clutch drum

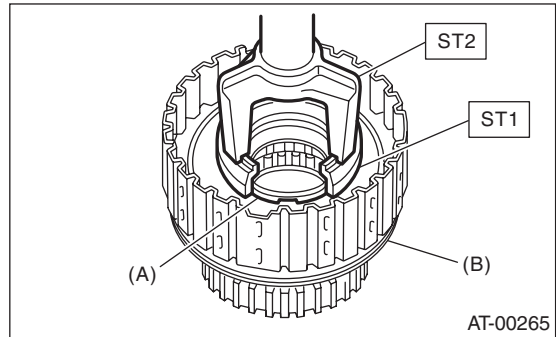
6) Remove the snap ring from low clutch drum.



(A) Snap ring
(B) Low clutch drum

7) Compress the spring retainer of the low & reverse brake, and remove the snap ring from low clutch drum using ST1 and ST2.

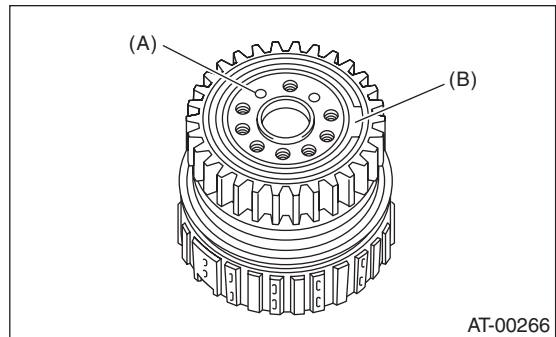
ST1 498627100 SEAT
ST2 398673600 COMPRESSOR



(A) Snap ring
(B) Low clutch drum

8) Remove the one-way clutch. <Ref. to 4AT-107, REMOVAL, AT Main Case.>

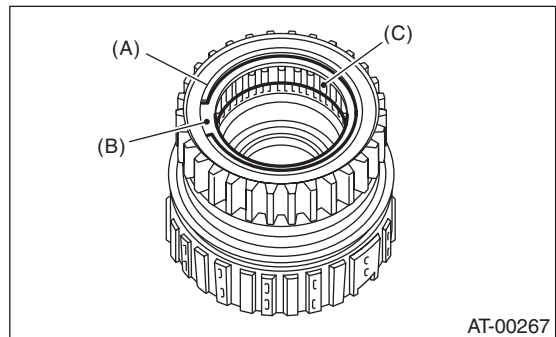
9) Install the one-way clutch inner race to the low clutch drum, and then apply compressed air to remove the low clutch piston.



(A) Apply compressed air.
(B) One-way clutch inner race

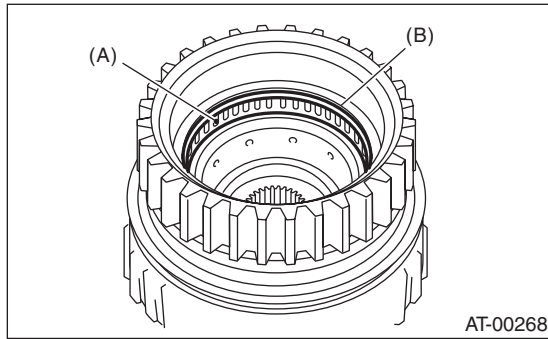
10) Remove the one-way clutch inner race.

11) Remove the one-way clutch after taking out the snap ring.



(A) Snap ring
(B) Plate
(C) One-way clutch

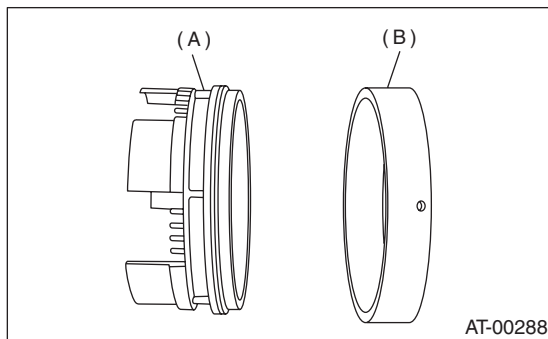
12) Remove the needle bearing after taking out the snap ring.



- (A) Needle bearing
- (B) Snap ring

3. 2-4 BRAKE

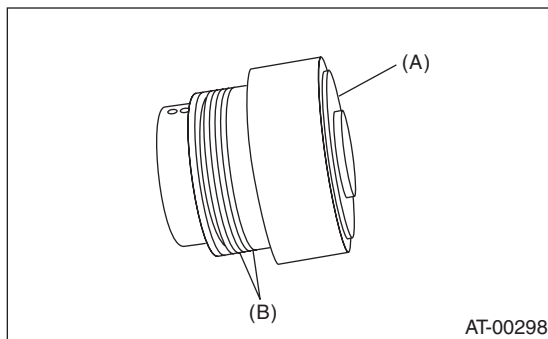
Separate the 2-4 brake piston and piston retainer.



- (A) 2-4 brake piston
- (B) 2-4 brake piston retainer

4. ONE-WAY CLUTCH INNER RACE

1) Remove the seal ring.

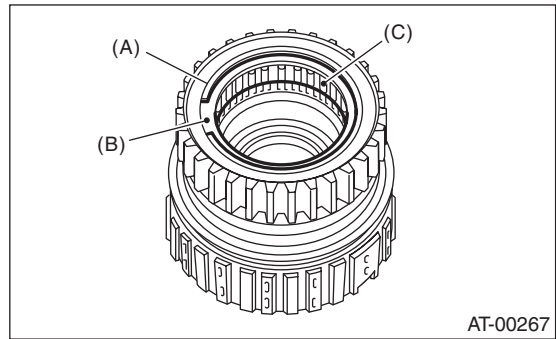


- (A) One-way clutch inner race
- (B) Seal ring

2) Remove the needle bearing using ST.
ST 398527700 PULLER ASSY

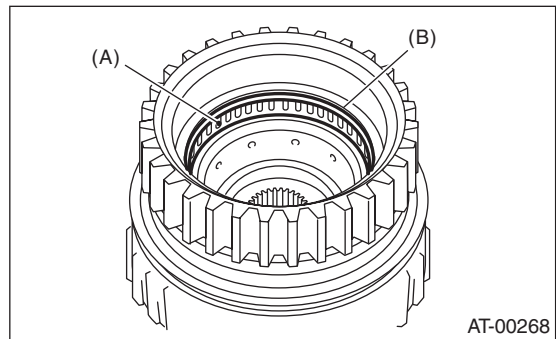
5. ONE-WAY CLUTCH OUTER RACE

1) Remove the one-way clutch after taking out the snap ring.



- (A) Snap ring
- (B) Plate
- (C) One-way clutch

2) Remove the needle bearing after taking out the snap ring.



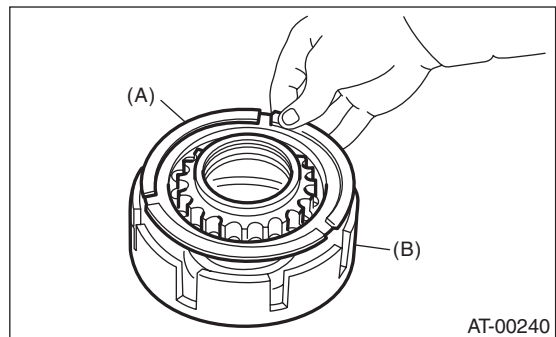
- (A) Needle bearing
- (B) Snap ring

D: ASSEMBLY

1. HIGH CLUTCH AND REVERSE CLUTCH

1) Install the new D-ring and lip seal to the high clutch piston and reverse clutch piston.

2) Install the high clutch piston to the reverse clutch piston.

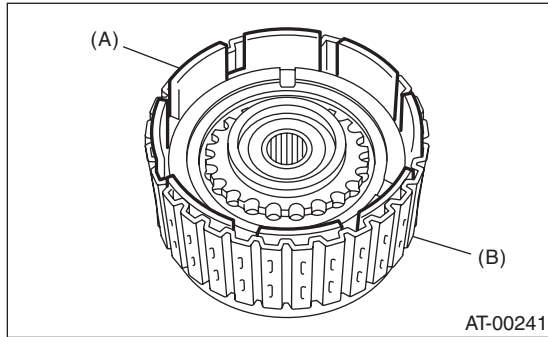


- (A) High clutch piston
- (B) Reverse clutch piston

AT Main Case

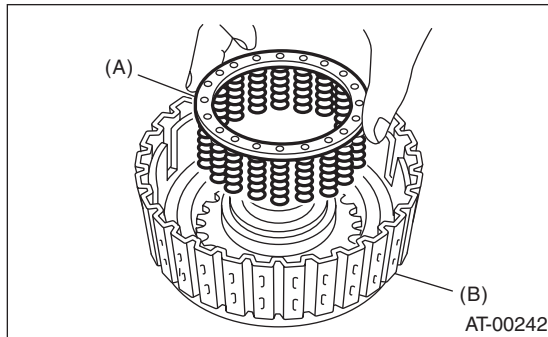
AUTOMATIC TRANSMISSION

3) Install the reverse clutch assembly to the high clutch drum. Align the groove on reverse clutch piston with the groove on high clutch drum during installation.



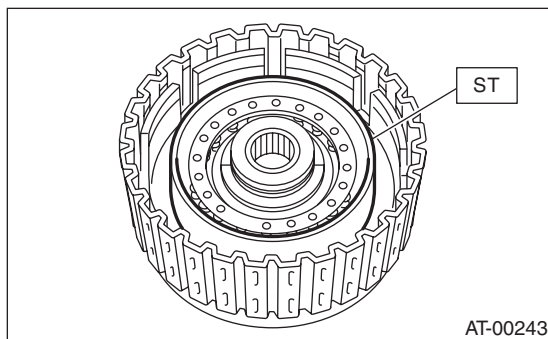
(A) Reverse clutch piston
(B) High clutch drum

4) Install the spring retainer to the high clutch piston.



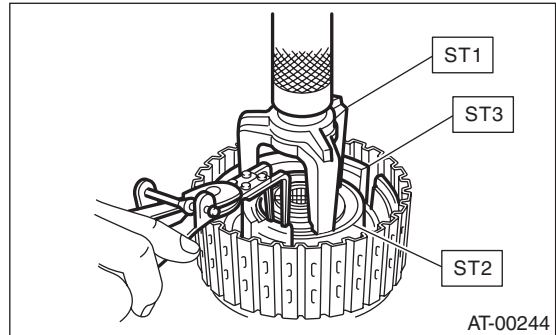
(A) Return spring
(B) High clutch drum

5) Attach the ST to the high clutch piston.
ST 498437000 HIGH CLUTCH PISTON GUIDE



6) Install the cover to the high clutch piston without bending the high clutch piston seal.

7) Install the snap ring using ST1 and ST2.
ST1 398673600 COMPRESSOR
ST2 498627100 SEAT
ST3 498437000 HIGH CLUTCH PISTON GAUGE



8) Measure the amount of drive plate compression and record that value.

- (1) Place the dish plate, driven plate, drive plate and retaining plate neatly in this order on surface table.
- (2) Set the micro gauge to clutch, and read its scale.

NOTE:

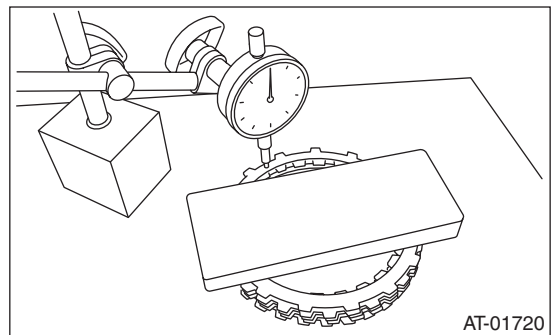
The value, which is read in the gauge at this time, is zero point.

- (3) Scale and record the weight "Z" of a flat board which will be put on retaining plate.

NOTE:

- Use a stiff board which does not bend against load as a flat board to be put on retaining plate.
- Use a flat board weighing less than 25.5 kg (56.2 lb).

- (4) Put the flat board on retaining plate.



(5) Using the following formula, read the push/pull gage, and calculate "N".

$$N = 25.5 \text{ kg (56.2 lb)} - Z$$

N: Value indicated on push/pull gauge

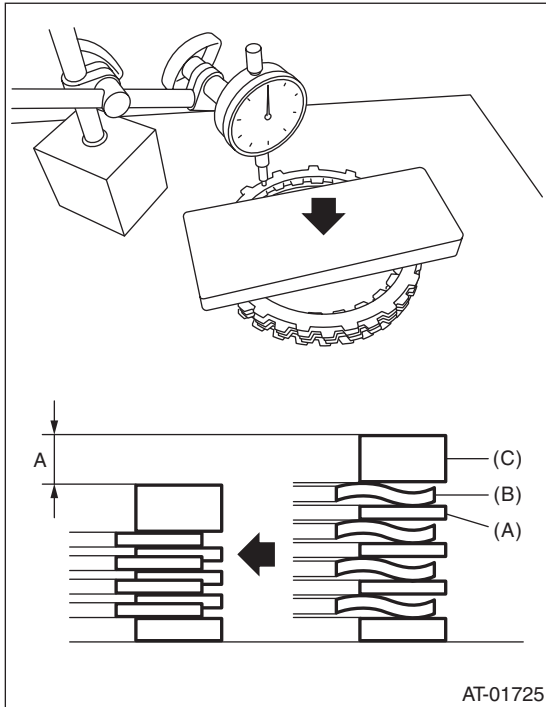
25.5 kg (56.2 lb) : Load applied to clutch plate

Z: Flat board weight

(6) Press the center of retaining plate by applying a force of N using push/pull gauge, and then measure and record the height A. Measure at three locations or more spaced by equal distances and take the average value.

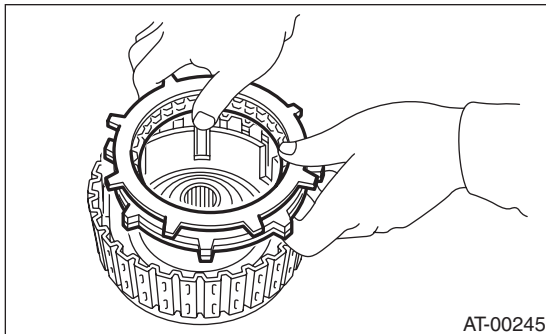
NOTE:

If measuring in three locations, measure every 120°. If measuring in four locations, measure every 90°.



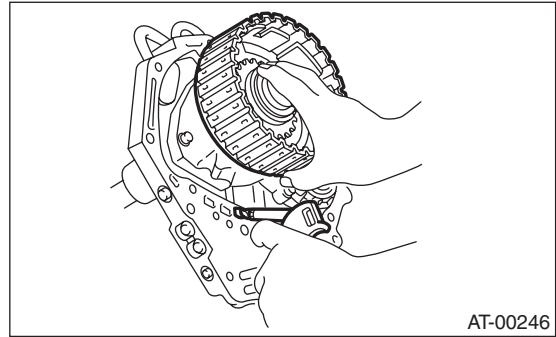
- (A) Drive plate
- (B) Driven plate
- (C) Retaining plate

9) Install the thickest driven plate to piston side, and then install the driven plate, drive plate, retaining plate to high clutch drum.

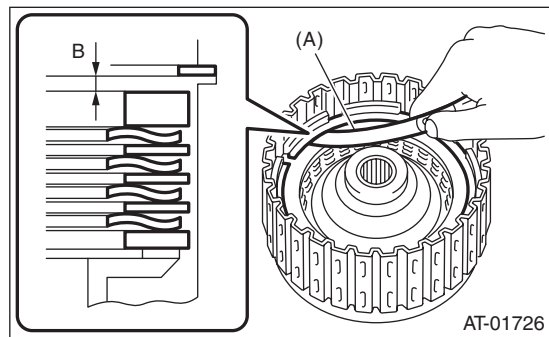


10) Install the snap ring to high clutch drum.

11) Apply compressed air intermittently to check for operation.



12) Check the piston stroke. (Non-turbo model)
 (1) Measure the clearance B between the retaining plate and snap ring. (High clutch)



(A) Thickness gauge

(2) Piston stroke calculation

Calculate with A and B dimensions recorded before. If the service limits from the calculation formula are exceeded, replace the drive plate and select and adjust the retaining plate to within default standard values.

$$T = A + B$$

T: Piston stroke

A: Amount of drive plate compression

B: Clearance between retaining plate and snap ring

Initial standard:

2.0 — 2.3mm (0.079 — 0.091 in)

Limit thickness:

2.6 mm (0.102 in)

High clutch retaining plate	
Part No.	Thickness mm (in)
31567AA710	4.7 (0.185)
31567AA720	4.8 (0.189)
31567AA730	4.9 (0.193)
31567AA740	5.0 (0.197)
31567AA670	5.1 (0.201)
31567AA680	5.2 (0.205)
31567AA690	5.3 (0.209)
31567AA700	5.4 (0.213)

AT Main Case

AUTOMATIC TRANSMISSION

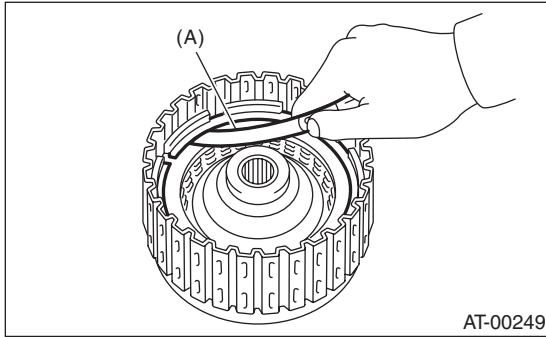
13) Measure the clearance between the high clutch retaining plate and snap ring. (Turbo model)
At this time, do not press down the retaining plate.

Initial standard:

0.8 — 1.1 mm (0.031 — 0.043 in)

Limit thickness:

1.5 mm (0.059 in)



(A) Thickness gauge

If the clearance exceeds the service limits, replace the drive plate, then select and adjust the retaining plate so that the clearance is within default standard values.

Retaining plate	
Part No.	Thickness mm (in)
31567AA710	4.7 (0.185)
31567AA720	4.8 (0.189)
31567AA730	4.9 (0.193)
31567AA740	5.0 (0.197)
31567AA670	5.1 (0.201)
31567AA680	5.2 (0.205)
31567AA690	5.3 (0.209)
31567AA700	5.4 (0.213)

14) Measure the amount of drive plate compression and record that value.

(1) Place the dish plate, driven plate, drive plate and retaining plate neatly in this order on surface table.

(2) Set the micro gauge to clutch, and read its scale.

NOTE:

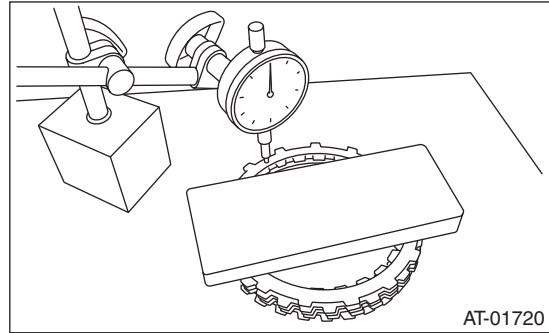
The value, which is read in the gauge at this time, is zero point.

(3) Scale and record the weight “Z” of a flat board which will be put on retaining plate.

NOTE:

- Use a stiff board which does not bend against load as a flat board to be put on retaining plate.
- Use a flat board of its weight less than 15.3 kg (33.7 lb).

(4) Put the flat board on retaining plate.



(5) Using the following formula, read the push/pull gauge, and calculate “N”.

$$N = 15.3 \text{ kg (33.7 lb)} - Z$$

N: Value indicated on push/pull gauge

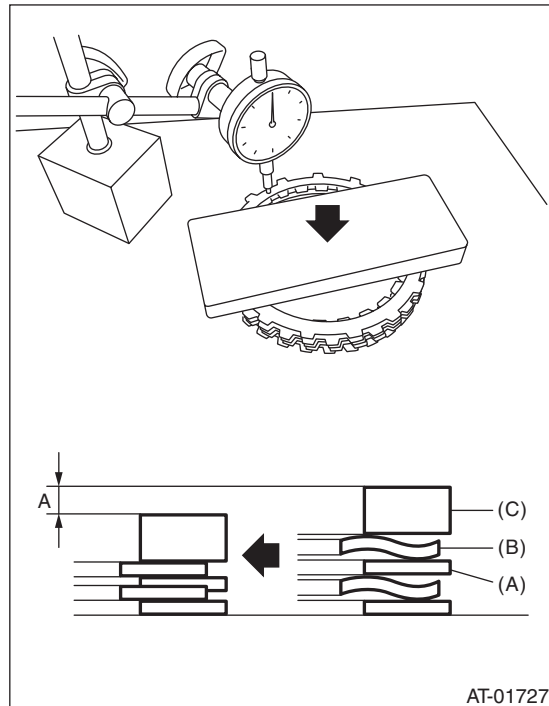
15.3 kg (33.7 lb) : Load applied to clutch plate

Z: Flat board weight

(6) Press the center of retaining plate by applying a force of N using push/pull gauge, and then measure and record the height A. Measure at three locations or more spaced by equal distances and take the average value.

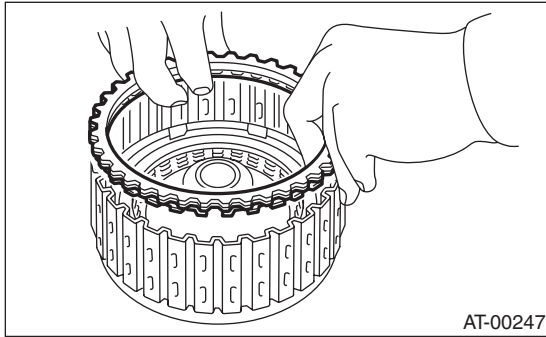
NOTE:

If measuring in three locations, measure every 120°. If measuring in four locations, measure every 90°.

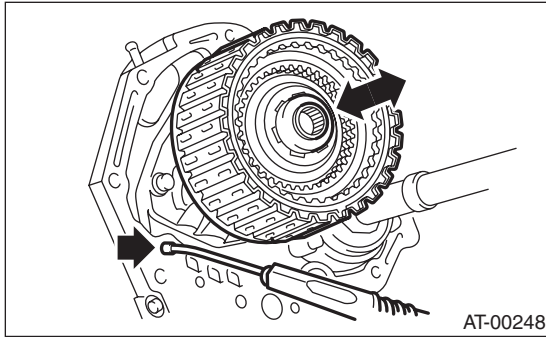


- (A) Drive plate
- (B) Driven plate
- (C) Retaining plate

15) Install the driven plate, drive plate, retaining plate and snap ring.

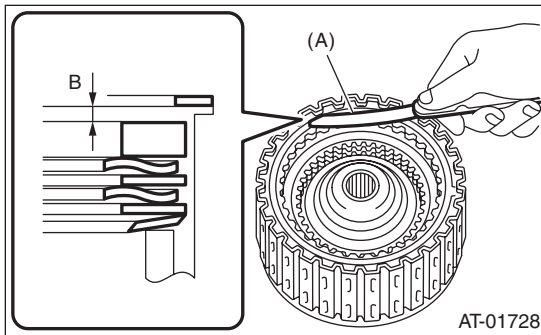


16) Apply compressed air intermittently to check for operation.



17) Check the piston stroke.

(1) Measure the clearance B between the retaining plate and snap ring. (Reverse clutch)
At this time, do not press down the retaining plate.



(A) Thickness gauge

(2) Piston stroke calculation

Calculate with A and B dimensions recorded before. If the calculated value exceeds the service limit, replace the drive plate with a new one and adjust it within the initial specification.

$$T = A + B$$

T: Piston stroke

A: Amount of drive plate compression

B: Clearance between retaining plate and snap ring

Initial standard:

1.1 — 1.4mm (0.043 — 0.055 in)

Limit thickness:

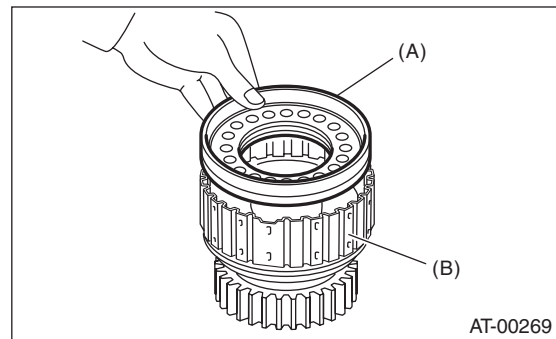
1.6 mm (0.063 in)

Reverse clutch retaining plate	
Part No.	Thickness mm (in)
31567AA910	4.0 (0.157)
31567AA920	4.2 (0.165)
31567AA930	4.4 (0.173)
31567AA940	4.6 (0.181)
31567AA950	4.8 (0.189)
31567AA960	5.0 (0.197)
31567AA970	5.2 (0.205)
31567AA980	5.4 (0.213)

2. PLANETARY GEAR AND LOW CLUTCH

1) Apply ATF to a new D-ring and install it to low clutch piston.

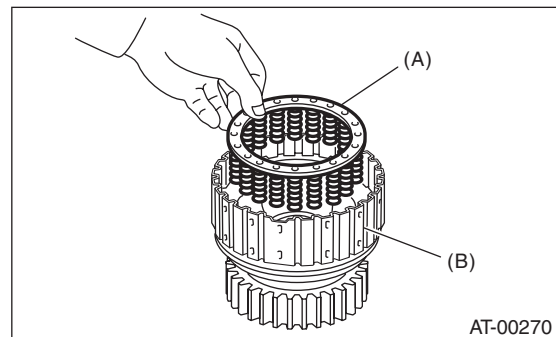
2) Install the low clutch piston to low clutch drum.



(A) Low clutch piston

(B) Low clutch drum

3) Install the spring retainer to low clutch piston.



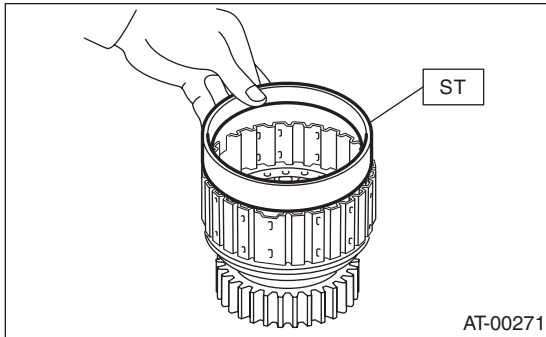
(A) Spring retainer

(B) Low clutch drum

AT Main Case

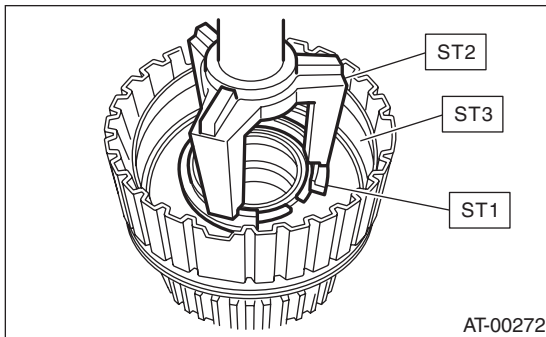
AUTOMATIC TRANSMISSION

- 4) Attach the ST to the low clutch drum.
 ST 498437100 LOW CLUTCH PISTON GUIDE

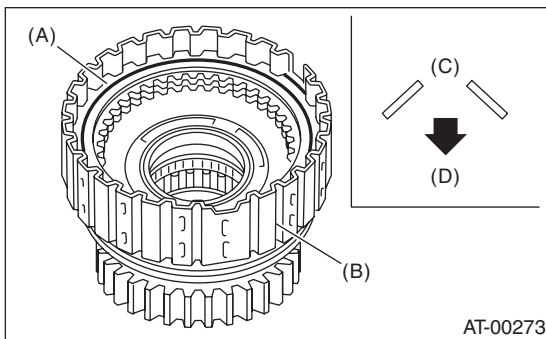


- 5) Using ST1 and ST2, set the cover on the piston and press against it, and attach the snap ring. At this time, be careful not to bend the cover seal.

- ST1 498627100 SEAT
 ST2 398673600 COMPRESSOR
 ST3 498437100 LOW CLUTCH PISTON GUIDE



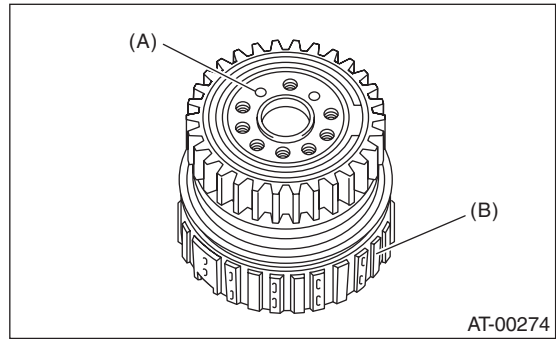
- 6) Install the dish plate, driven plate, drive plate and retaining plate, and then secure them with a snap ring.



- (A) Snap ring
 (B) Low clutch drum
 (C) Dish plate
 (D) Low clutch piston side

- 7) Check the low clutch for operation.
 (1) Remove the one-way clutch. <Ref. to 4AT-107, REMOVAL, AT Main Case.>

- (2) Set the one-way clutch inner race, and apply compressed air for checking.

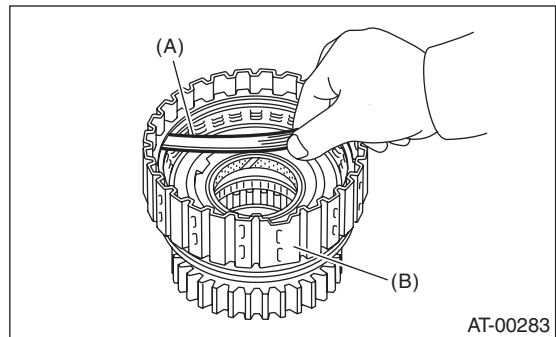


- (A) Apply compressed air.
 (B) Low clutch drum

- 8) Check the low clutch clearance.
 (1) Place same thickness shims on both sides to prevent plate from tilting.
 (2) Check the clearance between retaining plate and low clutch operation.

Initial standard:
 0.7 — 1.1 mm (0.028 — 0.043 in)

Limit thickness:
 1.6 mm (0.063 in)

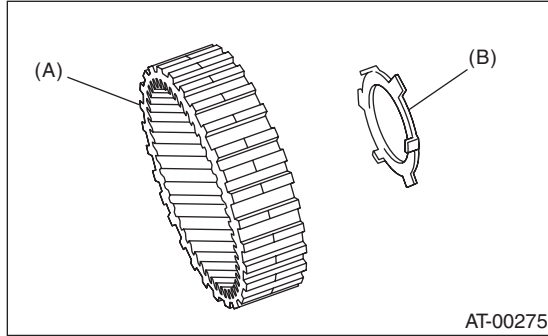


- (A) Thickness gauge
 (B) Low clutch drum

If the clearance exceeds the service limits, replace the drive plate, then select and adjust the retaining plate so that the clearance is within default standard values.

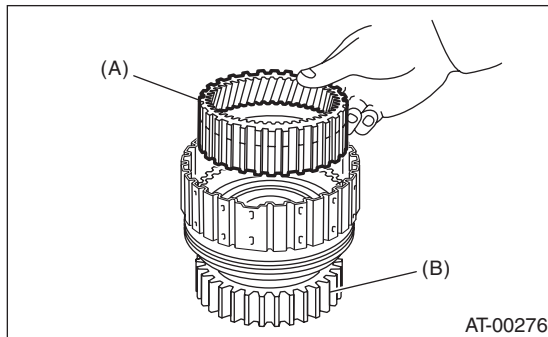
Retaining plate	
Part No.	Thickness mm (in)
31567AB050	3.8 (0.150)
31567AB060	4.0 (0.157)
31567AB070	4.2 (0.165)
31567AB080	4.4 (0.173)
31567AB090	4.6 (0.181)

9) Install the washer to the rear internal gear.



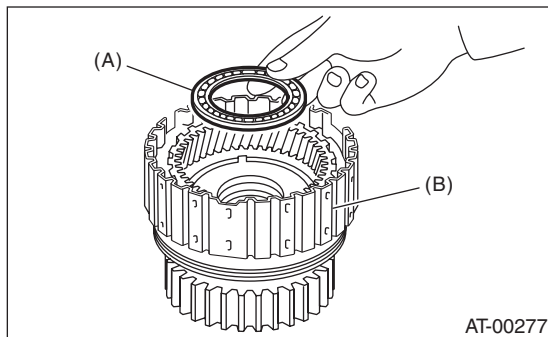
- (A) Rear internal gear
- (B) Washer

10) Install the rear internal gear.



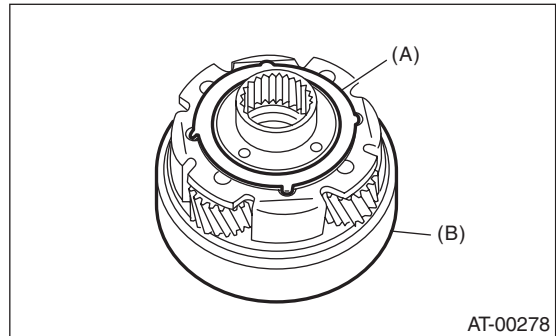
- (A) Rear internal gear
- (B) Low clutch drum

11) Install the thrust needle bearing in the correct direction.



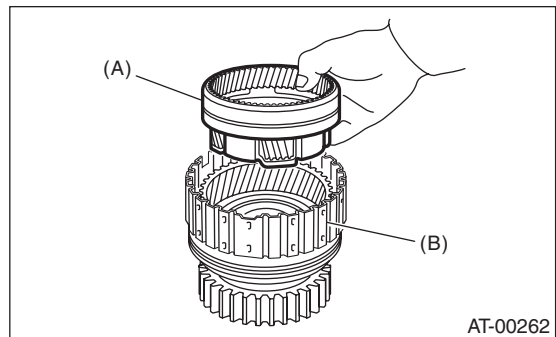
- (A) Thrust needle bearing
- (B) Low clutch drum

12) Install the washer by aligning the protrusion of the washer with the hole of the rear planetary carrier.



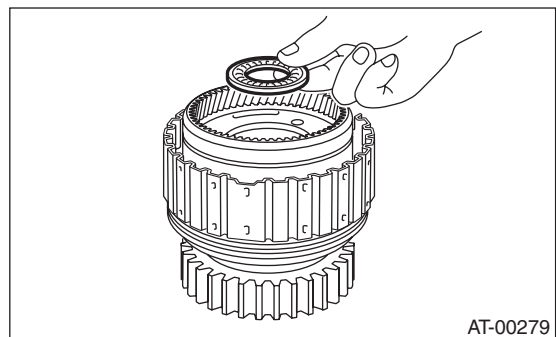
- (A) Washer
- (B) Rear planetary carrier

13) Install the rear planetary carrier to the low clutch drum.



- (A) Rear planetary carrier
- (B) Low clutch drum

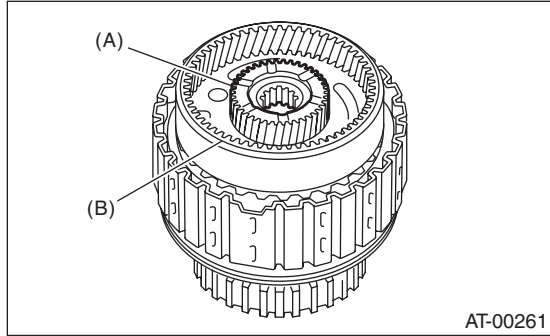
14) Install the thrust needle bearing in the correct direction.



AT Main Case

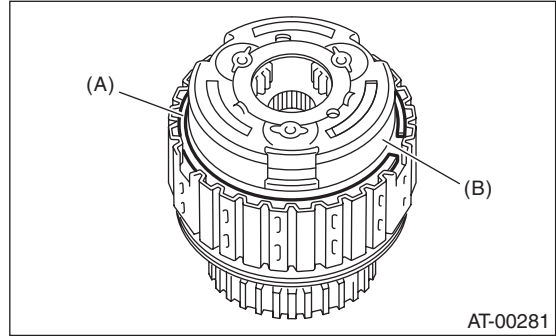
AUTOMATIC TRANSMISSION

15) Install the rear sun gear in the correct direction.



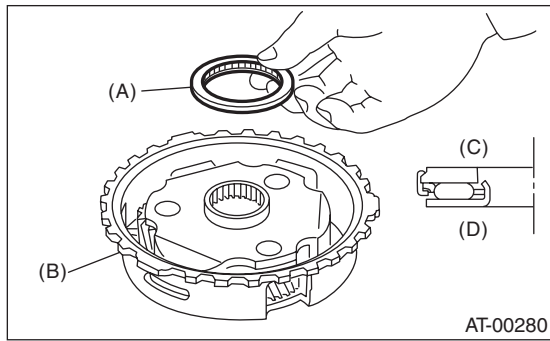
- (A) Rear sun gear
- (B) Rear planetary carrier

18) Install the snap ring to the low clutch drum.



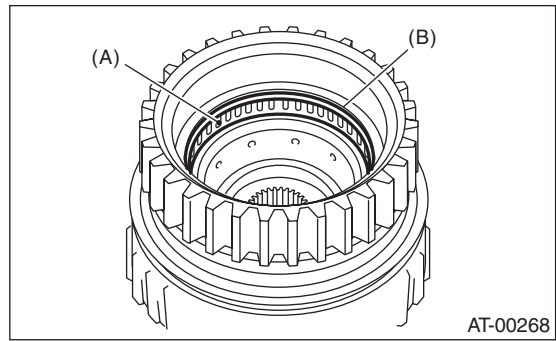
- (A) Snap ring
- (B) Front planetary carrier

16) Install the thrust needle bearing in the correct direction.



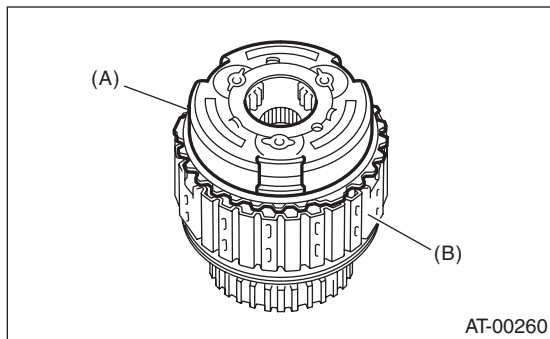
- (A) Thrust needle bearing
- (B) Front planetary carrier
- (C) Rear sun, gear side
- (D) Front planetary, carrier side

19) Install the needle bearing, and then secure with the snap ring.



- (A) Needle bearing
- (B) Snap ring

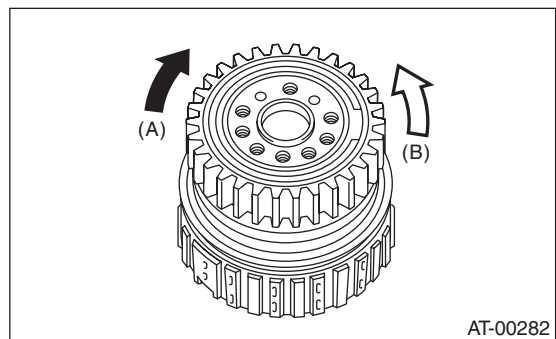
17) Install the front planetary carrier to the low clutch drum.



- (A) Front planetary carrier
- (B) Low clutch drum

20) Install the one-way clutch, and then secure with the snap ring.

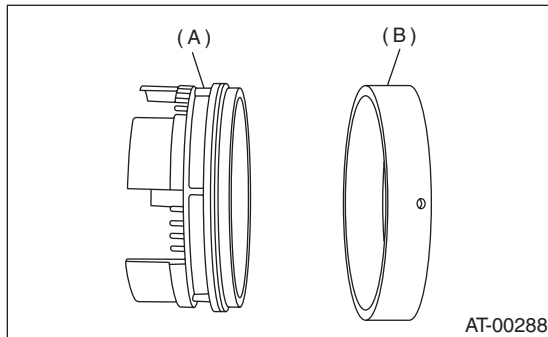
21) Set the one-way clutch inner race to the D clutch drum. Make sure that the forward clutch is free in the clockwise direction and locked in the counterclockwise direction, as viewed from the front of the vehicle.



- (A) Lock
- (B) Free

3. 2-4 BRAKE

- 1) Apply ATF to D-ring and install it to 2-4 brake piston.
- 2) Install 2-4 brake piston to 2-4 brake piston retainer.

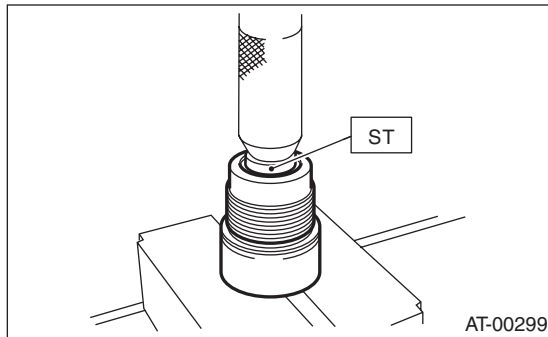


- (A) 2-4 brake piston
- (B) 2-4 brake piston retainer

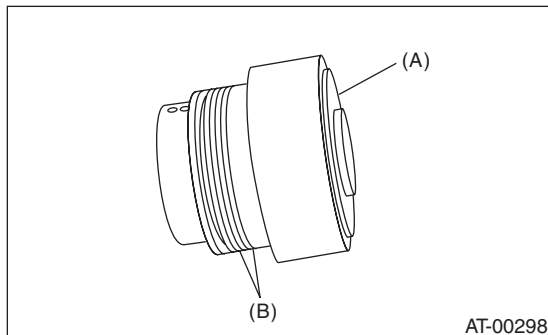
4. ONE-WAY CLUTCH INNER RACE

- 1) Install the needle bearing to inner race using ST and a press.

ST 398497701 SEAT



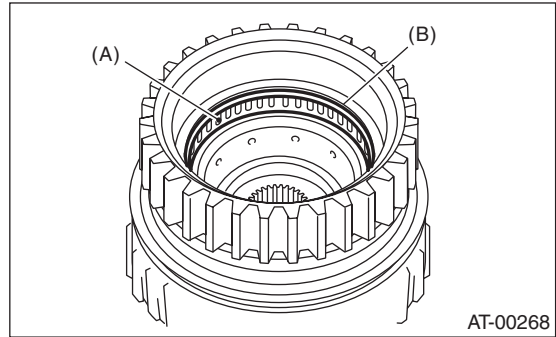
- 2) Apply vaseline to the groove of inner race and to the new seal ring.
- 3) Install two seal rings to the one-way clutch inner race.



- (A) One-way clutch inner race
- (B) Seal ring

5. ONE-WAY CLUTCH OUTER RACE

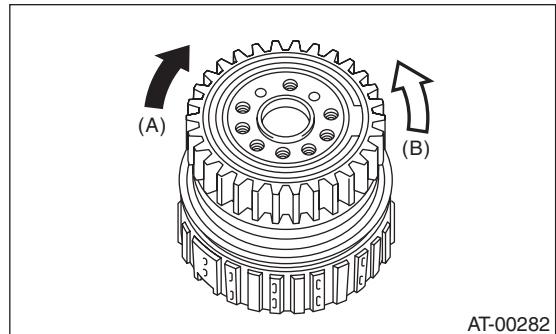
- 1) Install the needle bearing, and then secure with the snap ring.



- (A) Needle bearing
- (B) Snap ring

- 2) Install the one-way clutch, and then secure with the snap ring.

- 3) Set the one-way clutch inner race to the low clutch drum. Make sure that the forward clutch is free in the clockwise direction and locked in the counterclockwise direction, as viewed from the front of the vehicle.



- (A) Lock
- (B) Free

E: INSPECTION

1. HIGH CLUTCH AND REVERSE CLUTCH

Check the following items.

- Drive plate surface wear and damage
- Driven plate discoloration (burned color)
- Snap ring wear, return spring setting and breakage, and snap ring retainer deformation
- Lip seal and D-ring damage
- Piston and drum check ball operation
- Adjust the total end play. <Ref. to 4AT-93, ADJUSTMENT, Oil Pump Housing.>

2. PLANETARY GEAR AND LOW CLUTCH

Check the following items.

- Drive plate surface wear and damage
- Driven plate discoloration (burned color)
- Snap ring wear, return spring setting and breakage, and spring retainer deformation
- Lip seal and D-ring damage
- Piston check ball operation
- Inspect the total end play, and adjust it to be within the standard value. <Ref. to 4AT-93, ADJUSTMENT, Oil Pump Housing.>

3. 2-4 BRAKE

Check the following items.

- Drive plate surface wear and damage
- Driven plate discoloration (burned color)
- Snap ring wear and spring retainer deformation
- Lip seal and D-ring damage
- Inspect the total end play, and adjust it to be within the standard value. <Ref. to 4AT-93, ADJUSTMENT, Oil Pump Housing.>

4. ONE-WAY CLUTCH

- Check that the snap ring is not damaged and the seal ring is not deformed.
- Inspect the total end play, and adjust it to be within the standard value. <Ref. to 4AT-93, ADJUSTMENT, Oil Pump Housing.>

5. LOW & REVERSE BRAKE

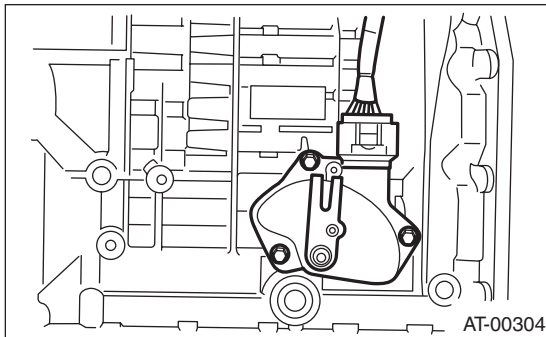
Check the following:

- Drive plate surface wear and damage
- Snap ring wear and spring retainer deformation

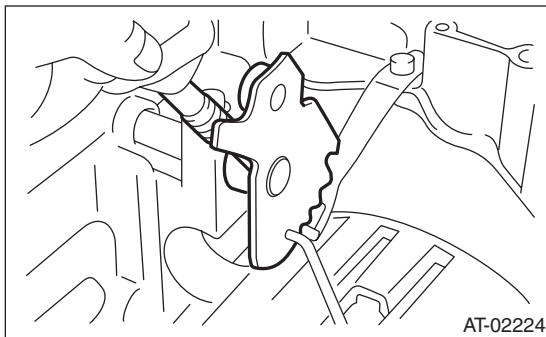
38. Transmission Control Device

A: REMOVAL

- 1) Remove the transmission assembly from vehicle body. <Ref. to 4AT-37, REMOVAL, Automatic Transmission Assembly.>
- 2) Pull out the torque converter clutch assembly. <Ref. to 4AT-67, REMOVAL, Torque Converter Clutch Assembly.>
- 3) Remove the input shaft.
- 4) Lift-up the lever on the rear side of transmission harness connector, and then disconnect it from the stay.
- 5) Disconnect the air breather hose. <Ref. to 4AT-65, REMOVAL, Air Breather Hose.>
- 6) Disconnect the inhibitor switch connector from the stay.
- 7) Wrap vinyl tape around the nipple attached to the air breather hose.
- 8) Remove the pitching stopper bracket.
- 9) Remove the inhibitor switch.



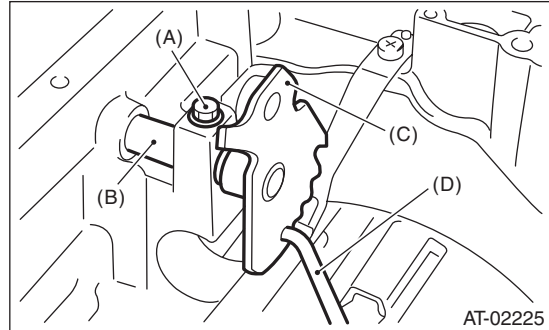
- 10) Remove the control valve body assembly. <Ref. to 4AT-56, REMOVAL, Control Valve Body.>
- 11) Pull out the manual plate spring pin.



- 12) Remove the bolts securing the range select lever, then remove the range select lever, manual plate and parking rod.

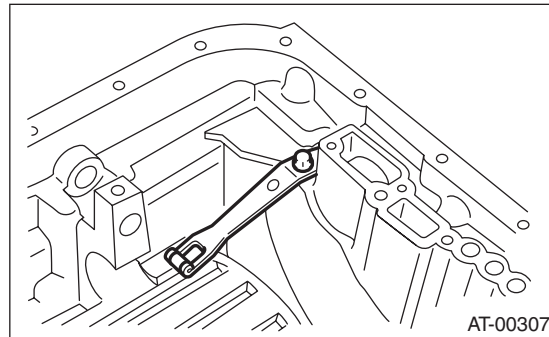
NOTE:

Be careful not to damage the lips of press-fitted oil seal in the case.



- (A) Bolt
- (B) Range select lever
- (C) Manual plate
- (D) Parking rod

- 13) Remove the detention spring.

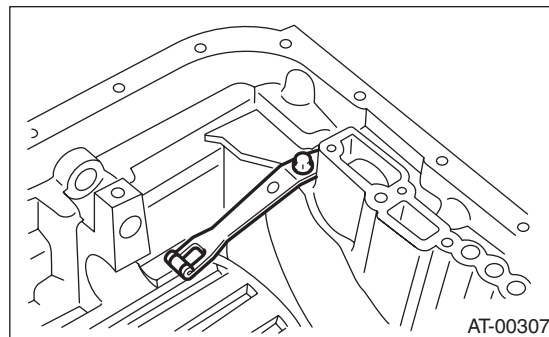


B: INSTALLATION

- 1) Install the detention spring to the transmission case.

Tightening torque:

6 N·m (0.6 kgf-m, 4.4 ft-lb)



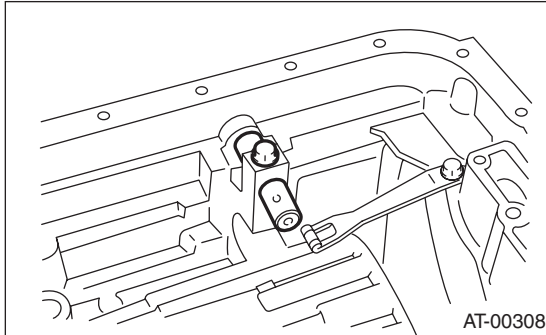
Transmission Control Device

AUTOMATIC TRANSMISSION

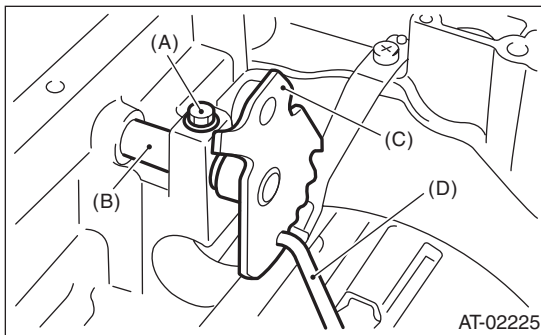
2) Insert the range select lever, and then tighten the bolt.

Tightening torque:

6 N·m (0.6 kgf-m, 4.4 ft-lb)

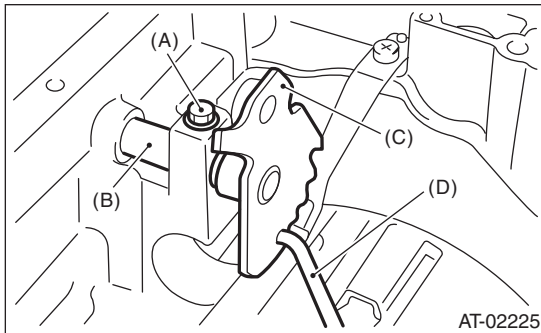


3) Insert the manual plate and parking rod.



- (A) Bolt
- (B) Range select lever
- (C) Manual plate
- (D) Parking rod

4) Insert the spring pin to the manual plate.



5) Install the oil pan and the control valve assembly. <Ref. to 4AT-57, INSTALLATION, Control Valve Body.>

6) Turn over the transmission case to its original position.

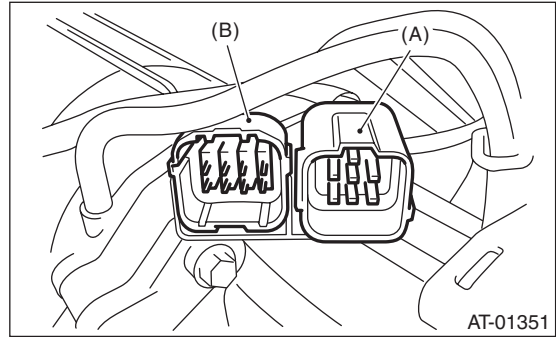
7) Install the pitching stopper bracket.

Tightening torque:

41 N·m (4.2 kgf-m, 30.4 ft-lb)

8) Install and adjust the inhibitor switch. <Ref. to 4AT-47, Inhibitor Switch.>

9) Insert the inhibitor switch and transmission connector to the stay.



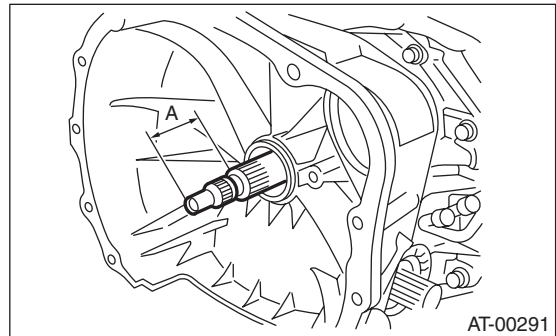
- (A) Transmission harness
- (B) Inhibitor switch harness

10) Install the air breather hose. <Ref. to 4AT-65, INSTALLATION, Air Breather Hose.>

11) Insert the input shaft while rotating it lightly by hand, and then check the amount of protrusion.

Normal protrusion A:

50 — 55 mm (1.97 — 2.17 in)



12) Install the torque converter clutch assembly. <Ref. to 4AT-67, INSTALLATION, Torque Converter Clutch Assembly.>

13) Install the transmission assembly to the vehicle. <Ref. to 4AT-40, INSTALLATION, Automatic Transmission Assembly.>

C: INSPECTION

Make sure that the manual lever and detention spring are not worn or otherwise damaged.

Basic Diagnostic Procedure

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

Step	Check	Yes	No
1 CHECK PRE-INSPECTION. 1) Ask the customer when and how the trouble occurred using the interview check list. <Ref. to 4AT(D)(diag)-4, Check List for Interview.> 2) Before performing diagnosis, inspect the following items which may influence AT problems. <ul style="list-style-type: none"> • General Inspection <Ref. to 4AT(D)(diag)-5, INSPECTION, General Description.> • Disconnection of harness connector • Visual check for harness damage • Oil leakage • Stall speed test <Ref. to 4AT-32, Stall Test.> • Line pressure test <Ref. to 4AT-34, Line Pressure Test.> • Transfer clutch pressure test <Ref. to 4AT-36, Transfer Clutch Pressure Test.> • Time lag test <Ref. to 4AT-33, Time Lag Test.> • Road test <Ref. to 4AT-31, Road Test.> • Inhibitor switch <Ref. to 4AT-47, Inhibitor Switch.> 	Is the unit that is thought to influence the AT problem working properly?	Go to step 2.	Repair or replace each item.
2 CHECK AT OIL TEMP WARNING LIGHT. Turn the ignition switch to ON.	Does the AT OIL TEMP warning light illuminate?	Go to step 4.	Go to step 3.
3 CHECK AT OIL TEMP WARNING LIGHT. 1) Turn the ignition switch to OFF. 2) Repair the AT OIL TEMP warning light circuit or power supply and ground line circuit. <Ref. to 4AT(D)(diag)-20, AT OIL TEMP Warning Light Display.> 3) Turn the ignition switch to ON.	Is the AT OIL TEMP warning light flashing?	Go to step 4.	Go to step 5.
4 CHECK INDICATION OF DTC. Display the DTC. NOTE: If the communication function of Subaru Select Monitor cannot be executed normally, check the communication circuit. <Ref. to 4AT(D)(diag)-25, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, Diagnostic Procedure for Subaru Select Monitor Communication.>	Is DTC displayed?	Go to step 6. NOTE: Record all DTC.	Go to step 5.
5 PERFORM GENERAL DIAGNOSTICS. 1) Inspect using "Diagnostic Procedure without Diagnostic Trouble Code (DTC)". <Ref. to 4AT(D)(diag)-87, Diagnostic Procedure without Diagnostic Trouble Code (DTC).> 2) Inspect using "General Diagnostic Table". <Ref. to 4AT(D)(diag)-90, General Diagnostic Table.> 3) Perform the Clear Memory Mode. 4) Perform the Inspection Mode. <Ref. to 4AT(D)(diag)-18, Inspection Mode.> 5) Display the DTC.	Is DTC displayed?	Go to step 6.	Finish the diagnosis.

Basic Diagnostic Procedure

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

	Step	Check	Yes	No
6	<p>PERFORM DIAGNOSIS.</p> <p>1) Inspect using the “Diagnostic Procedure with Diagnostic Trouble Code (DTC)”. <Ref. to 4AT(D)(diag)-31, Diagnostic Procedure with Diagnostic Trouble Code (DTC).></p> <p>NOTE: For DTC table, refer to “List of Diagnostic Trouble Code (DTC)”. <Ref. to 4AT(D)(diag)-29, List of Diagnostic Trouble Code (DTC).></p> <p>2) Repair the trouble cause.</p> <p>3) Perform the Clear Memory Mode.</p> <p>4) Perform the Inspection Mode. <Ref. to 4AT(D)(diag)-18, Inspection Mode.></p> <p>5) Display the DTC.</p>	Is DTC displayed?	Inspect using the “Diagnostic Procedure with Diagnostic Trouble Code (DTC)”. <Ref. to 4AT(D)(diag)-31, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Check List for Interview

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

2. Check List for Interview

A: CHECK

Check the following items when a problem has occurred.

NOTE:

Use copies of this page for interviewing customers.

Customer's name		
Date of purchase		
Date of repair		
Transmission model	Transmission	V.I.N.
Odometer reading	km (miles)	
Frequency	<input type="checkbox"/> Continuous <input type="checkbox"/> Intermittent (times a day)	
Weather	<input type="checkbox"/> Fine <input type="checkbox"/> Cloudy <input type="checkbox"/> Rainy <input type="checkbox"/> Snowy <input type="checkbox"/> Others ()	
Place	<input type="checkbox"/> Highland <input type="checkbox"/> Suburbs <input type="checkbox"/> Inner city <input type="checkbox"/> Uphill <input type="checkbox"/> Rough road <input type="checkbox"/> Others ()	
Ambient air temperature	<input type="checkbox"/> Hot <input type="checkbox"/> Warm <input type="checkbox"/> Cool <input type="checkbox"/> Cold	
Vehicle speed	km/h (MPH)	
AT OIL TEMP warning light (AT diagnostic indicator light)	<input type="checkbox"/> Blinks continuously	<input type="checkbox"/> Does not blink
Select lever position	<input type="checkbox"/> P <input type="checkbox"/> R <input type="checkbox"/> N <input type="checkbox"/> D <input type="checkbox"/> 3 <input type="checkbox"/> 2 <input type="checkbox"/> 1	
Driving condition	<input type="checkbox"/> Not affected <input type="checkbox"/> When revving at a stand-still <input type="checkbox"/> While decelerating	<input type="checkbox"/> At starting <input type="checkbox"/> While accelerating <input type="checkbox"/> While turning (<input type="checkbox"/> R/ <input type="checkbox"/> L)
Symptoms	<input type="checkbox"/> While idling <input type="checkbox"/> While cruising	
	<input type="checkbox"/> No up-shift	
	<input type="checkbox"/> No down-shift	
	<input type="checkbox"/> No kick down	
	<input type="checkbox"/> Vehicle does not move (<input type="checkbox"/> Any position <input type="checkbox"/> Particular position)	
	<input type="checkbox"/> Lock-up malfunction	
	<input type="checkbox"/> Noise or vibration	
	<input type="checkbox"/> Shift shock or slip	
<input type="checkbox"/> Select lever does not move		
<input type="checkbox"/> Others ()		

General Description

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

3. General Description

A: CAUTION

1. SUPPLEMENTAL RESTRAINT SYSTEM "AIRBAG"

The airbag system wiring harness is routed near the TCM.

CAUTION:

- The airbag system wiring harnesses and connectors are colored yellow. Do not use an electric test equipment to check these circuits.
- Be careful not to damage the airbag system wiring harness when performing TCM diagnostics or servicing.

2. MEASUREMENT

When measuring the voltage and resistance of the ECM, TCM or each sensor, use a tapered pin with a diameter of less than 0.64 mm (0.025 in) in order to avoid poor contact. Do not insert a pin of more than 0.65 mm (0.026 in) diameter.

B: INSPECTION

1. BATTERY

Measure the battery voltage and specific gravity of the electrolyte.

Standard voltage: 12 V or more

Specific gravity: 1.260 or more

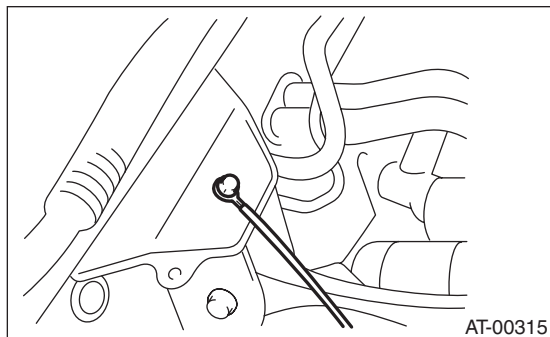
2. TRANSMISSION GROUND

Check that the ground terminal bolt is tightened securely.

Chassis side

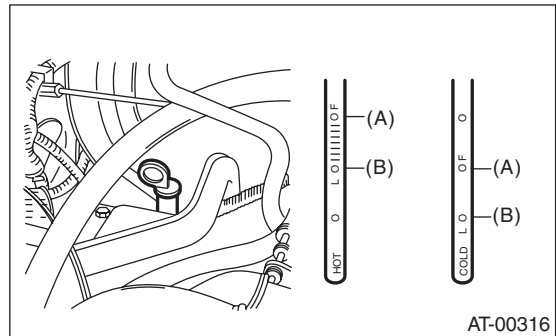
Tightening torque:

13 N·m (1.3 kgf·m, 9.4 ft·lb)



3. ATF LEVEL

Check that the ATF level is at the specified amount. <Ref. to 4AT-28, INSPECTION, Automatic Transmission Fluid.>

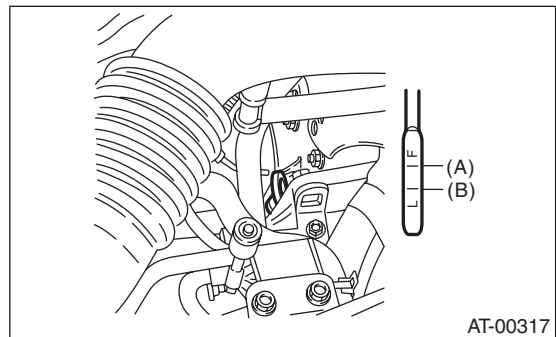


(A) Upper level

(B) Lower level

4. FRONT DIFFERENTIAL OIL LEVEL

Check the front differential oil level is the specified amount. <Ref. to 4AT-30, INSPECTION, Differential Gear Oil.>



(A) Upper level

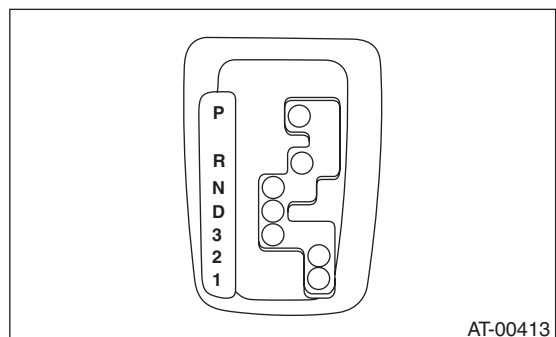
(B) Lower level

5. OPERATION OF SELECT LEVER

Check there is no noise, dragging or contact pattern in each select lever range.

WARNING:

Stop the engine while checking operation of the select lever.

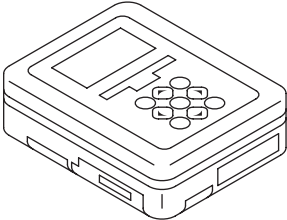


General Description

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

C: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B020XU0	1B020XU0	SUBARU SELECT MONITOR KIT	Troubleshooting the electrical system.

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.
Oscilloscope	Used for measuring the sensor.

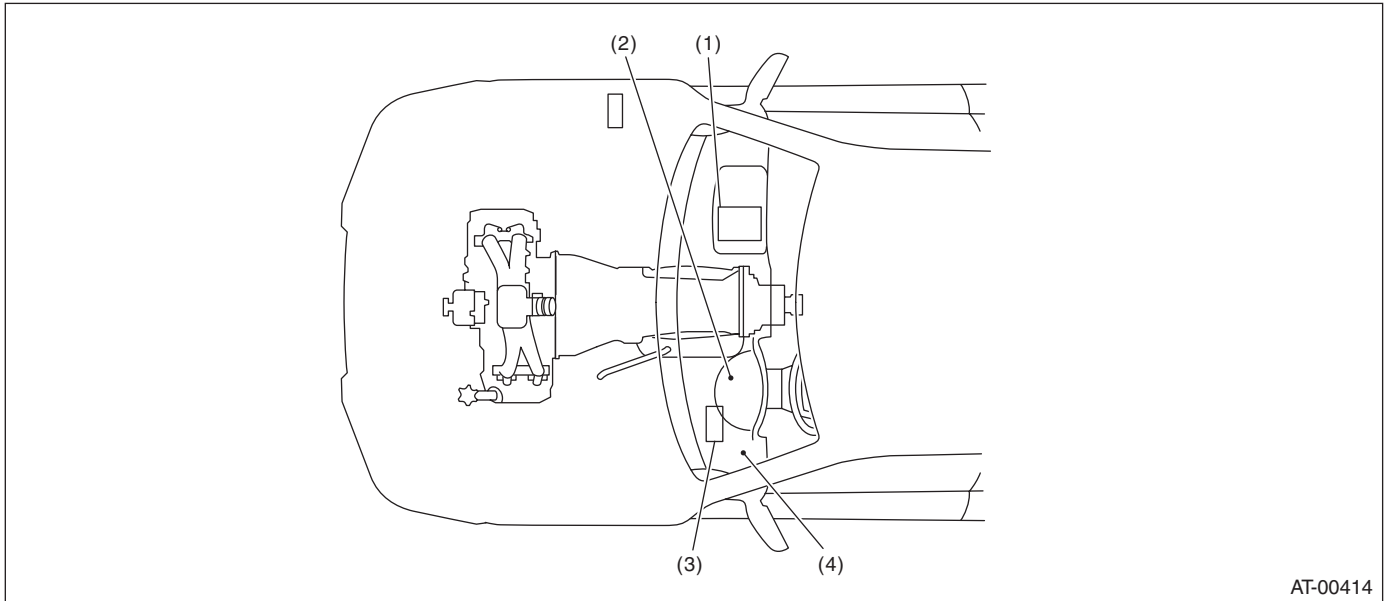
Electrical Component Location

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

4. Electrical Component Location

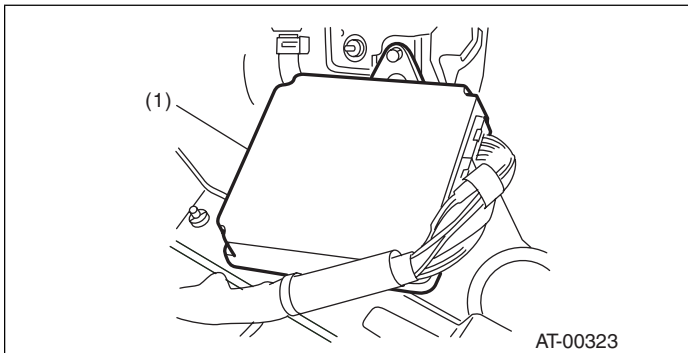
A: LOCATION

1. CONTROL MODULE

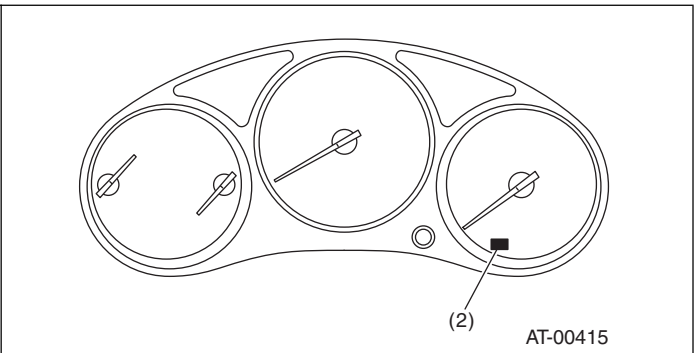


AT-00414

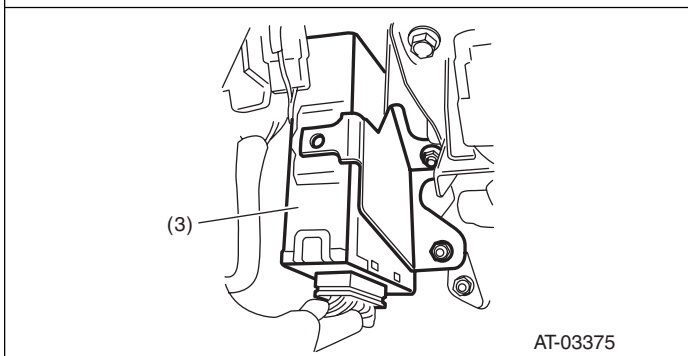
- (1) Engine control module (ECM)
- (2) AT OIL TEMP warning light (AT diagnostic indicator light)
- (3) Transmission control module (TCM)
- (4) Data link connector



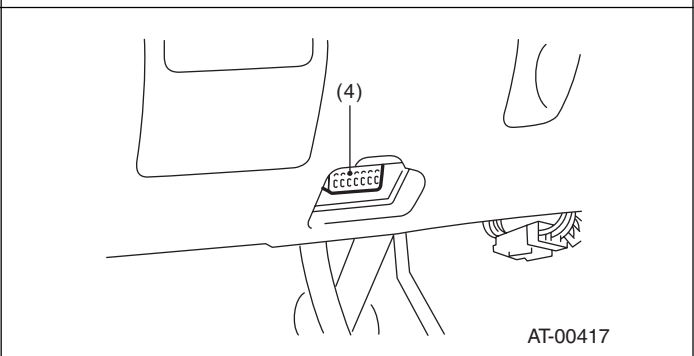
AT-00323



AT-00415



AT-03375

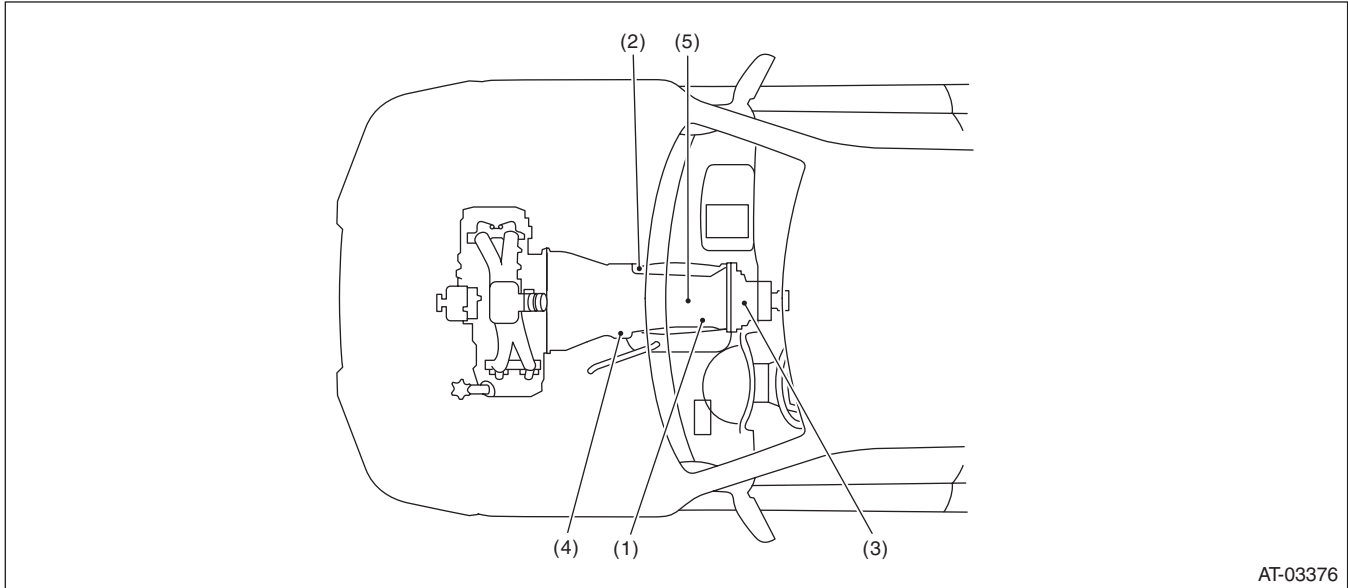


AT-00417

Electrical Component Location

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

2. SENSOR



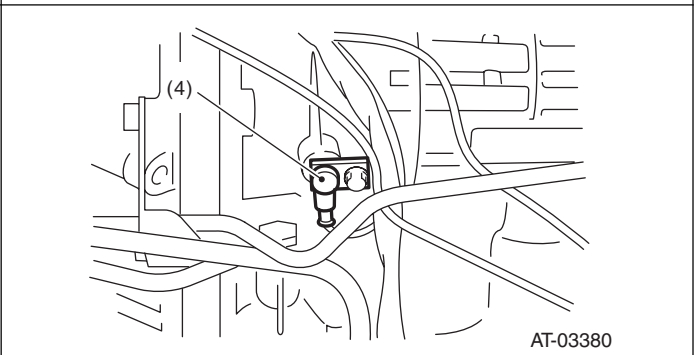
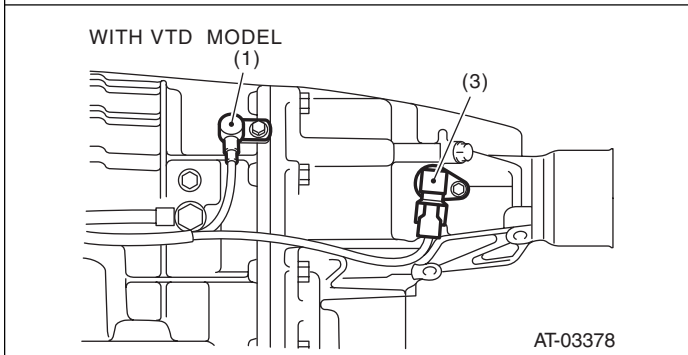
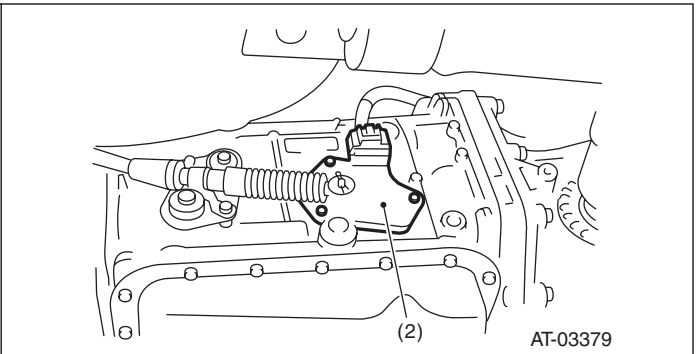
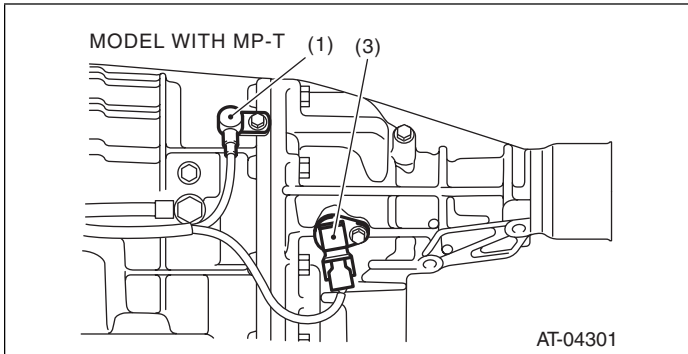
(1) Front vehicle speed sensor

(3) Rear vehicle speed sensor

(5) ATF temperature sensor

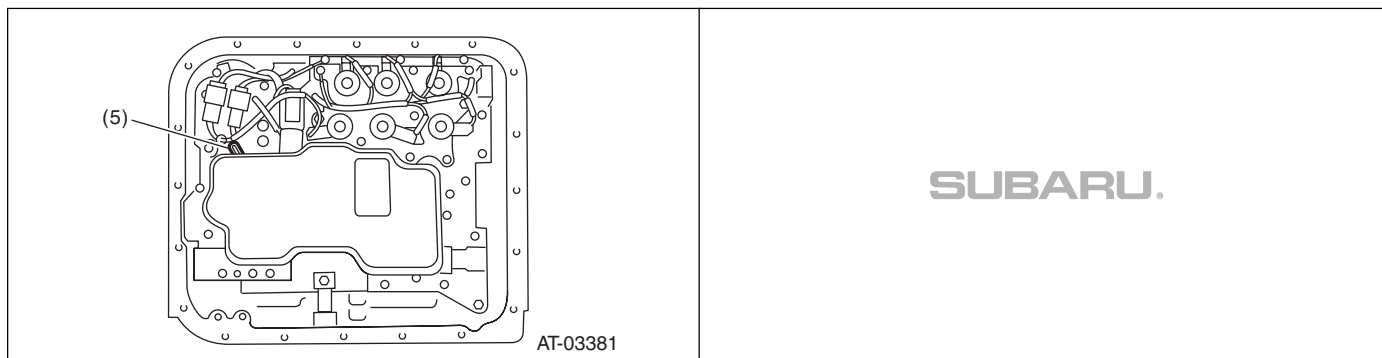
(2) Inhibitor switch

(4) Torque converter turbine speed sensor

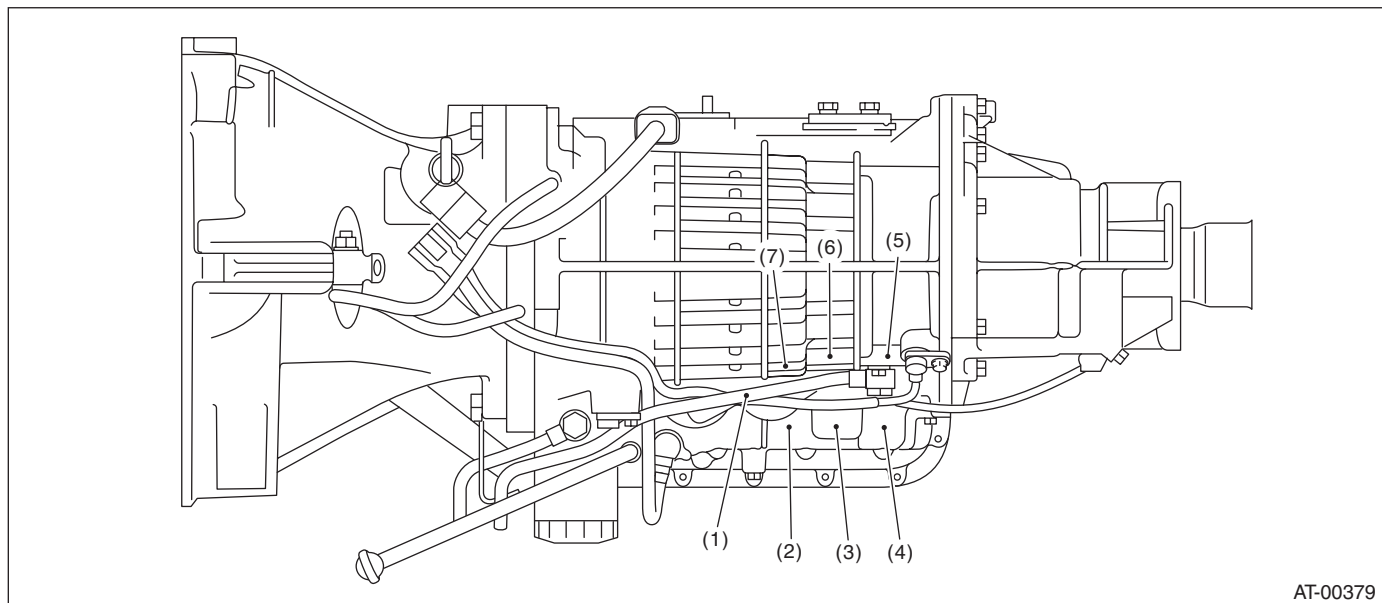


Electrical Component Location

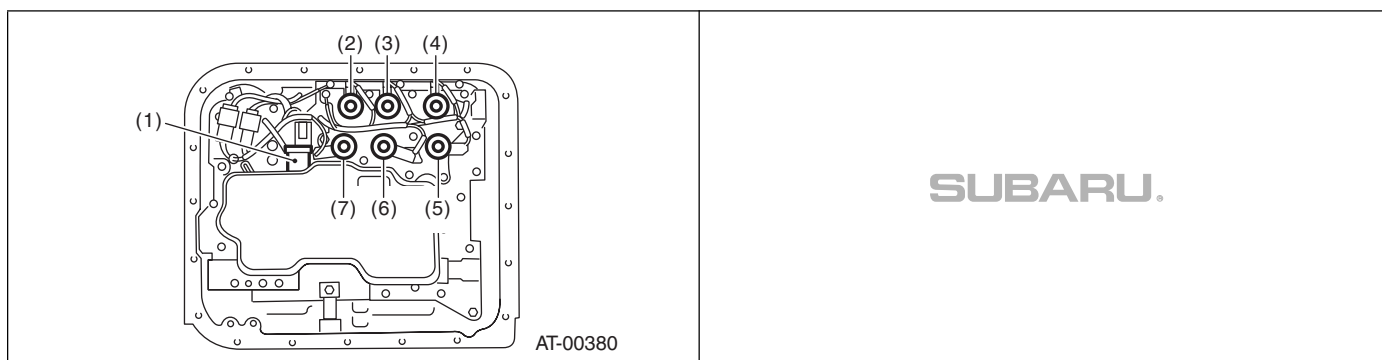
AUTOMATIC TRANSMISSION (DIAGNOSTICS)



3. SOLENOID



- | | | |
|-----------------------------------|---------------------------------|----------------------------|
| (1) Line pressure linear solenoid | (4) Low & reverse duty solenoid | (6) Transfer duty solenoid |
| (2) High clutch duty solenoid | (5) Low clutch duty solenoid | (7) Lock-up duty solenoid |
| (3) 2-4 brake duty solenoid | | |

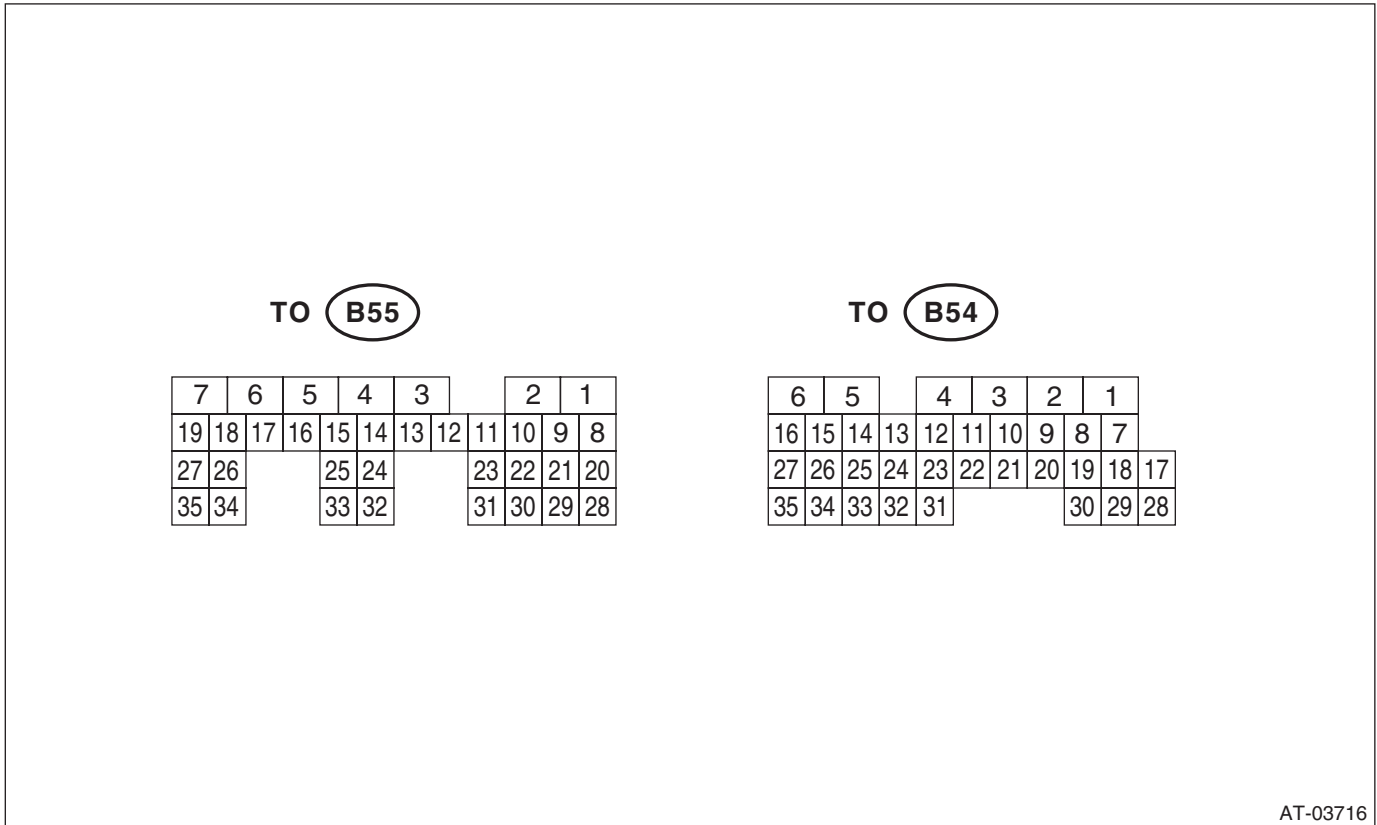


Transmission Control Module (TCM) I/O Signal

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

5. Transmission Control Module (TCM) I/O Signal

A: ELECTRICAL SPECIFICATION



AT-03716

Check with ignition switch ON.					
Contents	Measured terminal (Connector & Terminal No.)		Measuring condition	Voltage (V)	Resistance (Ω)
	Positive terminal	Ground terminal			
Backup power supply	(B55) No. 25	Chassis ground	Ignition switch OFF	10 — 13	—
	(B55) No. 26				
	(B55) No. 27				
ACC power supply	(B55) No. 12	Chassis ground	Ignition switch ACC	10 — 13	—
Ignition power supply	(B55) No. 1	Chassis ground	Ignition switch ON (engine OFF)	10 — 13	—
	(B55) No. 2				

Transmission Control Module (TCM) I/O Signal

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Check with ignition switch ON.						
Contents		Measured terminal (Connector & Terminal No.)		Measuring condition	Voltage (V)	Resistance (Ω)
		Positive terminal	Ground terminal			
Inhibitor switch	"P" range switch	(B54) No. 14	Chassis ground	Selector lever in "P" range	Less than 1	—
				Selector lever in any other than "P" range	8 or more	
	"R" range switch	(B54) No. 13	Chassis ground	Selector lever in "R" range	Less than 1	—
				Selector lever in any other than "R" range	8 or more	
	"N" range switch	(B54) No. 11	Chassis ground	Selector lever in "N" range	Less than 1	—
				Selector lever in any other than "N" range	8 or more	
	"D" range switch	(B54) No. 10	Chassis ground	Selector lever in "D" range	Less than 1	—
				Selector lever in any other than "D" range	8 or more	
	"3" range switch	(B54) No. 8	Chassis ground	Selector lever in "3" range	Less than 1	—
				Selector lever in any other than "3" range	8 or more	
	"2" range switch	(B54) No. 7	Chassis ground	Selector lever in "2" range	Less than 1	—
				Selector lever in any other than "2" range	8 or more	
	"1" range switch	(B54) No. 19	Chassis ground	Selector lever in "1" range	Less than 1	—
				Selector lever in any other than "1" range	8 or more	
Brake switch	(B54) No. 20	Chassis ground	When brake pedal is depressed.	10.5 or more	—	
			When brake pedal is released.	Less than 1		
ATF temperature sensor	(B54) No. 23	(B54) No. 12	ATF temperature 20°C (68°F)	3.5 — 4.3	2.5 k — 7 k	
			ATF temperature 80°C (176°F)	1.0 — 2.2	300 — 800	
ATF temperature sensor ground	(B54) No. 12	Chassis ground	—	0	Less than 1	
Rear vehicle speed sensor	(B54) No. 26	(B54) No. 15	Vehicle stopped	0	—	
			Vehicle speed at least 20 km/h (12 MPH)	More than 2 (AC range)		
Rear vehicle speed sensor ground	(B54) No. 15	Chassis ground	—	0	Less than 1	

Transmission Control Module (TCM) I/O Signal

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Check with ignition switch ON.					
Contents	Measured terminal (Connector & Terminal No.)		Measuring condition	Voltage (V)	Resistance (Ω)
	Positive terminal	Ground terminal			
Front vehicle speed sensor	(B54) No. 27	(B54) No. 16	Vehicle stopped	0	450 — 650
			Vehicle speed at least 20 km/h (12 MPH)	More than 1 (AC range)	
Front vehicle speed sensor ground	(B54) No. 16	Chassis ground	—	—	—
Torque converter turbine speed sensor	(B54) No. 1	(B54) No. 2	Engine idling after warm-up ("D" range)	0	450 — 650
			Engine idling after warm-up ("N" range)	More than 1 (AC range)	
Torque converter turbine speed sensor ground	(B54) No. 2	Chassis ground	—	—	—
Vehicle speed output signal	(B54) No. 21	Chassis ground	Vehicle speed at least 10 km/h (6 MPH)	Less than 1 ← → 4 or more	—
Engine speed signal	(B55) No. 11	Chassis ground	Ignition switch ON (engine OFF)	Less than 1	—
			Ignition switch ON (engine ON)	More than 5 (AC range)	
Line pressure linear solenoid	(B54) No. 4	(B54) No. 3	Ignition switch ON (engine OFF) "R" range throttle fully closed after engine warm-up.	3.7 — 7.7	4.0 — 6.0
			Ignition switch ON (engine OFF) "R" range throttle fully open after engine warm-up.	1.1 — 5.1	
Line pressure linear solenoid ground	(B54) No. 3	Chassis ground	—	Less than 1	Less than 1
Lock-up solenoid	(B54) No. 6	Chassis ground	When lock up occurs.	10.5 or more	2.0 — 4.5
			When lock up is released.	Less than 1	
Transfer duty solenoid (Model with MP-T)	(B54) No. 5	Chassis ground	With fuse installed to FWD switch	Less than 1	2.0 — 4.5
			With fuse removed from FWD switch (1st gear)	2.0 — 3.0	
Transfer duty solenoid (Model with VTD)	(B54) No. 5	Chassis ground	"P" or "N" range	Less than 1	2.0 — 4.5
			Throttle fully opened	5.0 or more	
2-4 brake duty solenoid	(B55) No. 4	Chassis ground	"P" or "N" range	5.0 or more	2.0 — 4.5
			2nd or 4th gear	Less than 1	

Transmission Control Module (TCM) I/O Signal

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Check with ignition switch ON.					
Contents	Measured terminal (Connector & Terminal No.)		Measuring condition	Voltage (V)	Resistance (Ω)
	Positive terminal	Ground terminal			
High clutch duty solenoid	(B55) No. 6	Chassis ground	3rd or 4th gear	Less than 1	2.0 — 4.5
			“P” or “N” range	5.0 or more	
Low clutch duty solenoid	(B55) No. 7	Chassis ground	1st or 2nd gear	Less than 1	2.0 — 4.5
			“P” or “N” range	5.0 or more	
Low & reverse duty solenoid	(B55) No. 5	Chassis ground	Except “1” range	5.0 or more	2.0 — 4.5
			“1” range	2.5 — 5.0	
FWD switch (Model with MP-T)	(B55) No. 10	Chassis ground	Fuse removed	10.5 or more	—
			Fuse installed	Less than 1	
AWD indicator light	(B55) No. 13	Chassis ground	Ignition switch ON (engine OFF)	Less than 1	—
			Ignition switch ON (engine ON)	9 or more	
ATF temperature warning	(B55) No. 15	Chassis ground	When light is ON	Less than 1	—
			When light is OFF	9 or more	
ABS, E/G ECM communication signal (+)	(B54) No. 18	Chassis ground	Ignition switch ON	Pulse signal	—
ABS, E/G ECM communication signal (-)	(B54) No. 17	Chassis ground		Pulse signal	
Combination meter	(B54) No. 22	Chassis ground	Ignition switch ON	Pulse signal	—
System ground	(B55) No. 20	Chassis ground	—	0	Less than 1
	(B55) No. 21	Chassis ground			
	(B55) No. 22	Chassis ground			
	(B55) No. 23	Chassis ground			
Range lock signal	(B55) No. 3	Chassis ground	“D” range vehicle speed 0 km/h (0 MPH)	10.5 or more	7 — 18
			“D” range vehicle speed 20 km/h (12 MPH)	Less than 1	
Data link signal (Subaru Select Monitor)	(B55) No. 8	Chassis ground	—	—	—

Subaru Select Monitor

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

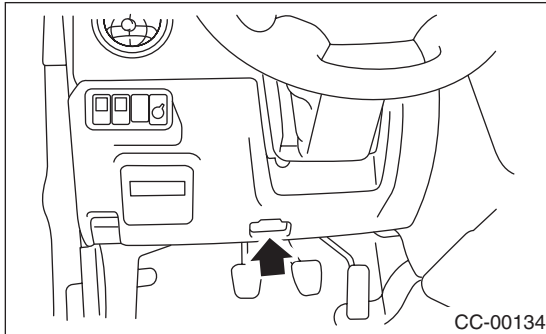
6. Subaru Select Monitor

A: OPERATION

1. READ DIAGNOSTIC TROUBLE CODE (DTC)

- 1) Prepare the Subaru Select Monitor kit.
- 2) Connect the diagnosis cable to the Subaru Select Monitor.
- 3) Connect the Subaru Select Monitor to the data link connector.

(1) Data link connector is located in the lower portion of instrument panel (on the driver's side).



(2) Connect the diagnosis cable to the data link connector.

NOTE:

Do not connect scan tools except for Subaru Select Monitor.

- 4) Turn the ignition switch to ON (engine OFF) and run the Subaru Select Monitor.

- A list of the support data is shown in the following table.

Contents	Display	Unit of measure
Battery voltage	Battery Voltage	V
Rear vehicle speed sensor signal	Rear Wheel Speed	km/h or MPH
Front vehicle speed sensor signal	Front Wheel Speed	km/h or MPH
Engine speed signal	Engine Speed	rpm
ATF temperature	ATF Temp.	°C or °F
Gear position	Gear Position	—
Line pressure control duty ratio	Line Pressure Duty Ratio	%
Lock up clutch duty ratio	Lock Up Duty Ratio	%
Transfer clutch duty ratio	Transfer Duty Ratio	%
Torque converter turbine speed signal	Turbine Revolution Speed	rpm
2-4 brake duty ratio	Brake Clutch Duty Ratio	%
Low clutch duty ratio	L/C Duty	%
High clutch duty ratio	H/C Duty	%
Low & reverse brake duty ratio	L&R/B Duty	%
Accelerator position	Accel. Opening Angle	%
ATF temperature light	ATF Temperature Lamp	ON or OFF
Stop light switch signal	Stop Light Switch Signal	ON or OFF
Parking range signal	P Range Signal	ON or OFF
Neutral range signal	N Range Signal	ON or OFF
Reverse range signal	R Range Signal	ON or OFF

5) On the «Main Menu» display screen, select the {Each System Check}.

6) On the «System Selection Menu» display screen, select the {Transmission Control System}.

7) Select the [OK] after the information of transmission type is displayed.

8) On the «Transmission Diagnosis» screen, select {DTC Display}.

NOTE:

- For details concerning the operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

- For details concerning the diagnostic trouble codes (DTC), refer to the List of DTC. <Ref. to 4AT(D)(diag)-29, List of Diagnostic Trouble Code (DTC).>

2. READ CURRENT DATA

1) On the «Main Menu» display screen, select the {Each System Check}.

2) On the «System Selection Menu» display screen, select the {Transmission Control System}.

3) Select the [OK] after the information of transmission type is displayed.

4) On the «Transmission Diagnosis» display screen, select the {Current Data Display & Save}.

5) On the «Transmission Diagnosis» display screen, select the {Data Display}.

6) Using the scroll key, scroll the display screen up or down until the desired data is shown.

Subaru Select Monitor

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Contents	Display	Unit of measure
Drive range signal	D Range Signal	ON or OFF
3rd range signal	3rd Range Signal	ON or OFF
2nd range signal	2nd Range Signal	ON or OFF
1st range signal	1st Range Signal	ON or OFF
AT diagnosis light output signal	Diagnosis Lamp	ON or OFF
FWD switch signal	FWD SW	ON or OFF
Shift lock solenoid signal	Shift Lock Solenoid	ON or OFF
Cruise control signal	Cruise Control Signal	ON or OFF

NOTE:

For details concerning the operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

3. CLEAR MEMORY MODE

- 1) On the «Main Menu» display screen, select the {Each System Check}.
- 2) On the «System Selection Menu» display screen, select the {Transmission Control System}.
- 3) Select the [OK] after the information of transmission type is displayed.
- 4) On the «Transmission Diagnosis» display screen, select the {Clear Memory}.
- 5) When “Done” and “Turn ignition switch OFF” are shown on the display screen, turn the ignition switch to OFF and then close the Subaru Select Monitor.

NOTE:

- If {Clear Memory 2} is selected and performed, DTC and learned control memory are cleared. If Clear Memory 2 is performed, execute the advance operation of learning control. <Ref. to 4AT(D)(diag)-15, FACILITATION OF LEARNING CONTROL, OPERATION, Subaru Select Monitor.>
- For details concerning the operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

4. FACILITATION OF LEARNING CONTROL

NOTE:

When the following services are performed, or when the shifting shock is occurred in total check with vehicle driving, perform the learning with following procedures.

- Replacement of TCM
 - Replacement of transmission assembly
 - Replacement of clutches
 - Replacement of control valve body
 - When {Clear Memory 2} is performed;
- 1) Shift the select lever to “P” range, and apply the parking brake.
 - 2) Lift-up the vehicle.
 - 3) Connect the Subaru Select Monitor to the data link connector, and then turn the ignition switch to ON.

4) Perform {Clear Memory 2} using the Subaru Select Monitor. <Ref. to 4AT(D)(diag)-15, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.>

5) Using the Subaru Select Monitor, check that there is no DTC displayed. <Ref. to 4AT(D)(diag)-14, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.>

6) Warm-up the engine until the ATF temperature displayed on the Subaru Select Monitor reaches 60 — 90°C (140 — 194°F). <Ref. to 4AT(D)(diag)-14, READ CURRENT DATA, OPERATION, Subaru Select Monitor.>

7) Shift the select lever to “R” range.

8) Turn all switches including headlight, air conditioner, seat heater, rear defogger and etc. OFF.

9) Turn the ignition switch to OFF, and wait more than 30 seconds with the accessory OFF.

10) When “Communication Failed!” is displayed on Subaru Select Monitor, press the brake pedal fully until the learning control promotion is completed.

11) Turn the ignition switch to ON.

12) Check that the Subaru Select Monitor is returned to normal operation.

13) Shift the select lever to “P” range, and then wait for more than 3 seconds.

14) Shift the select lever to “R” range, and then wait for more than 3 seconds.

15) Shift the select lever to “N” range, and then wait for more than 3 seconds.

16) Shift the select lever to “D” range, and then wait for more than 3 seconds.

17) Shift the select lever to “N” range, and then wait for more than 3 seconds.

18) Slowly depress the accelerator pedal to full throttle.

19) Slowly release the accelerator pedal completely.

20) Start the engine, and idle it.

21) Shift the select lever to “D” range.

Subaru Select Monitor

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

22) Start learning control promotion. At this time, the AT OIL TEMP warning light in the combination meter will start blinking at 2 Hz. When the AT OIL TEMP warning light does not blink, turn the ignition switch to OFF and repeat the procedures from step 4). When the AT OIL TEMP warning light which blinking at 2 Hz changes to blink at 0.5 Hz, learning control promotion is completed.

NOTE:

When blinking of AT OIL TEMP warning light changes from 2 Hz to 4 Hz during learning control promotion, repeat the procedure from step 4).

23) Shift the select lever to "N" range, and then turn the ignition switch to OFF.

24) Shift the select lever to "P" range to complete the learning control promotion.

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

1. SUBARU SELECT MONITOR

Refer to Subaru Select Monitor for information on how to display a DTC. <Ref. to 4AT(D)(diag)-14, OPERATION, Subaru Select Monitor.>

NOTE:

DTC can not be read through AT OIL TEMP warning light.

8. Inspection Mode

A: PROCEDURE

WARNING:

Observe the traffic law when driving on public roads.

Shift the select lever to “D” range, and then drive the vehicle at 60 km/h (37 MPH) for at least 10 seconds.

9. Clear Memory Mode

A: OPERATION

Refer to "Subaru Select Monitor" for information about how to clear a DTC.

<Ref. to 4AT(D)(diag)-15, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.>

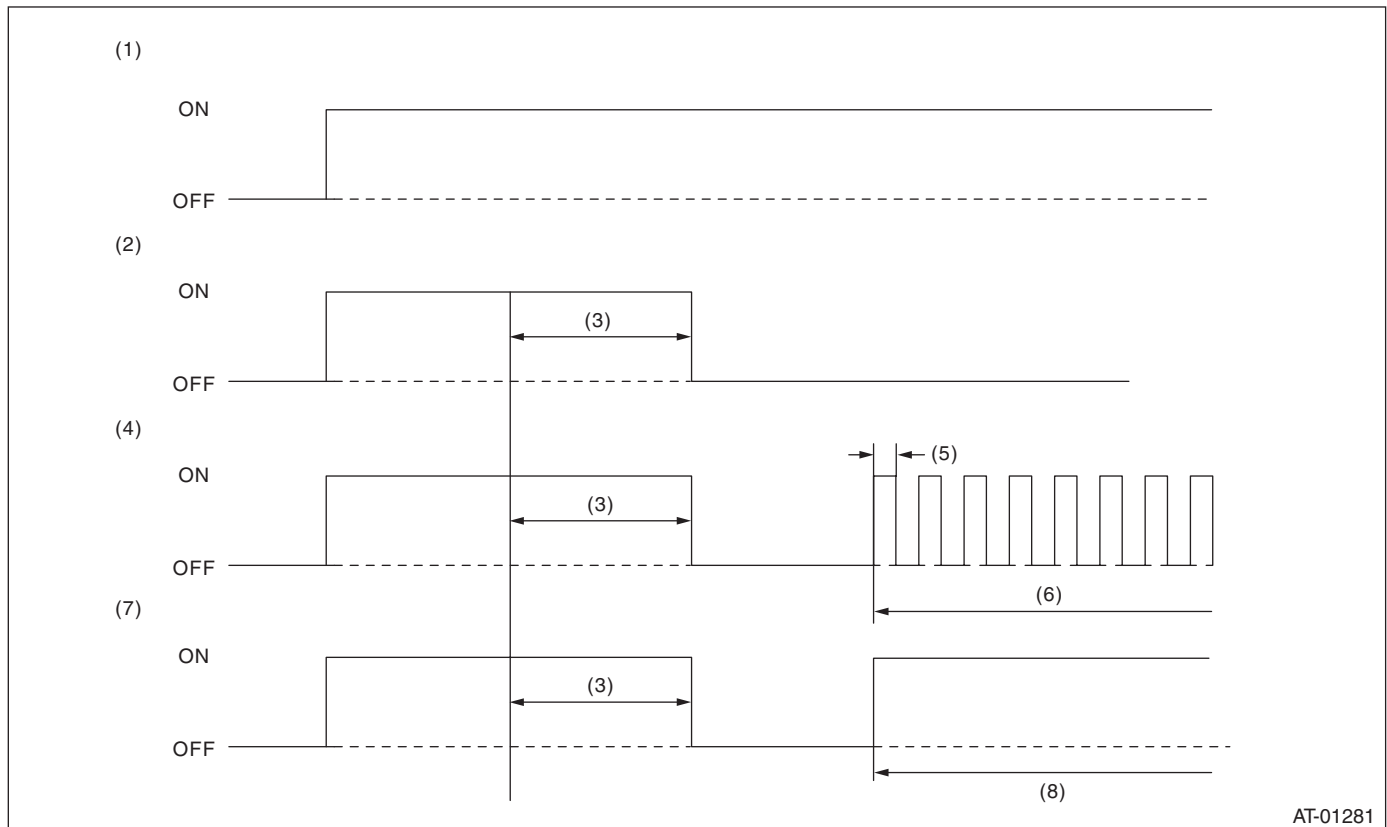
AT OIL TEMP Warning Light Display

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

10.AT OIL TEMP Warning Light Display

A: OPERATION

When any on-board diagnostics item is malfunctioning, AT OIL TEMP warning light blinks from the time malfunction is detected after starting the engine until ignition switch is turned to OFF. The malfunctioning part or unit can be determined by a DTC during the on-board diagnostics operation. Problems which occurred previously can also be identified through the memory function. If the AT OIL TEMP warning light does not show a problem (although a problem is occurring), the problem can be determined by checking the performance characteristics of each sensor using Subaru Select Monitor. Indicator light signal patterns are as shown in the figure.



- | | | |
|----------------------------------|-------------------------------|--------------------------------------|
| (1) Ignition switch (Engine OFF) | (4) Abnormal (Trouble occurs) | (7) Normal (ATF temperature is high) |
| (2) Normal | (5) 0.25 seconds | (8) ATF temperature is high |
| (3) 2 seconds | (6) Blink | |

B: INSPECTION

DIAGNOSIS:

The AT OIL TEMP warning light circuit is open or shorted.

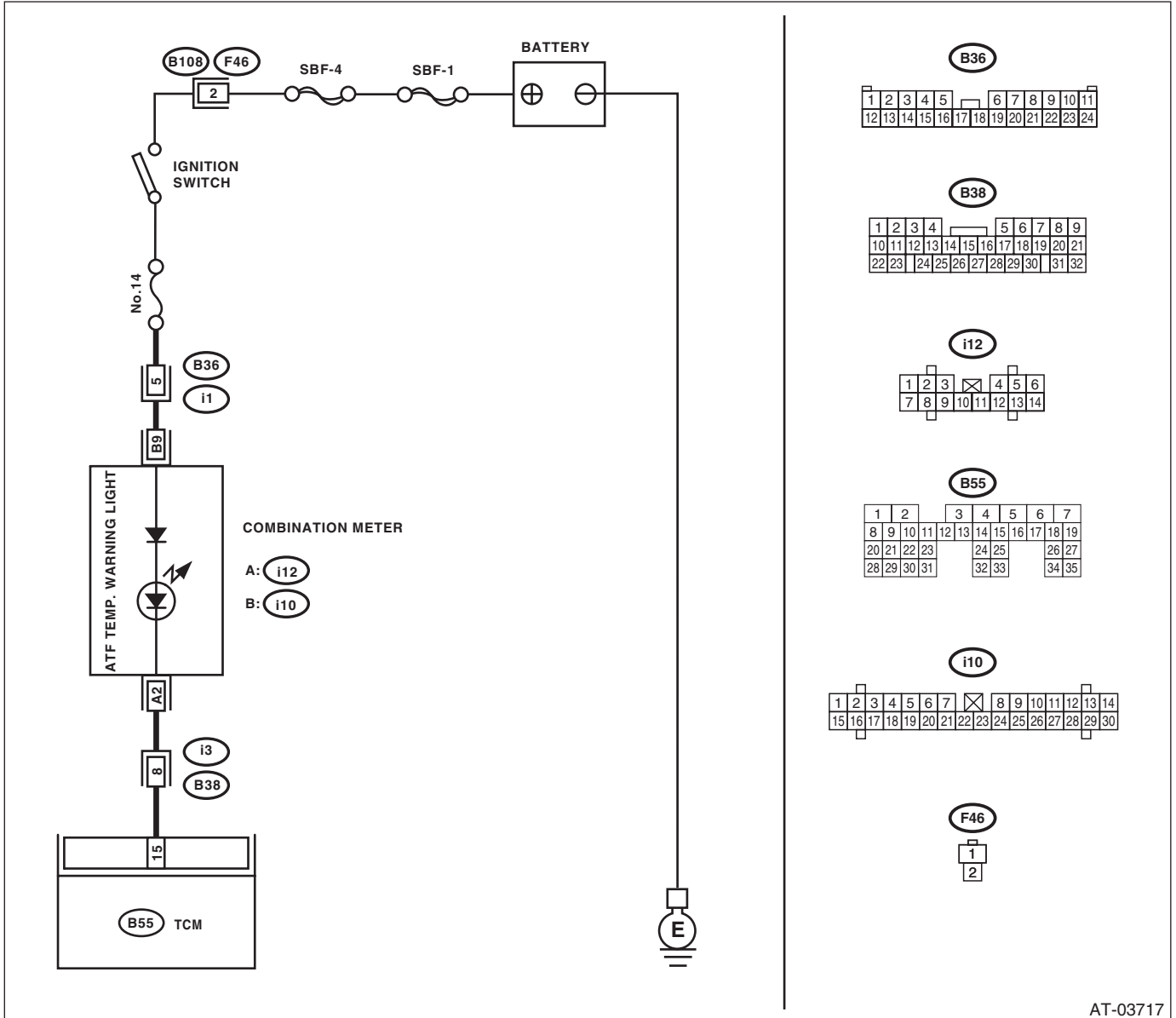
TROUBLE SYMPTOM:

- When the ignition switch is turned ON (engine OFF), AT OIL TEMP warning light does not illuminate.
- When the on-board diagnostics is performed, the AT OIL TEMP warning light remains illuminated.

AT OIL TEMP Warning Light Display

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

WIRING DIAGRAM:



AT-03717

Step	Check	Yes	No
1 CHECK FUSE (NO. 14). Remove the fuse (No. 14).	Is the fuse (No. 14) blown out?	Replace the fuse (No. 14). If the replaced fuse (No. 14) is blown out easily, repair the short circuit of the harness between fuse (No. 14) and the combination meter.	Go to step 2.

AT OIL TEMP Warning Light Display

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

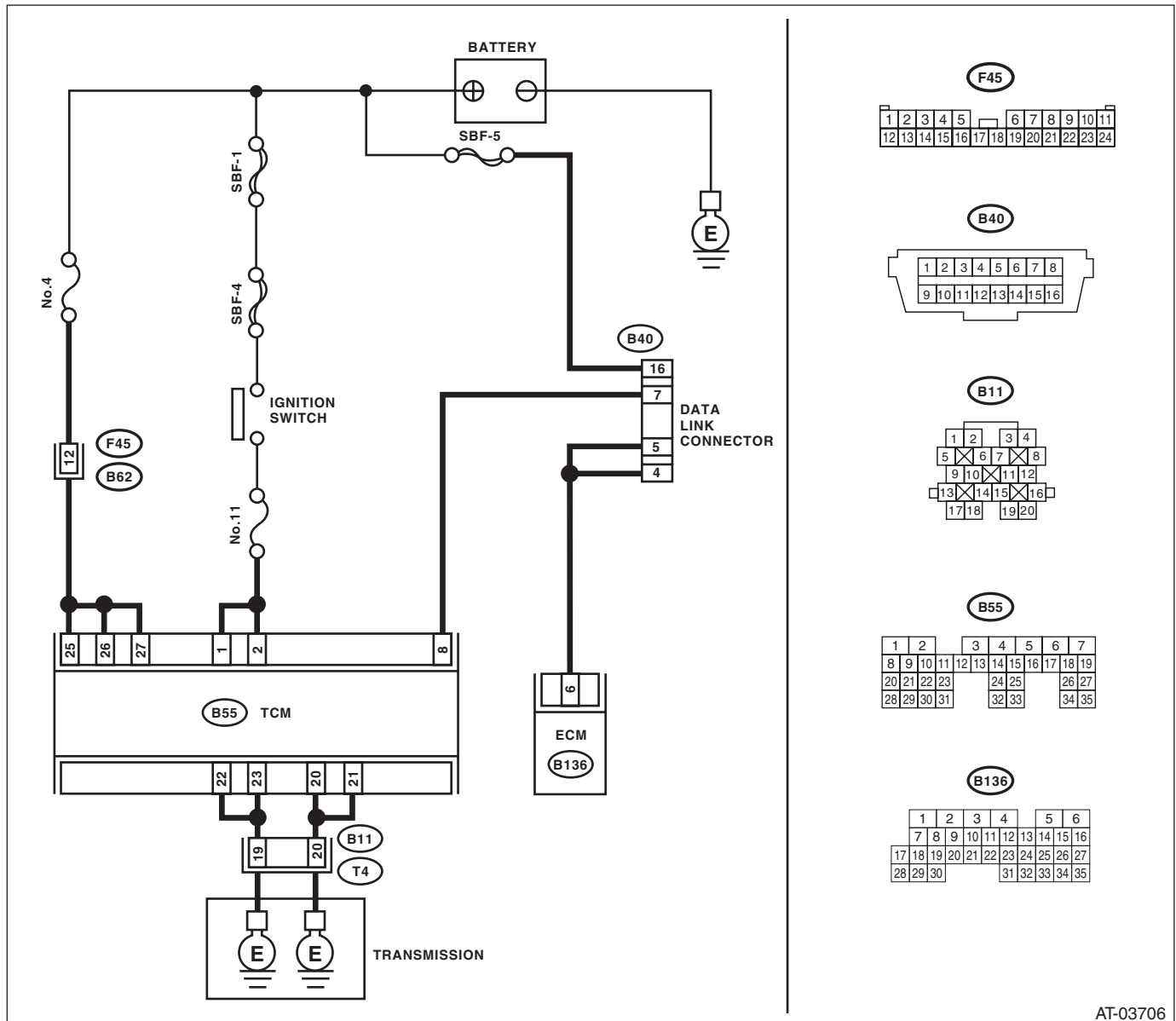
Step	Check	Yes	No
<p>2 CHECK HARNESS CONNECTOR BETWEEN COMBINATION METER AND IGNITION SWITCH.</p> <p>1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Turn the ignition switch to ON (engine OFF). 4) Measure the voltage between combination meter connector and chassis ground.</p> <p>Connector & terminal <i>(i10) No. 9 (+) — Chassis ground (-):</i></p>	Is the voltage 9 V or more?	Go to step 3.	Repair open or short circuit of harness between the combination meter and battery.
<p>3 CHECK AT OIL TEMP WARNING LIGHT.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector (B55) from TCM. 3) Turn the ignition switch to ON (engine OFF). 4) Short between the combination meter connector and chassis ground.</p> <p>CAUTION: When shorting, be sure to short through the fuse.</p>	Does the warning light illuminate?	Go to step 4.	Check the combination meter.
<p>4 CHECK OPEN CIRCUIT OF HARNESS.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from the combination meter. 3) Measure the resistance between the combination meter connector and TCM connector.</p> <p>Connector & terminal <i>(B55) No. 15 — (i12) No. 2:</i></p>	Is the resistance less than 1 Ω?	Go to step 5.	Repair the open circuit of harness between TCM and combination meter, and the poor contact of the connector.
<p>5 CHECK COMBINATION METER.</p> <p>Measure the resistance between combination meter connector and chassis ground.</p> <p>Connector & terminal <i>(i12) No. 2 — Chassis ground:</i></p>	Is the resistance 1 MΩ or more?	Go to step 6.	Repair the short circuit of harness between TCM and combination meter connector.
<p>6 CHECK INPUT SIGNAL FOR TCM.</p> <p>1) Connect all the connectors. 2) Turn the ignition switch to ON (engine OFF). 3) Measure the voltage between TCM connector and chassis ground.</p> <p>Connector & terminal <i>(B55) No. 15 (+) — Chassis ground (-):</i></p>	Is the voltage less than 1 V?	Go to step 7.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>
<p>7 CHECK POOR CONTACT.</p>	Is there poor contact of the AT OIL TEMP warning light circuit?	Repair the poor contact.	Check the power supply and ground circuit. <Ref. to 4AT(D)(diag)-23, CHECK POWER SUPPLY AND GROUND CIRCUIT, AT OIL TEMP Warning Light Display.>

AT OIL TEMP Warning Light Display

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

C: CHECK POWER SUPPLY AND GROUND CIRCUIT

WIRING DIAGRAM:



AT-03706

Step	Check	Yes	No	
1	CHECK BATTERY TERMINAL. Turn the ignition switch to OFF.	Is there poor contact at the battery terminal?	Repair or tighten the battery terminal.	Go to step 2.
2	CHECK POWER SUPPLY OF TCM. 1) Disconnect the connector from TCM. 2) Turn the ignition switch to ON. 3) Measure the voltage between TCM connector and chassis ground. Connector & terminal (B55) No. 25 (+) — Chassis ground (-): (B55) No. 26 (+) — Chassis ground (-): (B55) No. 27 (+) — Chassis ground (-):	Is the voltage 10 — 13 V?	Go to step 4.	Go to step 3.

AT OIL TEMP Warning Light Display

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
3 CHECK FUSE (NO. 4). 1) Turn the ignition switch to OFF. 2) Remove the fuse (No. 4).	Is the fuse (No. 4) blown out?	Replace the fuse (No. 4). If the replaced fuse (No. 4) has blown out easily, repair short circuit of harness between fuse (No. 4) and TCM.	Repair the open circuit of harness between fuse (No. 4) and TCM, or fuse (No. 4) and battery, and poor contact of the connector.
4 CHECK IGNITION POWER SUPPLY CIRCUIT. 1) Turn the ignition switch to ON (engine OFF). 2) Measure the ignition power supply voltage between TCM connector and chassis ground. <i>Connector & terminal</i> (B55) No. 1 (+) — Chassis ground (-): (B55) No. 2 (+) — Chassis ground (-):	Is the voltage 10 — 13 V?	Go to step 6.	Go to step 5.
5 CHECK FUSE (NO. 11). Remove the fuse (No. 11).	Is the fuse (No. 11) blown out?	Replace the fuse (No. 11). If the replaced fuse (No. 11) has blown out easily, repair short circuit of harness between fuse (No. 11) and TCM.	Repair the open circuit of harness between fuse (No. 4) and TCM, or fuse (No. 4) and battery, and poor contact of the connector.
6 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. <i>Connector & terminal</i> (B55) No. 22 — (B11) No. 19: (B55) No. 23 — (B11) No. 19: (B55) No. 20 — (B11) No. 20: (B55) No. 21 — (B11) No. 20:	Is the resistance less than 1 Ω?	Go to step 7.	Repair the open circuit of harness between TCM and transmission harness connector, and poor contact of connector.
7 CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND TRANSMISSION GROUND. Measure the resistance of the harness between transmission and transmission ground. <i>Connector & terminal</i> (T4) No. 19 — Transmission ground: (T4) No. 20 — Transmission ground:	Is the resistance less than 1 Ω?	Go to step 8.	Repair the open circuit of the harness between transmission and transmission ground.
8 CHECK POOR CONTACT OF CONNECTORS.	Is there poor contact in TCM power supply, ground and data link connector?	Repair the connector.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>

Diagnostic Procedure for Subaru Select Monitor Communication

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

11. Diagnostic Procedure for Subaru Select Monitor Communication

A: COMMUNICATION FOR INITIALIZING IMPOSSIBLE

NOTE:

If the AT OIL TEMP warning light turns on when the Subaru Select Monitor or general scan tool is connected, perform the following procedures.

1. Disconnect the Subaru Select Monitor or general scan tool from the vehicle.
2. Repeat the ignition switch ON-OFF cycle three times.
3. Turn the ignition switch to ON.

If the AT OIL TEMP warning light turns off, the Subaru Select Monitor or general scan tool may be faulty. Connect a different Subaru Select Monitor or general scan tool, and if AT OIL TEMP warning light remains off, delete the DTC.

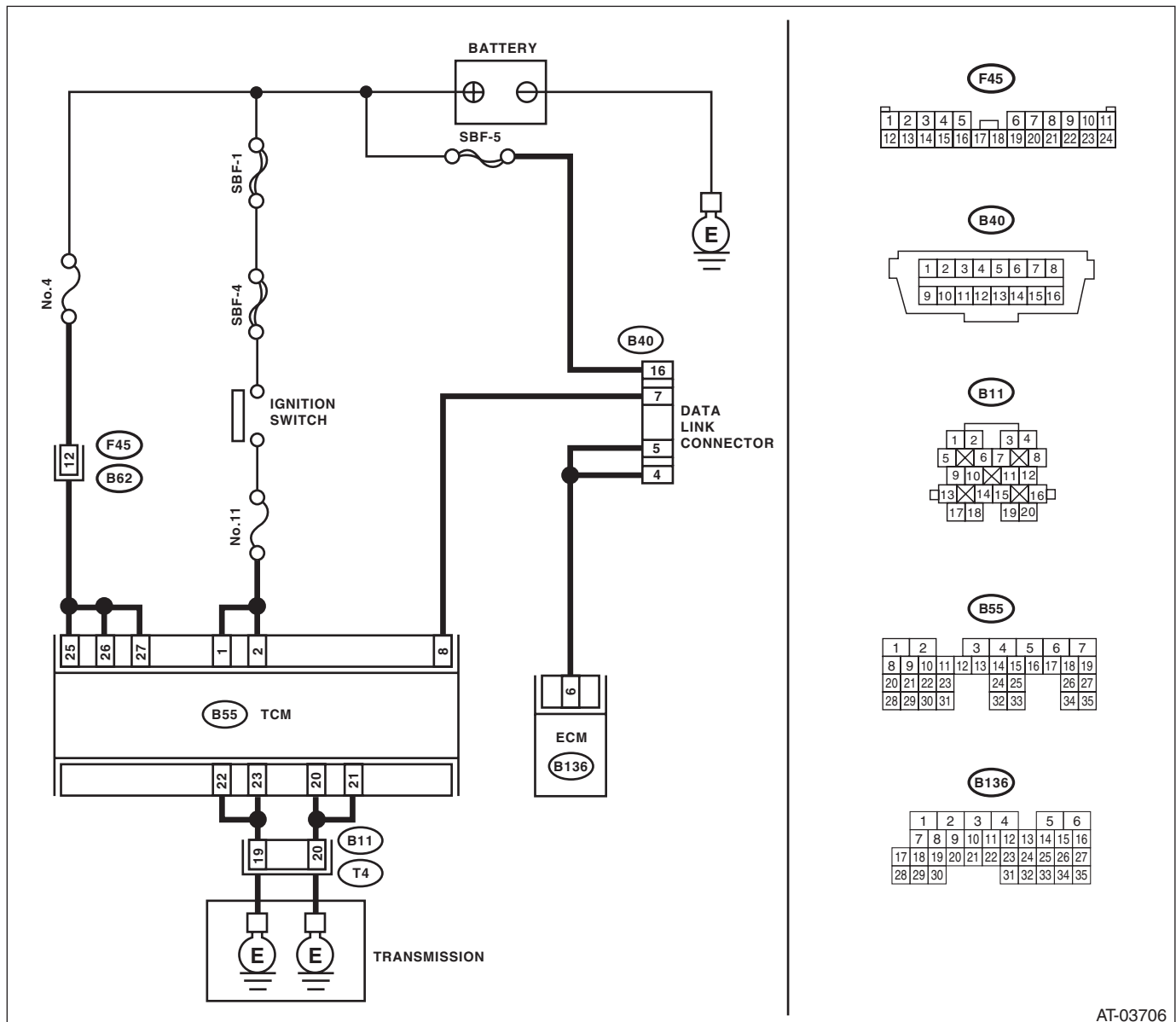
DIAGNOSIS:

Defective harness connector

TROUBLE SYMPTOM:

Subaru Select Monitor communication failure

WIRING DIAGRAM:



AT-03706

Diagnostic Procedure for Subaru Select Monitor Communication

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK INSTALLATION OF TCM CONNECTOR. Turn the ignition switch to OFF.	Is the TCM connector connected correctly?	Go to step 2.	Connect the TCM connector securely.
2	CHECK SUBARU SELECT MONITOR POWER SUPPLY CIRCUIT. Measure the voltage between data link connector and chassis ground. Connector & terminal (B40) No. 16 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 3.	Repair harness connector between the battery and data link connector, and poor contact of the connector.
3	CHECK SUBARU SELECT MONITOR GROUND CIRCUIT. 1) Disconnect the connectors from ECM. 2) Measure the resistance of harness between the data link connector and ECM or the chassis ground. Connector & terminal (B40) No. 5 — (B136) No. 6: (B40) No. 6 — (B136) No. 6:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit of harness between data link connector and chassis ground or ECM, and poor contact of connector.
4	CHECK ENGINE GROUND CIRCUIT. Check the engine ground circuit.	Is the engine ground circuit normal?	Go to step 5.	Repair ground circuit of ECM.
5	CHECK COMMUNICATION OF SUBARU SELECT MONITOR. 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Using the Subaru Select Monitor, check whether communication to the transmission system can be executed normally.	Is the name of the system displayed on Subaru Select Monitor?	Go to step 11.	Go to step 6.
6	CHECK COMMUNICATION OF SUBARU SELECT MONITOR. 1) Turn the ignition switch to OFF. 2) Disconnect the TCM connector. 3) Check whether communication to the engine, ABS, VDC and airbag system can be executed normally.	Is the name of the system displayed on Subaru Select Monitor?	Go to step 7.	Go to step 9.
7	CHECK COMMUNICATION OF SUBARU SELECT MONITOR. 1) Turn the ignition switch to OFF. 2) Connect the TCM connector. 3) Disconnect the ABS, VDC and airbag connector. CAUTION: Observe the safety precautions before disconnecting the airbag connectors. <Ref. to AB(diag)-4, CAUTION, General Description.> 4) Check whether communication to transmission system can be executed normally.	Is the name of the system displayed on Subaru Select Monitor?	Inspect the ABS, VDC and airbag module.	Go to step 8.
8	CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the following TCM connectors. 3) Check whether communication to ECM can be executed normally.	Is the name of the system displayed on Subaru Select Monitor?	Go to step 9.	Inspect the ECM.

Diagnostic Procedure for Subaru Select Monitor Communication

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector of ECM. 3) Measure the resistance between data link connector and chassis ground. Connector & terminal (B40) No. 7 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 10.	Check harness and connector between each control module and data link connector.
10 CHECK OUTPUT SIGNAL OF TCM. 1) Turn the ignition switch to ON. 2) Measure the voltage between data link connector and chassis ground. Connector & terminal (B40) No. 7 (+) — Chassis ground (-):	Is the voltage 1 V or more?	Check harness and connector between each control module and data link connector.	Go to step 11.
11 CHECK HARNESS CONNECTOR BETWEEN TCM AND DATA LINK CONNECTOR. Measure the resistance between TCM connector and data link connector. Connector & terminal (B55) No. 8 — (B40) No. 7:	Is the resistance less than 1 Ω ?	Go to step 12.	Repair the harness and connector between TCM and data link connector.
12 CHECK FOR IMPROPER CONNECTION OF TRANSMISSION HARNESS CONNECTOR.	Is the transmission harness connector connected to bulk-head harness connector correctly?	Go to step 13.	Connect the bulk-head harness connector to transmission harness connector.
13 CHECK POOR CONTACT OF CONNECTORS.	Is there poor contact in control module power supply and data link connector?	Repair the poor contact.	Go to step 14.
14 CHECK POWER SUPPLY OF TCM. 1) Disconnect the connector from TCM. 2) Measure the voltage between TCM connector and chassis ground. Connector & terminal (B55) No. 25 (+) — Chassis ground (-): (B55) No. 26 (+) — Chassis ground (-): (B55) No. 27 (+) — Chassis ground (-):	Is the voltage 10 — 13 V?	Go to step 16.	Go to step 15.
15 CHECK FUSE (NO. 4). Remove the fuse (No. 4).	Is the fuse (No. 4) blown out?	Replace the fuse (No. 4). If the replaced fuse (No. 4) has blown out easily, repair the short circuit of harness between fuse (No. 4) and TCM.	Repair the open circuit of harness between fuse (No. 4) and TCM, or fuse (No. 4) and battery, and poor contact of the connector.
16 CHECK IGNITION POWER SUPPLY CIRCUIT. 1) Turn the ignition switch to ON (engine OFF). 2) Measure the ignition power supply voltage between TCM connector and chassis ground. Connector & terminal (B54) No. 1 (+) — Chassis ground (-): (B54) No. 2 (+) — Chassis ground (-):	Is the voltage 10 — 13 V?	Go to step 18.	Go to step 17.

Diagnostic Procedure for Subaru Select Monitor Communication

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
17 CHECK FUSE (NO. 11). Remove the fuse (No. 11).	Is the fuse (No. 11) blown out?	Replace the fuse (No. 11). If the replaced fuse (No. 11) has blown out easily, repair the short circuit of harness between fuse (No. 11) and TCM.	Repair the open circuit of harness between fuse (No. 11) and TCM, or fuse (No. 11) and battery, and poor contact of the connector.
18 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. <i>Connector & terminal</i> <i>(B55) No. 22 — (B11) No. 19:</i> <i>(B55) No. 23 — (B11) No. 19:</i> <i>(B55) No. 20 — (B11) No. 20:</i> <i>(B55) No. 21 — (B11) No. 20:</i>	Is the resistance less than 1 Ω?	Go to step 19.	Repair the open circuit of harness between TCM and transmission harness connector, and poor contact of connector.
19 CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND TRANSMISSION GROUND. Measure the resistance of the harness between transmission and transmission ground. <i>Connector & terminal</i> <i>(T4) No. 19 — Transmission ground:</i> <i>(T4) No. 20 — Transmission ground:</i>	Is the resistance less than 1 Ω?	Go to step 20.	Repair the open circuit of the harness between transmission and transmission ground.
20 CHECK POOR CONTACT OF CONNECTORS.	Is there poor contact in TCM power supply, ground and data link connector?	Repair the connector.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>

List of Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

12. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Diagnosis content	Reference
P0705	Transmission Range Sensor Circuit (PRNDL Input)	Inhibitor switch malfunction, open or short circuit	<Ref. to 4AT(D)(diag)-31, DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT (PRNDL INPUT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0712	Transmission Fluid Temperature Sensor Circuit Low Input	ATF temperature sensor is faulty or input signal circuit is open.	<Ref. to 4AT(D)(diag)-39, DTC P0712 TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT LOW INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0713	Transmission Fluid Temperature Sensor Circuit High Input	ATF temperature sensor is faulty or input signal circuit is shorted.	<Ref. to 4AT(D)(diag)-42, DTC P0713 TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT HIGH INPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0715	Input/Turbine Speed Sensor Circuit	Torque converter turbine speed sensor malfunction, open or shorted input signal circuit	<Ref. to 4AT(D)(diag)-45, DTC P0715 INPUT/TURBINE SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0719	Torque Converter/Brake Switch "B" Circuit Low	Brake switch malfunction, open input signal circuit	<Ref. to 4AT(D)(diag)-47, DTC P0719 TORQUE CONVERTER/BRAKE SWITCH "B" CIRCUIT LOW, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0720	Output Speed Sensor Circuit	Front vehicle speed sensor malfunction, open or shorted input signal circuit	<Ref. to 4AT(D)(diag)-49, DTC P0720 OUTPUT SPEED SENSOR CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0724	Torque Converter/Brake Switch "B" Circuit High	Brake switch malfunction, shorted input signal circuit	<Ref. to 4AT(D)(diag)-52, DTC P0724 TORQUE CONVERTER/BRAKE SWITCH "B" CIRCUIT HIGH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0725	Engine Speed Input Circuit	Open or shorted engine speed output signal circuit	<Ref. to 4AT(D)(diag)-54, DTC P0725 ENGINE SPEED INPUT CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0731	Gear 1 Incorrect Ratio	Vehicle sensor, torque converter turbine speed sensor or control valve malfunction	<Ref. to 4AT(D)(diag)-56, DTC P0731 GEAR 1 INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0732	Gear 2 Incorrect Ratio	Vehicle sensor, torque converter turbine speed sensor or control valve malfunction	<Ref. to 4AT(D)(diag)-56, DTC P0732 GEAR 2 INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0733	Gear 3 Incorrect Ratio	Vehicle sensor, torque converter turbine speed sensor or control valve malfunction	<Ref. to 4AT(D)(diag)-56, DTC P0733 GEAR 3 INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0734	Gear 4 Incorrect Ratio	Vehicle sensor, torque converter turbine speed sensor or control valve malfunction	<Ref. to 4AT(D)(diag)-56, DTC P0734 GEAR 4 INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0736	Reverse Incorrect Ratio	Vehicle sensor, torque converter turbine speed sensor or control valve malfunction	<Ref. to 4AT(D)(diag)-57, DTC P0736 REVERSE INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0741	Torque Converter Clutch Circuit Performance or Stuck Off	Lock-up clutch is faulty or valve is stuck.	<Ref. to 4AT(D)(diag)-58, DTC P0741 TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

DTC	Item	Diagnosis content	Reference
P0743	Torque Converter Clutch Circuit Electrical	Lock-up solenoid is faulty or output signal circuit is open or shorted.	<Ref. to 4AT(D)(diag)-59, DTC P0743 TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0748	Pressure Control Solenoid "A" Electrical	Line pressure linear solenoid is faulty or output signal circuit is open or shorted.	<Ref. to 4AT(D)(diag)-62, DTC P0748 PRESSURE CONTROL SOLENOID "A" ELECTRICAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0753	Shift Solenoid "A" Electrical	Low clutch duty solenoid is faulty or output signal circuit is open or shorted.	<Ref. to 4AT(D)(diag)-64, DTC P0753 SHIFT SOLENOID "A" ELECTRICAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0758	Shift Solenoid "B" Electrical	2-4 brake duty solenoid is faulty or output signal circuit is open or shorted.	<Ref. to 4AT(D)(diag)-67, DTC P0758 SHIFT SOLENOID "B" ELECTRICAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0763	Shift Solenoid "C" Electrical	High clutch duty solenoid is faulty or output signal circuit is open or shorted.	<Ref. to 4AT(D)(diag)-70, DTC P0763 SHIFT SOLENOID "C" ELECTRICAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0768	Shift Solenoid "D" Electrical	Low & reverse clutch duty solenoid is faulty or output signal circuit is open or shorted.	<Ref. to 4AT(D)(diag)-73, DTC P0768 SHIFT SOLENOID "D" ELECTRICAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0801	Reverse Inhibit Control Circuit	Shift lock solenoid is faulty or output signal circuit is open or shorted.	<Ref. to 4AT(D)(diag)-76, DTC P0801 REVERSE INHIBIT CONTROL CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1706	AT Vehicle Speed Sensor Circuit Malfunction (rear wheel)	Rear vehicle speed sensor is faulty or input signal circuit is open or shorted.	<Ref. to 4AT(D)(diag)-78, DTC P1706 AT VEHICLE SPEED SENSOR CIRCUIT MALFUNCTION (REAR WHEEL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1707	AT AWD Solenoid Valve Circuit Malfunction	Transfer duty solenoid is faulty or output signal circuit is open or shorted.	<Ref. to 4AT(D)(diag)-81, DTC P1707 AT AWD SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1718	CAN Communication Circuit	CAN communication circuit is open or shorted.	<Ref. to 4AT(D)(diag)-84, DTC P1718 CAN COMMUNICATION CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

13. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P0705 TRANSMISSION RANGE SENSOR CIRCUIT (PRNDL INPUT)

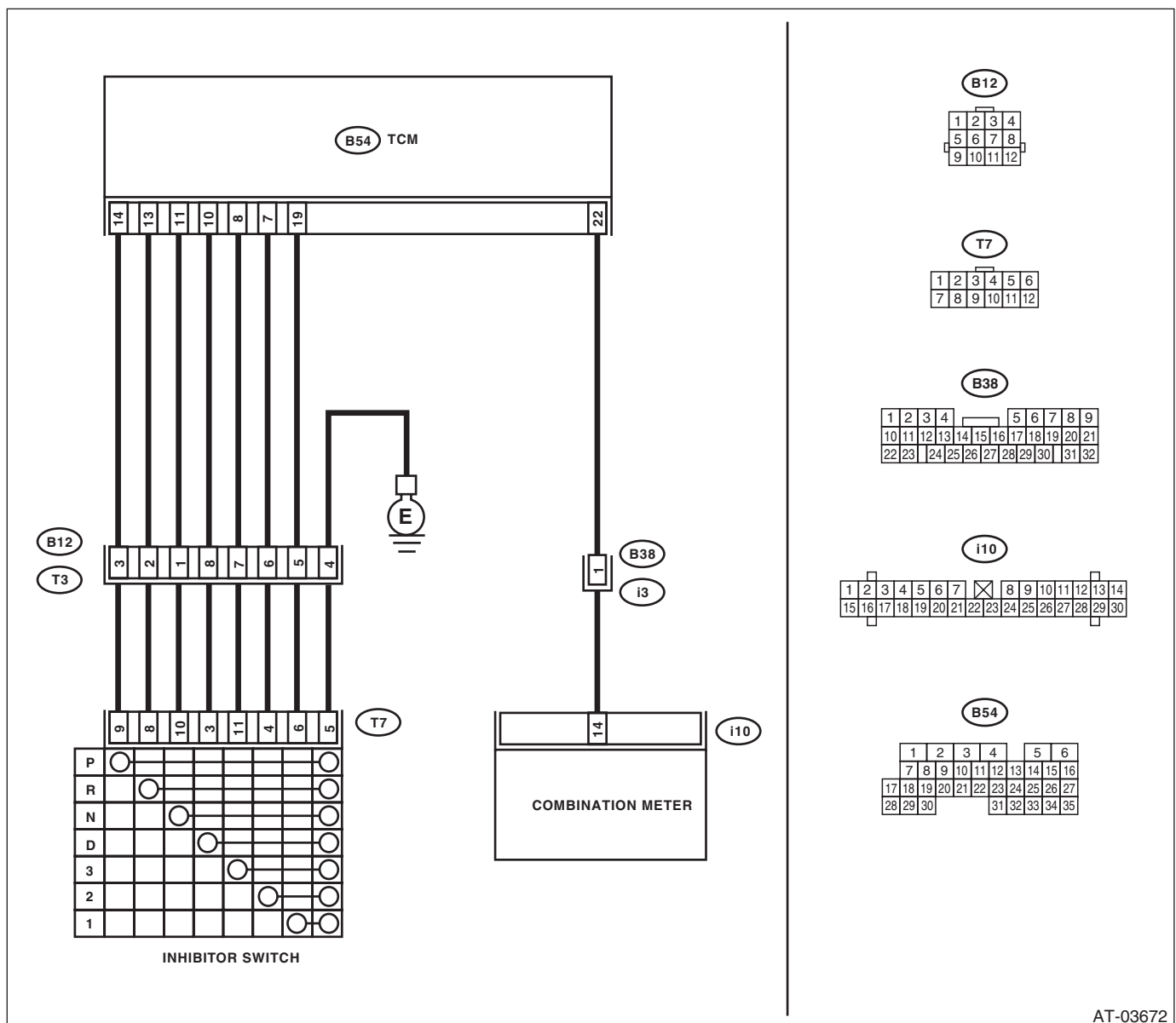
DTC DETECTING CONDITION:

- Inhibitor switch is faulty.
- The inhibitor input signal circuit is shorted.
- More than 2 range signal is input.
- No "D" range signal is input when select lever is moved from the "N" to the "3" range.

TROUBLE SYMPTOM:

- Shift characteristics are erroneous.
- Engine brake does not come into effect when the select lever is shifted to "3" range.
- Engine brake does not come into effect when the select lever is shifted to "2" range.
- Engine brake does not come into effect when the select lever is shifted to "1" range.
- The range position of the select lever and the AT select lever position indicator in the combination meter do not match.

WIRING DIAGRAM:



AT-03672

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK “P” RANGE SWITCH. Connect the Subaru Select Monitor to data link connector, and then check the LED display screen.	When the “P” range is selected, does the LED illuminate?	Go to step 2.	Go to step 22.
2	CHECK INDICATOR LIGHT.	Does the combination meter “P” range indicator light illuminate?	Go to step 3.	Go to step 26.
3	CHECK “P” RANGE SWITCH.	When the “R” range is selected, does the “P” range LED light up?	Go to step 27.	Go to step 4.
4	CHECK “R” RANGE SWITCH.	When the “R” range is selected, does the LED illuminate?	Go to step 5.	Go to step 28.
5	CHECK INDICATOR LIGHT.	Does the combination meter “R” range indicator light illuminate?	Go to step 6.	Go to step 31.
6	CHECK “R” RANGE SWITCH.	When the “N” range is selected, does the “R” range LED light up?	Go to step 32.	Go to step 7.
7	CHECK “N” RANGE SWITCH.	When the “N” range is selected, does the LED illuminate?	Go to step 8.	Go to step 33.
8	CHECK INDICATOR LIGHT.	Does the combination meter “N” range indicator light illuminate?	Go to step 9.	Go to step 36.
9	CHECK “N” RANGE SWITCH.	When the “D” range is selected, does the “N” range LED light up?	Go to step 37.	Go to step 10.
10	CHECK “D” RANGE SWITCH.	When the “D” range is selected, does the LED illuminate?	Go to step 11.	Go to step 38.
11	CHECK INDICATOR LIGHT.	Does the combination meter “D” range indicator light illuminate?	Go to step 12.	Go to step 41.
12	CHECK “D” RANGE SWITCH.	When the “3” range is selected, does the “D” range LED light up?	Go to step 42.	Go to step 13.
13	CHECK “3” RANGE SWITCH.	When the “3” range is selected, does the LED illuminate?	Go to step 14.	Go to step 43.
14	CHECK INDICATOR LIGHT.	Does the combination meter “3” range indicator light illuminate?	Go to step 15.	Go to step 46.
15	CHECK “3” RANGE SWITCH.	When the “2” range is selected, does the “3” range LED light up?	Go to step 47.	Go to step 16.
16	CHECK “2” RANGE SWITCH.	When the “2” range is selected, does the LED illuminate?	Go to step 17.	Go to step 48.
17	CHECK INDICATOR LIGHT.	Does the combination meter “2” range indicator light illuminate?	Go to step 18.	Go to step 51.
18	CHECK “2” RANGE SWITCH.	When the “1” range is selected, does the “2” range LED light up?	Go to step 52.	Go to step 19.
19	CHECK “1” RANGE SWITCH.	When the “1” range is selected, does the LED illuminate?	Go to step 20.	Go to step 53.
20	CHECK INDICATOR LIGHT.	Does the combination meter “1” range indicator light illuminate?	Go to step 21.	Go to step 56.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
21 CHECK "1" RANGE SWITCH.	When the "2" range is selected, does the "1" range LED light up?	Go to step 57.	Even if the AT OIL TEMP warning light is blinking, the circuit has returned to normal condition at this time. A temporary poor contact of connector or harness may be the cause. Repair the poor contact of harness.
22 CHECK HARNESS CONNECTOR BETWEEN INHIBITOR SWITCH AND CHASSIS GROUND. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from inhibitor switch. 3) Measure the resistance of harness between inhibitor switch and chassis ground. Connector & terminal (T7) No. 5 — Chassis ground:	Is the resistance less than 1 Ω?	Go to step 23.	Repair the open circuit of harness between inhibitor switch and chassis ground, and poor contact of the connector.
23 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER. 1) Disconnect the connectors from TCM and combination meter. 2) Measure the resistance of harness between TCM and combination meter. Connector & terminal (B54) No. 22 — (i10) No. 14:	Is the resistance less than 1 Ω?	Go to step 24.	Repair open circuit of harness between TCM connector and combination meter, and poor contact in connector.
24 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and inhibitor switch. 3) Measure the resistance of the harness between TCM and inhibitor switch connector. Connector & terminal (B54) No. 14 — (T7) No. 9:	Is the resistance less than 1 Ω?	Go to step 25.	Repair the open circuit of harness between TCM and inhibitor switch connector, and poor contact of the connector.
25 CHECK INPUT SIGNAL FOR TCM. 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Shift the select lever to "P" range. 5) Measure the voltage between TCM and chassis ground. Connector & terminal (B54) No. 14 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 26.	Go to step 59.
26 CHECK INPUT SIGNAL FOR TCM. 1) Shift the select lever to any range other than "P". 2) Measure the voltage between TCM and chassis ground. Connector & terminal (B54) No. 14 (+) — Chassis ground (-):	Is the voltage 8 V or more?	Go to step 59.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
27 CHECK "P" RANGE INDICATOR LIGHT BULB. 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "P" range indicator light bulb from the combination meter.	Is the "P" range indicator light bulb OK?	Go to step 59.	Replace the "P" range indicator light bulb. <Ref. to IDI-10, Combination Meter.>
28 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of the harness between TCM connector and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 14 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 29.	Repair ground short circuit in "P" range circuit.
29 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and inhibitor switch. 3) Measure the resistance of the harness between TCM and inhibitor switch connector. <i>Connector & terminal</i> <i>(B54) No. 13 — (T7) No. 8:</i>	Is the resistance less than 1 Ω?	Go to step 30.	Repair the open circuit of harness between TCM and inhibitor switch connector, and poor contact of the connector.
30 CHECK INPUT SIGNAL FOR TCM. 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to "R" range. 5) Measure the voltage between TCM and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 14 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 31.	Go to step 59.
31 CHECK INPUT SIGNAL FOR TCM. 1) Position the select lever to any other than "R" range. 2) Measure the voltage between TCM and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 13 (+) — Chassis ground (-):</i>	Is the voltage 8 V or more?	Go to step 59.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>
32 CHECK "R" RANGE INDICATOR LIGHT BULB. 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "R" range indicator light bulb from combination meter.	Is the "R" range indicator light bulb OK?	Go to step 59.	Replace the "R" range indicator light bulb. <Ref. to IDI-10, Combination Meter.>
33 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of the harness between TCM connector and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 13 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 34.	Repair ground short circuit in "R" range circuit.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
34 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and inhibitor switch. 3) Measure the resistance of the harness between TCM and inhibitor switch connector. Connector & terminal (B54) No. 11 — (T7) No. 10:	Is the resistance less than 1 Ω ?	Go to step 35.	Repair the open circuit of harness between TCM and inhibitor switch connector, and poor contact of the connector.
35 CHECK INPUT SIGNAL FOR TCM. 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to "N" range. 5) Measure the voltage between TCM and chassis ground. Connector & terminal (B54) No. 11 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 36.	Go to step 59.
36 CHECK INPUT SIGNAL FOR TCM. 1) Move the select lever to any other than "N" range. 2) Measure the voltage between TCM and chassis ground. Connector & terminal (B54) No. 11 (+) — Chassis ground (-):	Is the voltage 8 V or more?	Go to step 59.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>
37 CHECK "N" RANGE INDICATOR LIGHT BULB. 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "N" range indicator light bulb from the combination meter.	Is the "N" range indicator light bulb OK?	Go to step 59.	Replace the "N" range indicator light bulb. <Ref. to IDI-10, Combination Meter.>
38 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of the harness between TCM connector and chassis ground. Connector & terminal (B54) No. 11 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 39.	Repair the ground short circuit in "N" range circuit.
39 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and inhibitor switch. 3) Measure the resistance of the harness between TCM and inhibitor switch connector. Connector & terminal (B54) No. 10 — (T7) No. 3:	Is the resistance less than 1 Ω ?	Go to step 40.	Repair the open circuit of harness between TCM and inhibitor switch connector, and poor contact of the connector.
40 CHECK INPUT SIGNAL FOR TCM. 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to the "D" range. 5) Measure the voltage between TCM and chassis ground. Connector & terminal (B54) No. 10 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 41.	Go to step 59.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
41 CHECK INPUT SIGNAL FOR TCM. 1) Move the select lever to any other than "D" range. 2) Measure the voltage between TCM and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 10 (+) — Chassis ground (-):</i>	Is the voltage 8 V or more?	Go to step 59.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>
42 CHECK "D" RANGE INDICATOR LIGHT BULB. 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "D" range indicator light bulb from combination meter.	Is the "D" range indicator light bulb OK?	Go to step 59.	Replace the "D" range indicator light bulb. <Ref. to IDI-10, Combination Meter.>
43 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of the harness between TCM connector and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 8 — Chassis ground:</i>	Is the resistance 1 M Ω or more?	Go to step 44.	Repair ground short circuit in "D" range circuit.
44 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and inhibitor switch. 3) Measure the resistance of the harness between TCM and inhibitor switch connector. <i>Connector & terminal</i> <i>(B54) No. 8 — (T7) No. 11:</i>	Is the resistance less than 1 Ω ?	Go to step 45.	Repair the open circuit of harness between TCM and inhibitor switch connector, and poor contact of the connector.
45 CHECK INPUT SIGNAL FOR TCM. 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to the "3" range. 5) Measure the voltage between TCM and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 8 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 46.	Go to step 59.
46 CHECK INPUT SIGNAL FOR TCM. 1) Move the select lever out of the "3" range. 2) Measure the voltage between TCM and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 8 (+) — Chassis ground (-):</i>	Is the voltage 8 V or more?	Go to step 59.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>
47 CHECK "3" RANGE INDICATOR LIGHT BULB. 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "3" range indicator light bulb from combination meter.	Is the "3" range indicator light bulb OK?	Go to step 59.	Replace the "3" range indicator light bulb. <Ref. to IDI-10, Combination Meter.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
48 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of the harness between TCM connector and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 8 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 49.	Repair ground short circuit in “3” range circuit.
49 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and inhibitor switch. 3) Measure the resistance of the harness between TCM and inhibitor switch connector. <i>Connector & terminal</i> <i>(B54) No. 7 — (T7) No. 4:</i>	Is the resistance less than 1 Ω?	Go to step 50.	Repair the open circuit of harness between TCM and inhibitor switch connector, and poor contact of the connector.
50 CHECK INPUT SIGNAL FOR TCM. 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to the “2” range. 5) Measure the voltage between TCM and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 7 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 51.	Go to step 59.
51 CHECK INPUT SIGNAL FOR TCM. 1) Move the select lever out of the “2” range. 2) Measure the voltage between TCM and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 7 (+) — Chassis ground (-):</i>	Is the voltage 8 V or more?	Go to step 59.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>
52 CHECK “2” RANGE INDICATOR LIGHT BULB. 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the “2” range indicator light bulb from combination meter.	Is the “2” range indicator light bulb OK?	Go to step 59.	Replace the “2” range indicator light bulb. <Ref. to IDI-10, Combination Meter.>
53 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of the harness between TCM connector and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 7 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 54.	Repair ground short circuit in “2” range circuit.
54 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and inhibitor switch. 3) Measure the resistance of the harness between TCM and inhibitor switch connector. <i>Connector & terminal</i> <i>(B54) No. 19 — (T7) No. 6:</i>	Is the resistance less than 1 Ω?	Go to step 55.	Repair the open circuit of harness between TCM and inhibitor switch connector, and poor contact of the connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
55 CHECK INPUT SIGNAL FOR TCM. 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and inhibitor switch. 3) Turn the ignition switch to ON. 4) Move the select lever to the "1" range. 5) Measure the voltage between TCM and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 19 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 56.	Go to step 59.
56 CHECK INPUT SIGNAL FOR TCM. 1) Move the select lever out of the "1" range. 2) Measure the voltage between TCM and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 19 (+) — Chassis ground (-):</i>	Is the voltage 8 V or more?	Go to step 59.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>
57 CHECK "1" RANGE INDICATOR LIGHT BULB. 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Remove the "1" range indicator light bulb from combination meter.	Is the "1" range indicator light bulb OK?	Go to step 59.	Replace the "1" range indicator light bulb. <Ref. to IDI-10, Combination Meter.>
58 CHECK HARNESS CONNECTOR BETWEEN TCM AND INHIBITOR SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM, inhibitor switch and combination meter. 3) Measure the resistance of the harness between TCM connector and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 19 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 59.	Repair ground short circuit in "1" range circuit.
59 CHECK POOR CONTACT.	Is there poor contact in the inhibitor switch circuit?	Repair the poor contact.	Go to step 60.
60 CHECK INHIBITOR SWITCH.	Is the inhibitor switch in the normal position?	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>	Adjust inhibitor switch and select cable. <Ref. to 4AT-47, Inhibitor Switch.> <Ref. to CS-25, Select Cable.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

B: DTC P0712 TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT LOW INPUT

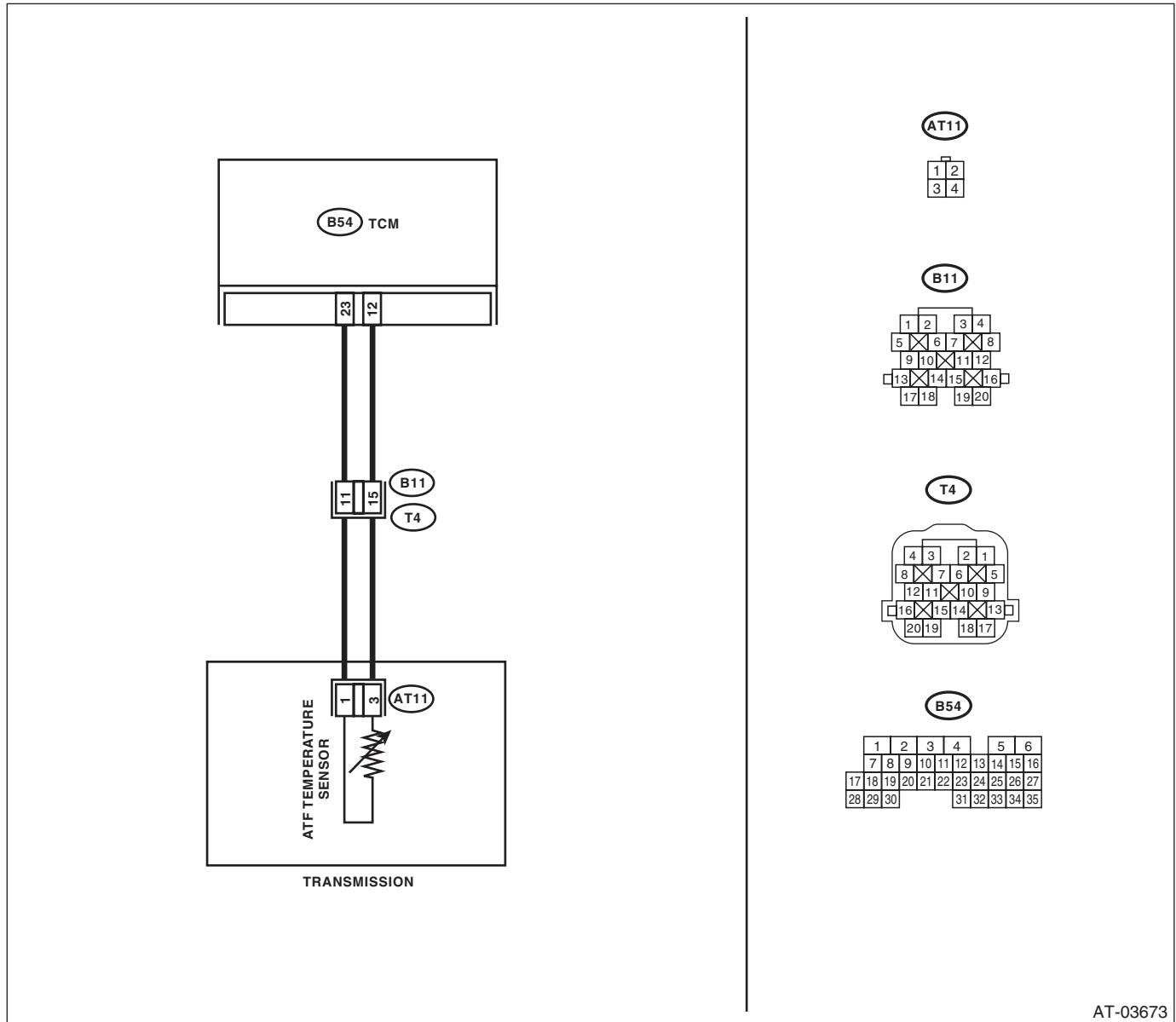
DTC DETECTING CONDITION:

Input signal circuit to ATF temperature sensor is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock

WIRING DIAGRAM:



Step	Check	Yes	No
1 CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM. 3) Measure the resistance of harness between TCM and transmission connector. Connector & terminal (B54) No. 23 — No. 11:	Is the resistance less than 1 Ω?	Go to step 2.	Repair the open circuit of harness between TCM and transmission connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR. Measure the resistance of harness between TCM and transmission connector. <i>Connector & terminal (B54) No. 12 — (B11) No. 15:</i>	Is the resistance less than 1 Ω ?	Go to step 3.	Repair the open circuit of harness between TCM and transmission connector.
3 CHECK ATF TEMPERATURE SENSOR. 1) Turn the ignition switch to OFF. 2) Connect the connectors to transmission and TCM. 3) Turn the ignition switch to ON and start engine. 4) Warm-up the transmission until the ATF temperature reaches to 80°C (176°F). NOTE: If the ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature. 5) Disconnect the connector from transmission. 6) Measure the resistance between transmission connector terminals. <i>Connector & terminal (T4) No. 11 — No. 15:</i>	Is the resistance between 300 — 800 Ω ?	Go to step 4.	Go to step 7.
4 CHECK ATF TEMPERATURE SENSOR. 1) Turn the ignition switch to ON (engine OFF). 2) Measure the resistance between transmission connector terminals. <i>Connector & terminal (T4) No. 11 — No. 15:</i>	Does the resistance value increase while the ATF temperature decreases?	Go to step 5.	Go to step 7.
5 CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR. 1) Connect the connector to transmission. 2) Connect the Subaru Select Monitor to the data link connector. 3) Turn the ignition switch to ON. (engine OFF) 4) Read the data of ATF temperature using Subaru Select Monitor.	Does the ATF temperature gradually decrease?	Even if the AT OIL TEMP warning light is blinking, the circuit has returned to normal condition at this time. A temporary poor contact of connector or harness may be the cause. Repair the harness and poor contact of ATF temperature sensor and transmission connector.	Go to step 6.
6 CHECK POOR CONTACT.	Is there poor contact in ATF temperature sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
<p>7 CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND ATF TEMPERATURE SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission. 3) Remove the transmission connector from bracket. 4) Lift up the vehicle and place it on rigid racks. NOTE: Raise all wheels off the floor. 5) Drain the automatic transmission fluid. CAUTION: Do not drain ATF until it cools down. 6) Remove the oil pan, and disconnect the connector from ATF temperature sensor connector. 7) Measure the resistance of harness between ATF temperature sensor and transmission connector. 8) Measure the resistance between transmission connector and transmission ground. Connector & terminal (T4) No. 11 — (AT11) No. 1:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 8.</p>	<p>Repair the open circuit of harness between ATF temperature sensor and transmission connector.</p>
<p>8 CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND ATF TEMPERATURE SENSOR. Measure the resistance of harness between ATF temperature sensor and transmission connector. Connector & terminal (T4) No. 15 — (AT11) No. 3:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 9.</p>	<p>Repair the open circuit of harness between ATF temperature sensor and transmission connector.</p>
<p>9 CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND ATF TEMPERATURE SENSOR. Measure the resistance of harness between transmission connector and transmission ground. Connector & terminal (T4) No. 11 — Transmission ground:</p>	<p>Is the resistance 1 MΩ or more?</p>	<p>Go to step 10.</p>	<p>Repair the short circuit of harness between ATF temperature sensor and transmission connector.</p>
<p>10 CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND ATF TEMPERATURE SENSOR. Measure the resistance of harness between transmission connector and transmission ground. Connector & terminal (T4) No. 15 — Transmission ground:</p>	<p>Is the resistance 1 MΩ or more?</p>	<p>Replace the control valve body. <Ref. to 4AT-56, Control Valve Body.></p>	<p>Repair the short circuit of harness between ATF temperature sensor and transmission connector.</p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

C: DTC P0713 TRANSMISSION FLUID TEMPERATURE SENSOR CIRCUIT HIGH INPUT

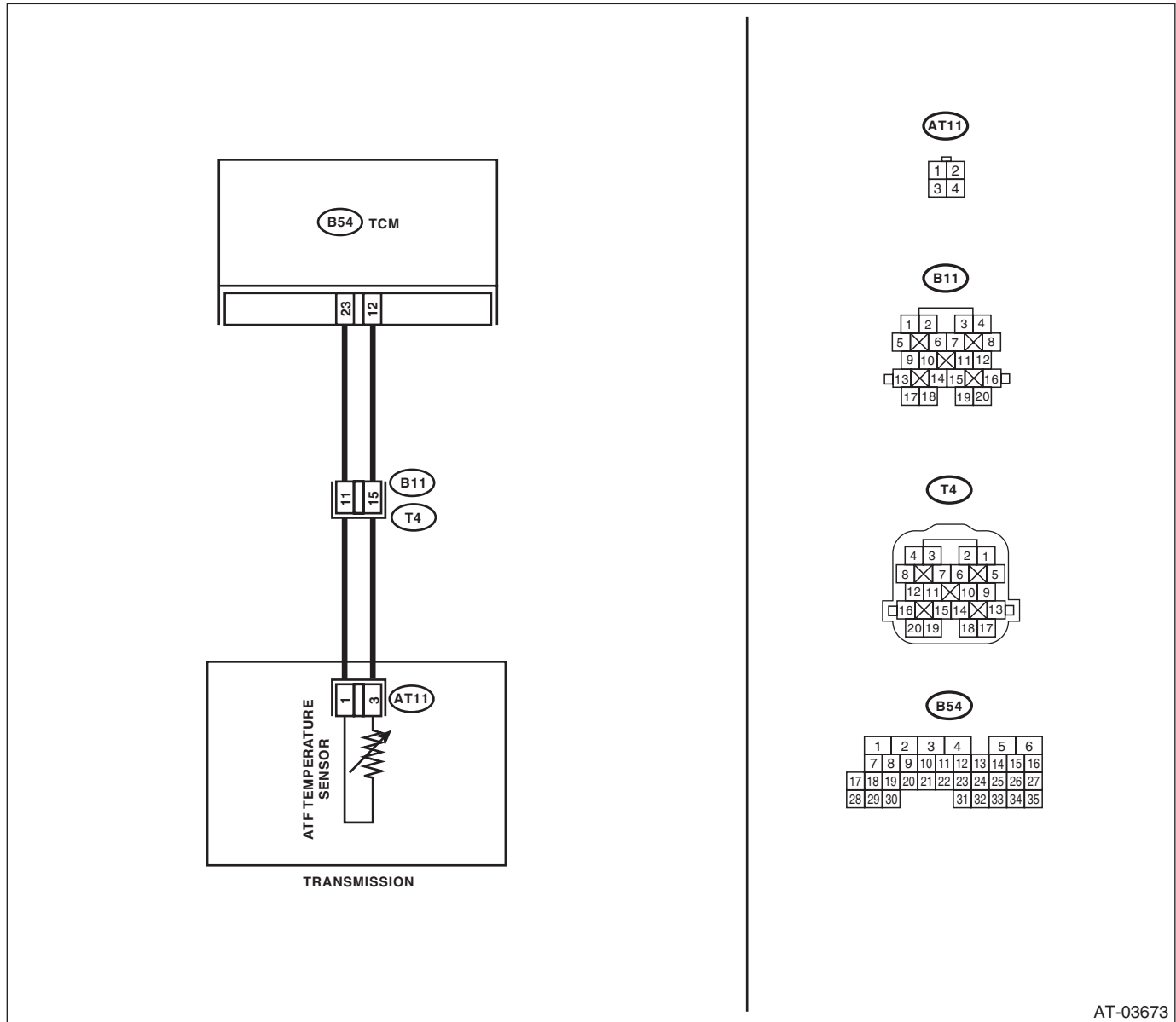
DTC DETECTING CONDITION:

Input signal circuit to ATF temperature sensor is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock

WIRING DIAGRAM:



AT-03673

Step	Check	Yes	No
1 CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM. 3) Measure the resistance between TCM connector terminals. <i>Connector & terminal</i> <i>(B54) No. 23 — No. 12:</i>	Is the resistance 500 Ω or more?	Go to step 2.	Go to step 4.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR. Measure the resistance of the harness between TCM connector and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 23 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 3.	Go to step 4.
3 CHECK HARNESS. Measure the resistance between TCM connector terminals while shaking the harness. <i>Connector & terminal</i> <i>(B54) No. 23 — No. 12:</i>	Does the resistance change?	Go to step 4.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>
4 CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission. 3) Measure the resistance of the harness between TCM connector and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 23 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 5.	Repair the short circuit of harness between TCM and transmission harness.
5 CHECK HARNESS CONNECTOR BETWEEN TCM AND ATF TEMPERATURE SENSOR. Measure the resistance of the harness between TCM connector and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 12 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 6.	Repair the short circuit of harness between TCM and transmission harness.
6 CHECK ATF TEMPERATURE SENSOR. Measure the resistance between transmission connector terminals. <i>Connector & terminal</i> <i>(T4) No. 11 — No. 15:</i>	Is the resistance 500 Ω or more?	Even if the AT OIL TEMP warning light is blinking, the circuit has returned to normal condition at this time. A temporary short circuit of connector or harness may be the cause. Repair the harness or connector.	Go to step 7.
7 CHECK TRANSMISSION HARNESS. 1) Lift up the vehicle and place it on rigid racks. 2) Drain the automatic transmission fluid. CAUTION: Do not drain ATF until it cools down. 3) Remove the oil pan. 4) Disconnect the harness connector from control valve. 5) Measure the resistance between transmission connector and transmission ground. <i>Connector & terminal</i> <i>(T4) No. 11 — Transmission ground:</i>	Is the resistance 1 MΩ or more?	Go to step 8.	Replace the transmission harness.
8 CHECK TRANSMISSION HARNESS. Measure the resistance between transmission connector and transmission ground. <i>Connector & terminal</i> <i>(T4) No. 15 — Transmission ground:</i>	Is the resistance 1 MΩ or more?	Go to step 9.	Replace the transmission harness.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

	Step	Check	Yes	No
9	CHECK ATF TEMPERATURE SENSOR. Measure the resistance between control valve connector terminals. Terminals No. 1 — No. 3:	Is the resistance 500 Ω or more?	Even if the AT OIL TEMP warning light is blinking, the circuit has returned to normal condition at this time. A temporary short circuit of connector or harness may be the cause. Repair the harness or connector.	Replace the control valve body. <Ref. to 4AT-56, Control Valve Body.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

D: DTC P0715 INPUT/TURBINE SPEED SENSOR CIRCUIT

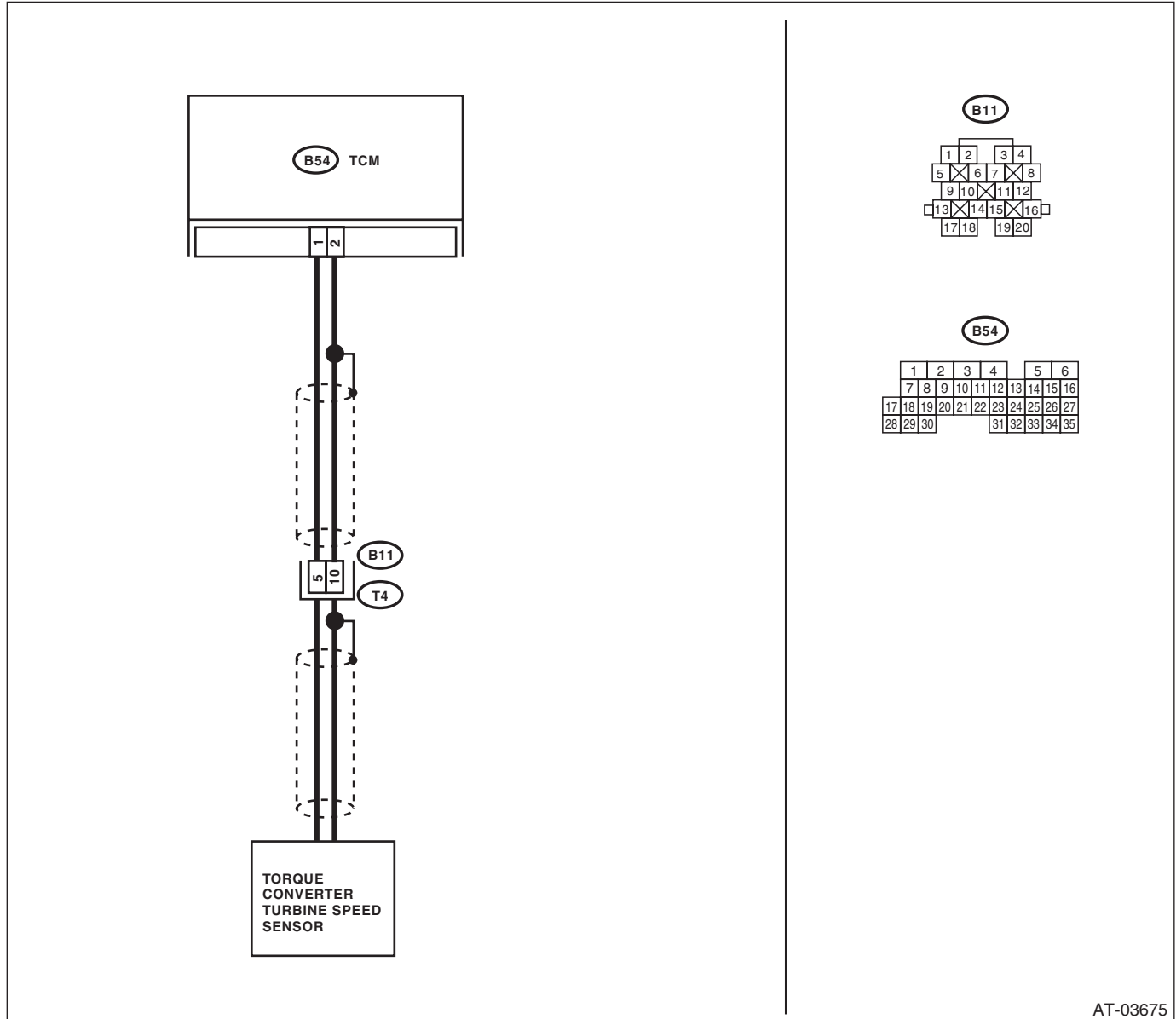
DTC DETECTING CONDITION:

Input signal circuit of TCM is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock

WIRING DIAGRAM:



AT-03675

Step	Check	Yes	No
1 CHECK TORQUE CONVERTER TURBINE SPEED SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission. 3) Measure the resistance between transmission connector receptacle's terminals. Connector & terminal (T4) No. 5 — No. 10:	Is the resistance between 450 — 650 Ω?	Go to step 2.	Replace the torque converter turbine speed sensor. <Ref. to 4AT-55, Torque Converter Turbine Speed Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. 1) Disconnect the connector from TCM. 2) Measure the resistance of the harness between TCM connector and transmission connector. <i>Connector & terminal</i> <i>(B54) No. 1 — (B11) No. 5:</i>	Is the resistance less than 1 Ω ?	Go to step 3.	Repair the open circuit of harness between TCM and transmission connector.
3 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure the resistance of the harness between TCM connector and transmission connector. <i>Connector & terminal</i> <i>(B54) No. 2 — (B11) No. 10:</i>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit of harness between TCM and transmission connector, and poor contact of the connector.
4 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure the resistance of the harness between TCM connector and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 2 — Chassis ground:</i>	Is the resistance 1 M Ω or more?	Go to step 5.	Repair the short circuit of harness between TCM and transmission connector.
5 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure the resistance of the harness between TCM connector and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 1 — Chassis ground:</i>	Is the resistance 1 M Ω or more?	Go to step 6.	Repair the short circuit of the harness between TCM and transmission connector, and poor contact of connector.
6 CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR. 1) Connect the connectors to TCM and transmission. 2) Connect the Subaru Select Monitor to the data link connector. 3) Turn the ignition switch to ON and the Subaru Select Monitor power switch ON. 4) Start the engine. 5) Shift the select lever to "P" or "N" range. 6) Read the data of turbine speed using Subaru Select Monitor. • Compare the tachometer with Subaru Select Monitor indications.	Is the revolution value same as the tachometer reading shown on the combination meter?	Even if the AT OIL TEMP warning light is blinking, the circuit has returned to normal condition at this time. A temporary poor contact of connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step 7.
7 CHECK POOR CONTACT.	Is there poor contact in torque converter turbine speed sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

E: DTC P0719 TORQUE CONVERTER/BRAKE SWITCH "B" CIRCUIT LOW

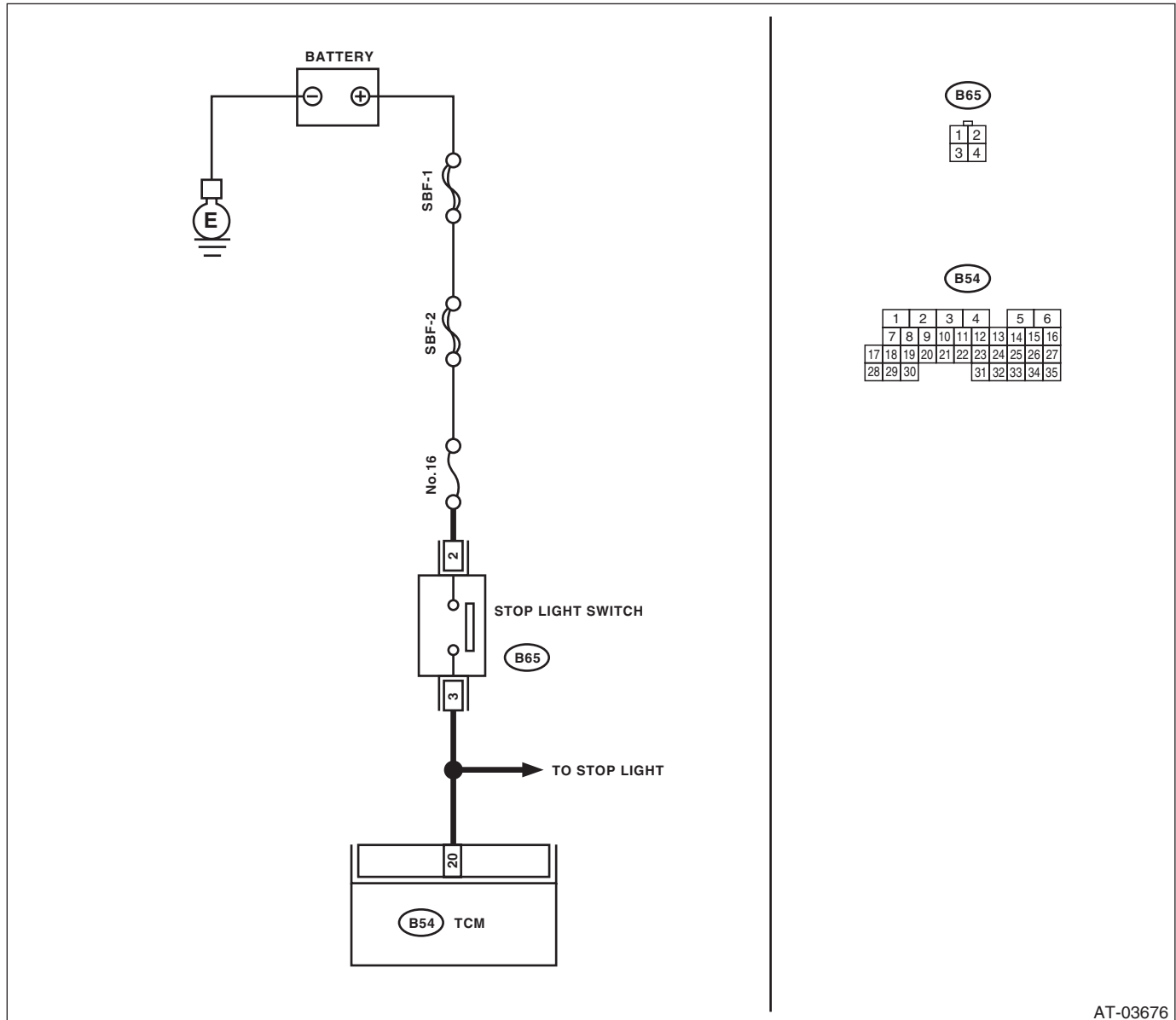
DTC DETECTING CONDITION:

Stop light switch malfunction, open input signal circuit

TROUBLE SYMPTOM:

Gear is not shifted down when climbing a hill.

WIRING DIAGRAM:



Step	Check	Yes	No
1 CHECK FUSE (NO. 16). Remove the fuse (No. 16).	Is the fuse (No. 16) blown out?	Replace the fuse (No. 16). If the replaced fuse (No. 16) is blown out easily, repair the short circuit of the harness between fuse (No. 16) and stop light switch.	Go to step 2.
2 CHECK OPERATION OF BRAKE LIGHT. Depress the brake pedal.	Does the brake light illuminate?	Go to step 3.	Check the brake light circuit.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
3 CHECK INPUT SIGNAL FROM TCM. 1) Depress the brake pedal. 2) Measure the voltage of the harness between TCM and stop light switch. <i>Connector & terminal</i> <i>(B54) No. 20 (+) — Chassis ground (-):</i>	Is the voltage 10.5 V or more?	Go to step 6.	Go to step 4.
4 CHECK HARNESS CONNECTOR BETWEEN TCM AND STOP LIGHT SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the TCM and stop light switch. 3) Measure the resistance of harness between the TCM and stop light switch. <i>Connector & terminal</i> <i>(B54) No. 20 — (B65) No. 3:</i>	Is the resistance less than 1 Ω ?	Go to step 5.	Repair the open circuit of the harness between the TCM and the stop light switch.
5 CHECK HARNESS CONNECTOR BETWEEN TCM AND STOP LIGHT SWITCH. Measure the resistance of the harness between TCM and chassis ground. <i>Connector & terminal</i> <i>(B54) No. 20 — Chassis ground:</i>	Is the resistance 1 M Ω or more?	Go to step 6.	Repair the short circuit of the harness between the TCM and the stop light switch.
6 CHECK POOR CONTACT.	Is there poor contact in input signal circuit of the stop light switch?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

F: DTC P0720 OUTPUT SPEED SENSOR CIRCUIT

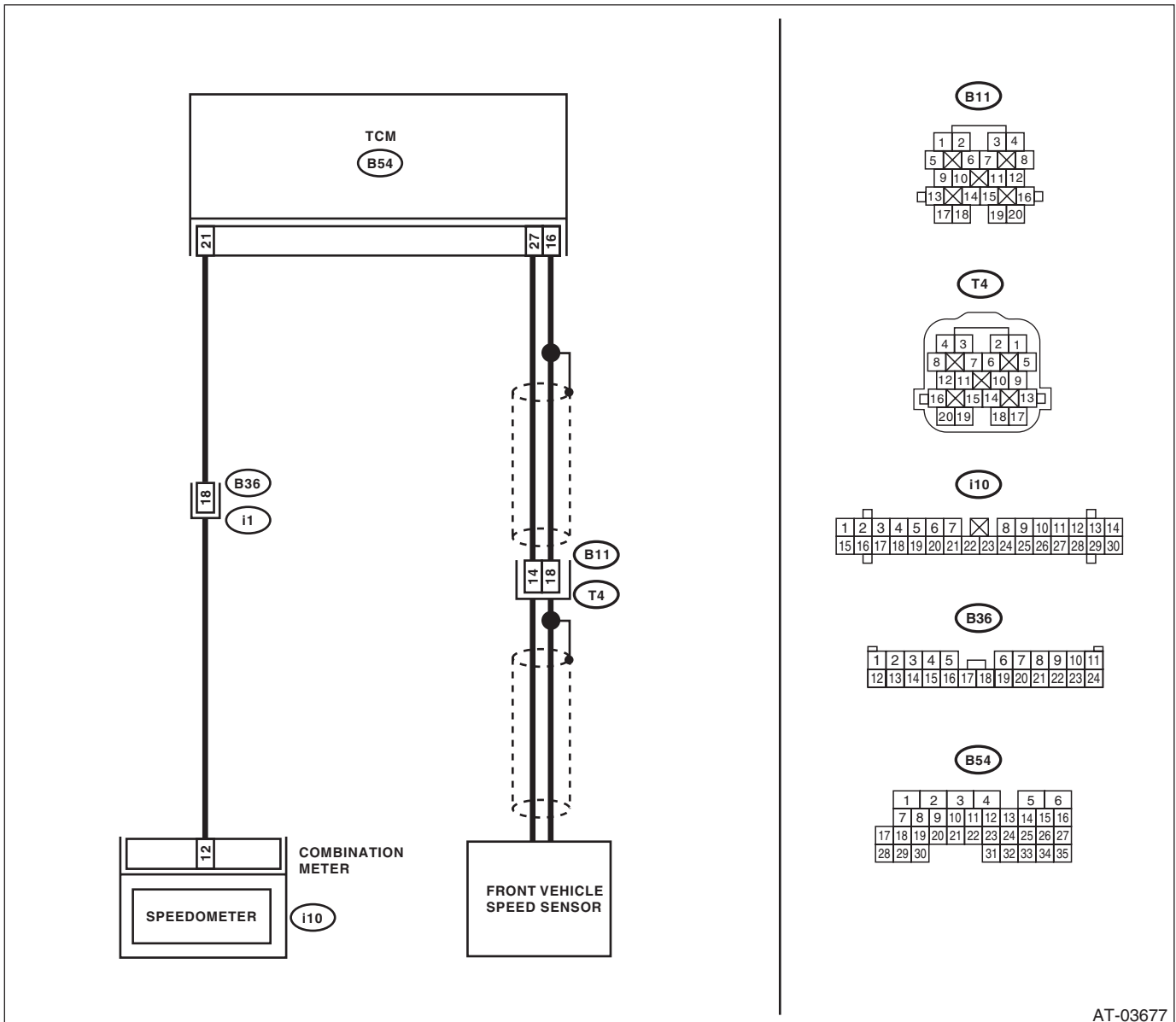
DTC DETECTING CONDITION:

- The vehicle speed signal is abnormal.
- The circuit in combination meter is faulty.
- The harness connector between TCM and vehicle speed sensor is shorted or open.

TROUBLE SYMPTOM:

- Erroneous idling.
- Engine stalls.
- Driving performance is poor.

WIRING DIAGRAM:



AT-03677

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and transmission. 3) Measure the resistance of the harness between TCM connector and transmission connector. <i>Connector & terminal (B54) No. 27 — (B11) No. 14:</i>	Is the resistance less than 1 Ω?	Go to step 2.	Repair the open circuit of harness between TCM and transmission connector.
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure the resistance of the harness between TCM connector and transmission connector. <i>Connector & terminal (B54) No. 16 — (B11) No. 18:</i>	Is the resistance less than 1 Ω?	Go to step 3.	Repair the open circuit of harness between TCM and transmission connector, and poor contact of the connector.
3 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure the resistance of the harness between TCM connector and transmission connector. <i>Connector & terminal (B54) No. 27 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 4.	Repair the short circuit of harness between TCM and transmission connector.
4 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure the resistance of the harness between TCM connector and transmission connector. <i>Connector & terminal (B54) No. 16 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 5.	Repair the short circuit of the harness between TCM and transmission connector, and poor contact of connector.
5 CHECK FRONT VEHICLE SPEED SENSOR. Measure the resistance between transmission connector receptacle's terminals. <i>Connector & terminal (T4) No. 14 — No. 18:</i>	Is the resistance between 450 — 650 Ω?	Go to step 6.	Replace the front vehicle speed sensor. <Ref. to 4AT-51, Front Vehicle Speed Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
<p>6 CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR.</p> <p>1) Connect all the connectors. 2) Connect the Subaru Select Monitor to the data link connector. 3) Lift up the vehicle and place it on rigid racks.</p> <p>NOTE: Raise all wheels off the floor.</p> <p>4) Turn the ignition switch to ON and the Subaru Select Monitor power switch ON. 5) Start the engine. 6) Read the data of vehicle speed using Subaru Select Monitor.</p> <ul style="list-style-type: none"> • Compare the speedometer with Subaru Select Monitor indications. • Vehicle speed is indicated in "km/h" or "MPH" <p>7) Slowly increase the vehicle speed to 60 km/h (37 MPH).</p> <p>NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this does not indicate a malfunction. When AT control diagnosis is finished, perform the ABS diagnostics clear memory. <Ref. to ABS(diag)-26, Clear Memory Mode.></p>	<p>Does the speedometer indication increase as the Subaru Select Monitor data increases?</p>	<p>Even if the AT OIL TEMP warning light is blinking, the circuit has returned to normal condition at this time. A temporary poor contact of connector or harness may be the cause. Repair the harness in of front vehicle speed sensor circuit.</p>	<p>Go to step 7.</p>
<p>7 CHECK POOR CONTACT.</p>	<p>Is there poor contact in front vehicle speed sensor circuit?</p>	<p>Repair the poor contact.</p>	<p>Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).></p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

G: DTC P0724 TORQUE CONVERTER/BRAKE SWITCH "B" CIRCUIT HIGH

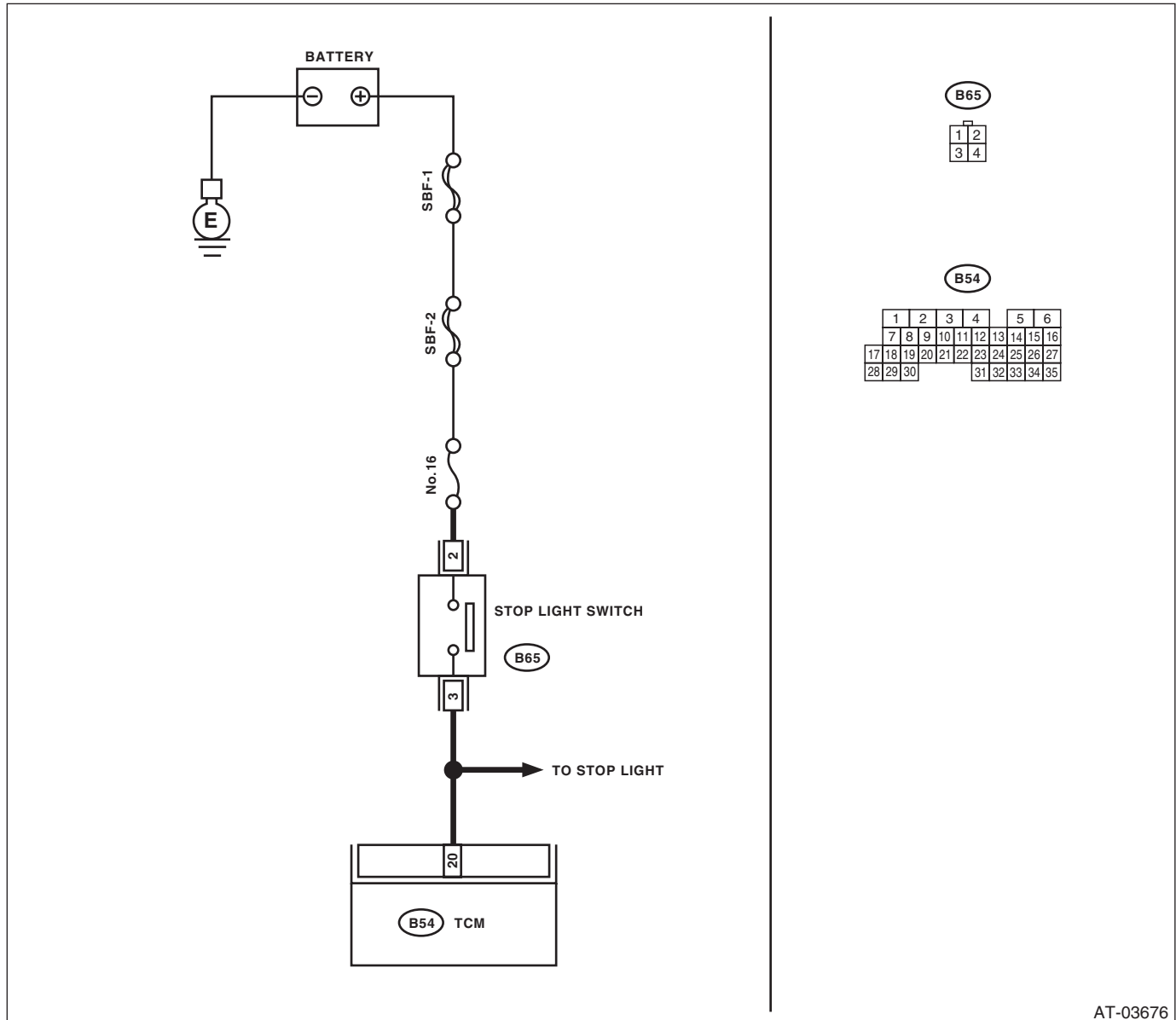
DTC DETECTING CONDITION:

Stop light switch malfunction, open input signal circuit

TROUBLE SYMPTOM:

Gear is not shifted down when climbing a hill.

WIRING DIAGRAM:



AT-03676

Step	Check	Yes	No
1 CHECK OPERATION OF BRAKE LIGHT. Depress the brake pedal.	The brake light illuminates.	Go to step 2.	Check the brake light circuit.
2 CHECK INPUT SIGNAL FROM TCM. 1) Depress the brake pedal. 2) Measure the voltage of the harness between TCM and stop light switch. Connector & terminal (B54) No. 20 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 5.	Go to step 3.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
3 CHECK STOP LIGHT SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from stop light switch. 3) Measure the resistance of harness between stop light switch connectors. Connector & terminal (B65) No. 2 — No. 3:	Is the resistance 1 MΩ or more?	Go to step 4.	Replace the stop light switch. <Ref. to BR-50, Stop Light Switch.>
4 CHECK HARNESS CONNECTOR BETWEEN TCM AND STOP LIGHT SWITCH. 1) Turn the ignition switch to ON. 2) Measure the voltage of harness between TCM and chassis ground. Connector & terminal (B54) No. 20 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 5.	Repair the short circuit of harness between TCM and stop light switch.
5 CHECK POOR CONTACT.	Is there poor contact in input signal circuit of the stop light switch?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

H: DTC P0725 ENGINE SPEED INPUT CIRCUIT

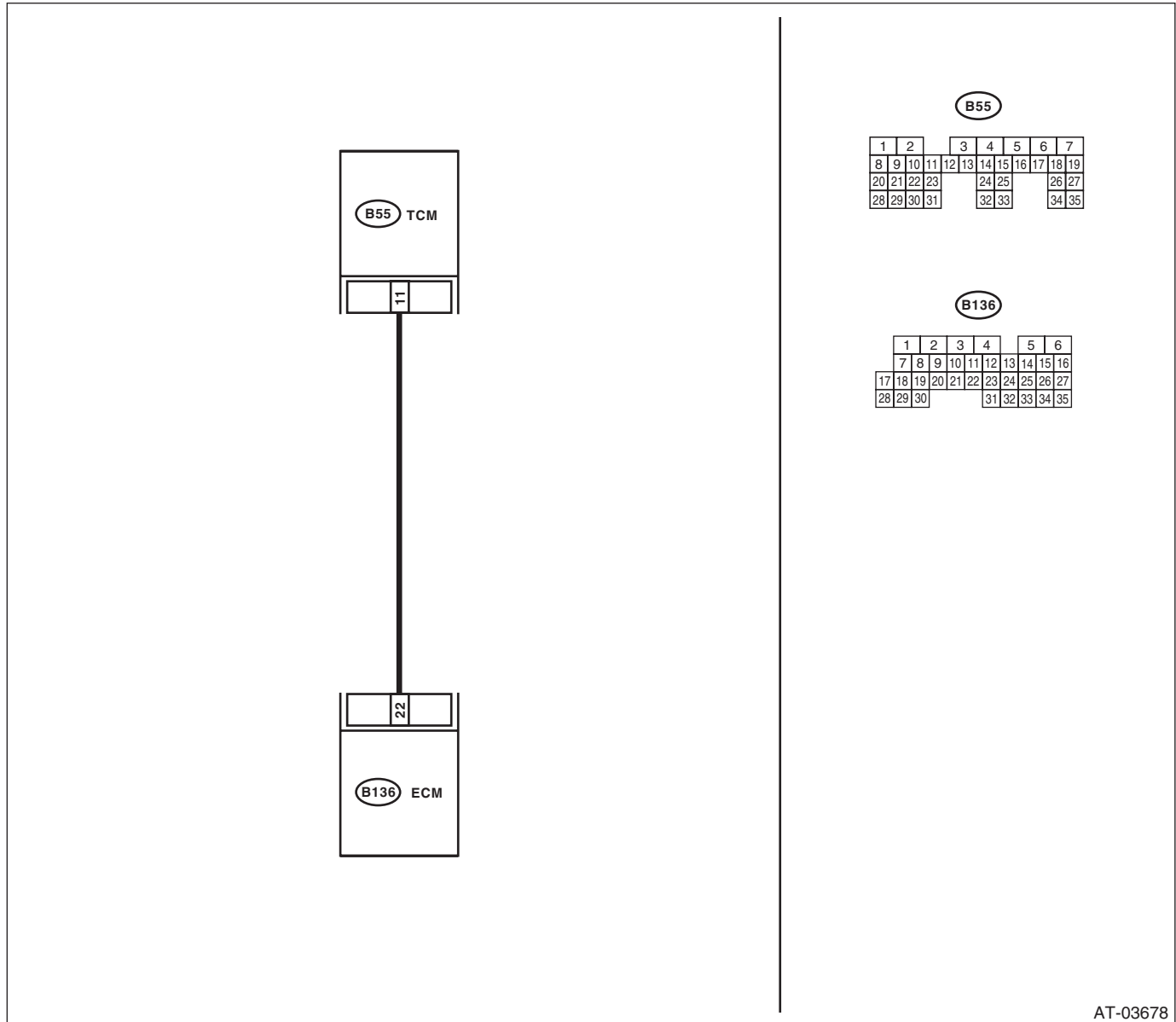
DTC DETECTING CONDITION:

Engine speed input signal circuit is open or shorted.

TROUBLE SYMPTOM:

- No lock-up occurs. (After engine is warmed-up)
- AT OIL TEMP warning light remains on when the vehicle speed is 0.

WIRING DIAGRAM:



AT-03678

Step	Check	Yes	No
1 CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and ECM. 3) Measure the resistance of harness between TCM and ECM. Connector & terminal (B55) No. 11 — (B136) No. 22:	Is the resistance less than 1 Ω?	Go to step 2.	Repair the open circuit of harness between TCM and ECM connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM. Measure the resistance of the harness between TCM connector and chassis ground. <i>Connector & terminal (B55) No. 11 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 3.	Repair the short circuit of harness between TCM and ECM connector.
3 CHECK INPUT SIGNAL FOR TCM USING SUBARU SELECT MONITOR. 1) Connect the connectors to TCM and ECM. 2) Connect the Subaru Select Monitor to the data link connector. 3) Start the engine, and run the Subaru Select Monitor. 4) Run the engine at idle. 5) Read the data of engine speed using Subaru Select Monitor. • Display shows engine speed signal value sent from ECM.	Is the revolution value almost same as the tachometer reading shown on the combination meter?	Even if the AT OIL TEMP warning light is blinking, the circuit has returned to normal condition at this time. A temporary poor contact of connector or harness may be the cause. Repair the harness or connector in the TCM and ECM.	Go to step 4.
4 CHECK POOR CONTACT.	Is there poor contact in engine speed signal circuit?	Repair the poor contact.	Go to step 5.
5 CONFIRM DTC P0725. Replace the ECM with a new part.	Does the DTC appear again, after the memory has been cleared?	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>	Replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

I: DTC P0731 GEAR 1 INCORRECT RATIO

NOTE:

Refer to DTC P0736 for diagnostic procedure. <Ref. to 4AT(D)(diag)-57, DTC P0736 REVERSE INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

J: DTC P0732 GEAR 2 INCORRECT RATIO

NOTE:

Refer to DTC P0736 for diagnostic procedure. <Ref. to 4AT(D)(diag)-57, DTC P0736 REVERSE INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

K: DTC P0733 GEAR 3 INCORRECT RATIO

NOTE:

Refer to DTC P0736 for diagnostic procedure. <Ref. to 4AT(D)(diag)-57, DTC P0736 REVERSE INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

L: DTC P0734 GEAR 4 INCORRECT RATIO

NOTE:

Refer to DTC P0736 for diagnostic procedure. <Ref. to 4AT(D)(diag)-57, DTC P0736 REVERSE INCORRECT RATIO, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

M: DTC P0736 REVERSE INCORRECT RATIO

DTC DETECTING CONDITION:

Vehicle sensor, torque converter turbine speed sensor or control valve malfunction

TROUBLE SYMPTOM:

- Shift point is too high or too low.
- Excessive shift shock
- Tight corner braking phenomenon occurs.
- Gear is not shifted to reverse.
- Gear position is held by fail safe function.

	Step	Check	Yes	No
1	CHECK ACCELERATOR PEDAL POSITION SENSOR. 1) Connect the Subaru Select Monitor to the data link connector. 2) Turn the ignition switch to ON. 3) Read the value of accelerator pedal position sensor on Subaru Select Monitor display.	Does the value of accelerator pedal position sensor change from 0% to 100% smoothly when throttle is operated from fully closed to fully open?	Go to step 2.	Check the accelerator pedal position sensor circuit.
2	CHECK FRONT VEHICLE SPEED SENSOR. 1) Lift up the vehicle and support with rigid racks. 2) Start the engine. 3) Shift the select lever to "D" range and slowly increase vehicle speed. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this indicates no malfunction. When AT control diagnosis is finished, perform the ABS clear memory of on-board diagnostics system. <Ref. to ABS(diag)-26, Clear Memory Mode.>	Does the vehicle speed displayed by Subaru Select Monitor roughly correspond with vehicle speed indicated by the combination meter?	Go to step 3.	Check the front vehicle speed sensor circuit.
3	CHECK TORQUE CONVERTER TURBINE SPEED SENSOR. 1) Move the select lever to "P" or "N" range. 2) Idle the engine.	Does the value of torque converter turbine speed sensor displayed by Subaru Select Monitor roughly correspond with the value of tachometer in combination meter?	There are malfunctions in TCM, TCM connector poor contact, or transmission assembly mechanical malfunction.	Check the torque converter turbine speed sensor circuit.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

N: DTC P0741 TORQUE CONVERTER CLUTCH CIRCUIT PERFORMANCE OR STUCK OFF

DTC DETECTING CONDITION:

- Lock up clutch malfunction
- Sticky valve

TROUBLE SYMPTOM:

No lock-up occurs.

	Step	Check	Yes	No
1	CHECK LOCK-UP DUTY SOLENOID CIRCUIT. Diagnose according to DTC P0743 procedure.	Is there any trouble?	Repair or replace the lock up duty solenoid circuit.	Go to step 2.
2	CHECK INHIBITOR SWITCH CIRCUIT. Diagnose according to DTC P0705 procedure.	Is there any trouble?	Repair or replace the inhibitor switch circuit.	Go to step 3.
3	CHECK STOP LIGHT SWITCH CIRCUIT. Diagnose according to DTC P0719 and P0724 procedures.	Is there any trouble?	Repair or replace the stop light switch circuit.	Go to step 4.
4	CHECK ATF TEMPERATURE SENSOR CIRCUIT. Diagnose according to DTC P0712 AND P0713 procedure.	Is there any trouble?	Repair or replace the ATF temperature sensor circuit.	Go to step 5.
5	CHECK ACCELERATOR PEDAL POSITION SENSOR. 1) Connect the Subaru Select Monitor to the data link connector. 2) Turn the ignition switch to ON. 3) Read the value of accelerator pedal position sensor on Subaru Select Monitor display.	Does the value of accelerator pedal position sensor change from 0% to 100% smoothly when throttle is operated from fully closed to fully open?	Go to step 6.	Check the accelerator pedal position sensor circuit.
6	CHECK TORQUE CONVERTER TURBINE SPEED SENSOR. 1) Move the select lever to "P" or "N" range. 2) Idle the engine.	Does the value of turbine speed displayed by Subaru Select Monitor almost correspond with the value of the tachometer?	Go to step 7.	Check the torque converter turbine speed sensor circuit.
7	CHECK ENGINE SPEED SIGNAL. Idle the engine.	Does the value of turbine speed displayed by Subaru Select Monitor almost correspond with the value of tachometer?	There is transmission assembly mechanical malfunction.	Check the engine speed signal circuit.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

O: DTC P0743 TORQUE CONVERTER CLUTCH CIRCUIT ELECTRICAL

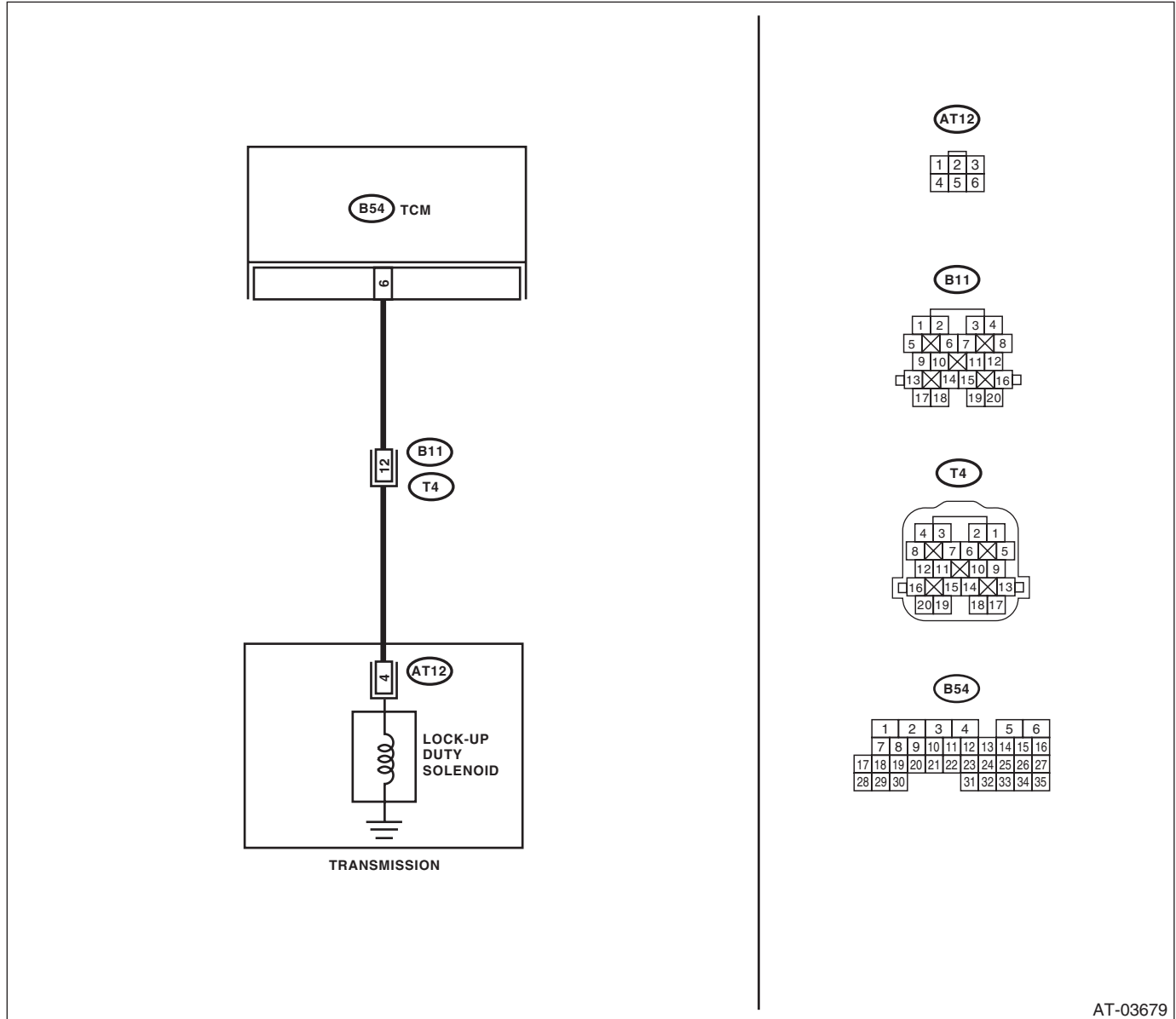
DTC DETECTING CONDITION:

Output signal circuit of lock-up duty solenoid is open or shorted.

TROUBLE SYMPTOM:

No lock-up occurs. (After engine is warmed-up)

WIRING DIAGRAM:



AT-03679

Step	Check	Yes	No	
1	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Perform the diagnosis according to DTC.	Go to step 2.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
<p>2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and transmission. 3) Measure the resistance of the harness between TCM connector and transmission connector.</p> <p>Connector & terminal (B54) No. 6 — (B11) No. 12:</p>	Is the resistance less than 1 Ω?	Go to step 3.	Repair the open circuit of harness between TCM and transmission connector.
<p>3 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</p> <p>Measure the resistance of the harness connector between TCM connector and chassis ground.</p> <p>Connector & terminal (B54) No. 6 — Chassis ground:</p>	Is the resistance 1 MΩ or more?	Go to step 4.	Repair the short circuit of harness between TCM and transmission connector.
<p>4 CHECK LOCK-UP DUTY SOLENOID.</p> <p>Measure the resistance between transmission connector receptacle's terminals.</p> <p>Connector & terminal (T4) No. 12 — No. 19:</p>	Is the resistance between 2.0 — 4.5 Ω?	Go to step 5.	Go to step 8.
<p>5 CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.</p> <p>1) Connect the connectors to TCM and transmission. 2) Lift up the vehicle and place it on rigid racks. NOTE: Raise all wheels off the floor. 3) Connect the Subaru Select Monitor to the data link connector. 4) Start the engine, and run the Subaru Select Monitor. 5) Start the engine and warm-up the engine until the ATF temperature exceeds 80°C (176°F). NOTE: If the ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature. 6) Read the data of lock-up duty solenoid using the Subaru Select Monitor. • Lock-up duty solenoid is indicated in "%". 7) Shift the select lever to "D," and slowly increase vehicle speed to 60 km/h (37 MPH). NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this does not indicate a malfunction. When AT control diagnosis is finished, perform the ABS diagnostics clear memory. <Ref. to ABS(diag)-26, Clear Memory Mode.></p>	Is the measured value 95%?	Go to step 6.	Go to step 7.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
<p>6 CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR. Return the engine to idling speed, shift the select lever to "N" range and read the data.</p>	Is the measured value 5%?	Even if the AT OIL TEMP warning light is blinking, the circuit has returned to normal condition at this time. A temporary poor contact of connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step 7.
<p>7 CHECK POOR CONTACT.</p>	Is there poor contact in lock-up duty solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>
<p>8 CHECK LOCK-UP DUTY SOLENOID (IN TRANSMISSION). 1) Disconnect the transmission connector. 2) Drain the automatic transmission fluid. CAUTION: Do not drain ATF until it cools down. 3) Remove the oil pan, and disconnect the connector from lock-up duty solenoid. 4) Measure the resistance between lock-up duty solenoid and transmission ground. Connector & terminal (AT12) No. 4 — Transmission ground:</p>	Is the resistance between 2.0 — 4.5 Ω?	Go to step 9.	Replace the control valve body. <Ref. to 4AT-56, Control Valve Body.>
<p>9 CHECK HARNESS CONNECTOR BETWEEN LOCK-UP DUTY SOLENOID AND TRANSMISSION. Measure the resistance of harness between lock-up duty solenoid and transmission connector. Connector & terminal (T4) No. 12 — (AT12) No. 4:</p>	Is the resistance less than 1 Ω?	Go to step 10.	Repair the open circuit of harness between TCM and transmission connector.
<p>10 CHECK HARNESS CONNECTOR BETWEEN LOCK-UP DUTY SOLENOID AND TRANSMISSION. Measure the resistance of harness between transmission connector and transmission ground. Connector & terminal (T4) No. 12 — Transmission ground:</p>	Is the resistance 1 MΩ or more?	Even if the AT OIL TEMP warning light is blinking, the circuit has returned to normal condition at this time. A temporary poor contact of connector or harness may be the cause. Repair the harness or connector in lock-up duty solenoid and transmission.	Repair the short circuit of harness between lock-up duty solenoid and transmission connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

P: DTC P0748 PRESSURE CONTROL SOLENOID "A" ELECTRICAL

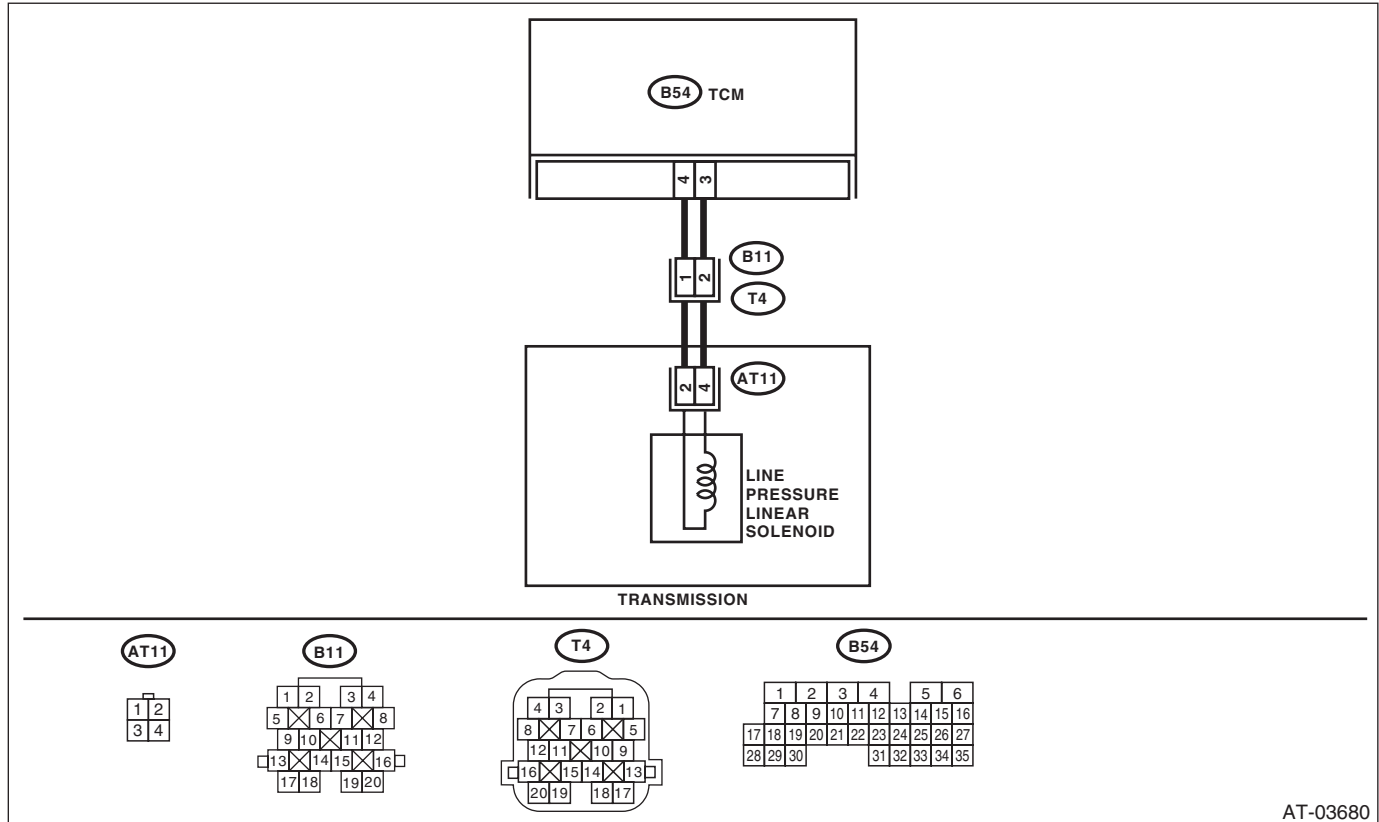
DTC DETECTING CONDITION:

Output signal circuit of line pressure linear solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock

WIRING DIAGRAM:



AT-03680

Step	Check	Yes	No
<p>1 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from transmission and TCM.</p> <p>3) Measure the resistance of the harness between TCM connector and transmission connector.</p> <p>Connector & terminal (B54) No. 3 — (B11) No. 2: (B54) No. 4 — (B11) No. 1:</p>	Is the resistance less than 1 Ω?	Go to step 2.	Repair the open circuit of harness between TCM and transmission connector.
<p>2 CHECK HARNESS CONNECTOR BETWEEN TCM AND CHASSIS GROUND.</p> <p>Measure the resistance of the harness between TCM connector and chassis ground.</p> <p>Connector & terminal (B54) No. 3 — Chassis ground: (B54) No. 4 — Chassis ground:</p>	Is the resistance 1 MΩ or more?	Go to step 3.	Repair the short circuit of harness between TCM and transmission connector.
<p>3 CHECK LINE PRESSURE LINEAR SOLENOID.</p> <p>Measure the resistance between transmission connector receptacle's terminals.</p> <p>Connector & terminal (T4) No. 1 — No. 2:</p>	Is the resistance between 4 — 6 Ω?	Go to step 4.	Go to step 5.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

	Step	Check	Yes	No
4	CHECK POOR CONTACT.	Is there poor contact in line pressure linear solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>
5	CHECK LINE PRESSURE LINEAR SOLENOID (IN TRANSMISSION). 1) Remove the transmission connector from bracket. 2) Drain the automatic transmission fluid. CAUTION: Do not drain ATF until it cools down. 3) Remove the oil pan, and disconnect the connector from line pressure linear solenoid. 4) Measure the resistance between line pressure linear solenoid connector and transmission ground. Connector & terminal (AT11) No. 2 — No. 4:	Is the resistance between 4 — 8 Ω ?	Go to step 6.	Replace the control valve body. <Ref. to 4AT-56, Control Valve Body.>
6	CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LINE PRESSURE LINEAR SOLENOID. Measure the resistance of harness between line pressure linear solenoid and transmission connector. Connector & terminal (T4) No. 1 — (AT11) No. 2: (T4) No. 2 — (AT11) No. 4:	Is the resistance less than 1 Ω ?	Go to step 7.	Repair the open circuit of harness between line pressure linear solenoid and transmission connector.
7	CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LINE PRESSURE LINEAR SOLENOID. Measure the resistance of harness between transmission connector and transmission ground. Connector & terminal (T4) No. 1 — Transmission ground: (T4) No. 2 — Transmission ground:	Is the resistance 1 $M\Omega$ or more?	Even if the AT OIL TEMP warning light is blinking, the circuit has returned to normal condition at this time. A temporary poor contact of connector or harness may be the cause. Repair the harness or connector in line pressure linear solenoid and transmission.	Repair the short circuit of harness between line pressure linear solenoid and transmission connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Q: DTC P0753 SHIFT SOLENOID "A" ELECTRICAL

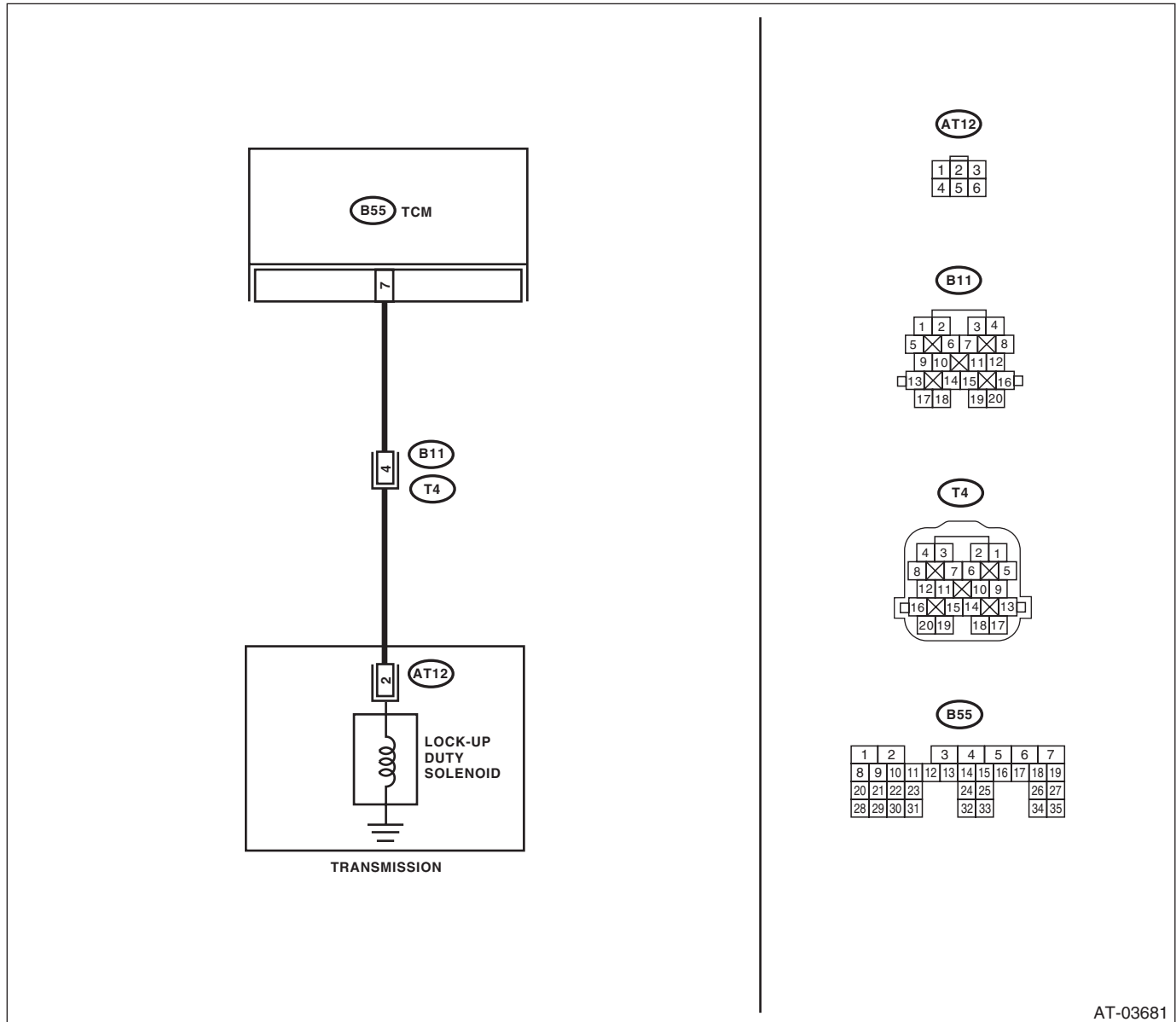
DTC DETECTING CONDITION:

Output signal circuit of low clutch duty solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock

WIRING DIAGRAM:



AT-03681

Step	Check	Yes	No
1 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and transmission. 3) Measure the resistance of harness between TCM and transmission connector. Connector & terminal (B55) No. 7 — (B11) No. 4:	Is the resistance less than 1 Ω?	Go to step 2.	Repair the open circuit of harness between TCM and transmission connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure the resistance of harness between TCM connector and transmission ground. <i>Connector & terminal (B55) No. 7 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 3.	Repair the short circuit of harness between TCM and transmission connector.
3 CHECK LOW CLUTCH DUTY SOLENOID. Measure the resistance between transmission connector terminals. <i>Connector & terminal (T4) No. 4 — No. 20:</i>	Is the resistance between 2.0 — 4.5 Ω?	Go to step 5.	Go to step 4.
4 CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR. 1) Connect the connectors to TCM and transmission. 2) Connect the Subaru Select Monitor to the data link connector. 3) Start the engine, and run the Subaru Select Monitor. 4) Warm-up the transmission until the ATF temperature reaches approximately 80°C (176°F). NOTE: If the ambient temperature falls below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature. 5) Stop the engine and turn the ignition switch to ON. (engine OFF) 6) Shift the select lever to “P” or “N” range. 7) Read the data of low clutch duty solenoid using Subaru Select Monitor. • Low clutch duty solenoid is indicated in “%”.	Is the measured value 100%?	Go to step 5.	Go to step 7.
5 CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR. 1) Turn the ignition switch to ON. (engine OFF) 2) Shift the select lever to “D” range. 3) Read the data of low clutch duty solenoid.	Is the measured value 0%?	Even if the AT OIL TEMP warning light is blinking, the circuit has returned to normal condition at this time. A temporary poor contact of connector or harness may be the cause. Repair the harness or connector in transmission.	Go to step 6.
6 CHECK POOR CONTACT.	Is there poor contact in low clutch duty solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
<p>7</p> <p>CHECK LOW CLUTCH DUTY SOLENOID (IN TRANSMISSION).</p> <p>1) Remove the transmission connector from bracket.</p> <p>2) Drain the automatic transmission fluid.</p> <p>CAUTION: Do not drain ATF until it cools down.</p> <p>3) Remove the oil pan, and disconnect the connector from low clutch duty solenoid.</p> <p>4) Measure the resistance between low clutch duty solenoid connector and transmission ground.</p> <p>Connector & terminal (AT12) No. 2 — Transmission ground:</p>	<p>Is the resistance between 2.0 — 4.5 Ω?</p>	<p>Go to step 8.</p>	<p>Replace the control valve body. <Ref. to 4AT-56, Control Valve Body.></p>
<p>8</p> <p>CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LOW CLUTCH DUTY SOLENOID.</p> <p>Measure the resistance of harness between low clutch duty solenoid and transmission connector.</p> <p>Connector & terminal (T4) No. 4 — (AT12) No. 2:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 9.</p>	<p>Repair the open circuit of harness between low clutch duty solenoid and transmission connector.</p>
<p>9</p> <p>CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LOW CLUTCH DUTY SOLENOID.</p> <p>Measure the resistance of harness between transmission connector and transmission ground.</p> <p>Connector & terminal (T4) No. 4 — Transmission ground:</p>	<p>Is the resistance 1 MΩ or more?</p>	<p>Even if the AT OIL TEMP warning light is blinking, the circuit has returned to normal condition at this time. A temporary poor contact of connector or harness may be the cause. Repair the harness or connector of the low clutch duty solenoid and transmission.</p>	<p>Repair the short circuit of harness between low clutch duty solenoid and transmission connector.</p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

R: DTC P0758 SHIFT SOLENOID "B" ELECTRICAL

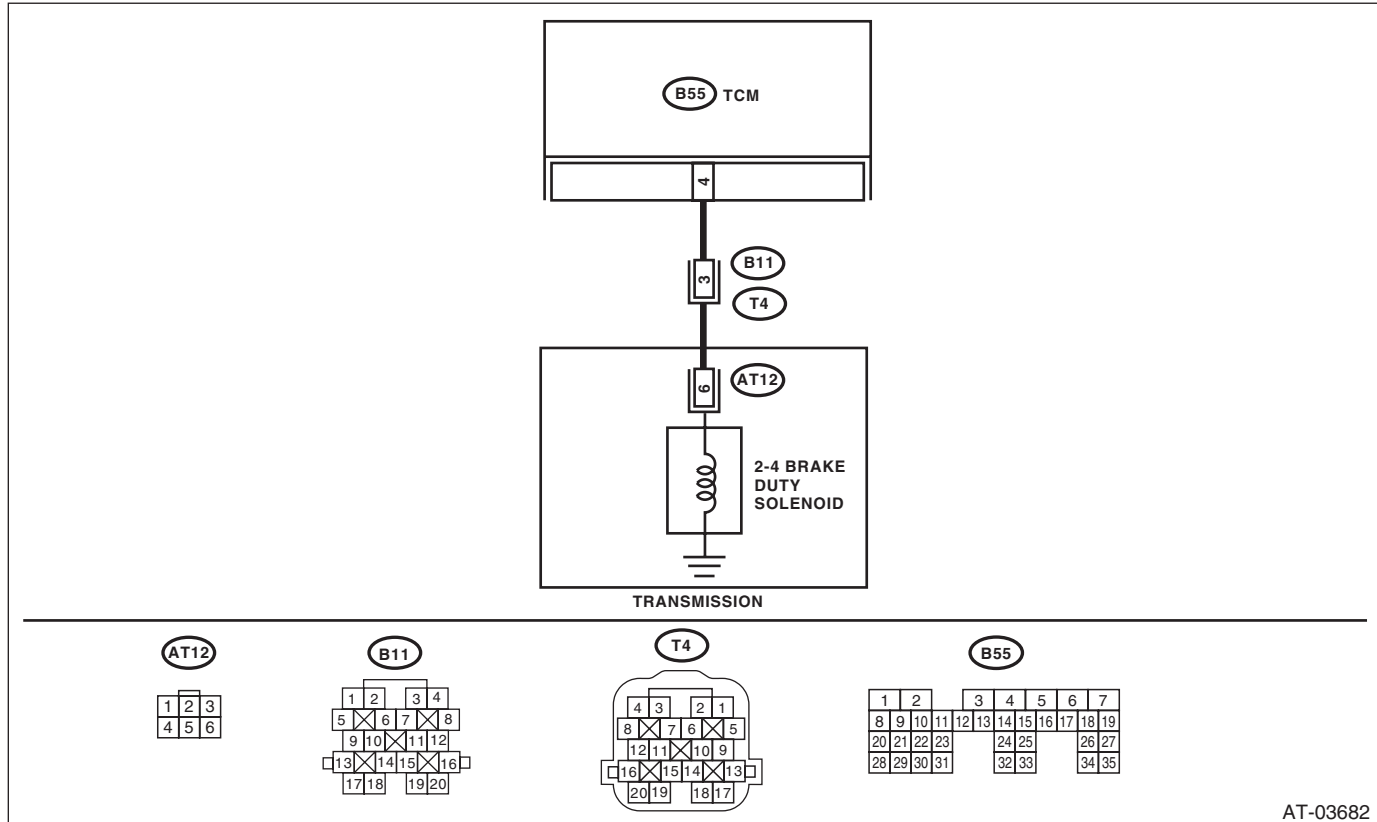
DTC DETECTING CONDITION:

Output signal circuit of 2-4 brake duty solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock

WIRING DIAGRAM:



AT-03682

Step	Check	Yes	No
1 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and transmission. 3) Measure the resistance of the harness between TCM connector and transmission connector. <i>Connector & terminal</i> <i>(B55) No. 4 — (B11) No. 3:</i>	Is the resistance less than 1 Ω?	Go to step 2.	Repair the open circuit of harness between TCM and transmission connector.
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure the resistance of harness between TCM connector and transmission ground. <i>Connector & terminal</i> <i>(B55) No. 4 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 3.	Repair the short circuit of harness between TCM and transmission connector.
3 CHECK 2-4 BRAKE DUTY SOLENOID. Measure the resistance between transmission connector terminals. <i>Connector & terminal</i> <i>(T4) No. 3 — No. 20:</i>	Is the resistance between 2.0 — 4.5 Ω?	Go to step 4.	Go to step 7.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
<p>4 CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.</p> <p>1) Connect all the connectors. 2) Connect the Subaru Select Monitor to the data link connector. 3) Start the engine, and run the Subaru Select Monitor. 4) Warm-up the transmission until the ATF temperature reaches approximately 80°C (176°F).</p> <p>NOTE: If the ambient temperature falls below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature.</p> <p>5) Stop the engine and turn the ignition switch to ON. (engine OFF) 6) Shift the select lever to “N” range. 7) While depressing the accelerator pedal, read the data of 2-4 brake duty solenoid using Subaru Select Monitor.</p> <ul style="list-style-type: none"> • 2-4 brake duty solenoid is indicated in “%”. 	Is the measured value 100%?	Go to step 5.	Go to step 6.
<p>5 CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.</p> <p>Shift the select lever to “2” range.</p>	Is the measured value 0%?	Even if the AT OIL TEMP warning light is blinking, the circuit has returned to normal condition at this time. A temporary poor contact of connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step 6.
<p>6 CHECK POOR CONTACT.</p>	Is there poor contact in 2-4 brake duty solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>
<p>7 CHECK 2-4 BRAKE DUTY SOLENOID (IN TRANSMISSION).</p> <p>1) Remove the transmission connector from bracket. 2) Drain the automatic transmission fluid.</p> <p>CAUTION: Do not drain ATF until it cools down.</p> <p>3) Remove the oil pan, and disconnect the connector from 2-4 brake duty solenoid. 4) Measure the resistance of harness between 2-4 brake duty solenoid connector and transmission ground.</p> <p>Connector & terminal (AT12) No. 6 — Transmission ground:</p>	Is the resistance between 2.0 — 4.5 Ω?	Go to step 8.	Replace the control valve body. <Ref. to 4AT-56, Control Valve Body.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
<p>8 CHECK HARNESS CONNECTOR BETWEEN 2-4 BRAKE DUTY SOLENOID AND TRANSMISSION. Measure the resistance of harness between 2-4 brake duty solenoid and transmission connector. <i>Connector & terminal</i> <i>(T4) No. 3 — (AT12) No. 6:</i></p>	Is the resistance less than 1 Ω?	Go to step 9.	Repair the open circuit of harness between 2-4 brake duty solenoid and transmission connector.
<p>9 CHECK HARNESS CONNECTOR BETWEEN 2-4 BRAKE DUTY SOLENOID AND TRANSMISSION. Measure the resistance of harness between transmission connector and transmission ground. <i>Connector & terminal</i> <i>(T4) No. 3 — Transmission ground:</i></p>	Is the resistance 1 MΩ or more?	Even if the AT OIL TEMP warning light is blinking, the circuit has returned to normal condition at this time. A temporary poor contact of connector or harness may be the cause. Repair the harness or connector in 2-4 brake duty solenoid and transmission.	Repair the short circuit of harness between 2-4 brake duty solenoid and transmission connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

S: DTC P0763 SHIFT SOLENOID "C" ELECTRICAL

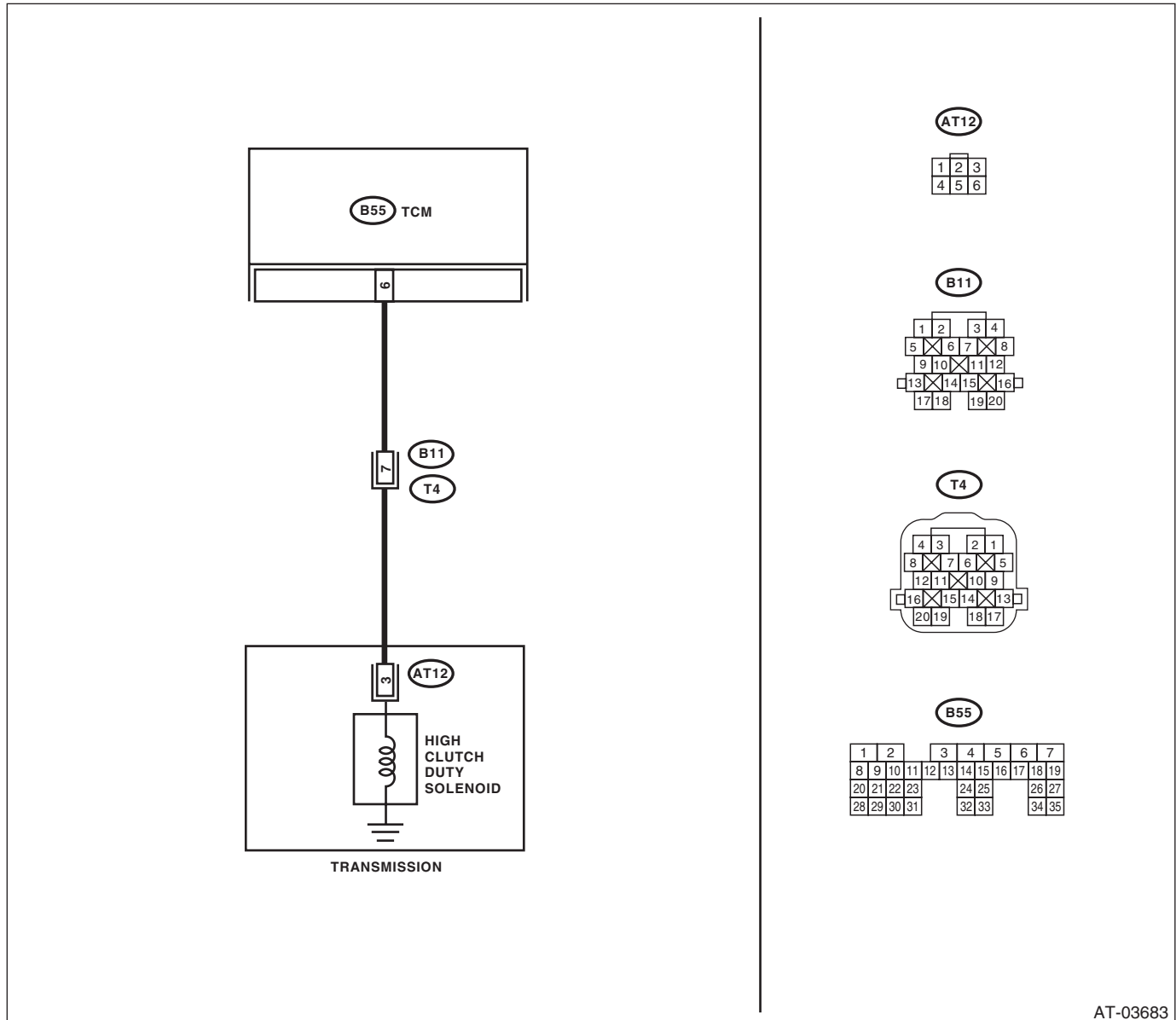
DTC DETECTING CONDITION:

Output signal circuit of high clutch duty solenoid is open or shorted.

TROUBLE SYMPTOM:

Excessive shift shock

WIRING DIAGRAM:



AT-03683

Step	Check	Yes	No
<p>1</p> <p>CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connectors from TCM and transmission.</p> <p>3) Measure the resistance of the harness between TCM connector and transmission connector.</p> <p>Connector & terminal (B55) No. 6 — (B11) No. 7:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 2.</p>	<p>Repair the open circuit of harness between TCM and transmission connector.</p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
<p>2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure the resistance of the harness connector between TCM connector and chassis ground. Connector & terminal (B55) No. 6 — Chassis ground:</p>	Is the resistance 1 MΩ or more?	Go to step 3.	Repair the short circuit of harness between TCM and transmission connector.
<p>3 CHECK HIGH CLUTCH DUTY SOLENOID. Measure the resistance between transmission connector receptacle's terminals. Connector & terminal (T4) No. 7 — No. 20:</p>	Is the resistance between 2.0 — 4.5 Ω?	Go to step 4.	Go to step 7.
<p>4 CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR. 1) Connect the connectors to TCM and transmission. 2) Lift up the vehicle and place it on rigid racks. NOTE: Raise all wheels off the floor. 3) Connect the Subaru Select Monitor to the data link connector. 4) Start the engine, and run the Subaru Select Monitor. 5) Start the engine and warm-up the engine until the ATF temperature exceeds 80°C (176°F). NOTE: If the ambient temperature is below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature. 6) Read the data of high clutch duty solenoid using Subaru Select Monitor. • High clutch duty solenoid is indicated in "%". 7) Shift the select lever to "D," and slowly increase vehicle speed to measure at 3rd or 4th. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this does not indicate a malfunction. When AT control diagnosis is finished, perform the ABS diagnostics clear memory. <Ref. to ABS(diag)-26, Clear Memory Mode.></p>	Is the measured value 0%?	Go to step 5.	Go to step 6.
<p>5 CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR. Return the engine to idling speed and shift the select lever to "N" range. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this does not indicate a malfunction. When AT control diagnosis is finished, perform the ABS diagnostics clear memory mode. <Ref. to ABS(diag)-26, Clear Memory Mode.></p>	Is the measured value 100%?	Even if the AT OIL TEMP warning light is blinking, the circuit has returned to normal condition at this time. A temporary poor contact of connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step 6.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
6 CHECK POOR CONTACT.	Is there poor contact in high clutch duty solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>
7 CHECK HIGH CLUTCH DUTY SOLENOID (IN TRANSMISSION). 1) Remove the transmission connector from bracket. 2) Drain the automatic transmission fluid. CAUTION: Do not drain ATF until it cools down. 3) Remove the oil pan, and disconnect the connector from high clutch duty solenoid. 4) Measure the resistance between high clutch duty solenoid connector and transmission ground. Connector & terminal (AT12) No. 3 — Transmission ground:	Is the resistance between 2.0 — 4.5 Ω ?	Go to step 8 .	Replace the control valve body. <Ref. to 4AT-56, Control Valve Body.>
8 CHECK HARNESS CONNECTOR BETWEEN HIGH CLUTCH DUTY SOLENOID AND TRANSMISSION. Measure the resistance of harness between high clutch duty solenoid and transmission connector. Connector & terminal (T4) No. 7 — (AT12) No. 3:	Is the resistance less than 1 Ω ?	Go to step 9 .	Repair the open circuit of harness between TCM and transmission connector.
9 CHECK HARNESS CONNECTOR BETWEEN HIGH CLUTCH DUTY SOLENOID AND TRANSMISSION. Measure the resistance of harness between transmission connector and transmission ground. Connector & terminal (T4) No. 7 — Transmission ground:	Is the resistance 1 M Ω or more?	Even if the AT OIL TEMP warning light is blinking, the circuit has returned to normal condition at this time. A temporary poor contact of connector or harness may be the cause. Repair the harness or connector in high clutch duty solenoid and transmission.	Repair the short circuit of harness between high clutch duty solenoid and transmission connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

T: DTC P0768 SHIFT SOLENOID “D” ELECTRICAL

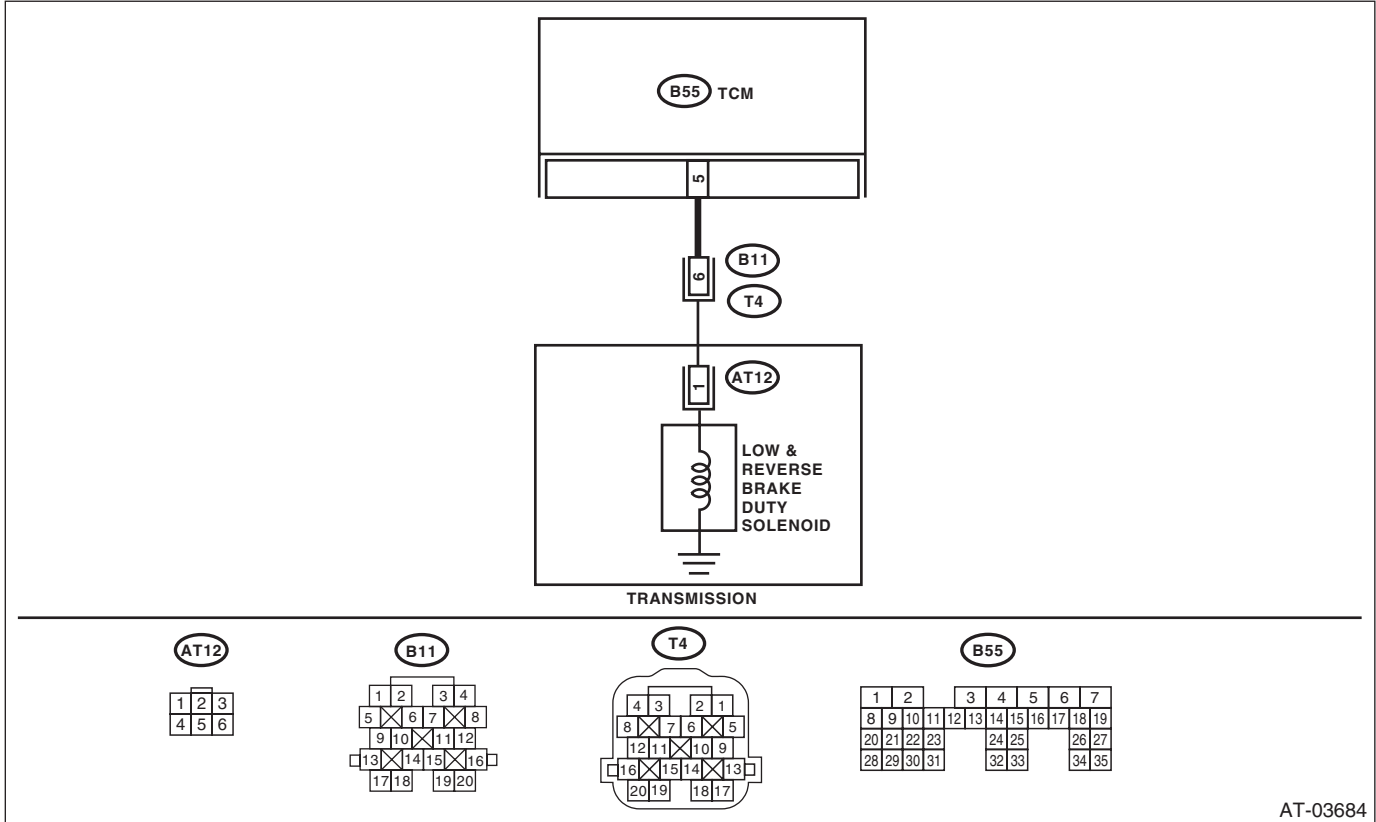
DTC DETECTING CONDITION:

The output signal circuit of low & reverse duty solenoid is open or shorted.

TROUBLE SYMPTOM:

Gear is not changed.

WIRING DIAGRAM:



AT-03684

Step	Check	Yes	No
1 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from transmission and TCM. 3) Measure the resistance of the harness between TCM connector and transmission connector. <i>Connector & terminal (B55) No. 5 — (B11) No. 6:</i>	Is the resistance less than 1 Ω?	Go to step 2.	Repair the open circuit of harness between TCM and transmission connector.
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND CHASSIS GROUND. Measure the resistance of the harness between TCM connector and chassis ground. <i>Connector & terminal (B55) No. 5 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 3.	Repair the short circuit of harness between TCM and transmission connector.
3 CHECK LOW & REVERSE BRAKE DUTY SOLENOID. Measure the resistance between transmission connector terminals. <i>Connector & terminal (T4) No. 6 — No. 20:</i>	Is the resistance between 2.0 — 4.5 Ω?	Go to step 4.	Go to step 7.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
<p>4 CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.</p> <p>1) Connect all the connectors. 2) Connect the Subaru Select Monitor to the data link connector. 3) Start the engine, and run the Subaru Select Monitor. 4) Warm-up the transmission until the ATF temperature reaches approximately 80°C (176°F).</p> <p>NOTE: If the ambient temperature falls below 0°C (32°F), drive the vehicle until the ATF reaches its operating temperature.</p> <p>5) Stop the engine and turn the ignition switch to ON. (engine OFF) 6) Move the select lever to "N". 7) Read the data of low & reverse brake duty solenoid using Subaru Select Monitor.</p> <ul style="list-style-type: none"> • Low & reverse brake duty solenoid is indicated in "%". 	Is the measured value 100%?	Go to step 5.	Go to step 6.
<p>5 CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR.</p> <p>1) Lift up the vehicle and support with rigid racks.</p> <p>NOTE: Raise all wheels off the floor.</p> <p>2) Shift the select lever to "1" range. Slowly increase the vehicle speed up to 15 km/h (9 MPH), and then return the accelerator pedal.</p> <p>NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this does not indicate a malfunction. When AT control diagnosis is finished, perform the ABS diagnostics clear memory procedure. <Ref. to ABS(diag)-26, Clear Memory Mode.></p> <p>3) Read the data of the low & reverse duty solenoid.</p>	Is the measured value 55%?	Even if the AT OIL TEMP warning light is blinking, the circuit has returned to normal condition at this time. A temporary poor contact of connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step 6.
<p>6 CHECK POOR CONTACT.</p>	Is there poor contact in the low & reverse duty solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>
<p>7 CHECK LOW & REVERSE BRAKE DUTY SOLENOID (IN TRANSMISSION).</p> <p>1) Remove the transmission connector from bracket. 2) Drain the automatic transmission fluid.</p> <p>CAUTION: Do not drain ATF until it cools down.</p> <p>3) Remove the oil pan, and disconnect the connector from low & reverse brake duty solenoid. 4) Measure the resistance between low & reverse brake duty solenoid connector and transmission ground.</p> <p>Connector & terminal (AT12) No. 1 — Transmission ground:</p>	Is the resistance between 2.0 — 4.5 Ω?	Go to step 8.	Replace the control valve body. <Ref. to 4AT-56, Control Valve Body.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
<p>8</p> <p>CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LOW & REVERSE BRAKE DUTY SOLENOID.</p> <p>Measure the resistance of harness between low & reverse duty solenoid and transmission connector.</p> <p><i>Connector & terminal (T4) No. 6 — (AT12) No. 1:</i></p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 9.</p>	<p>Repair open circuit of harness between low & reverse brake duty solenoid and transmission connector.</p>
<p>9</p> <p>CHECK HARNESS CONNECTOR BETWEEN TRANSMISSION AND LOW & REVERSE BRAKE DUTY SOLENOID.</p> <p>Measure the resistance of harness between transmission connector and transmission ground.</p> <p><i>Connector & terminal (T4) No. 6 — Transmission ground:</i></p>	<p>Is the resistance 1 MΩ or more?</p>	<p>Even if the AT OIL TEMP warning light is blinking, the circuit has returned to normal condition at this time. A temporary poor contact of connector or harness may be the cause. Repair harness or connector in low & reverse brake duty solenoid and transmission.</p>	<p>Repair the short circuit of the harness between the low & reverse brake duty solenoid and the transmission connector.</p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

U: DTC P0801 REVERSE INHIBIT CONTROL CIRCUIT

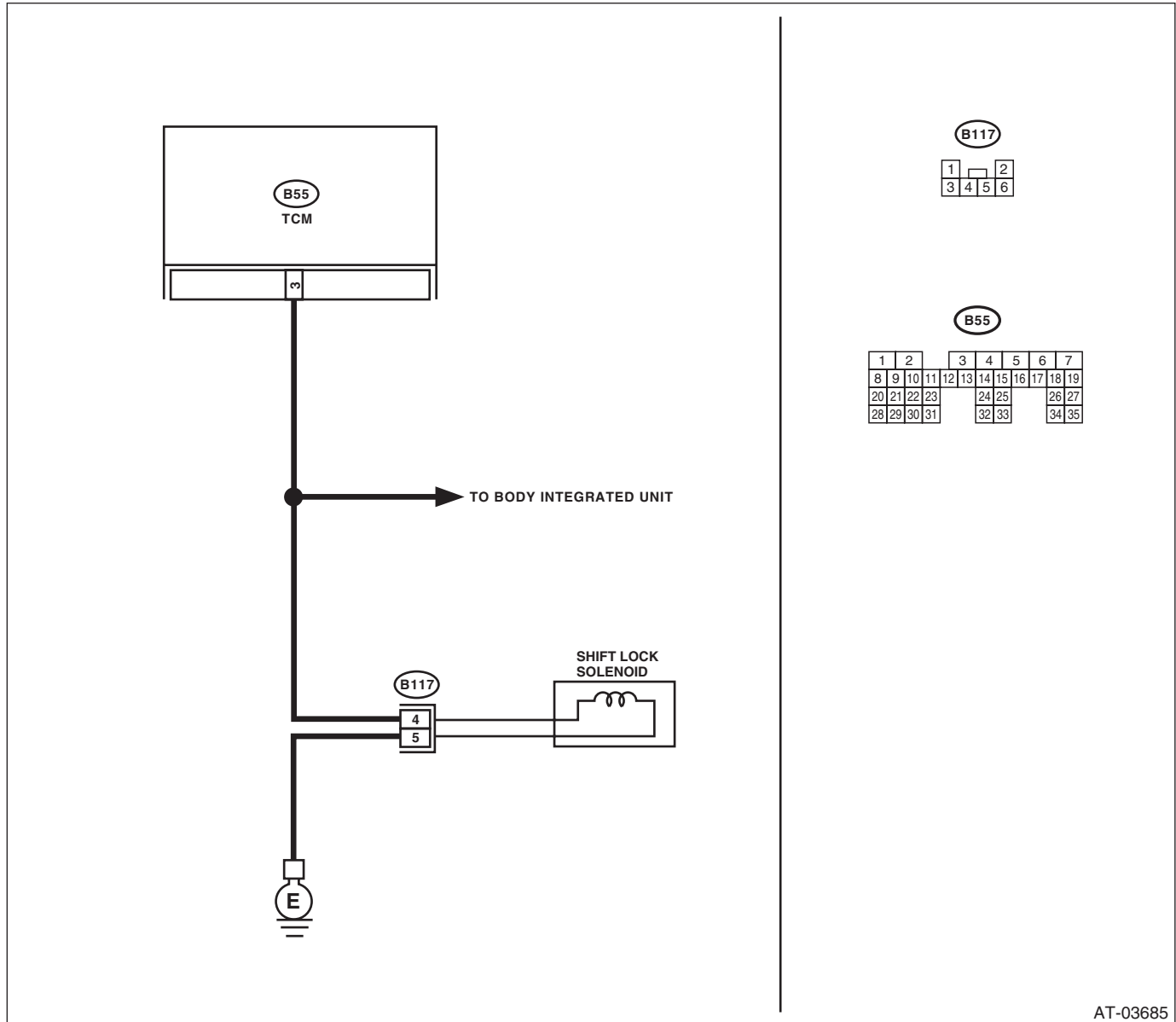
DTC DETECTING CONDITION:

Shift lock solenoid malfunction, open or short reverse inhibitor control circuit

TROUBLE SYMPTOM:

- Gear is shifted from “N” range to “P” range during driving at 20 km/h (12 MPH) or more.
- Gear cannot be shifted from “N” range to “R” range.

WIRING DIAGRAM:



AT-03685

Step	Check	Yes	No
1 CHECK HARNESS CONNECTOR BETWEEN TCM AND SHIFT LOCK SOLENOID. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and shift lock solenoid. 3) Measure the resistance of harness between TCM and shift lock solenoid connector. Connector & terminal (B55) No. 3 — (B117) No. 4:	Is the resistance less than 1 Ω?	Go to step 2.	Repair the open circuit of harness between TCM and shift lock solenoid connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND SHIFT LOCK SOLENOID. Measure the resistance of the harness between TCM and chassis ground. <i>Connector & terminal</i> <i>(B55) No. 3 — Chassis ground:</i>	Is the resistance 1 M Ω or more?	Go to step 3.	Repair the short circuit of harness between TCM and shift lock solenoid connector.
3 CHECK HARNESS BETWEEN SHIFT LOCK SOLENOID AND CHASSIS GROUND TERMINAL. Measure the resistance of harness between shift lock solenoid and chassis ground. <i>Connector & terminal</i> <i>(B117) No. 5 — Chassis ground:</i>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit of harness between chassis ground and shift lock solenoid connector.
4 CHECK SHIFT LOCK SOLENOID. Measure the resistance of shift lock solenoid terminals. <i>Connector & terminal</i> <i>(B117) No. 5 — No. 4:</i>	Is the resistance between 7 — 18 Ω ?	Go to step 5.	Replace the shift lock solenoid. <Ref. to CS-28, AT Shift Lock Solenoid and "P" Range Switch.>
5 CHECK OUTPUT SIGNAL OF TCM. 1) Connect all the connectors. 2) Turn the ignition switch to ON. 3) Shift the select lever to "D" range. 4) Measure the voltage between TCM and chassis ground. <i>Connector & terminal</i> <i>(B55) No. 3 (+) — Chassis ground (-):</i>	Is the voltage 10.5 V or more?	Go to step 6.	Go to step 7.
6 CHECK OUTPUT SIGNAL OF TCM. 1) Lift up the vehicle and place it on rigid racks. NOTE: Raise all wheels off the floor. 2) Start the engine. 3) Shift the select lever to "D" range and slowly increase vehicle speed to 20 km/h (12 MPH). NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this does not indicate a malfunction. When AT control diagnosis is finished, perform the ABS diagnostics clear memory. <Ref. to ABS(diag)-26, Clear Memory Mode.> 4) Measure the voltage between TCM and chassis ground. <i>Connector & terminal</i> <i>(B55) No. 3 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Even if the AT OIL TEMP warning light is blinking, the circuit has returned to normal condition at this time. A temporary poor contact of connector or harness may be the cause. Repair the harness or connector in the reverse inhibitor control circuit.	Go to step 7.
7 CHECK POOR CONTACT.	Is there poor contact in the reverse inhibitor control circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

V: DTC P1706 AT VEHICLE SPEED SENSOR CIRCUIT MALFUNCTION (REAR WHEEL)

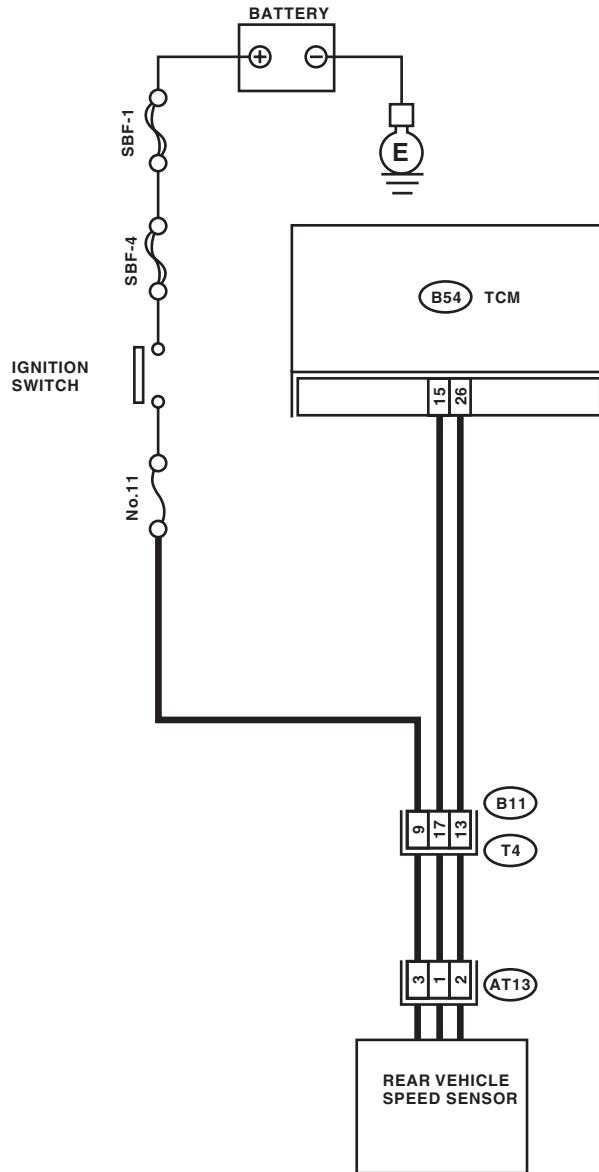
DTC DETECTING CONDITION:

Input signal circuit of TCM is open or shorted.

TROUBLE SYMPTOM:

No lock up or tight corner braking.

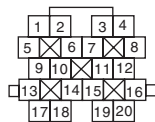
WIRING DIAGRAM:



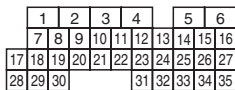
(AT13)



(B11)



(B54)



AT-03686

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK IGNITION POWER SUPPLY CIRCUIT. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from rear vehicle speed sensor. 3) Turn the ignition switch to ON. 4) Measure the ignition power supply voltage between rear vehicle speed sensor connector and transmission ground. Connector & terminal (AT13) No. 3 (+) — Transmission ground (-):</p>	Is the voltage 10 V or more?	Go to step 2.	Check harness between rear vehicle speed sensor and battery for open circuit, short or poor contact. Repair the harness if required.
2	<p>CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. 1) Turn the ignition switch to OFF. 2) Measure the resistance of the harness between TCM connector and transmission connector. Connector & terminal (B54) No. 15 — (AT13) No. 1:</p>	Is the resistance less than 1 Ω?	Go to step 3.	Repair the open circuit or poor contact of the connector in harness between TCM and rear vehicle speed sensor connector.
3	<p>CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure the resistance of the harness between TCM connector and transmission connector. Connector & terminal (B54) No. 26 — (AT13) No. 2:</p>	Is the resistance less than 1 Ω?	Go to step 4.	Repair the open circuit or poor contact of the connector in harness between TCM and rear vehicle speed sensor connector.
4	<p>CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure the resistance of the harness between TCM connector and chassis ground. Connector & terminal (B54) No. 15 — Chassis ground:</p>	Is the resistance 1 MΩ or more?	Go to step 5.	Repair the short circuit of harness between TCM and rear vehicle speed sensor connector.
5	<p>CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure the resistance of the harness between TCM connector and chassis ground. Connector & terminal (B54) No. 26 — Chassis ground:</p>	Is the resistance 1 MΩ or more?	Go to step 6.	Repair the short circuit of harness between TCM and rear vehicle speed sensor connector.
6	<p>CHECK INPUT SIGNAL FOR TCM. 1) Connect the connectors to TCM and transmission. 2) Lift up the vehicle and place it on rigid racks. NOTE: Raise all wheels off the floor. 3) Start the engine and set vehicle in 20 km/h (12 MPH) condition. NOTE: The speed difference between front and rear wheels may light the ABS warning light, but this does not indicate a malfunction. When AT control diagnosis is finished, perform the ABS diagnostics clear memory. <Ref. to ABS(diag)-26, Clear Memory Mode.> 4) Measure the AC voltage between TCM connector terminals. Connector & terminal (B54) No. 26 (+) — No. 15 (-):</p>	Is the voltage approx. 2 V or more?	Go to step 7.	Replace the rear vehicle speed sensor. <Ref. to 4AT-54, Rear Vehicle Speed Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

	Step	Check	Yes	No
7	CHECK POOR CONTACT.	Is there poor contact in rear vehicle speed sensor circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

W: DTC P1707 AT AWD SOLENOID VALVE MALFUNCTION

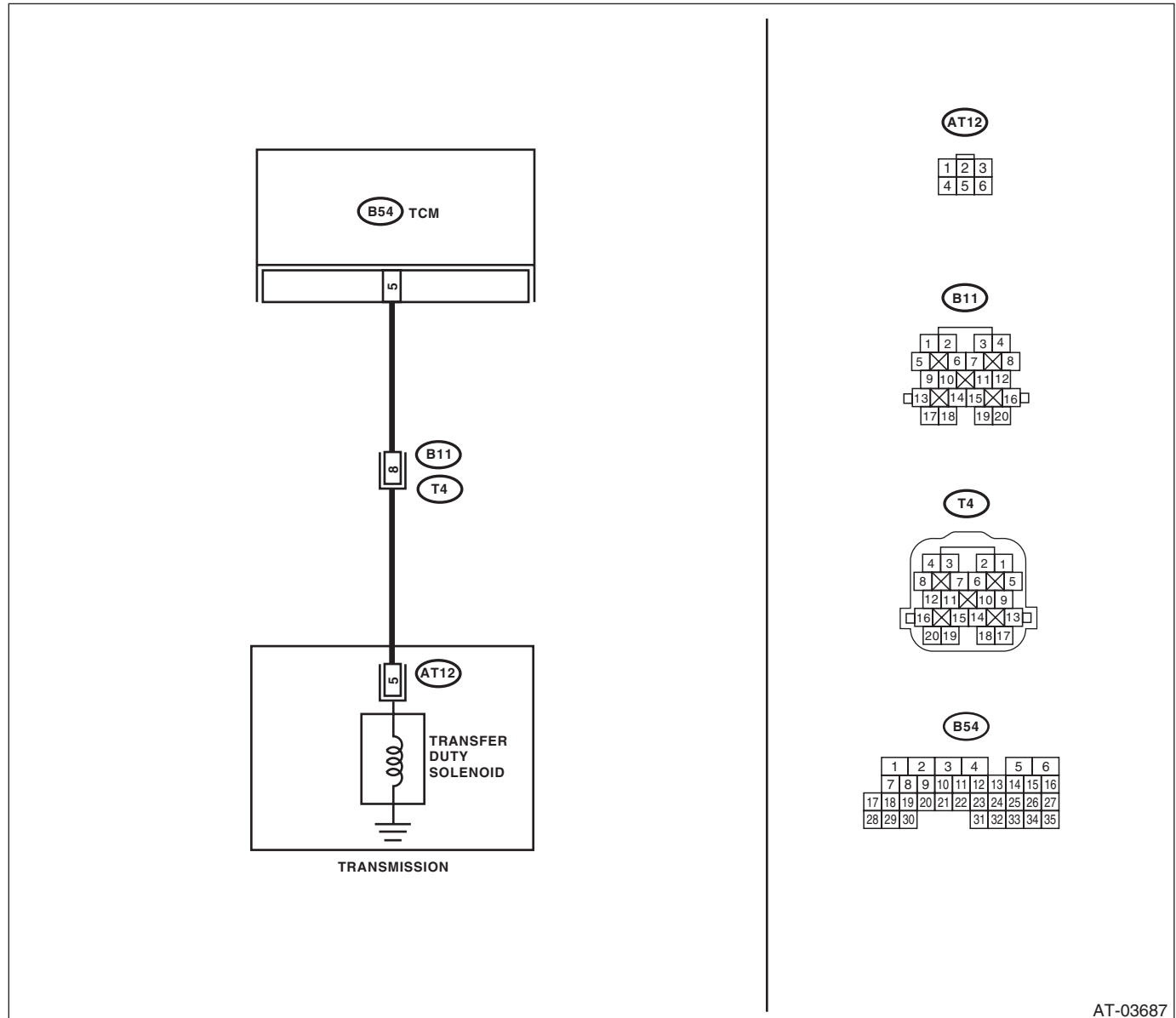
DTC DETECTING CONDITION:

Output signal circuit of transfer duty solenoid is open or shorted.

TROUBLE SYMPTOM:

Tight corner braking phenomenon occurs.

WIRING DIAGRAM:



AT-03687

Step	Check	Yes	No
<p>1 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connectors from TCM and transmission.</p> <p>3) Measure the resistance of the harness between TCM connector and transmission connector.</p> <p>Connector & terminal (B54) No. 5 — (B11) No. 8:</p>	Is the resistance less than 1 Ω?	Go to step 2.	Repair the open circuit of harness between TCM and transmission connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND TRANSMISSION. Measure the resistance of harness connector between TCM and chassis ground. Connector & terminal (B54) No. 5 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 3.	Repair the short circuit of harness between TCM and transmission connector.
3 CHECK TRANSFER DUTY SOLENOID. Measure the resistance between transmission connector and transmission terminals. Connector & terminal (T4) No. 8 — No. 20:	Is the resistance between 2.0 — 4.5 Ω ?	Go to step 4.	Go to step 7.
4 CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR. 1) Connect the connectors to TCM and transmission. 2) Connect the Subaru Select Monitor to the data link connector. 3) Turn the ignition switch to ON (engine OFF), and run the Subaru Select Monitor. 4) Shift the select lever to the "N" range, and fully close the throttle pedal. (Vehicle speed is 0 km/h (0 MPH)) 5) Read the data of transfer duty solenoid using Subaru Select Monitor. • Transfer duty solenoid is indicated in "%".	Is the measured value 5%?	Go to step 5.	Go to step 8.
5 CHECK OUTPUT SIGNAL FROM TCM USING SUBARU SELECT MONITOR. 1) Shift the select lever to "D" range. 2) Read the data of transfer duty solenoid using Subaru Select Monitor. • Transfer duty solenoid is indicated in "%".	Is the measured value approximately 18 to 35%?	Even if the AT OIL TEMP warning light is blinking, the circuit has returned to normal condition at this time. A temporary poor contact of connector or harness may be the cause. Repair the harness or connector in TCM and transmission.	Go to step 6.
6 CHECK POOR CONTACT.	Is there poor contact in transfer duty solenoid circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>
7 CHECK TRANSFER DUTY SOLENOID (IN TRANSMISSION). 1) Lift up the vehicle and place it on rigid racks. NOTE: Raise all wheels off the floor. 2) Drain the automatic transmission fluid. CAUTION: Do not drain ATF until it cools down. 3) Remove the extension case, and disconnect the connector from transfer duty solenoid. 4) Measure the resistance between transfer duty solenoid connector and transmission ground. Connector & terminal (AT12) No. 5 — Transmission ground:	Is the resistance between 2.0 — 4.5 Ω ?	Go to step 8.	Replace the control valve body. <Ref. to 4AT-56, Control Valve Body.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
<p>8 CHECK HARNESS CONNECTOR BETWEEN TRANSFER DUTY SOLENOID AND TRANSMISSION. Measure the resistance of harness between transfer duty solenoid and transmission connector. <i>Connector & terminal</i> <i>(T4) No. 8 — (AT12) No. 5:</i></p>	Is the resistance less than 1 Ω?	Go to step 9.	Repair the open circuit of harness between transfer duty solenoid and transmission connector.
<p>9 CHECK HARNESS CONNECTOR BETWEEN TRANSFER DUTY SOLENOID AND TRANSMISSION. Measure the resistance of harness between transmission connector and transmission ground. <i>Connector & terminal</i> <i>(T4) No. 8 — Transmission ground:</i></p>	Is the resistance 1 MΩ or more?	Even if the AT OIL TEMP warning light turns on, the circuit has returned to normal condition at this time. A temporary poor contact of connector or harness may be the cause. Repair the harness or poor contact in the transfer duty solenoid and transmission.	Repair short circuit of the harness between the transfer duty solenoid and transmission connector.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

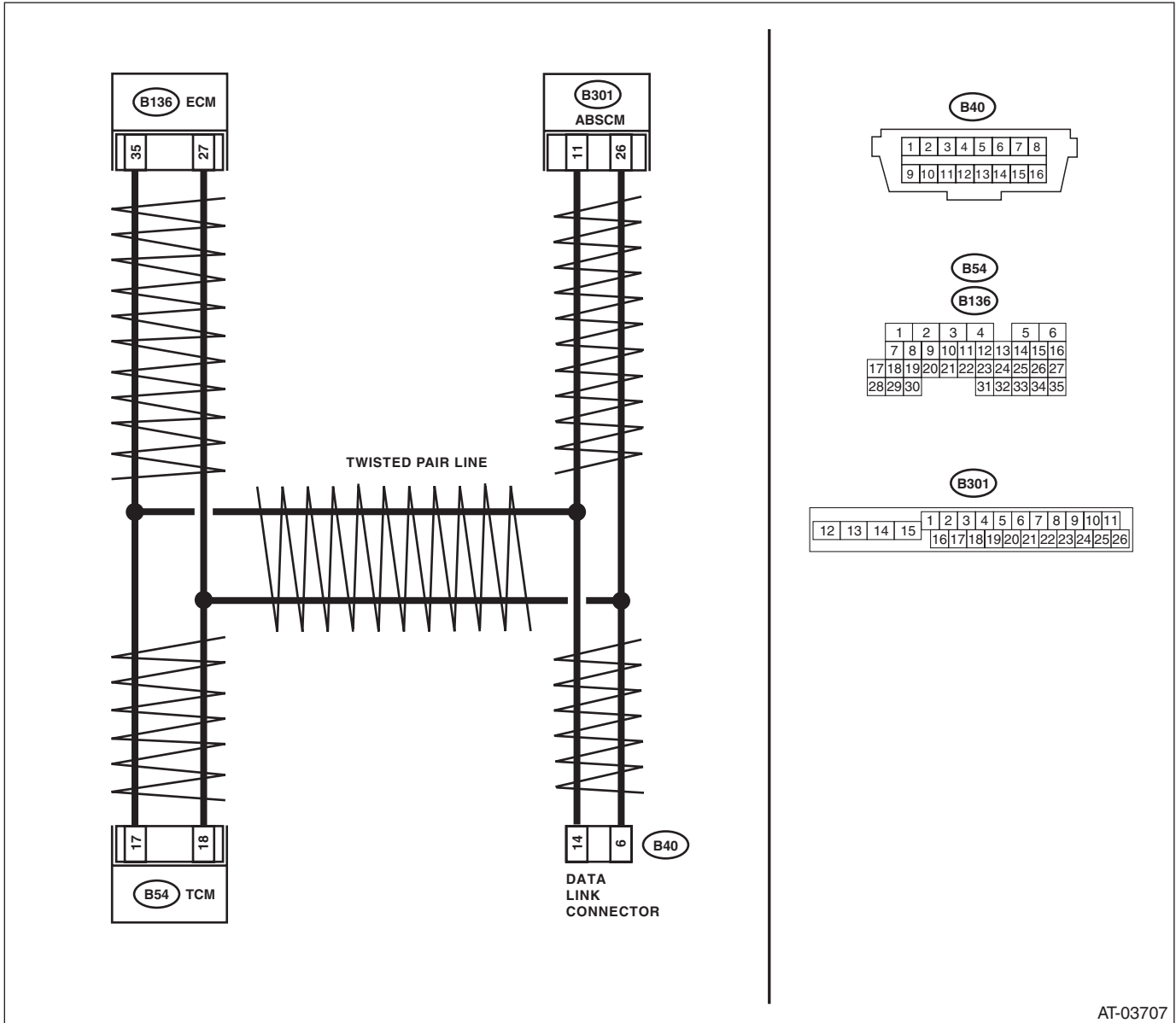
X: DTC P1718 CAN COMMUNICATION CIRCUIT

DTC DETECTING CONDITION:

Input signal circuit of TCM is open or shorted.

WIRING DIAGRAM:

- Model without VDC

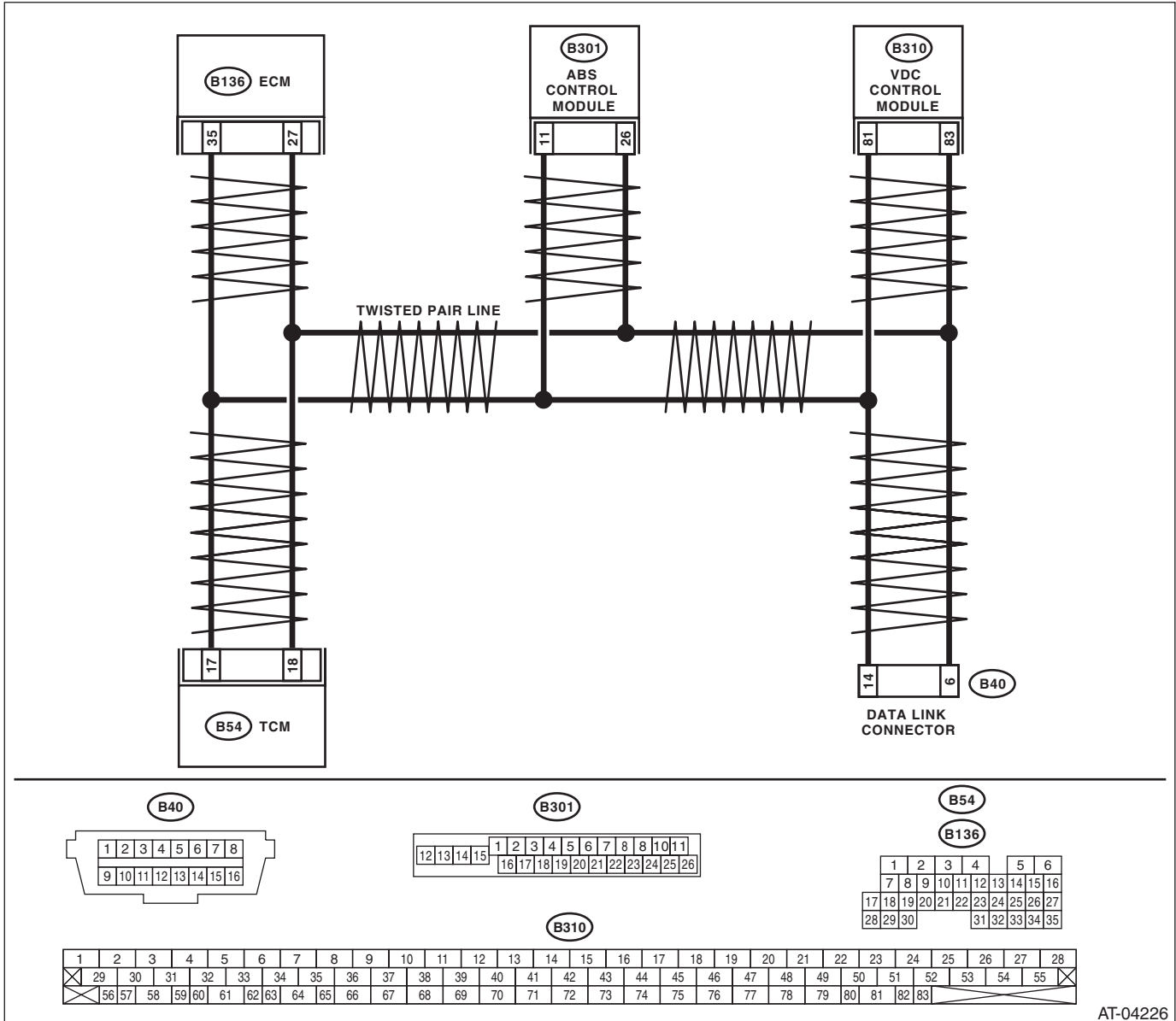


AT-03707

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

- Model with VDC



AT-04226

Step	Check	Yes	No
<p>1</p> <p>CHECK HARNESS CONNECTOR BETWEEN TCM AND VDCCM OR ABSCM&H/U.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from TCM, ECM, VDCCM or ABSCM&H/U.</p> <p>3) Measure the resistance of the harness between TCM, VDCM or ABSCM&H/U connector.</p> <p>Connector & terminal</p> <p>Model with VDC (B54) No. 17 — (B310) No. 81:</p> <p>Model without VDC (B54) No. 17 — (B301) No. 11:</p>	<p>Is the resistance less than 1 Ω?</p>	<p>Go to step 2.</p>	<p>Repair open circuit of the harness between the TCM and the VDCCM, or the poor contact in the connector.</p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK HARNESS CONNECTOR BETWEEN TCM AND VDCCM OR ABSCM&H/U. Measure the resistance of the harness between TCM and VDCCM or ABSCM&H/U connector. <i>Connector & terminal</i> <i>Model with VDC</i> (B54) No. 18 — (B310) No. 83: <i>Model without VDC</i> (B54) No. 18 — (B301) No. 26:	Is the resistance less than 1 Ω?	Go to step 3.	Repair open circuit of the harness between the TCM and the VDCCM, or the poor contact in the connector.
3 CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from TCM and ECM. 3) Measure the resistance of harness between TCM and ECM connector. <i>Connector & terminal</i> (B54) No. 17 — (B136) No. 35:	Is the resistance less than 1 Ω?	Go to step 4.	Repair open circuit of the harness between the TCM and the ECM, or the poor contact in the connector.
4 CHECK HARNESS CONNECTOR BETWEEN TCM AND ECM. Measure the resistance of harness between TCM and ECM connector. <i>Connector & terminal</i> (B54) No. 18 — (B136) No. 27:	Is the resistance less than 1 Ω?	Go to step 5.	Repair open circuit of the harness between the TCM and the ECM, or the poor contact in the connector.
5 CHECK HARNESS CONNECTOR BETWEEN TCM, ECM AND VDCCM OR ABSCM&H/U. Measure the resistance of the harness between TCM and chassis ground. <i>Connector & terminal</i> (B54) No. 17 — Chassis ground: (B54) No. 18 — Chassis ground:	Is the resistance 1 MΩ or more?	It is possible that the TCM, ECM, VDCCM or ABSCM&H/U are defected (replace and recheck).	Repair the short circuit of the harness between TCM, ECM and VDCCM or ABSCM&H/U.

Diagnostic Procedure without Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

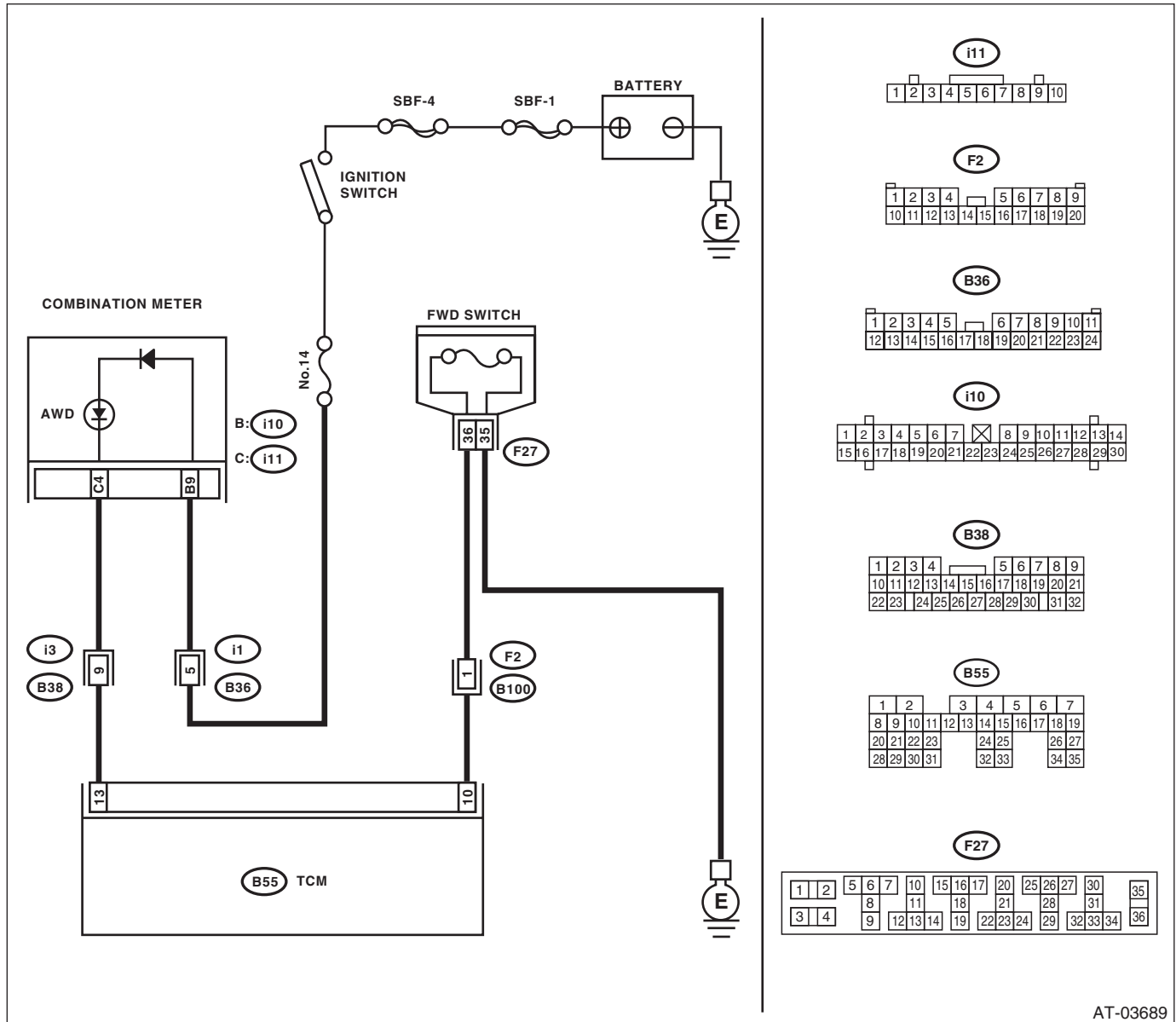
14. Diagnostic Procedure without Diagnostic Trouble Code (DTC)

A: CHECK FWD SWITCH

DIAGNOSIS:

- LED does not come on even if FWD switch is ON.
- FWD signal circuit is open or shorted.

WIRING DIAGRAM:



AT-03689

Step	Check	Yes	No
1	CHECK FWD SWITCH. Connect the Subaru Select Monitor to data link connector, and then check the LED screen.	Go to step CHECK SYMPTOM RELATED DIAGNOSTIC. <Ref. to 4AT(D)(diag)-90, INSPECTION, General Diagnostic Table.>	Go to step 2.

Diagnostic Procedure without Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
<p>2 CHECK AWD INDICATOR LIGHT. 1) Turn the ignition switch to OFF. 2) Disconnect the ECM and TCM connector. 3) Turn the ignition switch to ON. 4) Short between the combination meter connector and chassis ground.</p> <p>CAUTION: When shorting, be sure to short through the fuse.</p> <p>Connector & terminal <i>(i10) No. 4 — Chassis ground:</i></p>	Does the AWD indicator light illuminate?	Go to step 3.	Replace the combination meter. <Ref. to IDI-10, Combination Meter.>
<p>3 CHECK HARNESS CONNECTOR BETWEEN TCM AND FWD SWITCH. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the TCM and FWD switches. 3) Measure the resistance of harness between TCM and FWD switch connector.</p> <p>Connector & terminal <i>(B55) No. 10 — (F27) No. 36:</i></p>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit of harness between TCM and FWD switch connectors.
<p>4 CHECK HARNESS CONNECTOR BETWEEN FWD SWITCH AND CHASSIS GROUND. Measure the resistance of harness between FWD switch and chassis ground.</p> <p>Connector & terminal <i>(F27) No. 35 — Chassis ground:</i></p>	Is the resistance less than 1 Ω ?	Go to step 5.	Repair the open circuit of harness between FWD switch connector and chassis ground.
<p>5 CHECK HARNESS CONNECTOR BETWEEN TCM AND FWD SWITCH. Measure the resistance of harness connector between TCM and body to make sure that circuit does not short.</p> <p>Connector & terminal <i>(B55) No. 10 — Chassis ground:</i></p>	Is the resistance 1 M Ω or more?	Go to step 6.	Repair the short circuit of harness between TCM and FWD switch connectors.
<p>6 CHECK INPUT SIGNAL FOR TCM. 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and FWD switch. 3) Turn the ignition switch to ON. 4) Measure the signal voltage for TCM while installing the fuse to FWD switch connector.</p> <p>Connector & terminal <i>(B55) No. 10 (+) — Chassis ground (-):</i></p>	Is the voltage less than 1 V?	Go to step 7.	Go to step 11.
<p>7 CHECK INPUT SIGNAL FOR TCM. Measure the signal voltage for TCM with the fuse removed from FWD switch connector.</p> <p>Connector & terminal <i>(B55) No. 10 (+) — Chassis ground (-):</i></p>	Is the voltage 10.5 V or more?	Go to step 8.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>
<p>8 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from TCM and combination meter. 3) Measure the resistance of the harness between TCM and the combination meter connector.</p> <p>Connector & terminal <i>(B55) No. 13 — (i11) No. 4:</i></p>	Is the resistance less than 1 Ω ?	Go to step 9.	Repair the open circuit of harness between TCM and combination meter, and the poor contact of the connector.

Diagnostic Procedure without Diagnostic Trouble Code (DTC)

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK HARNESS CONNECTOR BETWEEN TCM AND COMBINATION METER. Measure the resistance of the harness connector between TCM and chassis ground to make sure that circuit is not shorted. <i>Connector & terminal (B55) No. 13 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 10.	Repair short circuit of harness between TCM and combination meter connector.
10 CHECK OUTPUT SIGNAL OF TCM. 1) Turn the ignition switch to OFF. 2) Connect the connector to TCM and combination meter. 3) Turn the ignition switch to ON. 4) Measure the signal voltage for TCM while installing and removing the fuse to FWD switch connector. <i>Connector & terminal (B55) No. 13 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 11.	Go to step 12.
11 CHECK OUTPUT SIGNAL OF TCM. Measure the signal voltage for TCM with the fuse removed from FWD switch connector. <i>Connector & terminal (B55) No. 13 (+) — Chassis ground (-):</i>	Is the voltage 10.5 V or more?	Go to step 12.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>
12 CHECK POOR CONTACT.	Is there poor contact in FWD switch circuit?	Repair the poor contact.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>

General Diagnostic Table

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

15. General Diagnostic Table

A: INSPECTION

Symptoms	Problem parts
Starter does not operate when select lever is in "P" or "N" range. Starter rotates when select lever is in "R", "D", "3" or "2" range.	<ul style="list-style-type: none"> • Inhibitor switch • Select cable • Select lever • Starter motor and harness
Abnormal noise when select lever is in "P" or "N".	<ul style="list-style-type: none"> • Strainer • Transfer duty solenoid • Oil pump • Drive plate • ATF level too high or too low
Hissing noise occurs during standing start.	<ul style="list-style-type: none"> • Strainer • ATF level too high or too low
Noise occurs while driving in "D1".	<ul style="list-style-type: none"> • Final gear • Planetary gear • Reduction gear • Differential gear oil level too high or too low
Noise occurs while driving in "D2".	
Noise occurs while driving in "D3".	<ul style="list-style-type: none"> • Final gear • Low & reverse brake • Reduction gear • Differential gear oil level too high or too low
Noise occurs while driving in "D4".	<ul style="list-style-type: none"> • Final gear • Low & reverse brake • Planetary gear • Reduction gear • Differential gear oil level too high or too low
Engine stalls while shifting from "1" range to another.	<ul style="list-style-type: none"> • Control valve • Lock-up damper • Engine performance • Input shaft
Vehicle moves when select lever is in "N" range.	<ul style="list-style-type: none"> • Select cable • Inhibitor switch • TCM • Low clutch
Shock occurs when select lever is shifted from "N" to "D" range.	<ul style="list-style-type: none"> • Accelerator pedal position sensor • ATF temperature sensor • Line pressure duty solenoid • Low clutch duty solenoid • Low clutch • TCM • Harness • Control valve • ATF deterioration
Excessive time lag occurs when select lever is shifted from "N" to "D" range.	<ul style="list-style-type: none"> • Control valve • Low clutch • Line pressure duty solenoid • Seal ring • Front gasket of transmission case
Shock occurs when the select lever is moved from "N" to "R" range.	<ul style="list-style-type: none"> • Accelerator pedal position sensor • ATF temperature sensor • Line pressure duty solenoid • TCM • Harness • Control valve • ATF deterioration

General Diagnostic Table

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Symptoms	Problem parts
Excessive time lag occurs when the select lever is moved from "N" to "R" range.	<ul style="list-style-type: none"> Control valve Low & reverse clutch Reverse clutch Line pressure duty solenoid Seal ring Front gasket of transmission case
Vehicle does not start in any shift range. (Engine stalls)	<ul style="list-style-type: none"> Parking brake mechanism Planetary gear
Vehicle does not start in any shift range. (Engine operates)	<ul style="list-style-type: none"> Strainer Line pressure duty solenoid Control valve Drive pinion Hypoid gear Axle shaft Differential gear Oil pump Input shaft Output shaft Planetary gear Drive plate ATF level is too low Front gasket of transmission case
Vehicle does not start in "R" range only. (Engine operates)	<ul style="list-style-type: none"> Select cable Select lever Line pressure duty solenoid Control valve Low & reverse clutch Reverse clutch
Vehicle does not start in "R" range only. (Engine stalls)	<ul style="list-style-type: none"> Low clutch 2-4 brake Planetary gear Parking brake mechanism
Vehicle does not start in only when in the "D", "3" range. (Engine operates)	<ul style="list-style-type: none"> Low clutch One-way clutch
Vehicle does not start in only in the "D", "3" or "2" range. (Engine operates)	Low clutch
Vehicle does not start in only in the "D", "3" or "2" range. (Engine stalls)	Reverse clutch
Vehicle does not start in "R" range only. (Engine operates)	Control valve
Acceleration during standing start is poor. (High rpm stall)	<ul style="list-style-type: none"> Control valve Low clutch Reverse clutch ATF level is too low ATF deterioration Front gasket of transmission case Differential gear oil level too high or too low
Acceleration during standing start is poor. (Low rpm stall)	<ul style="list-style-type: none"> Oil pump Torque converter one-way clutch Engine performance
Acceleration is poor when select lever is in the "D", "3" or "2" range. (Normal rpm stall)	<ul style="list-style-type: none"> TCM Control valve High clutch 2-4 brake Planetary gear
Acceleration is poor when select lever is in "R" range. (Normal rpm stall)	<ul style="list-style-type: none"> Control valve High clutch 2-4 brake Planetary gear

General Diagnostic Table

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Symptoms	Problem parts
No shift occurs from 1st to 2nd gear.	<ul style="list-style-type: none"> • TCM • Rear vehicle speed sensor • Front vehicle speed sensor • Accelerator pedal position sensor • Control valve • 2-4 brake
No shift occurs from 2nd to 3rd gear.	<ul style="list-style-type: none"> • TCM • Control valve • High clutch
No shift occurs from 3rd to 4th gear.	<ul style="list-style-type: none"> • TCM • ATF temperature sensor • Control valve • 2-4 brake
Engine brake does not come into effect when the select lever is shifted to "3" range.	<ul style="list-style-type: none"> • Inhibitor switch • TCM • Accelerator pedal position sensor • Control valve
Engine brake is not effected when the select lever is in "3" or "2" range.	Control valve
Engine brake does not come into effect when the select lever is shifted to "1" range.	<ul style="list-style-type: none"> • Control valve • Low & reverse brake
Shift characteristics are erroneous.	<ul style="list-style-type: none"> • Inhibitor switch • TCM • Front vehicle speed sensor • Rear vehicle speed sensor • Accelerator pedal position sensor • Control valve • Ground
No lock-up occurs.	<ul style="list-style-type: none"> • TCM • Accelerator pedal position sensor • ATF temperature sensor • Control valve • Lock-up facing • Engine speed signal
Parking brake does not function.	<ul style="list-style-type: none"> • Select cable • Select lever • Parking mechanism
Shift lever cannot be moved or is hard to move from "P" range.	
ATF spurts out.	ATF level too high
Differential oil spurts out.	Differential gear oil level too high
Differential oil level changes excessively.	<ul style="list-style-type: none"> • Seal pipe • Double oil seal
Odor is produced from ATF supply pipe.	<ul style="list-style-type: none"> • High clutch • 2-4 brake • Low & reverse clutch • Reverse clutch • Lock-up facing • ATF deterioration
Shock occurs when shifting from 1st to 2nd gear.	<ul style="list-style-type: none"> • TCM • Torque converter turbine speed sensor • Accelerator pedal position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake • ATF deterioration • Engine performance • Low & reverse duty solenoid

General Diagnostic Table

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Symptoms	Problem parts
Slippage occurs when shifting from 1st to 2nd gear.	<ul style="list-style-type: none"> • TCM • Accelerator pedal position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake
Shock occurs when shifting from 2nd to 3rd gear.	<ul style="list-style-type: none"> • TCM • Torque converter turbine speed sensor • Accelerator pedal position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Low & reverse duty solenoid • Control valve • High clutch • 2-4 brake • ATF deterioration • Engine performance • High clutch duty solenoid
Slippage occurs when shifting from 2nd to 3rd gear.	<ul style="list-style-type: none"> • TCM • Accelerator pedal position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • High clutch • 2-4 brake • Low & reverse duty solenoid
Shock occurs when shifting from 3rd to 4th gear.	<ul style="list-style-type: none"> • TCM • Torque converter turbine speed sensor • Accelerator pedal position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • Low clutch duty solenoid • 2-4 brake • ATF deterioration • Engine performance
Slippage occurs when shifting from 3rd to 4th gear.	<ul style="list-style-type: none"> • TCM • Accelerator pedal position sensor • 2-4 brake duty solenoid • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake
Shock occurs when select lever is shifted from the "3" range to the "2" range.	<ul style="list-style-type: none"> • TCM • Torque converter turbine speed sensor • Accelerator pedal position sensor • ATF temperature sensor • Line pressure duty solenoid • Control valve • 2-4 brake duty solenoid • 2-4 brake • ATF deterioration • High clutch duty solenoid

General Diagnostic Table

AUTOMATIC TRANSMISSION (DIAGNOSTICS)

Symptoms	Problem parts
Shock occurs when select lever is shifted from the "2" range to the "1" range.	<ul style="list-style-type: none"> • TCM • Torque converter turbine speed sensor • Accelerator pedal position sensor • ATF temperature sensor • Line pressure duty solenoid • Control valve • Low & reverse clutch • ATF deterioration • 2-4 brake duty solenoid • Low & reverse brake duty solenoid
Shock occurs when accelerator pedal is released from medium speed.	<ul style="list-style-type: none"> • TCM • Accelerator pedal position sensor • ATF temperature sensor • Line pressure duty solenoid • Control valve • Lock-up damper • Engine performance
Vibration occurs during straight-forward operation.	<ul style="list-style-type: none"> • TCM • Lock-up duty solenoid • Lock-up facing • Lock-up damper
Vibration occurs during turns. (Tight corner braking phenomenon)	<ul style="list-style-type: none"> • TCM • Front vehicle speed sensor • Rear vehicle speed sensor • Accelerator pedal position sensor • ATF temperature sensor • Transfer clutch • Transfer valve • Transfer duty solenoid • ATF deterioration • Harness
Front wheel slippage occurs during standing starts.	<ul style="list-style-type: none"> • TCM • Front vehicle speed sensor • FWD switch • Accelerator pedal position sensor • ATF temperature sensor • Control valve • Transfer clutch • Transfer valve • Transfer pipe • Transfer duty solenoid
It is not set in FWD mode.	<ul style="list-style-type: none"> • TCM • FWD switch • Transfer clutch • Transfer valve • Transfer duty solenoid
Select lever is hard to move.	<ul style="list-style-type: none"> • Select cable • Select lever • Detent spring • Manual plate
Select lever is excessively hard to move. (Unreasonable resistance)	<ul style="list-style-type: none"> • Detent spring • Manual plate
Select lever slips out of selected shift position during acceleration or while driving on rough terrain.	<ul style="list-style-type: none"> • Select cable • Select lever • Detent spring • Manual plate

General Description

MANUAL TRANSMISSION AND DIFFERENTIAL

1. General Description

A: SPECIFICATION

1. MANUAL TRANSMISSION AND DIFFERENTIAL

Model		Non-turbo	Turbo	
Type		5-forward speeds with synchromesh and 1-reverse		
Transmission gear ratio		1st	3.454	
		2nd	2.062	1.947
		3rd	1.448	1.366
		4th	1.088	0.972
		5th	0.780	0.738
		Rev.	3.333	
Front reduction gear	Final	Type of gear	Hypoid	
		Gear ratio	4.111	4.444
Rear reduction gear	Transfer	Type of gear	Helical	
		Gear ratio	1.000	
	Final	Type of gear	Hypoid	
		Gear ratio	4.111	4.444
Front differential	Type and number of gear	Straight bevel gear (Bevel pinion: 2, Bevel gear: 2)		
Center differential	Type and number of gear	Straight bevel gear (Bevel pinion: 2, Bevel gear: 2 and viscous coupling)		
Transmission gear oil		GL-5		
Transmission gear oil capacity		3.5 ℓ (3.7 US qt, 3.1 Imp qt)		

2. TRANSMISSION GEAR OIL

Recommended oil

(1)	
(2)	
(3)	GL-5
(4)	
(°C)	-30 -26 -15 -5 0 15 25 30
(°F)	-22 -15 5 23 32 59 77 86
	MT-00001

- (1) Item
- (2) Transmission gear oil
- (3) API classification
- (4) SAE viscosity No. and applicable temperature

3. TRANSMISSION CASE ASSEMBLY

Drive pinion shim adjustment

Hypoid gear backlash:

0.13 — 0.18 mm (0.0051 — 0.0071 in)

Drive pinion shim			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
32295AA031	0.150 (0.0059)	32295AA071	0.250 (0.0098)
32295AA041	0.175 (0.0069)	32295AA081	0.275 (0.0108)
32295AA051	0.200 (0.0079)	32295AA091	0.300 (0.0118)
32295AA061	0.225 (0.0089)	32295AA101	0.500 (0.0197)

Selection of main shaft rear plate

Main shaft rear plate		
Dimension "A" mm (in)	Part No.	Mark
4.00 — 4.13 (0.1575 — 0.1626)	32294AA041	1
3.87 — 3.99 (0.1524 — 0.1571)	32294AA051	2

General Description

MANUAL TRANSMISSION AND DIFFERENTIAL

4. DRIVE PINION ASSEMBLY

Preload adjustment of thrust bearing

Starting torque:

0.3 — 0.8 N·m (0.03 — 0.08 kgf·m, 0.2 — 0.6 ft·lb)

Adjusting washer No. 1	
Part No.	Thickness mm (in)
803025051	3.925 (0.1545)
803025052	3.950 (0.1555)
803025053	3.975 (0.1565)
803025054	4.000 (0.1575)
803025055	4.025 (0.1585)
803025056	4.050 (0.1594)
803025057	4.075 (0.1604)

Adjusting washer No. 2	
Part No.	Thickness mm (in)
803025059	3.850 (0.1516)
803025054	4.000 (0.1575)
803025058	4.150 (0.1634)

5. REVERSE IDLER GEAR

Adjustment of reverse idler gear position

Reverse idler gear to transmission case (LH) wall clearance

6.0 — 7.5 mm (0.236 — 0.295 in)

Reverse shifter lever		
Part No.	Mark	Remarks
32820AA070	7	Further from case wall
32820AA080	8	Standard
32820AA090	9	Closer to the case wall

After installing a suitable reverse shifter lever, adjust the clearance using washers.

Reverse idler gear to transmission case wall clearance

0 — 0.5 mm (0 — 0.020 in)

Washer (20.5 × 26 × t)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
803020151	0.4 (0.016)	803020154	1.9 (0.075)
803020152	1.1 (0.043)	803020155	2.3 (0.091)
803020153	1.5 (0.059)	—	—

6. SHIFTER FORK AND ROD

Select a suitable shifter fork so that both the coupling sleeve and reverse driven gear are positioned in the center of their synchromesh mechanisms.

Rod end clearance

A: 3rd-4th — 5th

0.5 — 1.3 mm (0.020 — 0.051 in)

B: 1st-2nd — 3rd-4th

0.4 — 1.4 mm (0.016 — 0.055 in)

1st-2nd shifter fork		
Part No.	Mark	Remarks
32804AA060	1	Approaches 1st gear by 0.2 mm (0.008 in).
32804AA070	No mark	Standard
32804AA080	3	Approaches 2nd gear by 0.2 mm (0.008 in)

3rd-4th shifter fork		
Part No.	Mark	Remarks
32810AA061	1	Approaches 4th gear by 0.2 mm (0.008 in).
32810AA071	No mark	Standard
32810AA101	3	Approaches 3rd gear by 0.2 mm (0.008 in)

5th shifter fork (non-turbo) / Identifying paint (pink)		
Part No.	Mark	Remarks
32812AA201	7	Approaches 5th gear by 0.2 mm (0.008 in).
32812AA211	No mark	Standard
32812AA221	9	Moves away from 5th gear by 0.2 mm (0.008 in).

5th shifter fork (turbo) / Identifying paint (blue)		
Part No.	Mark	Remarks
32812AA231	7	Approaches 5th gear by 0.2 mm (0.008 in).
32812AA241	No mark	Standard
32812AA251	9	Moves away from 5th gear by 0.2 mm (0.008 in).

General Description

MANUAL TRANSMISSION AND DIFFERENTIAL

7. TRANSFER CASE

Neutral position adjustment

Adjusting shim	
Part No.	Thickness mm (in)
32190AA000	0.15 (0.0059)
32190AA010	0.30 (0.0118)

Reverse accent shaft		
Part No.	Mark	Remarks
32188AA130	S	Neutral position is closer to 1st.
32188AA140	T	Standard
32188AA150	U	Neutral position is closer to reverse gear.

Reverse check plate adjustment

Reverse check plate			
Part No.	Mark	Angleθ	Remarks
32189AA000	0	28°	Arm stops closer to 5th gear.
32189AA010	1	31°	Arm stops closer to 5th gear.
33189AA020	2	34°	Arm stops in the center.
32189AA030	3	37°	Arm stops closer to reverse gear.
32189AA040	4	40°	Arm stops closer to reverse gear.

8. EXTENSION ASSEMBLY

Tapered roller bearing preload (amount of standard protrusion):

0.2 — 0.3 mm (0.0008 — 0.012 in)

NOTE:

Make sure to set between the preload range.

Thrust washer (50 × 61 × t)	
Part No.	Thickness mm (in)
803050060	0.50 (0.0197)
803050061	0.55 (0.0217)
803050062	0.60 (0.0236)
803050063	0.65 (0.0256)
803050064	0.70 (0.0276)
803050065	0.75 (0.0295)
803050066	0.80 (0.0315)
803050067	0.85 (0.0335)
803050068	0.90 (0.0354)
803050069	0.95 (0.0374)
803050070	1.00 (0.0394)
803050071	1.05 (0.0413)
803050072	1.10 (0.0433)
803050073	1.15 (0.0453)

Thrust washer (50 × 61 × t)	
Part No.	Thickness mm (in)
803050074	1.20 (0.0472)
803050075	1.25 (0.0492)
803050076	1.30 (0.0512)
803050077	1.35 (0.0531)
803050078	1.40 (0.0551)
803050079	1.45 (0.0571)

Thrust washer to center differential side clearance:

0.15 — 0.35 mm (0.0059 — 0.0138 in)

Thrust washer	
Part No.	Thickness mm (in)
803036050	0.9 (0.035)
803036054	1.0 (0.039)
803036051	1.1 (0.043)
803036055	1.2 (0.047)
803036052	1.3 (0.051)
803036056	1.4 (0.055)
803036053	1.5 (0.059)
803036057	1.6 (0.063)
803036058	1.7 (0.067)

9. FRONT DIFFERENTIAL

Bevel gear to pinion backlash:

0.13 — 0.18 mm (0.0051 — 0.0071 in)

Washer (38.1 × 50 × t)			
Part No.	Thickness mm (in)	Part No.	Thickness mm (in)
803038021	0.925 — 0.950 (0.0364 — 0.0374)	803038023	1.025 — 1.050 (0.0404 — 0.0413)
803038022	0.975 — 1.000 (0.0384 — 0.0394)	—	—

10. TRANSFER DRIVE GEAR

Snap ring (Outer-30) to ball bearing inner race clearance:

0.01 — 0.15 mm (0.0004 — 0.0059 in)

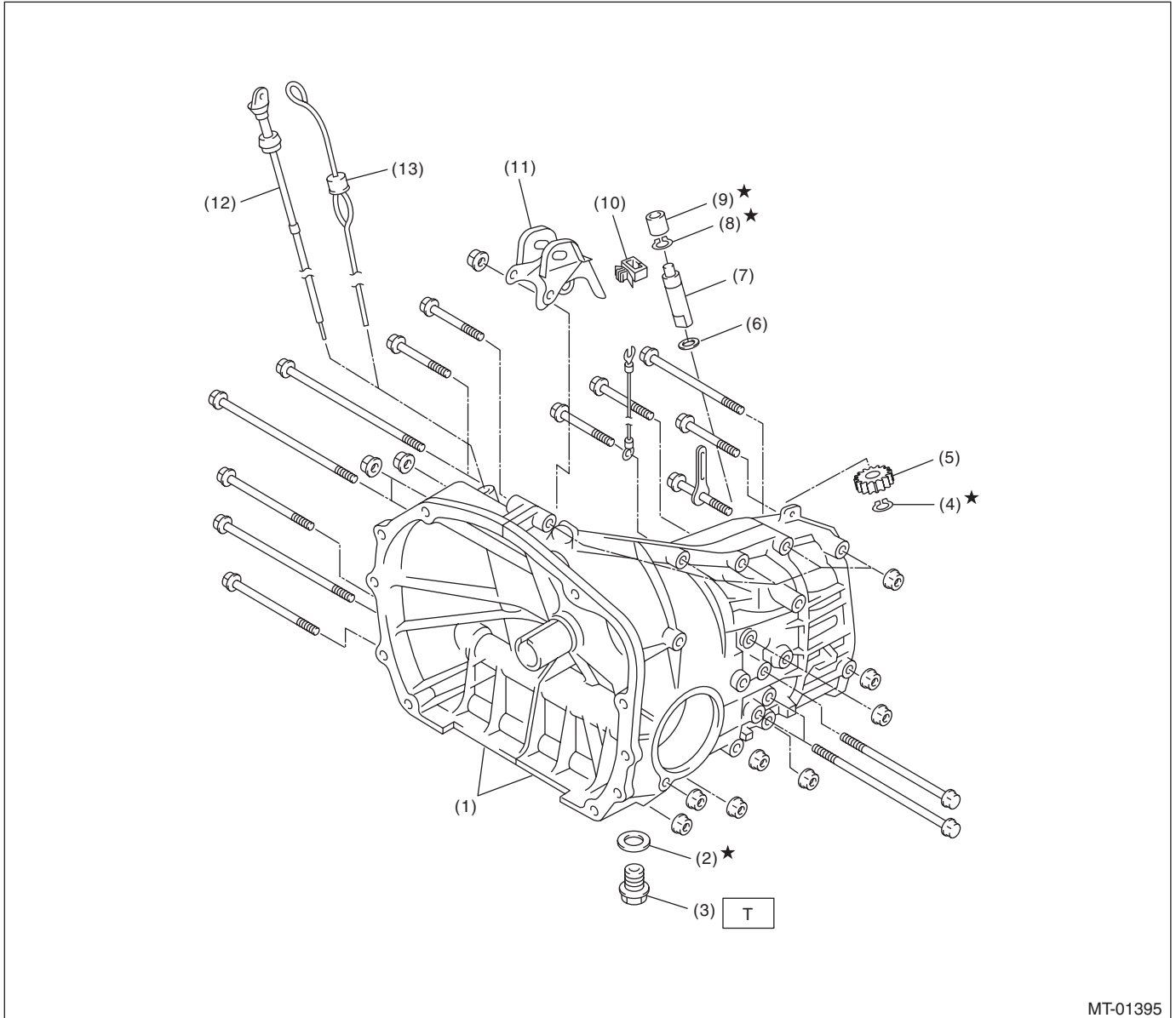
Snap ring (Outer-30)	
Part No.	Thickness mm (in)
805030041	1.53 (0.0602)
805030042	1.65 (0.0650)
805030043	1.77 (0.0697)

General Description

MANUAL TRANSMISSION AND DIFFERENTIAL

B: COMPONENT

1. TRANSMISSION CASE



- (1) Transmission case ASSY
- (2) Gasket
- (3) Drain plug
- (4) Snap ring (Outer)
- (5) Speedometer driven gear
- (6) Washer

- (7) Speedometer shaft
- (8) Snap ring (Outer)
- (9) Oil seal
- (10) Clamp
- (11) Pitching stopper bracket
- (12) Oil level gauge (Non-turbo model)

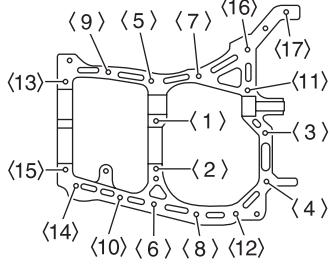
- (13) Oil level gauge (Turbo model)

Tightening torque: N·m (kgf·m, ft·lb)
T: 44 (4.5, 32.5) (Aluminum gasket)
70 (7.1, 51.6) (Copper gasket)

General Description

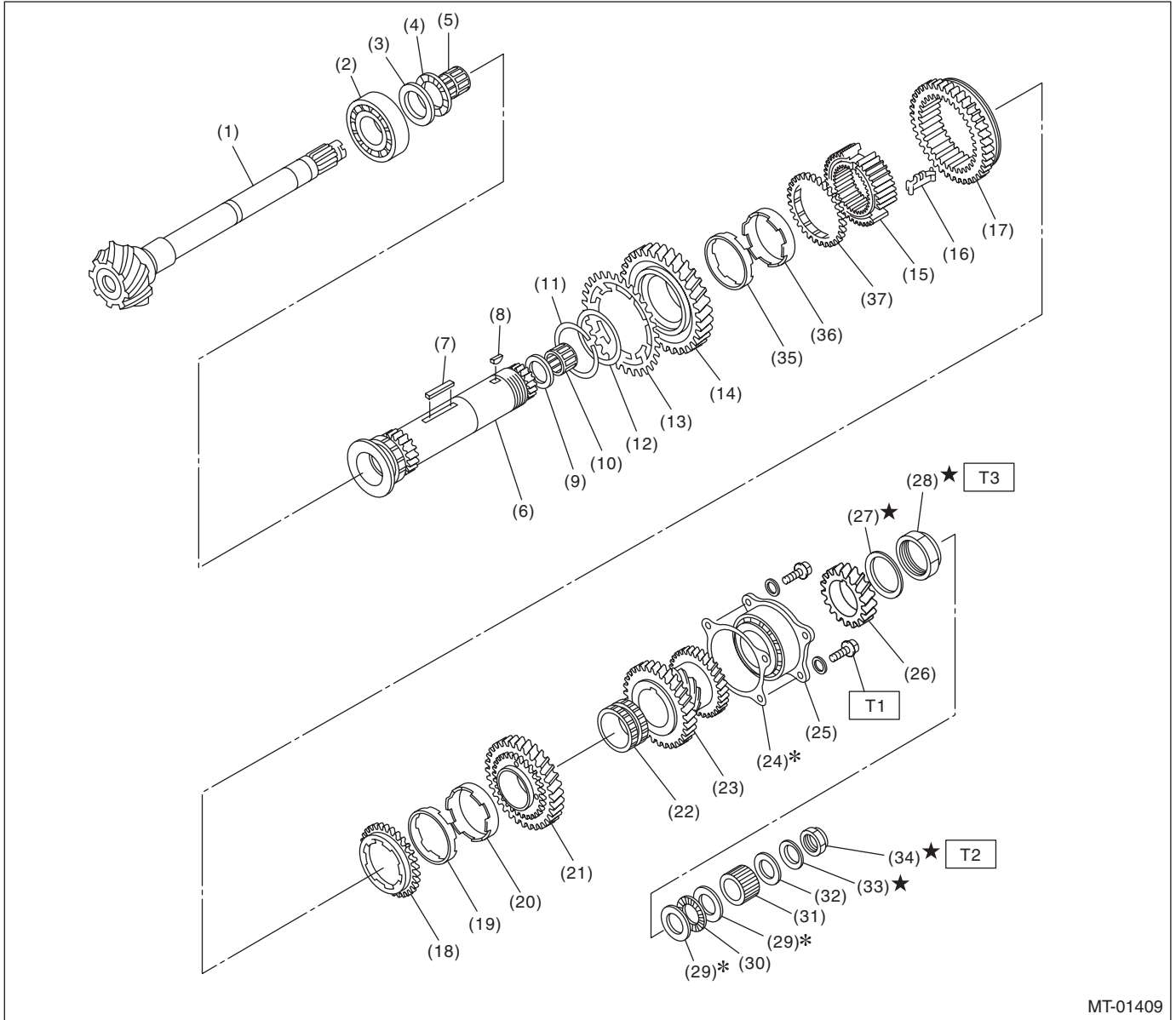
MANUAL TRANSMISSION AND DIFFERENTIAL

TRANSMISSION CASE TIGHTENING TORQUE

 <p>MT-00003</p>	Bolt No.	Bolt size	Tightening torque: N-m (kgf-m, ft-lb)
	<5> — <15>	8 mm	25 (2.5, 18.1)
<1> — <4> <16>, <17>	10 mm	39 (4.0, 28.9)	

General Description

2. DRIVE PINION ASSEMBLY



MT-01409

General Description

MANUAL TRANSMISSION AND DIFFERENTIAL

- | | | |
|--|-------------------------------|-------------------------------------|
| (1) Drive pinion shaft | (15) 1st-2nd synchronizer hub | (29) Washer |
| (2) Roller bearing | (16) Insert key | (30) Thrust bearing |
| (3) Washer | (17) Reverse driven gear | (31) Differential bevel gear sleeve |
| (4) Thrust bearing | (18) Outer baulk ring | (32) Washer |
| (5) Needle bearing | (19) Synchro cone | (33) Lock washer |
| (6) Driven shaft | (20) Inner baulk ring | (34) Lock nut |
| (7) Key | (21) 2nd driven gear | (35) Inner baulk ring |
| (8) Woodruff key | (22) 2nd driven gear bushing | (36) Synchro cone |
| (9) Drive pinion collar | (23) 3rd-4th driven gear | (37) Outer baulk ring |
| (10) Needle bearing | (24) Driven pinion shim | |
| (11) Snap ring/outer (Non-turbo model) | (25) Roller bearing | |
| (12) Washer (Non-turbo model) | (26) 5th driven gear | |
| (13) Sub-gear (Non-turbo model) | (27) Lock washer | |
| (14) 1st driven gear | (28) Lock nut | |

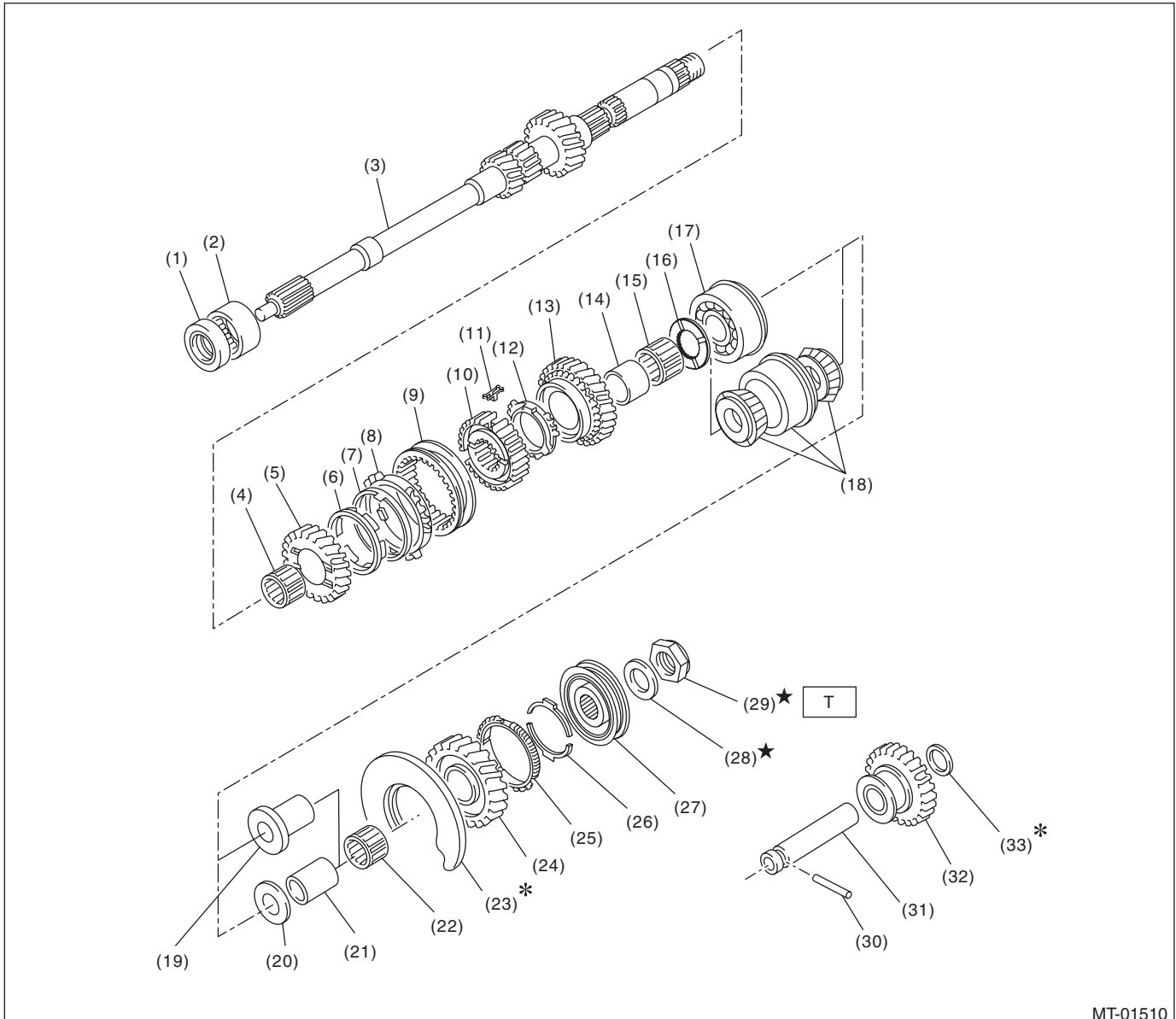
Tightening torque: N·m (kgf·m, ft·lb)

T1: 30 (3.1, 22.1)

T2: 120 (12.2, 88.5)

T3: 260 (26.5, 192)

3. MAIN SHAFT ASSEMBLY (SINGLE-RANGE)



MT-01510

General Description

MANUAL TRANSMISSION AND DIFFERENTIAL

- | | | |
|----------------------------------|--|-------------------------------|
| (1) Oil seal | (15) Needle bearing | (24) 5th drive gear |
| (2) Needle bearing | (16) 4th gear thrust washer | (25) 5th baulk ring |
| (3) Transmission main shaft | (17) Ball bearing (Non-turbo model) | (26) Baulk lever |
| (4) Needle bearing | (18) Taper roller bearing (Turbo model) | (27) 5th hub & sleeve No. 2 |
| (5) 3rd drive gear | (19) 5th needle bearing race (Turbo model) | (28) Lock washer |
| (6) Inner baulk ring | (20) 5th gear thrust washer (Non-turbo model) | (29) Lock nut |
| (7) 3rd synchro cone | (21) 5th needle bearing race (Non-turbo model) | (30) Straight pin |
| (8) Outer baulk ring | (22) Needle bearing | (31) Reverse idler gear shaft |
| (9) 3rd-4th coupling sleeve | (23) Main shaft rear plate | (32) Reverse idler gear |
| (10) 3rd-4th synchronizer hub | | (33) Washer |
| (11) 3rd-4th shifting insert key | | |
| (12) 4th baulk ring | | |
| (13) 4th drive gear | | |
| (14) 4th needle bearing race | | |

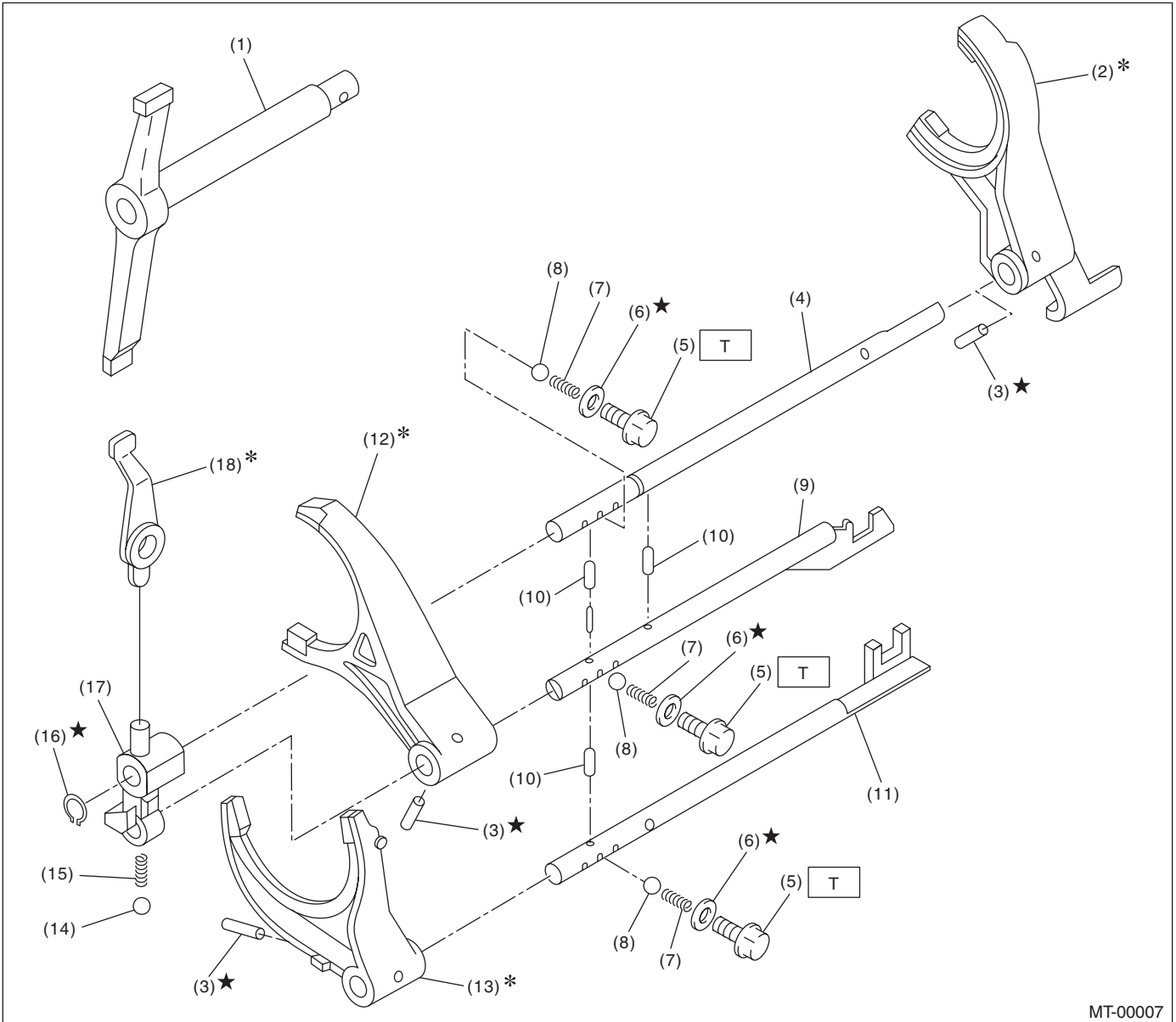
Tightening torque: N·m (kgf·m, ft·lb)

T: 120 (12.2, 88.5)

General Description

MANUAL TRANSMISSION AND DIFFERENTIAL

4. SHIFTER FORK AND SHIFTER ROD



MT-00007

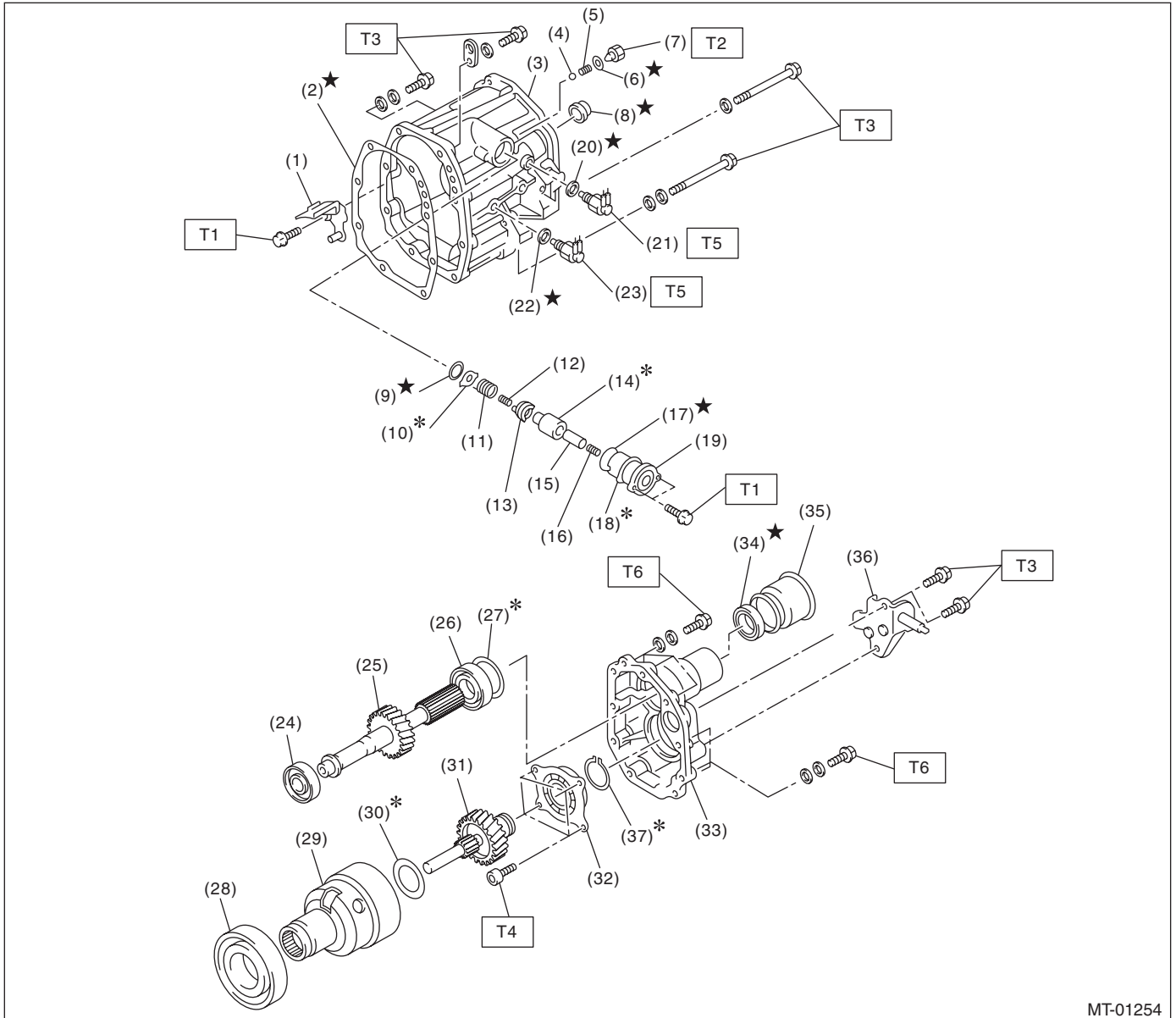
- | | | |
|--------------------------|---------------------------|----------------------------|
| (1) Shifter arm | (8) Ball | (15) Spring |
| (2) 5th shifter fork | (9) 3rd-4th fork rod | (16) Snap ring (Outer) |
| (3) Straight pin | (10) Interlock plunger | (17) Reverse fork rod arm |
| (4) Reverse fork rod | (11) 1st-2nd fork rod | (18) Reverse shifter lever |
| (5) Checking ball plug | (12) 3rd-4th shifter fork | |
| (6) Gasket | (13) 1st-2nd shifter fork | |
| (7) Checking ball spring | (14) Ball | |

Tightening torque: N-m (kgf-m, ft-lb)

T: 20 (2.0, 14.5)

General Description

5. TRANSFER CASE AND EXTENSION



MT-01254

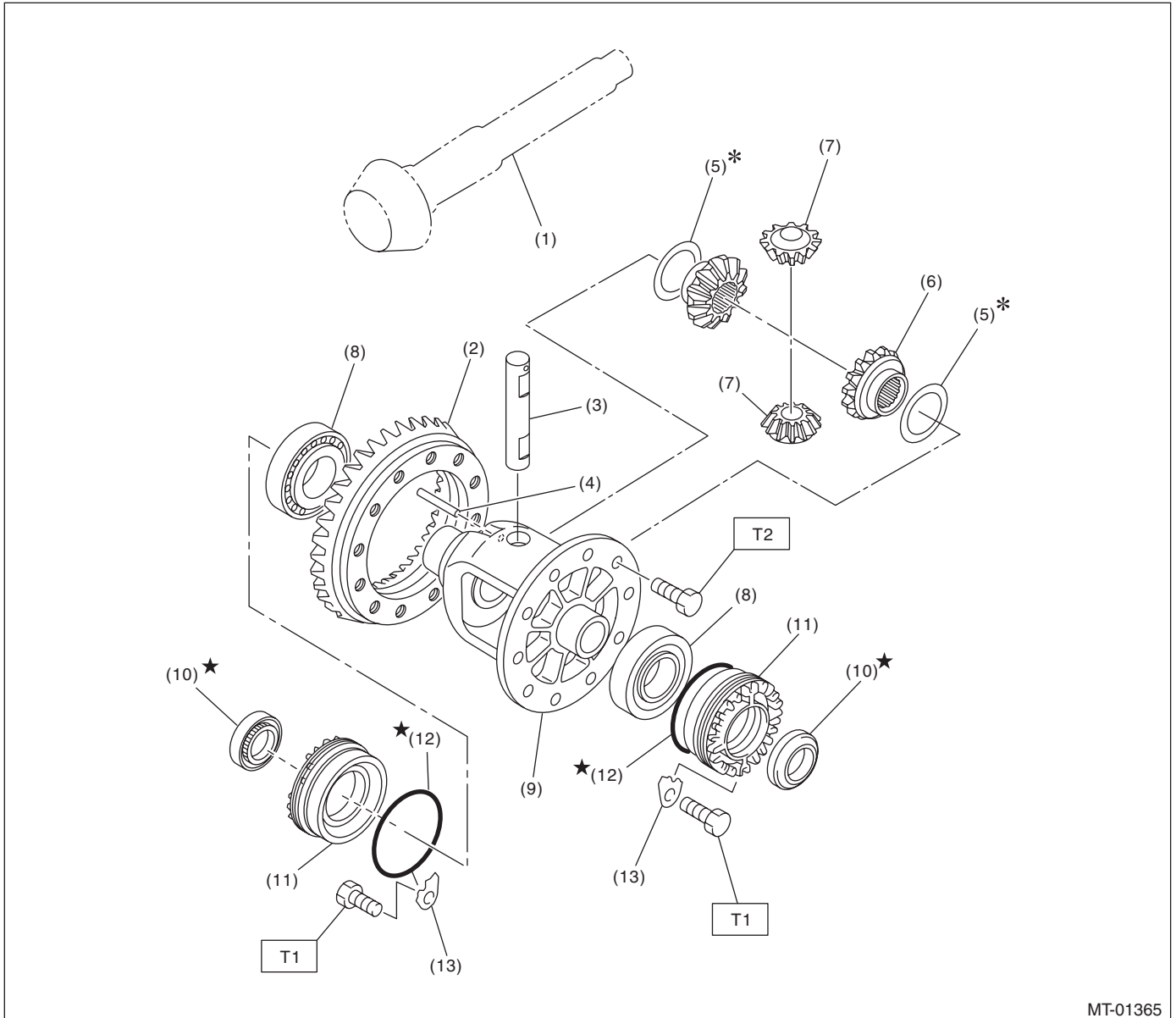
General Description

MANUAL TRANSMISSION AND DIFFERENTIAL

(1) Oil guide	(16) Return spring	(31) Transfer drive gear
(2) Gasket	(17) O-ring	(32) Ball bearing
(3) Transfer case	(18) Adjusting select shim	(33) Extension case
(4) Ball	(19) Reverse check sleeve	(34) Oil seal
(5) Reverse accent spring	(20) Gasket	(35) Dust cover
(6) Gasket	(21) Neutral position switch	(36) Shift bracket
(7) Plug	(22) Gasket	(37) Snap ring
(8) Oil seal	(23) Back-up light switch	
(9) Snap ring (Inner)	(24) Roller bearing	<hr/> Tightening torque: N·m (kgf-m, ft-lb)
(10) Reverse check plate	(25) Transfer driven gear	T1: 6.4 (0.65, 4.7)
(11) Reverse check spring	(26) Roller bearing	T2: 9.75 (1.0, 7.2)
(12) Reverse return spring	(27) Adjusting washer	T3: 24.5 (2.5, 18.1)
(13) Reverse check cam	(28) Ball bearing	T4: 26 (2.7, 20)
(14) Reverse accent shaft	(29) Center differential	T5: 32.3 (3.3, 23.8)
(15) Return spring cap	(30) Adjusting washer	T6: 40 (4.1, 30)

General Description

6. FRONT DIFFERENTIAL



MT-01365

- | | | |
|-----------------------------|---------------------------------|--------------------------|
| (1) Drive pinion shaft | (7) Differential bevel pinion | (13) Retainer lock plate |
| (2) Hypoid driven gear | (8) Roller bearing | |
| (3) Pinion shaft | (9) Differential case | |
| (4) Straight pin | (10) Oil seal | |
| (5) Washer | (11) Differential side retainer | |
| (6) Differential bevel gear | (12) O-ring | |

Tightening torque: N-m (kgf-m, ft-lb)

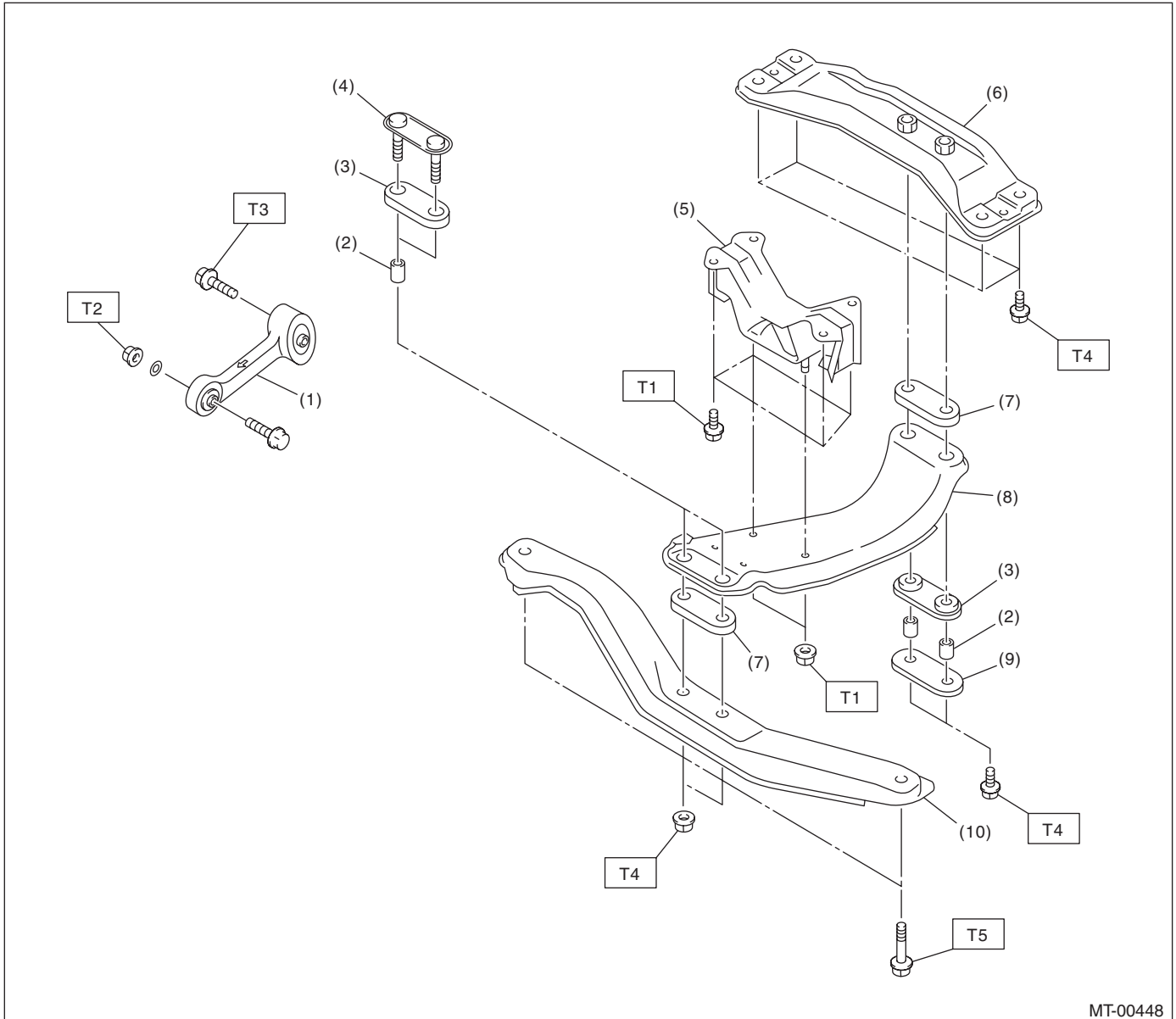
T1: 25 (2.5, 18.1)

T2: 62 (6.3, 45.6)

General Description

MANUAL TRANSMISSION AND DIFFERENTIAL

7. TRANSMISSION MOUNTING



MT-00448

- | | |
|-------------------------|------------------------|
| (1) Pitching stopper | (7) Cushion D |
| (2) Spacer | (8) Center crossmember |
| (3) Cushion C | (9) Rear plate |
| (4) Front plate | (10) Front crossmember |
| (5) Rear cushion rubber | |
| (6) Rear crossmember | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 35 (3.6, 26)

T2: 50 (5.1, 36.9)

T3: 58 (5.9, 43)

T4: 70 (7.1, 51)

T5: 140 (14.3, 103)

C: CAUTION

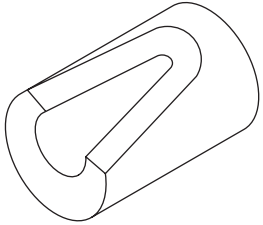
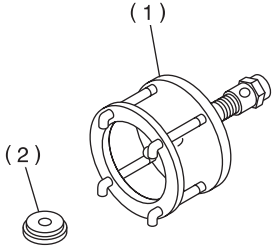
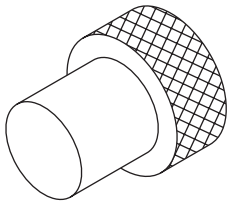
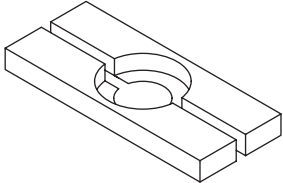
- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- When disassembling the case and other light alloy parts, use a plastic hammer to force it apart. Do not pry apart with screwdrivers or other tools.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Use SUBARU genuine gear oil, grease or the equivalent. Do not mix gear oil, grease, etc. with those of different grades or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Apply gear oil onto sliding or revolving surfaces before installation.
- Replace deformed or damaged snap rings with new parts.
- Before installing O-rings or oil seals, apply sufficient amount of gear oil to avoid damage and deformation.
- Be careful not to incorrectly install or fail to install O-rings, snap rings and other such parts.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Avoid damaging the mating surface of the case.
- Before applying liquid gasket, completely remove the liquid gasket.

General Description

MANUAL TRANSMISSION AND DIFFERENTIAL

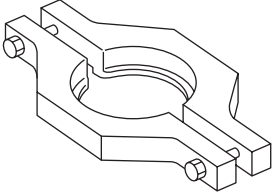
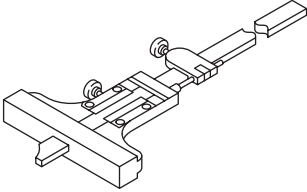
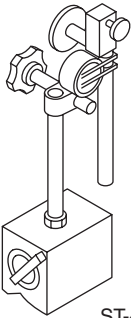
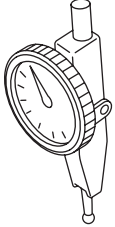
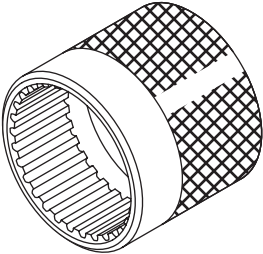
D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-399411700</p>	399411700	ACCENT BALL INSTALLER	Used for installing reverse shifter rail arm.
 <p style="text-align: center;">ST-899524100</p>	899524100	PULLER SET	Used for removing and installing the roller bearing (Differential). (1) Puller (2) Cap
 <p style="text-align: center;">ST-399780104</p>	399780104	WEIGHT	Used for measuring preload on the roller bearing.
 <p style="text-align: center;">ST-498077000</p>	498077000	REMOVER	Used for removing the roller bearing of the drive pinion shaft.

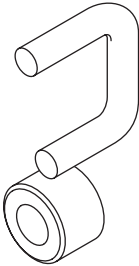
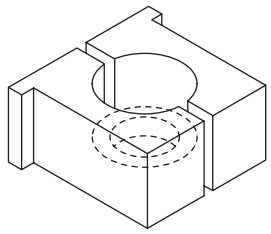
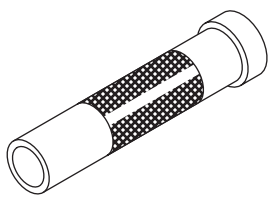
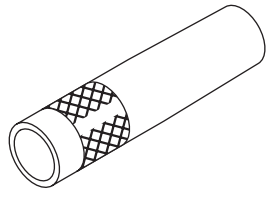
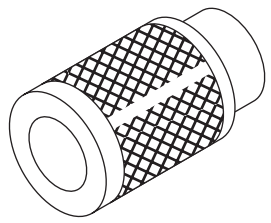
General Description

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST-498077300</p>	498077300	CENTER DIFFERENTIAL BEARING REMOVER	Used for removing the center differential cover ball bearing.
 <p>ST-498147000</p>	498147000	DEPTH GAUGE	Used for adjusting the main shaft axial end play.
 <p>ST-498247001</p>	498247001	MAGNET BASE	<ul style="list-style-type: none"> • Used for measuring backlash between the side gear and pinion, and the hypoid gear. • Used together with DIAL GAUGE (498247100).
 <p>ST-498247100</p>	498247100	DIAL GAUGE	<ul style="list-style-type: none"> • Used for measuring backlash between the side gear and pinion, and the hypoid gear. • Used together with MAGNET BASE (498247001).
 <p>ST-498247400</p>	498247400	STOPPER	Used for securing the drive pinion shaft assembly and the driven gear assembly when removing the drive pinion shaft assembly lock nut.

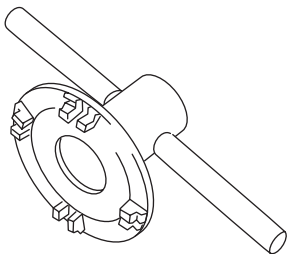
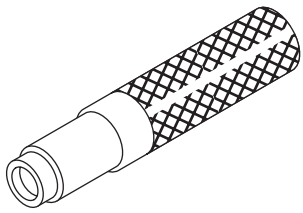
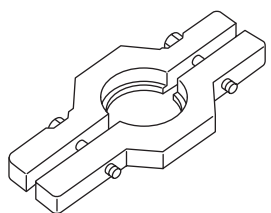
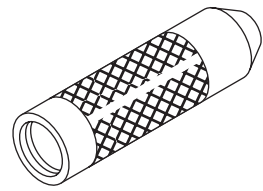
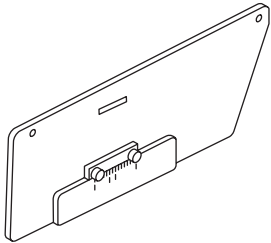
General Description

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-498787100</p>	498787100	MAIN SHAFT STOPPER	Used for removing and installing the lock nut of the transmission main shaft.
 <p style="text-align: center;">ST-498937000</p>	498937000	TRANSMISSION HOLDER	Used for removing and installing the lock nut of the transmission main shaft.
 <p style="text-align: center;">ST-499277100</p>	499277100	BUSHING 1-2 INSTALLER	<ul style="list-style-type: none"> • Used for installing the 1st driven gear thrust plate and the 1st-2nd driven gear bushing. • Used for installing the roller bearing outer race to the differential case.
 <p style="text-align: center;">ST-499277200</p>	499277200	INSTALLER	Used for press-fitting the 2nd driven gear, roller bearings and the 5th driven gear onto the driven shaft.
 <p style="text-align: center;">ST-499757002</p>	499757002	INSTALLER	<ul style="list-style-type: none"> • Used for installing the snap ring (OUT 25), and ball bearing (25 × 26 × 17). • Used for installing the bearing cone of the transfer driven gear (extension core side).

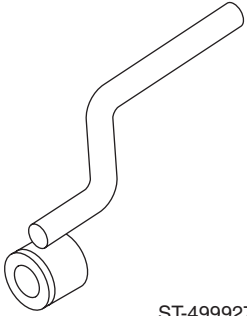
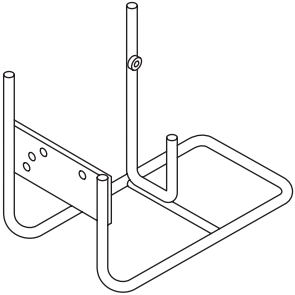
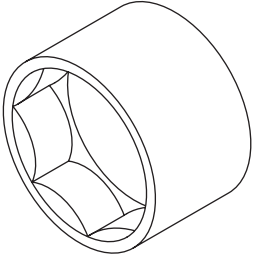
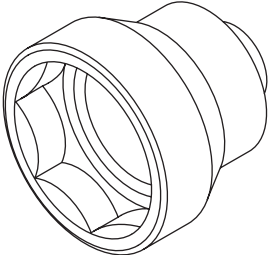
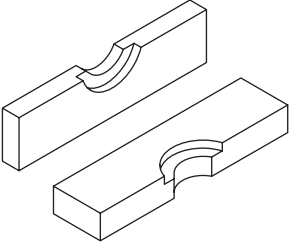
General Description

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST18630AA010</p>	18630AA010	WRENCH COMPL RETAINER	<ul style="list-style-type: none"> • Used for removing and installing the differential side retainer. • WRENCH ASSEMBLY (499787000) can also be used.
 <p>ST-499827000</p>	499827000	PRESS	Used for installing the speedometer oil seal when attaching the speedometer cable to the transmission.
 <p>ST-499857000</p>	499857000	5TH DRIVEN GEAR REMOVER	Used for removing the 5th driven gear.
 <p>ST-499877000</p>	499877000	RACE 4-5 INSTALLER	<ul style="list-style-type: none"> • Used for installing the 4th needle bearing race and ball bearing onto the transmission main shaft. • Used together with REMOVER (899714110).
 <p>ST-499917500</p>	499917500	DRIVE PINION GAUGE ASSY	Used for adjusting the drive pinion shim.

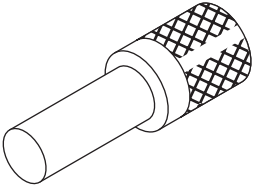
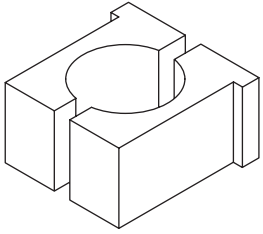
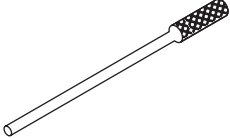
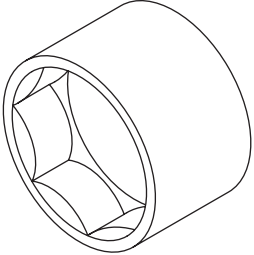
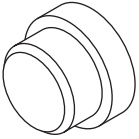
General Description

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-499927100</p>	499927100	HANDLE	Used for fitting the transmission main shaft.
 <p style="text-align: center;">ST-499937100</p>	499937100	TRANSMISSION STAND	Used for disassembling and assembling the transmission.
 <p style="text-align: center;">ST-499987003</p>	499987003	SOCKET WRENCH (35)	Used for removing and installing the driven pinion lock nut and main shaft lock nut.
 <p style="text-align: center;">ST-499987300</p>	499987300	SOCKET WRENCH (50)	Used for removing and installing the driven gear assembly lock nut.
 <p style="text-align: center;">ST-899714110</p>	899714110	REMOVER	Used for fixing the transmission main shaft, drive pinion, rear drive shaft.

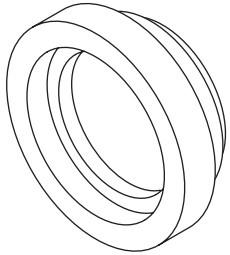
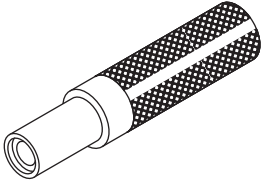
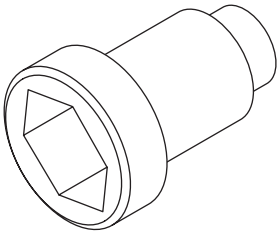
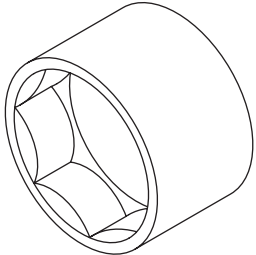
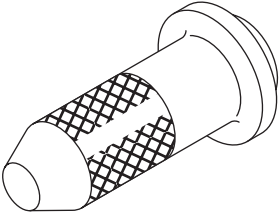
General Description

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST-899864100</p>	899864100	REMOVER	Used for removing transmission main shaft and drive pinion parts.
 <p>ST-899884100</p>	899884100	HOLDER	Used for tightening the lock nut on the sleeve.
 <p>ST-899904100</p>	899904100	REMOVER	Used for removing and installing the straight pin.
 <p>ST-899988608</p>	899988608	SOCKET WRENCH (27)	Used for removing and installing the drive pinion lock nut.
 <p>ST-398497701</p>	398497701	ADAPTER	<ul style="list-style-type: none"> • Used for installing roller bearing onto the differential case. • Used together with INSTALLER (499277100).

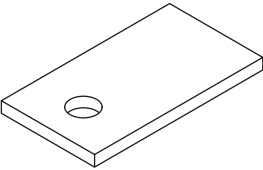
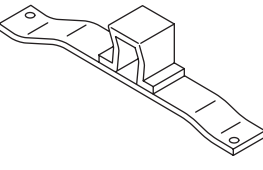
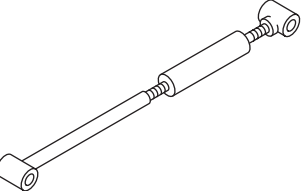
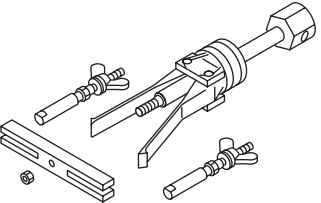
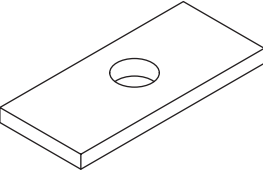
General Description

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-499587000</p>	499587000	INSTALLER	Used for installing the driven gears to the driven shaft.
 <p style="text-align: center;">ST-899824100</p>	899824100	PRESS	Used for installing the speedometer shaft oil seal.
 <p style="text-align: center;">ST-499987100</p>	499987100	SOCKET WRENCH (35)	Used for removing and installing the drive pinion lock nut.
 <p style="text-align: center;">ST-899984103</p>	899984103	SOCKET WRENCH (35)	Used for removing and installing the drive pinion lock nut.
 <p style="text-align: center;">ST-498057300</p>	498057300	INSTALLER	Used for installing the extension oil seal.

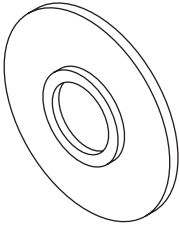
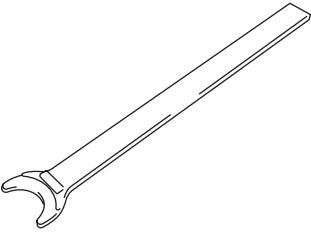
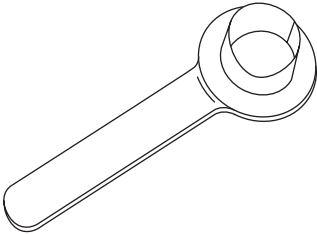
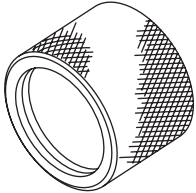
General Description

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST-498255400</p>	498255400	PLATE	Used for measuring backlash.
 <p>ST41099AA010</p>	41099AA010	ENGINE SUPPORT BRACKET	Used for supporting the engine.
 <p>ST41099AA020</p>	41099AA020	ENGINE SUPPORT	Used for supporting the engine.
 <p>ST-398527700</p>	398527700	PULLER ASSY	<ul style="list-style-type: none"> • Used for removing the extension case roller bearing. • Used for removing the front differential side retainer bearing outer race. • Used for removing the front differential side retainer oil seal.
 <p>ST-398643600</p>	398643600	GAUGE	Used for measuring the total end play, extension end play and drive pinion height.

General Description

MANUAL TRANSMISSION AND DIFFERENTIAL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-398177700</p>	398177700	INSTALLER	<ul style="list-style-type: none"> • Used for installing the bearing cone of transfer driven gear (transfer case side). • Used for installing the ball bearing of the transfer drive gear.
 <p style="text-align: center;">ST28399SA000</p>	28399SA000	FRONT DRIVE SHAFT REMOVER	Used for removing the front drive shaft. (common for the MT model, and the AT model)
 <p style="text-align: center;">ST28399SA010</p>	28399SA010	FRONT DRIVE SHAFT OIL SEAL PROTECTOR	Used for protecting the oil seal from damage when inserting the front drive shaft.
 <p style="text-align: center;">ST18675AA000</p>	18675AA000	DIFFERENTIAL SIDE OIL SEAL INSTALLER	Used for installing the differential side retainer oil seal.

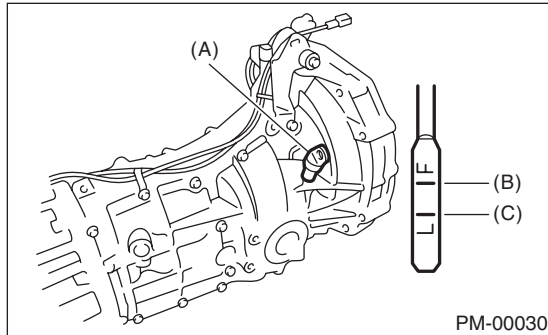
2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.

2. Transmission Gear Oil

A: INSPECTION

- 1) Park the vehicle on a level surface.
- 2) Turn the ignition switch to OFF, and wait until the engine cools.
- 3) Remove the oil level gauge and wipe it clean.
- 4) Reinsert the level gauge all the way. Be sure that the level gauge is correctly inserted and in the proper direction.
- 5) Pull out the oil level gauge again and check the oil level. If it is below the lower level, add oil through the oil level gauge hole to bring the level up to the upper level.



- (A) Oil level gauge
- (B) Upper level
- (C) Lower level

B: REPLACEMENT

- 1) Pull out the oil level gauge.
- 2) Lift-up the vehicle.
- 3) Drain transmission gear oil completely.

CAUTION:

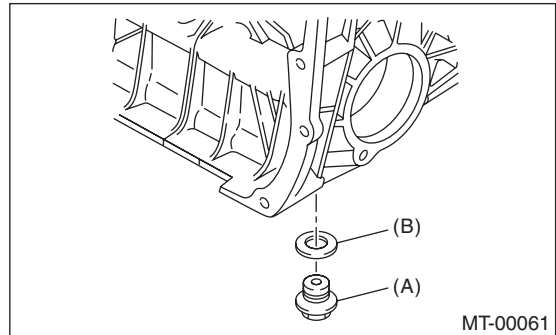
- Immediately after the engine has been running, the transmission gear oil is hot. Be careful not to burn yourself.
- Be careful not to spill the transmission gear oil on exhaust pipe, to prevent emitting smoke or causing a fire. If differential gear oil is spilled on the exhaust pipe, wipe it off completely.

- 4) Use a new gasket, and tighten the transmission gear oil drain plug.

Tightening torque:

44 N·m (4.5 kgf-m, 32.5 ft-lb) (Aluminum gasket)

70 N·m (7.1 kgf-m, 51.6 ft-lb) (Copper gasket)



- (A) Drain plug
- (B) Gasket

- 5) Lower the vehicle.
- 6) Pour the gear oil into the gauge hole.

RECOMMENDED GEAR OIL

Use GL-5 or the equivalent.

Gear oil capacity

3.5 ℓ (3.7 US qt, 3.1 Imp qt)

- 7) Measure the transmission gear oil level to check that it is within specifications.

CAUTION:

When inserting the level gauge into the transmission, align the protrusion on the top part of the level gauge with the notch in the gauge hole.

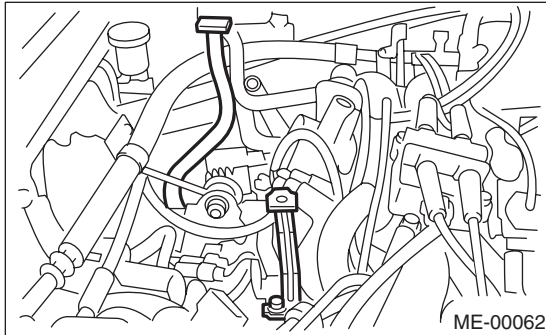
Manual Transmission Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

3. Manual Transmission Assembly

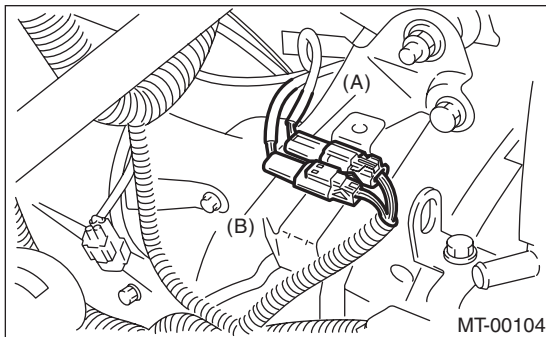
A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Open the front hood fully, and support with stay.
- 3) Disconnect the ground cable from the battery.
- 4) Drain transmission gear oil completely.
<Ref. to 5MT-25, REPLACEMENT, Transmission Gear Oil.>
- 5) Remove the air intake duct and air cleaner case. (Non-turbo model) <Ref. to IN (H4SO)-6, REMOVAL, Air Intake Chamber.>
- 6) Remove the air cleaner case. (Non-turbo model)



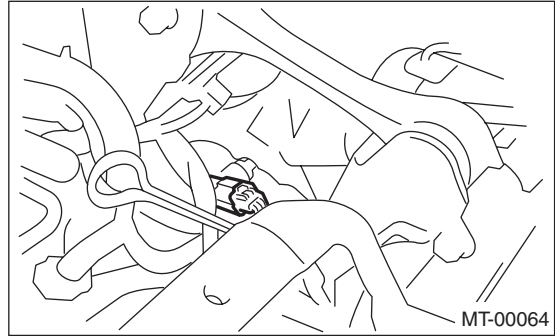
- 7) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 8) Disconnect the following connectors and transmission cables.

- (1) Neutral position switch connector
 - (2) Back-up light switch connector
- Non-turbo model

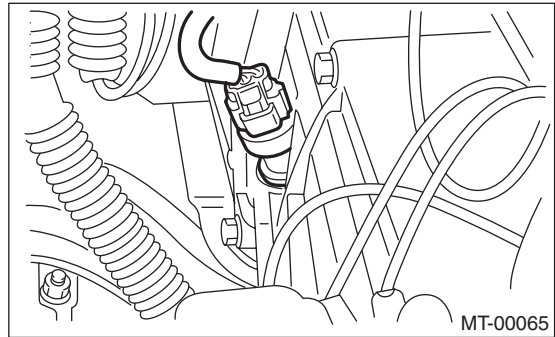


- (A) Neutral position switch connector
(B) Back-up light switch connector

- Turbo model

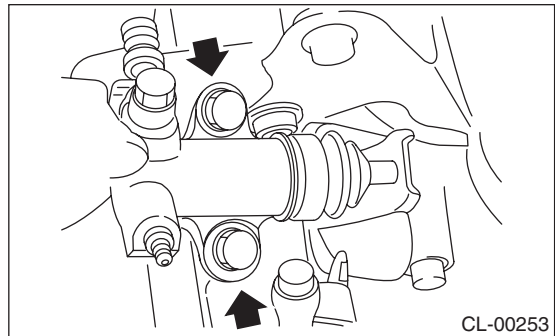


- (3) Vehicle speed sensor connector

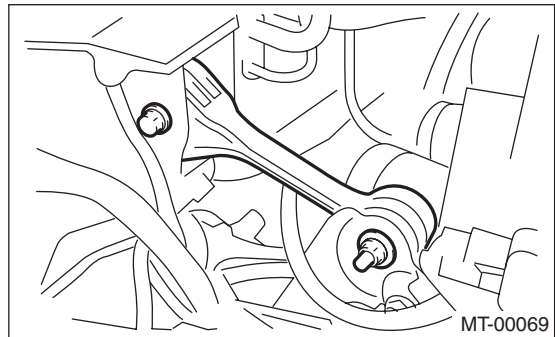


- 9) Remove the starter. <Ref. to SC (H4SO)-6, REMOVAL, Starter.>

- 10) Remove the operating cylinder from transmission, and suspend on a wire.



- 11) Remove the pitching stopper.



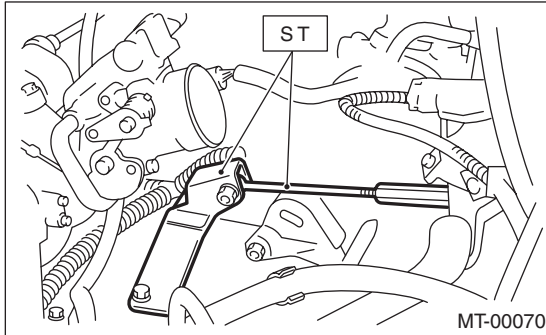
Manual Transmission Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

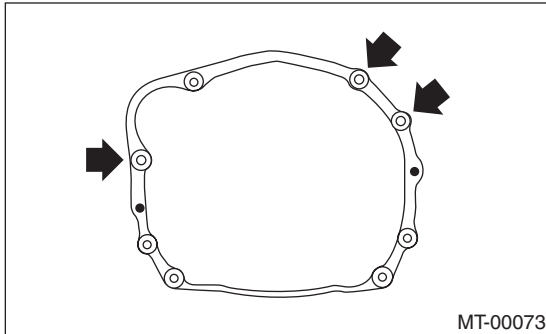
12) Set the ST.

ST 41099AA010 ENGINE SUPPORT BRACKET

ST 41099AA020 ENGINE SUPPORT



13) Remove the bolts which hold upper side of transmission to engine.



14) Remove the front and center exhaust pipes. (Non-turbo model) <Ref. to EX (H4SO)-4, REMOVAL, Front Exhaust Pipe.>

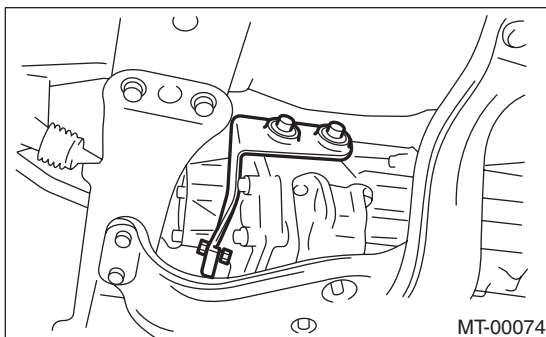
15) Remove the center exhaust pipe. (Turbo model) <Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>

16) Remove the rear exhaust pipe and muffler.

CAUTION:

When removing the exhaust pipes, be careful each exhaust pipe does not drop out.

17) Remove the hanger bracket from the right side of transmission.

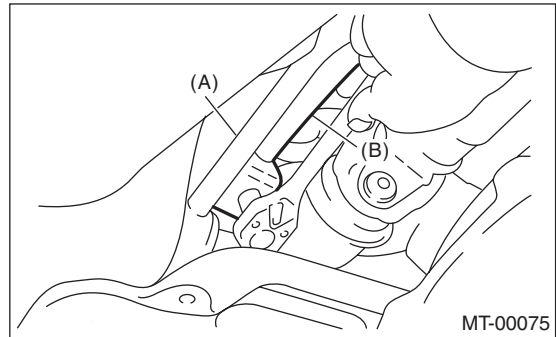


18) Remove the propeller shaft. <Ref. to DS-12, REMOVAL, Propeller Shaft.>

19) Remove the gear shift rod and the stay from the transmission.

(1) Disconnect the stay from the transmission.

(2) Remove the gear shift rod from the transmission.

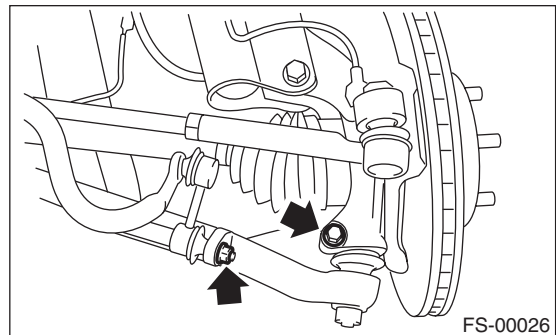


(A) Stay

(B) Gear shift rod

20) Separate the stabilizer link from the transverse link.

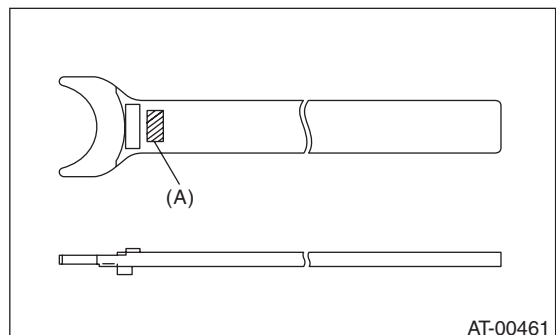
21) Remove the bolt securing the ball joint of the transverse link to the housing, then separate the transverse link and the housing.



22) Using the ST, remove the front drive shaft from the transmission side.

NOTE:

• Face letters "MT" on the handle of the ST to the transmission side.



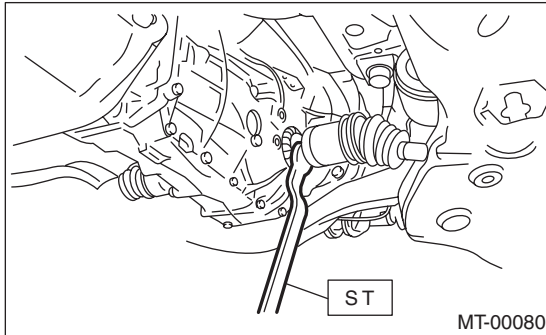
(A) Letter "MT"

Manual Transmission Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

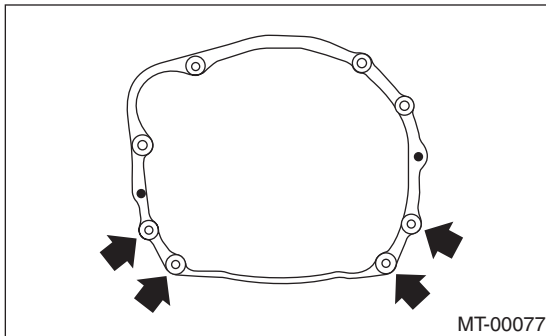
- Keep an angle so that the protrusion of the ST touches the transmission case during the operation.

ST 28399SA000 FRONT DRIVE SHAFT REMOVER



- 23) Hold the transmission side joint (AARi) of front drive shaft by hand and extract the housing from the transmission by pressing it outside so as not to stretch the boot on the AARi side.

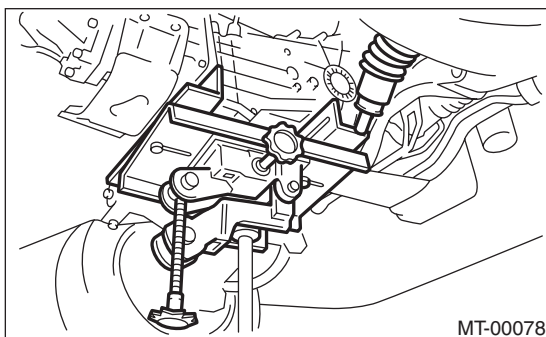
- 24) Remove the bolts and nuts which hold lower side of transmission to engine.



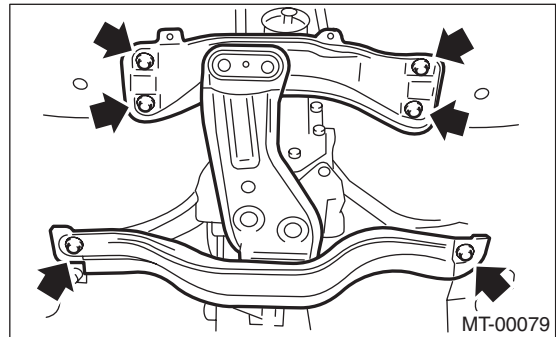
- 25) Place the transmission jack under the transmission.

CAUTION:

Always support the transmission case with a transmission jack.



- 26) Remove the transmission rear crossmember from the vehicle.



- 27) Remove the transmission.

NOTE:

Move the transmission jack towards the rear until main shaft is withdrawn from the clutch cover.

- 28) Separate the transmission assembly from the rear cushion rubber.

B: INSTALLATION

- 1) Replace the differential side retainer oil seal with a new part. <Ref. to 5MT-34, REPLACEMENT, Differential Side Retainer Oil Seal.>

NOTE:

Be sure to replace the differential side retainer oil seal after the removing the front drive shaft.

- 2) Install the rear cushion rubber to the transmission assembly.

Tightening torque:

35 N·m (3.57 kgf·m, 25.8 ft·lb)

- 3) Install the transmission onto the engine.

(1) Gradually raise the transmission with the transmission jack.

(2) Engage at the spline section.

NOTE:

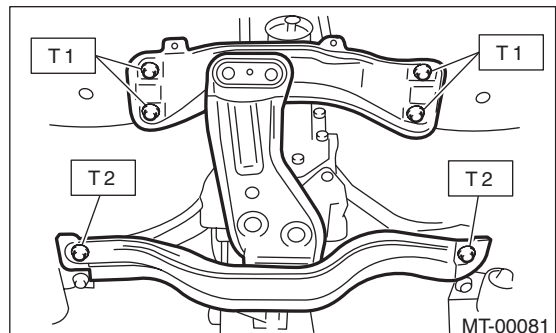
Be careful not to hit the main shaft against the clutch cover.

- 4) Install the transmission rear crossmember.

Tightening torque:

T1: 70 N·m (7.1 kgf·m, 51 ft·lb)

T2: 140 N·m (14.3 kgf·m, 103 ft·lb)



- 5) Take out the transmission jack.

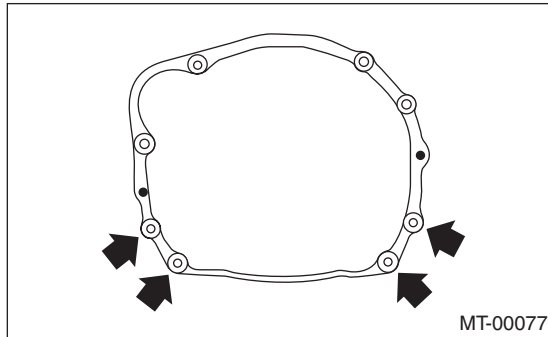
Manual Transmission Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

6) Tighten the nuts and bolts which holds the lower side of the transmission to the engine.

Tightening torque:

50 N-m (5.1 kgf-m, 36.9 ft-lb)



7) Connect the engine and transmission.

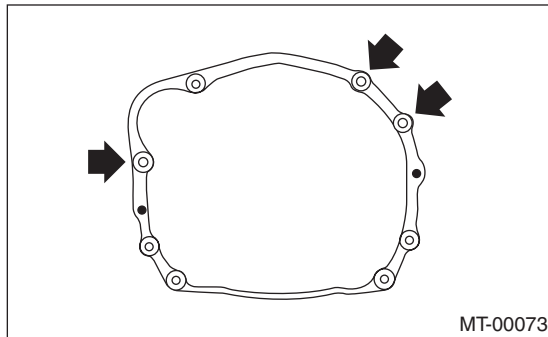
(1) Install the starter.

<Ref. to SC (H4SO)-6, INSTALLATION, Starter.>

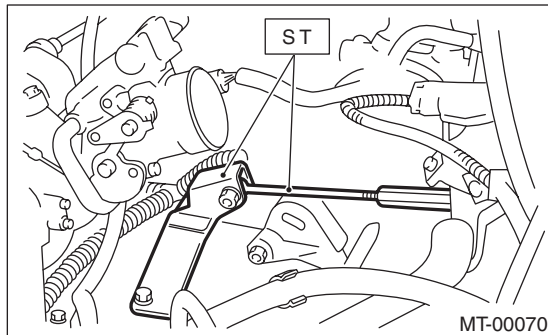
(2) Tighten the bolts which holds the upper side of the transmission to the engine.

Tightening torque:

50 N-m (5.1 kgf-m, 36.9 ft-lb)



8) Remove the ST.

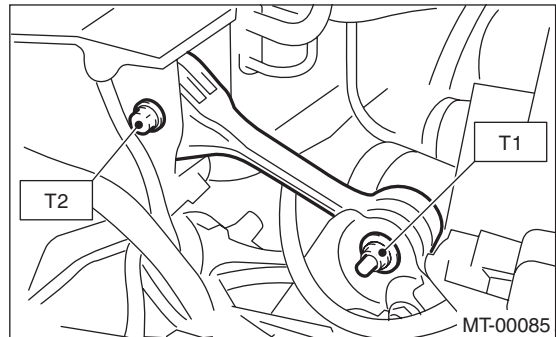


9) Install the pitching stopper.

Tightening torque:

T1: 50 N-m (5.1 kgf-m, 36.9 ft-lb)

T2: 58 N-m (5.9 kgf-m, 43 ft-lb)



10) Lift-up the vehicle.

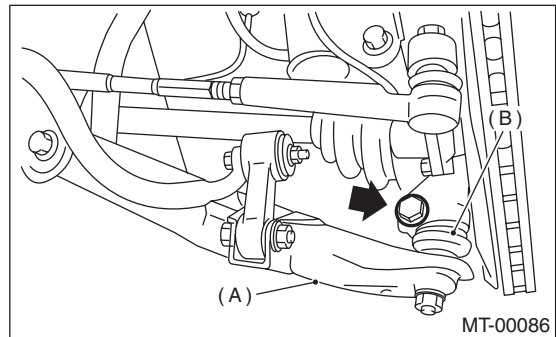
11) Install the front drive shaft into the transmission. <Ref. to DS-30, INSTALLATION, Front Drive Shaft.>

ST 28399SA010 FRONT DRIVE SHAFT OIL SEAL PROTECTOR

12) Insert the ball joints of the lower arm into the housing, then tighten the installing bolts.

Tightening torque:

49 N-m (5.0 kgf-m, 36 ft-lb)



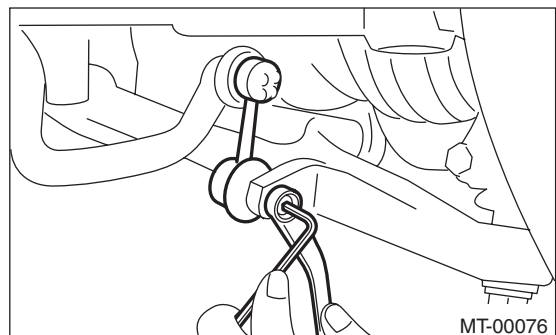
(A) Transverse link

(B) Ball joint

13) Attach the stabilizer link to the transverse link.

Tightening torque:

45 N-m (4.6 kgf-m, 33.2 ft-lb)

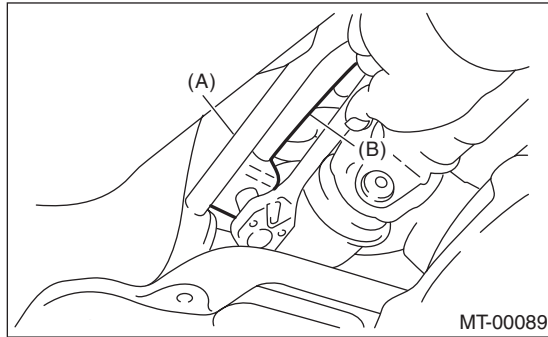


Manual Transmission Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

- 14) Attach the gear shift rod and stay.
(1) Attach the gear shift rod to the transmission.

Tightening torque:
12 N·m (1.2 kgf·m, 8.9 ft·lb)

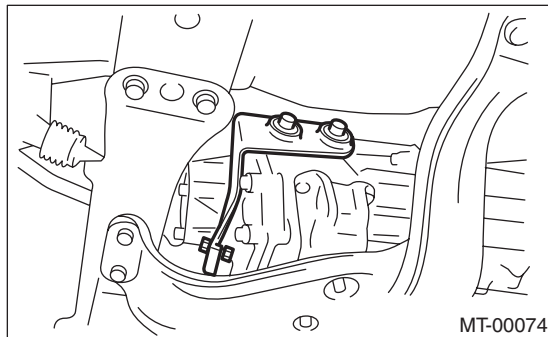


- (A) Stay
(B) Gear shift rod

- (2) Attach the stay to the transmission.

Tightening torque:
18 N·m (1.8 kgf·m, 13.0 ft·lb)

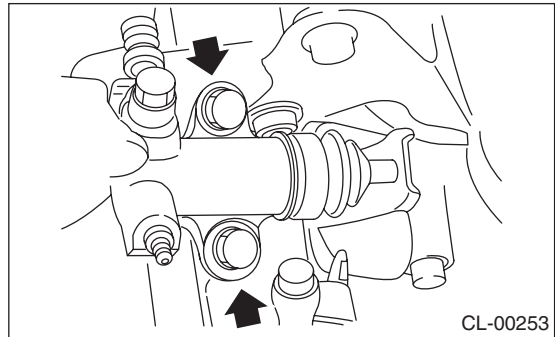
- 15) Install the propeller shaft. <Ref. to DS-13, INSTALLATION, Propeller Shaft.>
16) Install the hanger bracket on the right side of the transmission.



- 17) Install the rear exhaust pipe and muffler.
18) Install the front exhaust pipe and the center exhaust pipe. (Non-turbo model)
<Ref. to EX (H4SO)-5, INSTALLATION, Front Exhaust Pipe.>
19) Install the center exhaust pipe. (Turbo model)
<Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.>
20) Install the under cover.

- 21) Install the operating cylinder.

Tightening torque:
37 N·m (3.8 kgf·m, 27.5 ft·lb)



- 22) Connect the following connectors.
(1) Transmission ground cable

Tightening torque:
13 N·m (1.3 kgf·m, 9.4 ft·lb)
(2) Vehicle speed sensor connector
(3) Neutral position switch connector
(4) Back-up light switch connector

- 23) Install the air cleaner case stay.
24) Install the air intake chamber. <Ref. to IN (H4SO)-6, INSTALLATION, Air Intake Chamber.>
25) Install the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>
26) Pour transmission gear oil through the gauge hole. <Ref. to 5MT-25, REPLACEMENT, Transmission Gear Oil.>
27) Connect the ground cable to the battery.

Transmission Mounting System

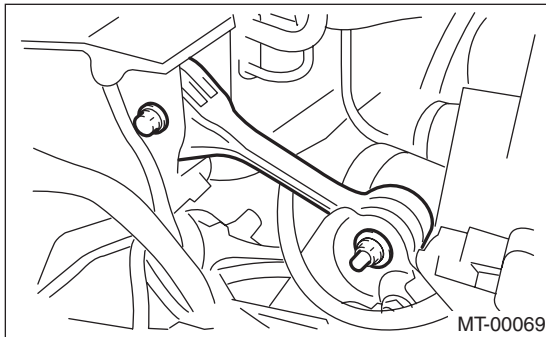
MANUAL TRANSMISSION AND DIFFERENTIAL

4. Transmission Mounting System

A: REMOVAL

1. PITCHING STOPPER

- 1) Disconnect the ground cable from the battery.
- 2) Remove the air intake duct and cleaner case.
- 3) Remove the air intake duct. (Non-turbo model)
- 4) Remove the air intake chamber. (Non-turbo model) <Ref. to IN (H4SO)-6, REMOVAL, Air Intake Chamber.>
- 5) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 6) Remove the pitching stopper.



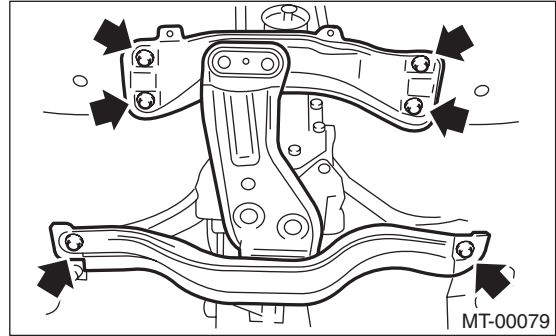
2. CROSSMEMBER AND CUSHION RUBBER

- 1) Disconnect the ground cable from the battery.
- 2) Jack-up the vehicle and support it with rigid racks.
- 3) Remove the front and center exhaust pipes. (Non-turbo model) <Ref. to EX (H4SO)-4, REMOVAL, Front Exhaust Pipe.> <Ref. to EX (H4SO)-7, REMOVAL, Center Exhaust Pipe.>
- 4) Remove the center exhaust pipe. (Turbo model) <Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
- 5) Remove the rear exhaust pipe and muffler.
- 6) Set the transmission jack under the transmission body.

CAUTION:

Always support the transmission case with a transmission jack.

- 7) Remove the rear crossmember.



- 8) Remove the rear cushion rubber.

B: INSTALLATION

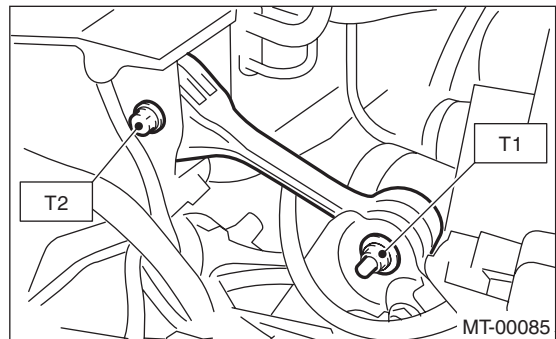
1. PITCHING STOPPER

- 1) Install the pitching stopper.

Tightening torque:

T1: 50 N·m (5.1 kgf-m, 36.9 ft-lb)

T2: 58 N·m (5.9 kgf-m, 43 ft-lb)



- 2) Install the air intake duct and air intake chamber. (Non-turbo model) <Ref. to IN (H4SO)-6, INSTALLATION, Air Intake Chamber.>
- 3) Install the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>
- 4) Connect the ground cable to the battery.

Transmission Mounting System

MANUAL TRANSMISSION AND DIFFERENTIAL

2. CROSSMEMBER AND CUSHION RUBBER

1) Install the rear cushion rubber.

Tightening torque:

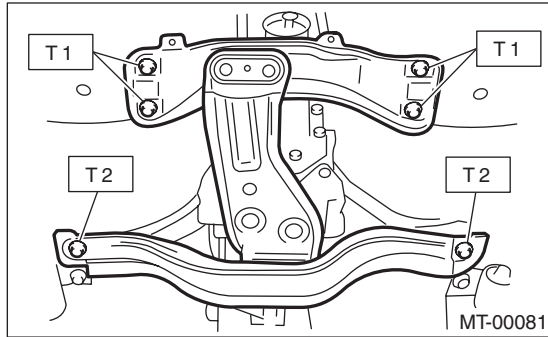
35 N·m (3.6 kgf·m, 26 ft·lb)

2) Install the rear crossmember.

Tightening torque:

T1: 70 N·m (7.1 kgf·m, 51 ft·lb)

T2: 140 N·m (14.3 kgf·m, 103 ft·lb)



3) Remove the transmission jack.

4) Install the front and center exhaust pipe. (Non-turbo model)

<Ref. to EX (H4SO)-5, INSTALLATION, Front Exhaust Pipe.>

5) Install the center exhaust pipe. (Turbo model)
<Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.>

6) Install the rear exhaust pipe and muffler.

C: INSPECTION

Perform the following inspection procedures, and repair or replace faulty parts.

1. PITCHING STOPPER

Make sure that the pitching stopper is not bent or damaged. Check that the rubber is not stiff, cracked or otherwise damaged.

2. CROSSMEMBER AND CUSHION RUBBER

Make sure that the crossmember is not bent or damaged. Check that the cushion rubber is not stiff, cracked, or otherwise damaged.

5. Oil Seal

A: INSPECTION

Check the oil seals for leaks. If leaking, replace with a new oil seal.

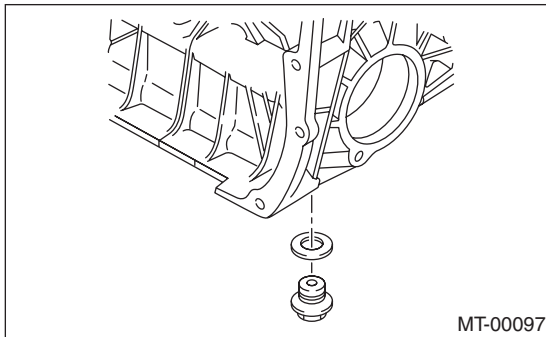
B: REPLACEMENT

- 1) Clean the transmission exterior.
- 2) Drain gear oil completely.
- 3) Tighten the drain plug after draining gear oil and replacing with a new gasket.

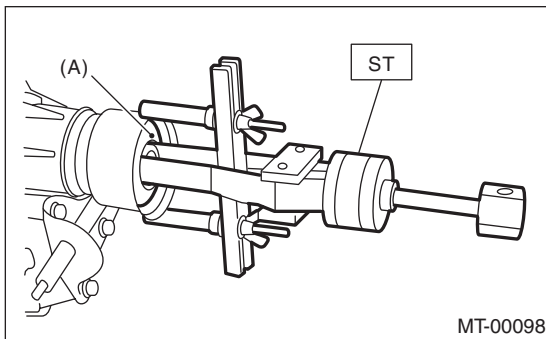
Tightening torque:

44 N·m (4.5 kgf·m, 32.5 ft·lb) (Aluminum gasket)

70 N·m (7.1 kgf·m, 51.6 ft·lb) (Copper gasket)

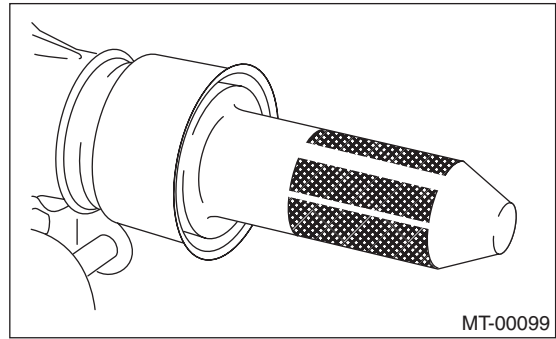


- 4) Remove the rear exhaust pipe and muffler.
 - 5) Remove the propeller shaft. <Ref. to DS-12, REMOVAL, Propeller Shaft.>
 - 6) Using the ST, remove the oil seal.
- ST 398527700 PULLER ASSY



(A) Oil seal

- 7) Using the ST, install the oil seal.
- ST 498057300 INSTALLER



- 8) Install the propeller shaft. <Ref. to DS-13, INSTALLATION, Propeller Shaft.>
- 9) Install the rear exhaust pipe and muffler.
- 10) Pour in gear oil and check the oil level. <Ref. to 5MT-25, REPLACEMENT, Transmission Gear Oil.>

Differential Side Retainer Oil Seal

MANUAL TRANSMISSION AND DIFFERENTIAL

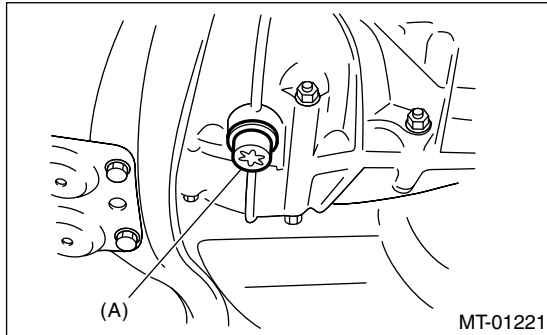
6. Differential Side Retainer Oil Seal

A: INSPECTION

Check for leakage of gear oil from the differential side retainer oil seal. If there is an oil leak, replace the oil seal.

B: REPLACEMENT

- 1) Lift-up the vehicle.
- 2) Drain the differential gear oil from the differential oil drain plug.



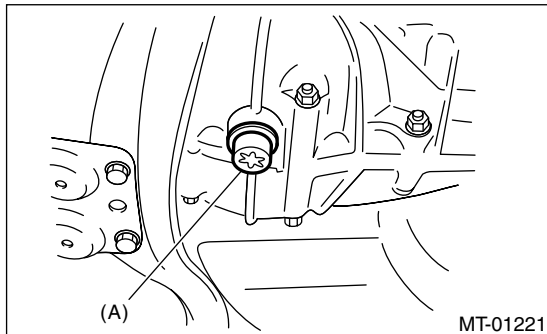
(A) Drain plug

- 3) Replace the gasket with a new part and tighten the differential oil drain plug.

Tightening torque:

44 N·m (4.5 kgf·m, 32.5 ft·lb) (Aluminum gasket)

70 N·m (7.1 kgf·m, 51.6 ft·lb) (Copper gasket)



(A) Drain plug

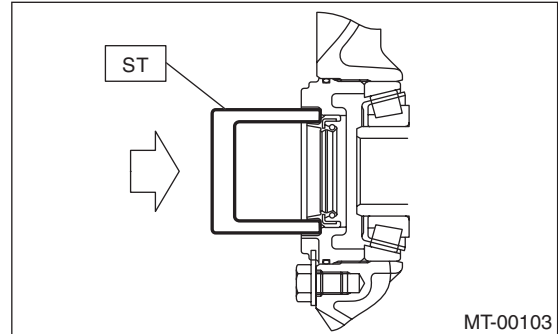
- 4) Remove the front and center exhaust pipes. (Non-turbo model) <Ref. to EX (H4SO)-4, REMOVAL, Front Exhaust Pipe.>
- 5) Separate the front drive shaft from the transmission. <Ref. to DS-29, REMOVAL, Front Drive Shaft.>
- 6) Remove the differential side retainer oil seal using a screw driver wrapped with vinyl tape etc.

- 7) Using the ST, install the differential side retainer oil seal by lightly tapping with a hammer.

ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER

NOTE:

Apply oil to the oil seal lips.



- 8) Install the front drive shaft. <Ref. to DS-30, INSTALLATION, Front Drive Shaft.>

- 9) Install the front and center exhaust pipe. (Non-turbo model) <Ref. to EX (H4SO)-5, INSTALLATION, Front Exhaust Pipe.>

- 10) Lower the vehicle.

- 11) Pour gear oil through the gauge hole. <Ref. to 5MT-25, REPLACEMENT, Transmission Gear Oil.>

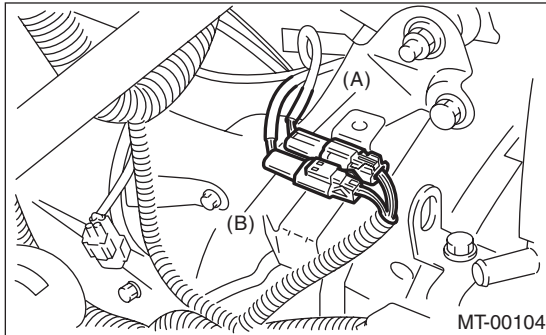
7. Switches and Harness

A: REMOVAL

1. BACK-UP LIGHT SWITCH AND NEUTRAL POSITION SWITCH

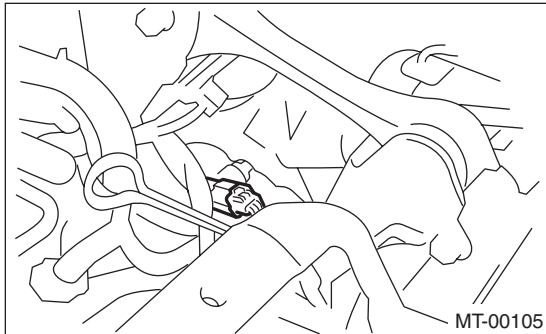
- 1) Disconnect the ground cable from the battery.
- 2) Remove the air intake chamber. (Non-turbo model) <Ref. to IN (H4SO)-6, REMOVAL, Air Intake Chamber.>
- 3) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 4) Disconnect the connector back-up light switch and neutral position switch.

- Non-turbo model



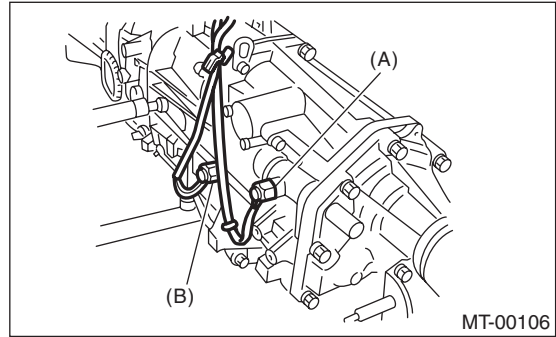
- (A) Neutral position switch connector
- (B) Back-up light switch connector

- Turbo model



- 5) Lift-up the vehicle.

- 6) Remove the back-up light switch and neutral position switch with the harness.



- (A) Neutral position switch connector
- (B) Back-up light switch connector

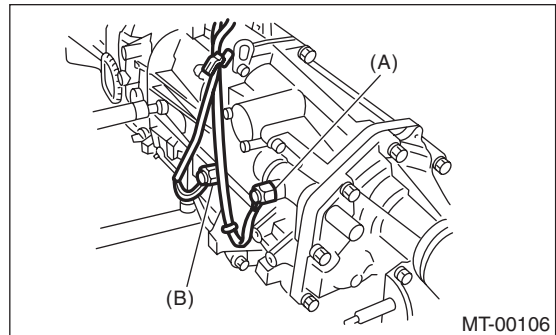
B: INSTALLATION

1. BACK-UP LIGHT SWITCH AND NEUTRAL POSITION SWITCH

- 1) Install the back-up light switch and neutral position switch with the harness.

Tightening torque:

32.3 N·m (3.3 kgf-m, 23.8 ft-lb)



- (A) Neutral position switch (Brown)
- (B) Back-up light switch (Gray)

- 2) Connect the connectors of back-up light switch and neutral position switch.
- 3) Install the air intake chamber. (Non-turbo model) <Ref. to IN (H4SO)-6, INSTALLATION, Air Intake Chamber.>
- 4) Install the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>
- 5) Connect the ground cable to the battery.

Switches and Harness

MANUAL TRANSMISSION AND DIFFERENTIAL

C: INSPECTION

1. BACK-UP LIGHT SWITCH

Check the back-up light switch. <Ref. to LI-6, INSPECTION, Back-up Light System.>

2. NEUTRAL POSITION SWITCH

- 1) Turn the ignition switch to OFF.
- 2) Disconnect the connector of neutral position switch.
- 3) Measure the resistance between neutral position switch terminals.

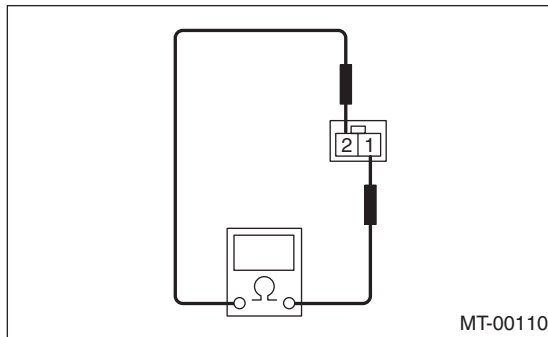
Non-turbo model:

Gear shift position	Terminal No.	Specified resistance
Neutral position	1 and 2	Less than 1 Ω
Other positions		Over 1 M Ω

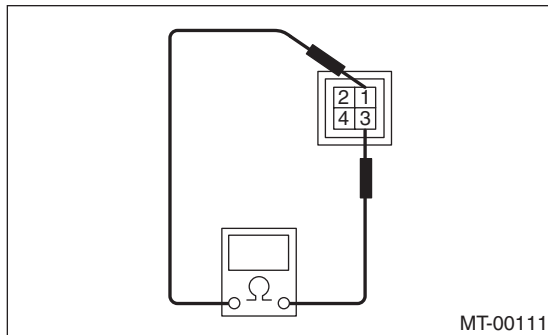
Turbo model:

Gear shift position	Terminal No.	Specified resistance
Neutral position	1 and 3	Less than 1 Ω
Other positions		Over 1 M Ω

- Non-turbo model



- Turbo model

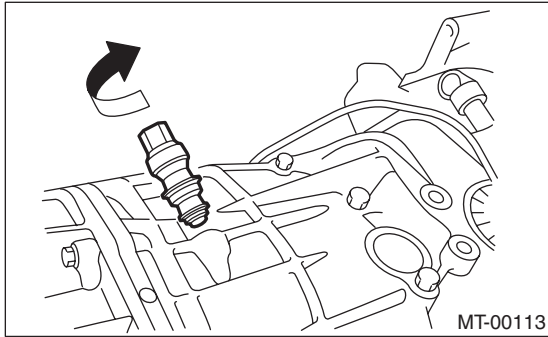


- 4) Replace faulty parts.

8. Vehicle Speed Sensor

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Lift-up the vehicle.
- 3) Remove the front, center, rear exhaust pipes and muffler.
- 4) Disconnect the connector from vehicle speed sensor.
- 5) Turn and remove the vehicle speed sensor.



B: INSTALLATION

NOTE:

- Discard the old vehicle speed sensor after removal, use a new sensor for the installation.
 - Make sure that there is no foreign matter on the sensor mounting.
 - Align the tip end of the key with the key groove on the end of speedometer shaft during installation.
- 1) Hand tighten the vehicle speed sensor.
 - 2) Tighten the vehicle speed sensor using suitable tools.

Tightening torque:

5.9 N·m (0.6 kgf-m, 4.3 ft-lb)

- 3) Connect the connector to the vehicle speed sensor.
- 4) Install the front, center and rear exhaust pipes, and the muffler.
- 5) Lower the vehicle.
- 6) Connect the ground cable to the battery.

C: INSPECTION

Inspect the vehicle speed sensor.

<Ref. to IDI-5, CHECK VEHICLE SPEED SENSOR, INSPECTION, Combination Meter System.>

Preparation for Overhaul

MANUAL TRANSMISSION AND DIFFERENTIAL

9. Preparation for Overhaul

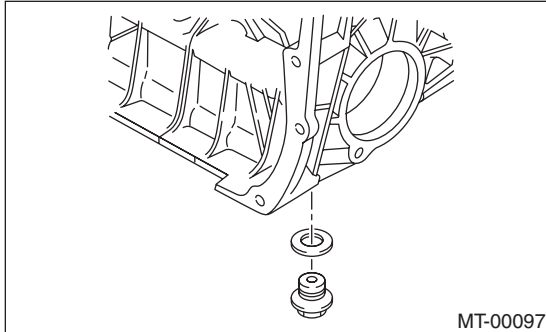
A: PROCEDURE

- 1) Clean oil, grease, dirt and dust from the transmission.
- 2) Remove the drain plug to drain oil.
- 3) Using a new gasket, and install the drain plug.

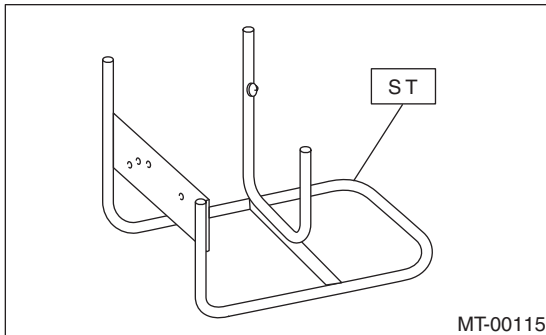
Tightening torque:

44 N·m (4.5 kgf·m, 32.5 ft·lb) (Aluminum gasket)

70 N·m (7.1 kgf·m, 51.6 ft·lb) (Copper gasket)



- 4) Attach the transmission to ST.
ST 499937100 TRANSMISSION STAND

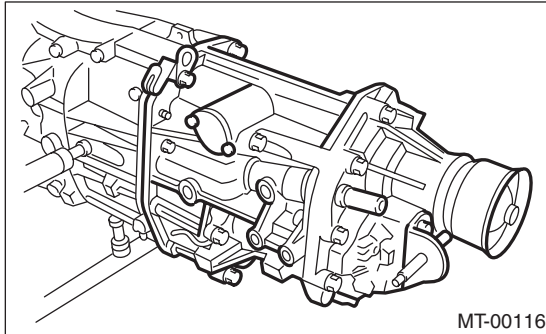


- 5) Apply oil to rotating parts before assembly.
- 6) All disassembled parts, if to be reused, should be reinstalled in the original positions and directions.
- 7) Gaskets, lock washers and lock nuts must be replaced with new parts.
- 8) Use liquid gasket to the specified areas to prevent leakage.

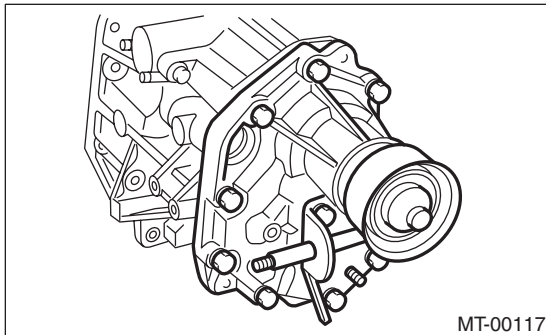
10. Transfer Case and Extension Case Assembly

A: REMOVAL

- 1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-26, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the back-up light switch and neutral position switch. <Ref. to 5MT-35, REMOVAL, Switches and Harness.>
- 3) Remove the transfer case together with the extension case assembly.

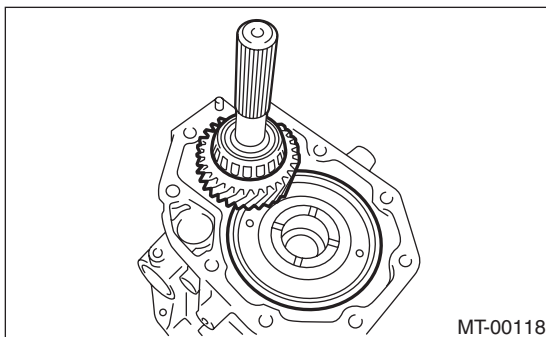


- 4) Remove the shifter arm.
- 5) Remove the extension case assembly.

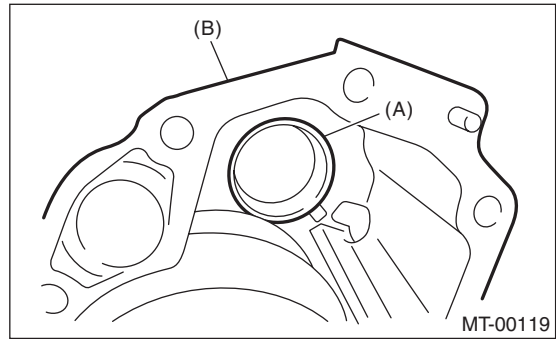


B: INSTALLATION

- 1) Install the center differential and transfer driven gear into the transfer case.

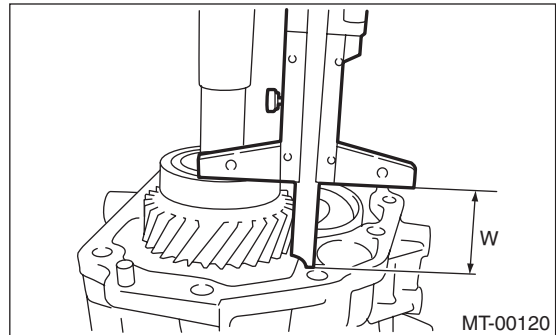


- 2) Remove the bearing outer race from the extension case.



- (A) Bearing outer race
(B) Extension case

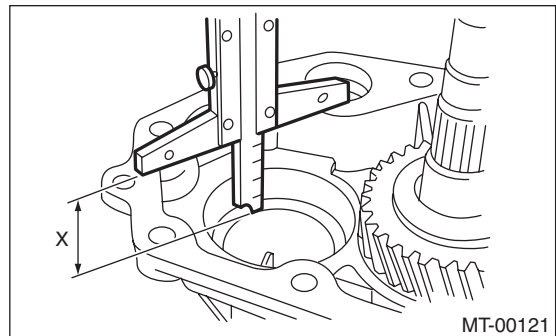
- 3) While pressing the bearing outer race horizontally, rotate the driven shaft for ten turns.
- 4) Measure the height "W" between transfer case and taper roller bearing on the transfer driven gear.



- 5) Measure the depth "X".

NOTE:

Measure with the bearing outer race mounted and the thrust washer removed.



- 6) Calculate the tight "t" using following equation. $t = X - W + (0.2 - 0.3 \text{ mm}) (0.008 - 0.012 \text{ in})$
- 7) Select the washer with the nearest value in the following table.

Tapered roller bearing preload (amount of standard protrusion):

0.2 — 0.3 mm (0.008 — 0.012 in)

Transfer Case and Extension Case Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

NOTE:

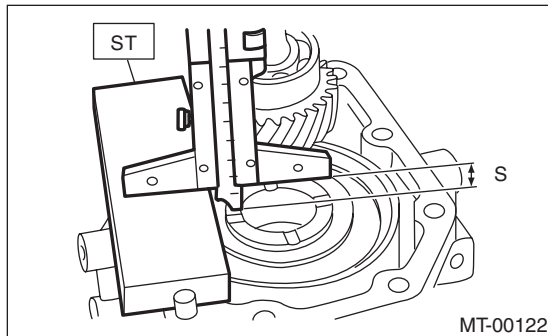
Make sure to set between the preload range.

Thrust washer (50 × 61 × t)	
Part No.	Thickness mm (in)
803050060	0.50 (0.0197)
803050061	0.55 (0.0217)
803050062	0.60 (0.0236)
803050063	0.65 (0.0256)
803050064	0.70 (0.0276)
803050065	0.75 (0.0295)
803050066	0.80 (0.0315)
803050067	0.85 (0.0335)
803050068	0.90 (0.0354)
803050069	0.95 (0.0374)
803050070	1.00 (0.0394)
803050071	1.05 (0.0413)
803050072	1.10 (0.0433)
803050073	1.15 (0.0453)
803050074	1.20 (0.0472)
803050075	1.25 (0.0492)
803050076	1.30 (0.0512)
803050077	1.35 (0.0531)
803050078	1.40 (0.0551)
803050079	1.45 (0.0571)

8) Fit the thrust washers on the transfer drive shaft.
9) Install the bearing outer race into the extension case.

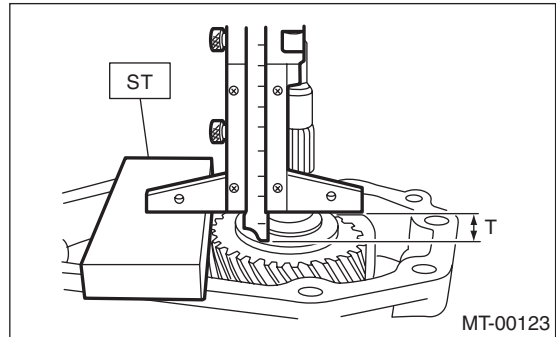
10) Measure the depth "S" between transfer case and center differential.

ST 398643600 GAUGE



11) Measure the depth "T" between extension case and transfer drive gear.

ST 398643600 GAUGE



NOTE:

ST thickness [15 mm (0.59 in)]

12) Calculate the space "U" using the following equation: $U = S + T - 30 \text{ mm (1.18 in)}$ [Thickness of ST]

13) Select a suitable washer in the following table.

Standard clearance

0.15 — 0.35 mm (0.0059 — 0.0138 in)

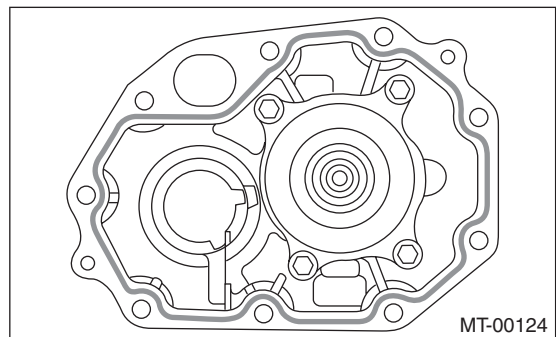
Thrust washer	
Part No.	Thickness mm (in)
803036050	0.9 (0.035)
803036054	1.0 (0.039)
803036051	1.1 (0.043)
803036055	1.2 (0.047)
803036052	1.3 (0.051)
803036056	1.4 (0.055)
803036053	1.5 (0.059)
803036057	1.6 (0.063)
803036058	1.7 (0.067)

14) Fit the thrust washer onto the center differential.

15) Apply a proper amount of liquid gasket to the transfer case mating surface.

Liquid gasket

THREE BOND 1215 (Part No. 004403007) or equivalent



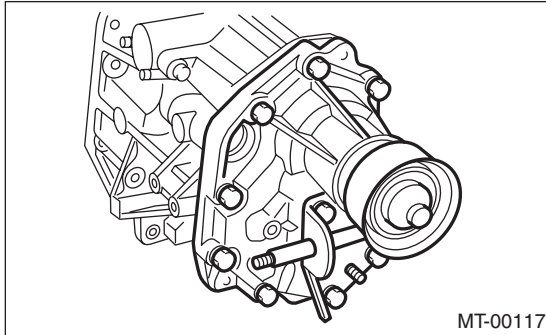
Transfer Case and Extension Case Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

16) Install the extension assembly into the transfer case.

Tightening torque:

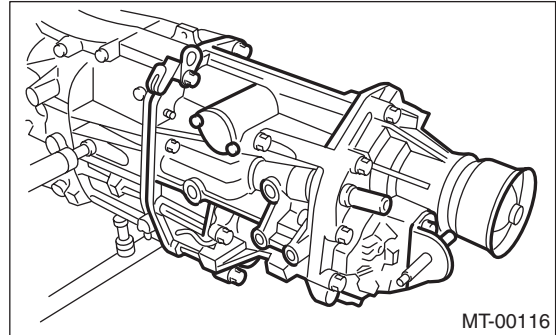
40 N·m (4.1 kgf·m, 30 ft·lb)



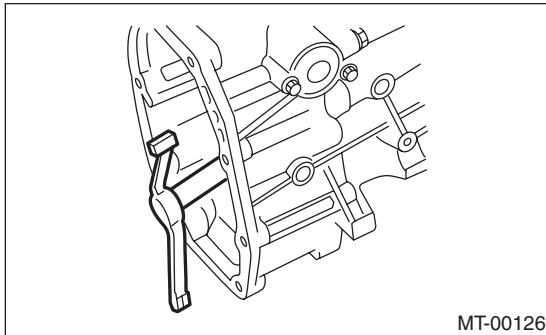
19) Install the extension case assembly along with the transfer case to the transmission case.

Tightening torque:

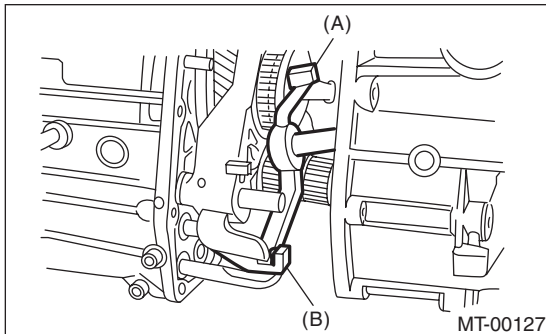
24.5 N·m (2.5 kgf·m, 18.1 ft·lb)



17) Attach the shifter arm to transfer case.



18) Hang the shifter arm on 3rd-4th fork rod.



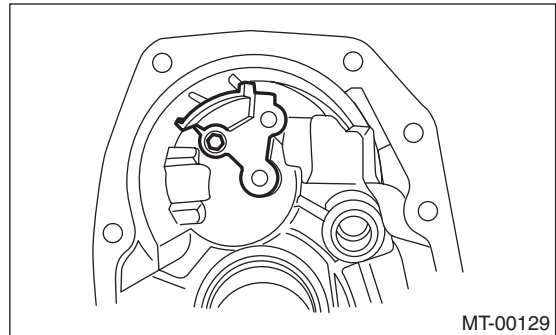
(A) Shifter arm

(B) 3rd-4th fork rod

C: DISASSEMBLY

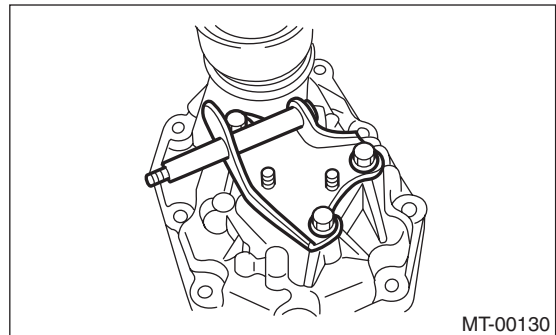
1. TRANSFER CASE

- 1) Remove the reverse check assembly. <Ref. to 5MT-48, REMOVAL, Reverse Check Sleeve.>
- 2) Remove the oil guide.



2. EXTENSION CASE

- 1) Remove the transfer drive gear assembly. <Ref. to 5MT-43, REMOVAL, Transfer Drive Gear.>
- 2) Remove the shift bracket.



- 3) Remove the oil seal from the extension case. <Ref. to 5MT-33, REPLACEMENT, Oil Seal.>

Transfer Case and Extension Case Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

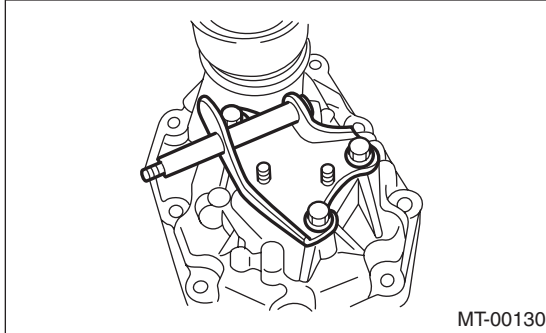
D: ASSEMBLY

1. EXTENSION CASE

- 1) Press-fit the new oil seal to the extension case using ST. <Ref. to 5MT-33, REPLACEMENT, Oil Seal.>
- 2) Install the shift bracket to extension case.

Tightening torque:

24.5 N·m (2.5 kgf-m, 18.1 ft-lb)



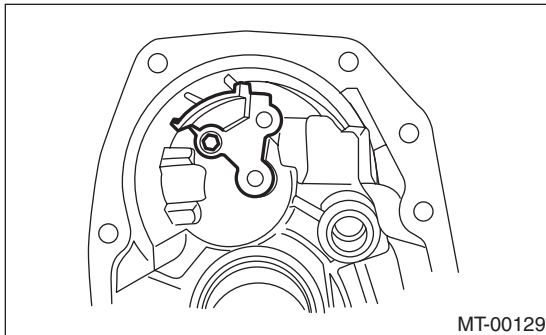
- 3) Install the transfer drive gear to the extension case. <Ref. to 5MT-43, INSTALLATION, Transfer Drive Gear.>

2. TRANSFER CASE

- 1) Install the oil guide to the transfer case.

Tightening torque:

6.4 N·m (0.65 kgf-m, 4.7 ft-lb)

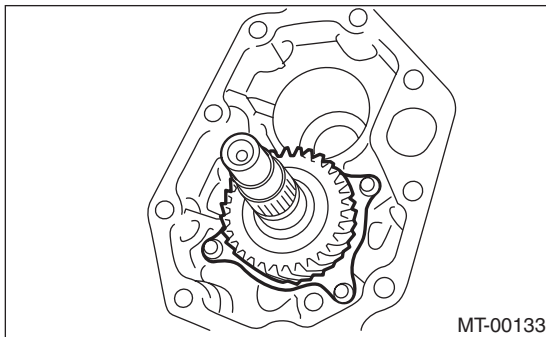


- 2) Install the reverse check sleeve assembly to the transfer case. <Ref. to 5MT-48, INSTALLATION, Reverse Check Sleeve.>

11. Transfer Drive Gear

A: REMOVAL

- 1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-26, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the back-up light switch and neutral position switch. <Ref. to 5MT-35, REMOVAL, Switches and Harness.>
- 3) Remove the transfer case together with the extension case assembly. <Ref. to 5MT-39, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove the extension case assembly.
- 5) Remove the transfer driven gear.
- 6) Remove the transfer drive gear.

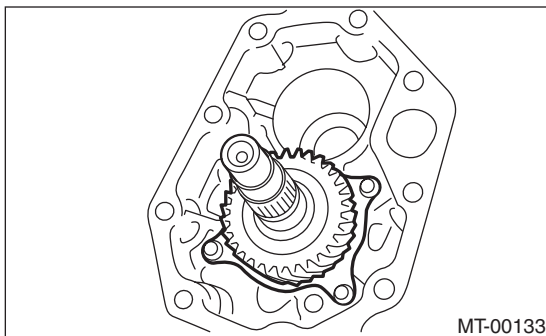


B: INSTALLATION

- 1) Attach the transfer drive gear.

Tightening torque:

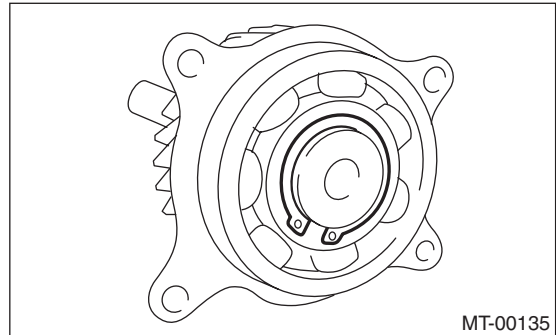
26 N·m (2.7 kgf·m, 20 ft·lb)



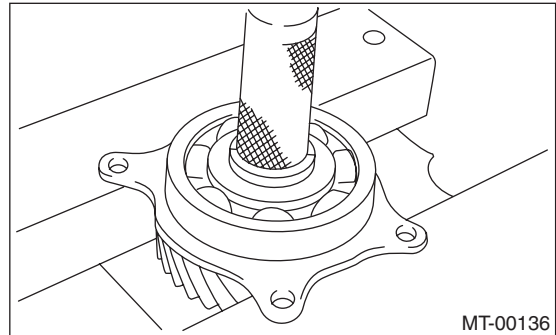
- 2) Install the transfer driven gear.
- 3) Install the extension case assembly.
- 4) Install the transfer case and the extension case assembly. <Ref. to 5MT-39, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 5) Install the back-up light switch and the neutral position switch. <Ref. to 5MT-35, INSTALLATION, Switches and Harness.>
- 6) Install the manual transmission assembly to the vehicle. <Ref. to 5MT-28, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

- 1) Remove the snap ring.



- 2) Remove the ball bearing.



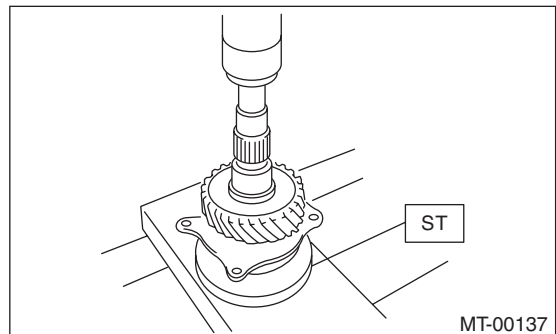
D: ASSEMBLY

- 1) Set the ST against the inner race of the bearing, and install the drive shaft.

ST 398177700 INSTALLER

CAUTION:

Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).



- 2) Install the snap ring on the transfer drive shaft.
- 3) Inspect the clearance between the snap ring and the ball bearing. <Ref. to 5MT-44, INSPECTION, Transfer Drive Gear.>

Transfer Drive Gear

MANUAL TRANSMISSION AND DIFFERENTIAL

E: INSPECTION

1) Bearing

Replace the bearings in the following cases.

- In case of broken or rusty bearings
- In case of worn or damaged bearings
- In the case that the bearing fails to turn smoothly or makes an abnormal noise when turned, even after gear oil lubrication.

2) Drive gear

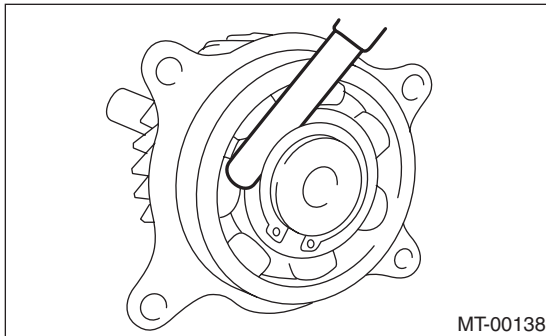
Replace the drive gear in following case.

- If the drive gear tooth surface and shaft are excessively broken or damaged.

3) Measure the clearance between snap ring and inner race of ball bearing with a thickness gauge.

Clearance:

0.01 — 0.15 mm (0.0004 — 0.0059 in)



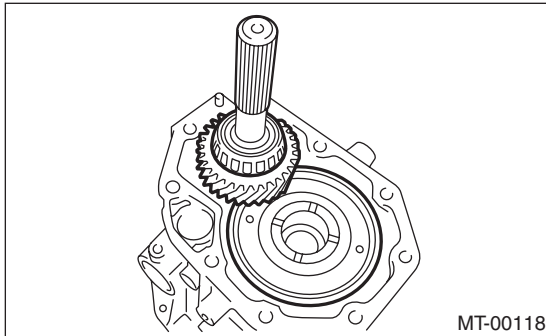
If the measured value is not within the specification, select a suitable snap ring from the table below and replace.

Snap ring (Outer-30)	
Part No.	Thickness mm (in)
805030041	1.53 (0.0602)
805030042	1.65 (0.0650)
805030043	1.77 (0.0697)

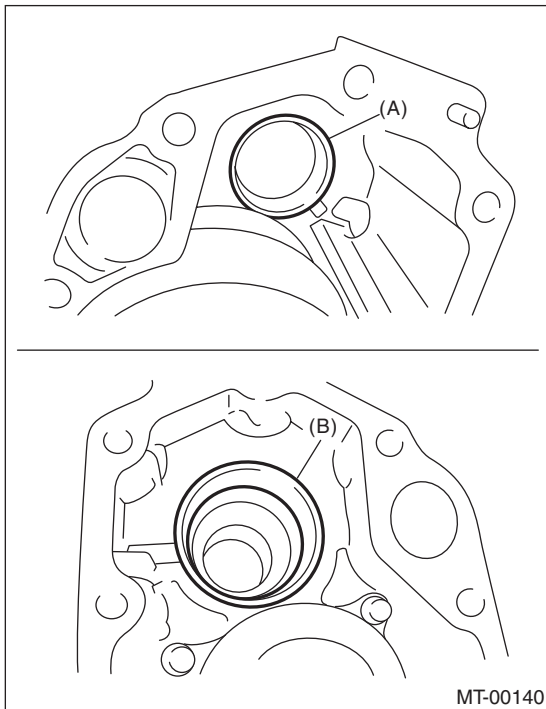
12. Transfer Driven Gear

A: REMOVAL

- 1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-26, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the back-up light switch and neutral position switch. <Ref. to 5MT-35, REMOVAL, Switches and Harness.>
- 3) Remove the transfer case together with the extension case assembly. <Ref. to 5MT-39, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove the extension case assembly.
- 5) Remove the transfer driven gear.



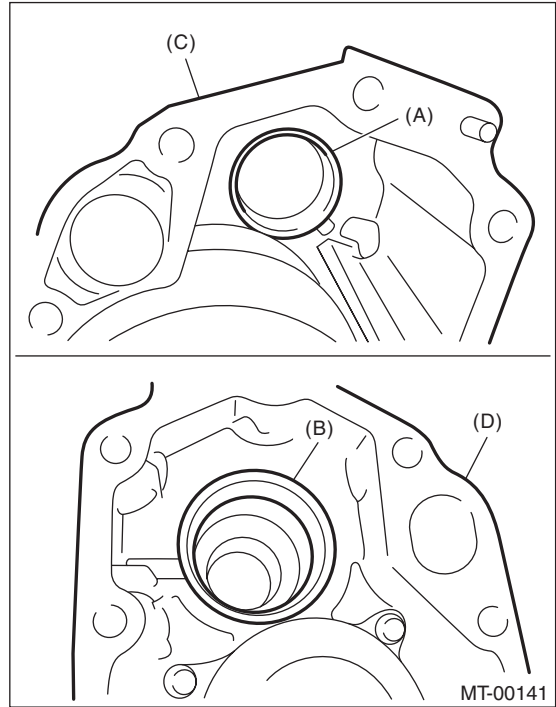
- 6) Remove bearing outer races from the extension case and transfer case.



- (A) Bearing outer race (Extension case side)
- (B) Bearing outer race (Transfer case side)

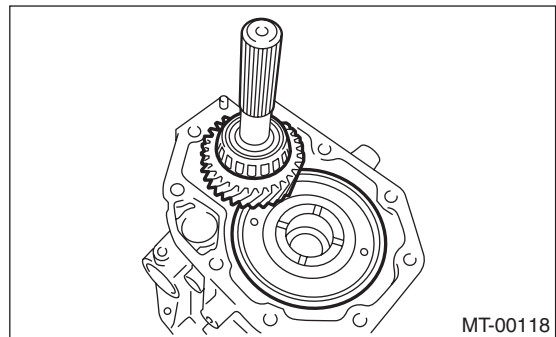
B: INSTALLATION

- 1) Install the bearing outer races to extension case and transfer case.



- (A) Bearing outer race (Extension case side)
- (B) Bearing outer race (Transfer case side)
- (C) Extension case
- (D) Transfer case

- 2) Install the transfer driven gear.



- 3) Install the transfer case and the extension case assembly. <Ref. to 5MT-39, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 4) Install the back-up light switch and the neutral position switch. <Ref. to 5MT-35, INSTALLATION, Switches and Harness.>
- 5) Install the manual transmission assembly to the vehicle. <Ref. to 5MT-28, INSTALLATION, Manual Transmission Assembly.>

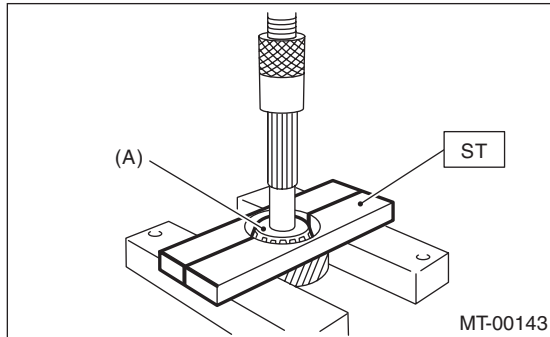
Transfer Driven Gear

MANUAL TRANSMISSION AND DIFFERENTIAL

C: DISASSEMBLY

1) Using the ST, remove the roller bearing (extension case side).

ST 498077000 REMOVER

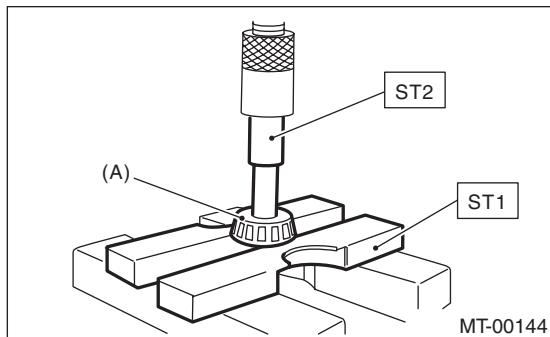


(A) Roller bearing

2) Using ST1 and ST2, remove the roller bearing (transfer case side).

ST1 498077000 REMOVER

ST2 899864100 REMOVER



(A) Roller bearing

D: ASSEMBLY

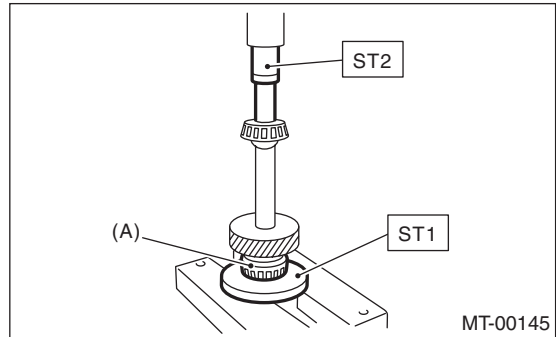
1) Using the ST, install the roller bearing (extension case side).

ST1 398177700 INSTALLER

ST2 899864100 REMOVER

CAUTION:

Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).



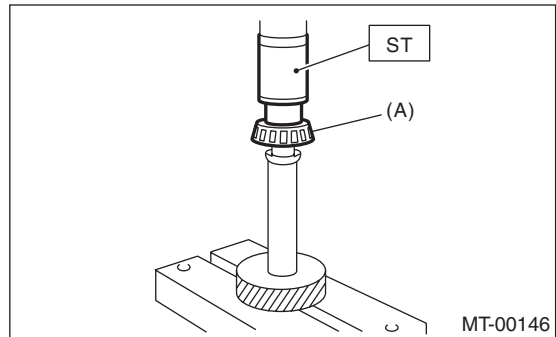
(A) Roller bearing

2) Using ST, install the roller bearing (transfer case side).

ST 499757002 INSTALLER

CAUTION:

Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).



(A) Roller bearing

E: INSPECTION

1) Bearing

Replace the bearings in the following cases.

- In case of broken or rusty bearings
- In case of worn or damaged bearings
- In the case that the bearing fails to turn smoothly or makes an abnormal noise when turned, even after gear oil lubrication.

2) Driven gear

Replace the driven gear in the following cases.

- If the driven gear tooth surface and shaft are excessively broken or damaged.

13.Center Differential

A: REMOVAL

- 1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-26, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the transfer case together with the extension case assembly. <Ref. to 5MT-39, REMOVAL, Transfer Case and Extension Case Assembly.>
- 3) Remove the extension case assembly. <Ref. to 5MT-39, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove the transfer driven gear. <Ref. to 5MT-45, REMOVAL, Transfer Driven Gear.>
- 5) Remove the center differential.

B: INSTALLATION

- 1) Install the center differential into transfer case.
- 2) Install the transfer driven gear. <Ref. to 5MT-45, INSTALLATION, Transfer Driven Gear.>
- 3) Install the extension case assembly. <Ref. to 5MT-39, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 4) Install the transfer case together with the extension case assembly. <Ref. to 5MT-39, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 5) Install the back-up light switch and neutral position switch. <Ref. to 5MT-35, INSTALLATION, Switches and Harness.>
- 6) Install the manual transmission assembly to the vehicle. <Ref. to 5MT-28, INSTALLATION, Manual Transmission Assembly.>

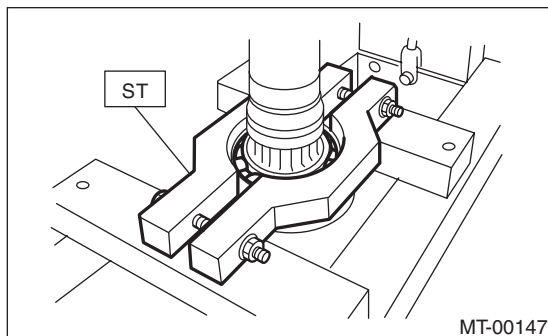
C: DISASSEMBLY

- 1) Remove the ball bearing using ST.

NOTE:

Do not reuse the ball bearing.

ST 498077300 CENTER DIFFERENTIAL BEARING REMOVER



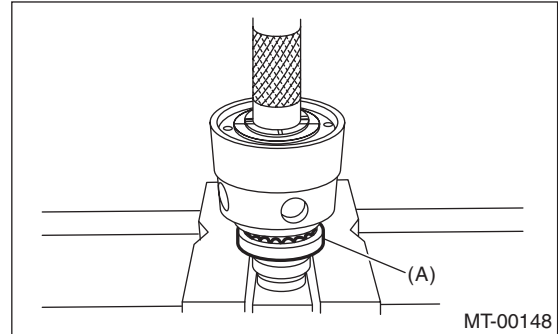
- 2) Aside from the ball bearings, the center differential is a non-disassembly part and must not be disassembled.

D: ASSEMBLY

Install the ball bearing into the center differential assembly.

CAUTION:

Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).



(A) Ball bearing

E: INSPECTION

- 1) Bearing

Replace the bearings in the following cases.

- In case of broken or rusty bearings
- In case of worn or damaged bearings
- In the case that the bearing fails to turn smoothly or makes an abnormal noise when turned, even after gear oil lubrication.
- When the bearing has other problems.

- 2) Center differential

Replace the center differential assembly in the following case.

- In case of worn or damaged bearings

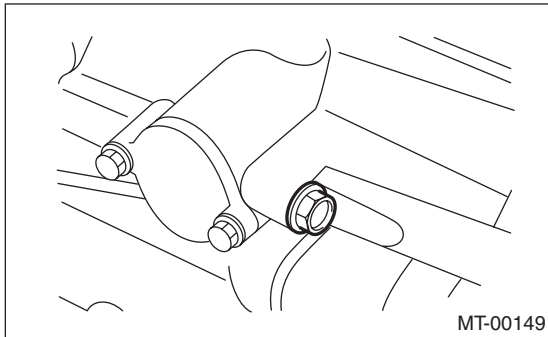
Reverse Check Sleeve

MANUAL TRANSMISSION AND DIFFERENTIAL

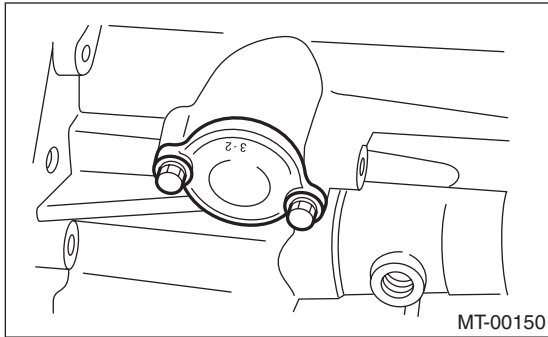
14. Reverse Check Sleeve

A: REMOVAL

- 1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-26, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the transfer case together with the extension case assembly. <Ref. to 5MT-39, REMOVAL, Transfer Case and Extension Case Assembly.>
- 3) Remove the shifter arm.
- 4) Remove the plug, gasket, reverse accent spring, and reverse check ball.



- 5) Remove the reverse check sleeve.

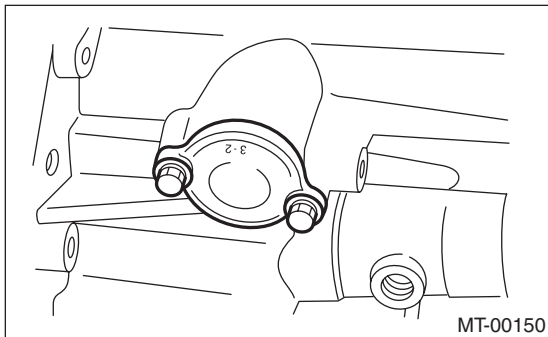


B: INSTALLATION

- 1) Install the reverse check sleeve.

Tightening torque:

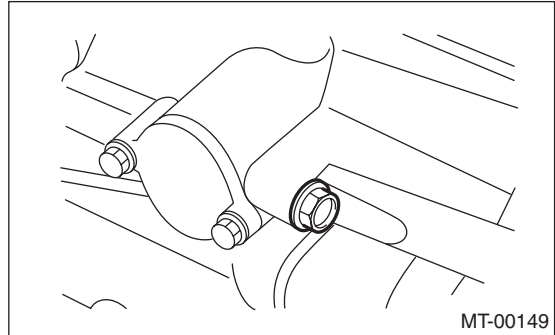
6.4 N·m (0.65 kgf-m, 4.7 ft-lb)



- 2) Install the reverse check ball, reverse accent spring, gasket and plug to transfer case.

Tightening torque:

9.75 N·m (1.0 kgf-m, 7.2 ft-lb)



- 3) Attach the shifter arm to the transfer case assembly.
- 4) Install the transfer case together with the extension case assembly. <Ref. to 5MT-39, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 5) Install the manual transmission assembly to the vehicle. <Ref. to 5MT-28, INSTALLATION, Manual Transmission Assembly.>

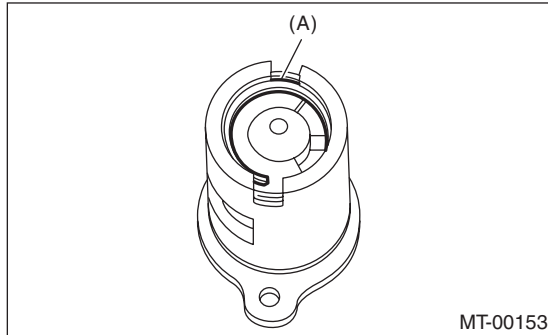
Reverse Check Sleeve

C: DISASSEMBLY

1) Cover the reverse check sleeve with a rag, and remove the snap ring using a screwdriver.

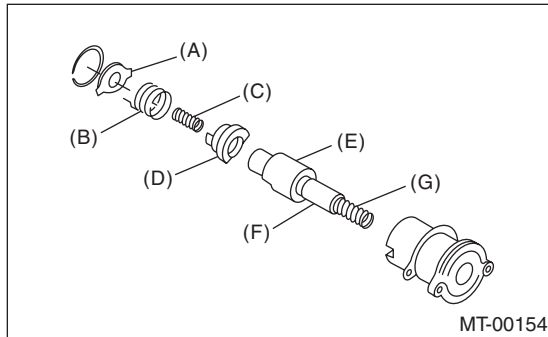
NOTE:

If deformed or worn, replace with a new snap ring.



(A) Snap ring

2) Remove the reverse check plate, reverse check spring, reverse check cam, return spring (5th-Rev), reverse accent shaft, return spring cap and return spring (1st-2nd).



- (A) Reverse check plate
- (B) Reverse check spring
- (C) Return spring (5th-Rev)
- (D) Reverse check cam
- (E) Reverse accent shaft
- (F) Return spring cap
- (G) Return spring (1st-2nd)

3) Remove the O-ring.

NOTE:

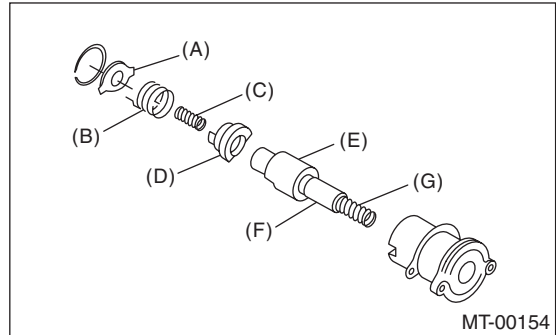
- For the reverse check sleeve, make sure only to use an undamaged O-ring with no scratches on it.
- Be careful not to damage the adjusting shim between reverse check sleeve assembly and the case.

D: ASSEMBLY

1) Install the return spring (1st-2nd), return spring cap, reverse accent shaft, check cam, return spring and check spring to the reverse check sleeve.

NOTE:

Be sure to position the bent section of reverse check spring to fit in the groove of the check cam.



- (A) Reverse check plate
- (B) Reverse check spring
- (C) Return spring (5th-Rev)
- (D) Reverse check cam
- (E) Reverse accent shaft
- (F) Return spring cap
- (G) Return spring (1st-2nd)

2) Hook the bent section of reverse check spring over reverse check plate.

3) Rotate the cam so that the protrusion of the reverse check cam comes to the opening of the plate.

4) With cam held in that position, install the plate onto the reverse check sleeve and hold in place with the snap ring.

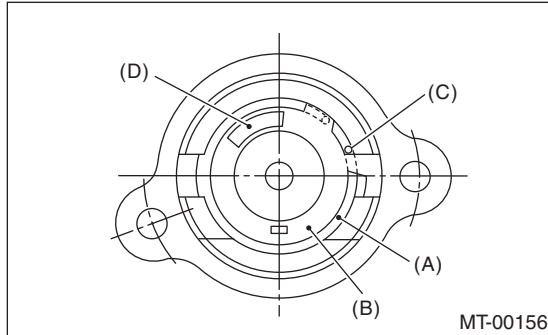
5) Position the new O-ring in the groove of sleeve.

Reverse Check Sleeve

MANUAL TRANSMISSION AND DIFFERENTIAL

E: INSPECTION

- Make sure the cutout of the reverse accent shaft is aligned with the opening in the reverse check sleeve.
 - Turn the cam by hand to check for smooth rotation.
 - Move the cam and shaft all the way toward the plate, and make sure it releases.
- If the cam does not return properly, replace the reverse check spring. If the shaft does not return, check for scratches on the inner surface of sleeve. If the sleeve is in good order, replace the spring.



- (A) Snap ring
- (B) Reverse check plate
- (C) Checking spring
- (D) Check cam

- Select a suitable reverse accent shaft and reverse check plate. <Ref. to 5MT-50, ADJUSTMENT, Reverse Check Sleeve.>

F: ADJUSTMENT

1. NEUTRAL POSITION ADJUSTMENT

- 1) Shift the gear into 3rd gear position.
- 2) Because of the return spring, until the arm contacts the stopper the shifter arm will feel lighter moving towards 1st/2nd gear and heavier towards the reverse gear.
- 3) Make adjustment so that the heavy stroke (reverse side) is a little heavier than the lighter stroke (1st/2nd side).
- 4) To adjust, remove the bolts holding the reverse check sleeve assembly to the case, and move the sleeve assembly outward, then place an adjustment shim (0 to 1 ea.) between the sleeve assembly and the case to adjust the clearance.
- 5) Be careful not to damage the O-ring when placing shims.

NOTE:

- When the shim is removed, the neutral position will move closer to reverse; when the shim is added, the neutral position will move closer to 1st gear.

- If it is not possible to adjust the clearance with only shims, replace the reverse accent shaft and re-adjust.

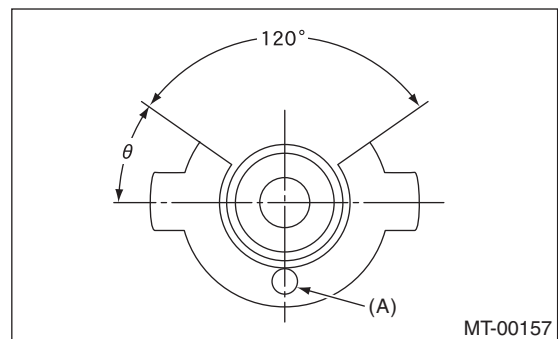
Adjusting shim	
Part No.	Thickness mm (in)
32190AA000	0.15 (0.0059)
32190AA010	0.30 (0.0118)

Reverse accent shaft		
Part No.	Mark	Remarks
32188AA130	S	Neutral position is closer to 1st gear.
32188AA140	T	Standard
32188AA150	U	Neutral position is closer to reverse gear.

2. REVERSE CHECK PLATE ADJUSTMENT

- 1) Shift the shifter arm to "5th" and then to reverse to see if the reverse check mechanism operates properly.
- 2) Also check to see if the arm returns to neutral when released from the reverse position. If the arm does not return properly, replace the reverse check plate.

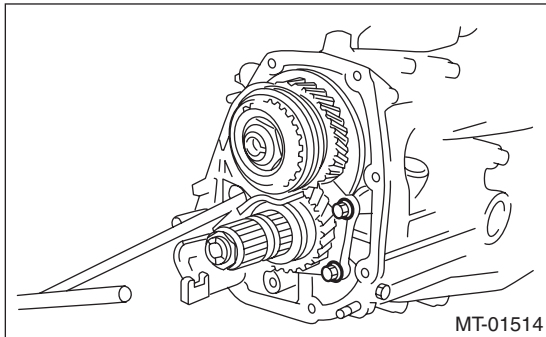
Reverse check plate			
Part No.	(A): No.	Angle θ	Remarks
32189AA000	0	28°	Arm stops closer to 5th gear.
32189AA010	1	31°	Arm stops closer to 5th gear.
32189AA020	2	34°	Arm stops in the center.
32189AA030	3	37°	Arm stops closer to reverse gear.
32189AA040	4	40°	Arm stops closer to reverse gear.



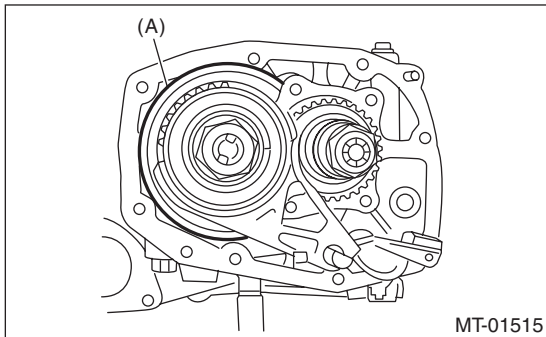
15. Transmission Case

A: REMOVAL

- 1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-26, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the clutch release lever. <Ref. to CL-15, REMOVAL, Release Bearing and Lever.>
- 3) Remove the transfer case together with the extension case assembly. <Ref. to 5MT-39, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove the bearing mounting bolts.

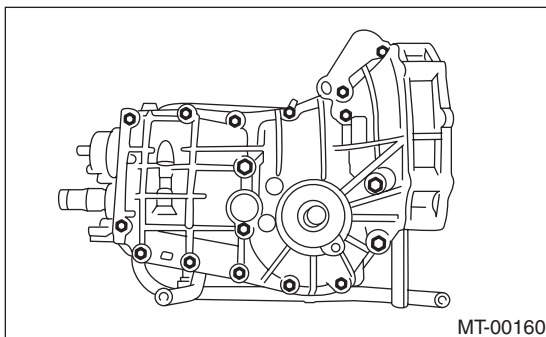


- 5) Remove the main shaft rear plate.



(A) Main shaft rear plate

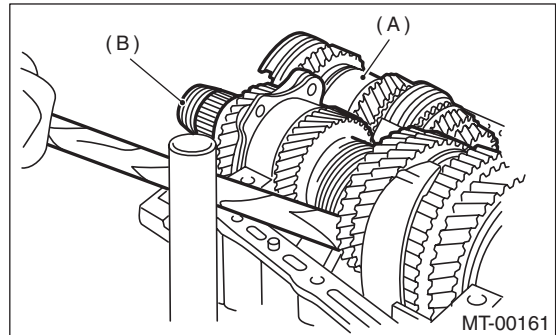
- 6) Separate the transmission case into the right and left cases by loosening the coupling bolts and nuts.



- 7) Remove the drive pinion shaft assembly from the left side of the transmission case and remove the main shaft assembly.

NOTE:

Use a hammer handle, etc. to remove if too tight.



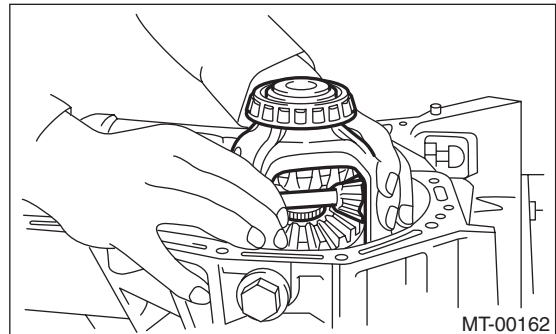
(A) Air assist injector solenoid valve

(B) Drive pinion shaft ASSY

- 8) Remove the differential assembly.

NOTE:

- Do not confuse the right and left roller bearing outer races.
- Be careful not to damage the oil seal of retainer.



Transmission Case

MANUAL TRANSMISSION AND DIFFERENTIAL

B: INSTALLATION

- 1) Wipe off grease, oil and dust on the mating surfaces of transmission cases with a cleaning solution.
- 2) Install the front differential assembly.
- 3) Install the main shaft assembly.
Install the transmission case knock pin into the knock pin hole of needle bearing.
- 4) Install the drive pinion shaft assembly.
Install the transmission case knock pin into the roller bearing knock pin hole.
- 5) Apply liquid gasket, and then join the right side and left side of the case together.

Liquid gasket

THREE BOND 1215 (Part No. 004403007) or equivalent

- 6) Tighten the bolt together with the bracket and the clip, as shown in the figure.

NOTE:

- Insert the 10 mm bolts from the bottom and tighten the nuts at the top.
- Put the cases together so that the drive pinion shim and input shaft holder shims are not caught in between.
- Check that the speedometer gear is engaged.

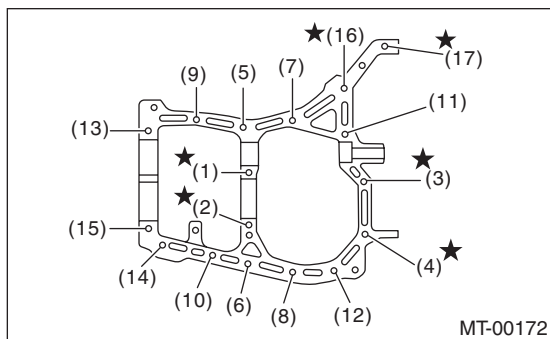
Tightening torque:

8 mm bolt

25 N·m (2.5 kgf-m, 18.1 ft-lb)

★ **10 mm bolt**

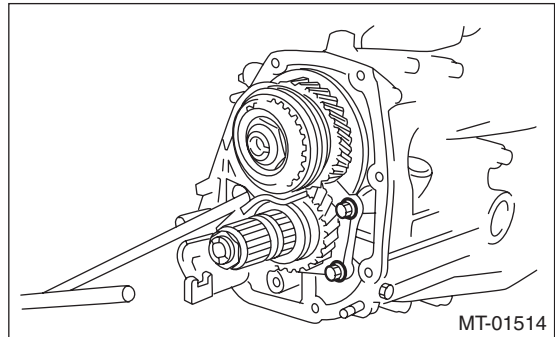
39 N·m (4.0 kgf-m, 28.9 ft-lb)



- 7) Tighten the bearing mounting bolts.

Tightening torque:

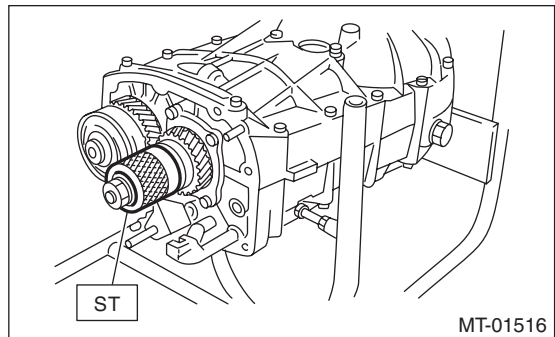
30 N·m (3.1 kgf-m, 22.1 ft-lb)



- 8) Perform backlash adjustment of the hypoid gear and preload measurement of the roller bearing.

NOTE:

Support the drive pinion assembly with the ST.
ST 498427100 STOPPER



- 9) Place the transmission with the left side of case facing downward, and put ST1 on bearing cup.

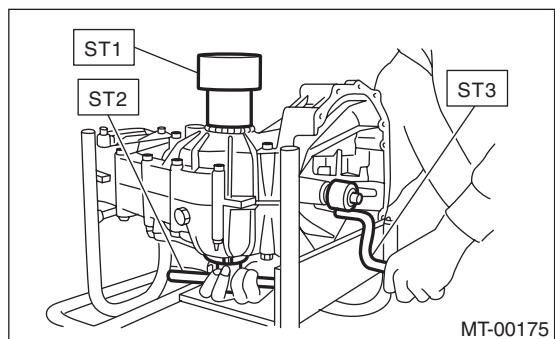
- 10) Screw the retainer assembly from the bottom into left case using ST2. Fit the ST3 on transmission main shaft. Shift the gear into 4th or 5th, and turn the shaft several times. Screw in the retainer while rotating the ST3 until a slight resistance is felt on ST2.

This is the contact point of the hypoid gear and the drive pinion shaft. Repeat the above sequence several times to ensure the contact point.

ST1 399780104 WEIGHT

ST2 18630AA010 WRENCH COMPL RETAINER

ST3 499927100 HANDLE



Transmission Case

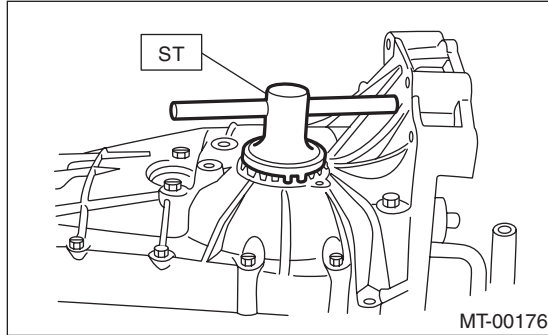
MANUAL TRANSMISSION AND DIFFERENTIAL

11) With the O-ring on the upper side removed, remove the retainer weight and screw, and stop at a point where a slight resistance is felt.

NOTE:

At this point, the backlash between the hypoid gear and drive pinion shaft is zero.

ST 18630AA010 WRENCH COMPL RETAINER



12) Loosen the retainer on the lower side by 3 notches of the lock plate, and turn the retainer on the upper side by the same amount in order to obtain the backlash.

13) Rotate the retainer of the upper side additionally by 1 notch in order to apply preload on taper roller bearing.

14) Temporarily attach both the upper and lower lock plates, and put marks both the holder and lock plate for later readjustment.

NOTE:

If it is hard to attach the lock plate, attach with the front and back reversed.

15) Turn the transmission main shaft several times while tapping around the retainer lightly with plastic hammer.

16) Inspect and adjust backlash and tooth contact of the hypoid gear. <Ref. to 5MT-70, INSPECTION, Front Differential Assembly.>

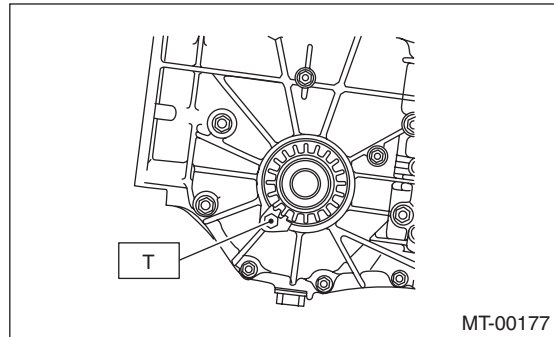
17) After checking the tooth contact of the hypoid gears, remove the lock plate. Then loosen the retainer until the O-ring groove appears. Fit the O-ring into the groove and then tighten the retainer up to its original position before it was loosened. Install the lock plate.

NOTE:

- When loosening the retainer, record the turns it took before the retainer was loosened.
- Perform this for both upper and lower retainers.

Tightening torque:

T: 25 N·m (2.5 kgf-m, 18.1 ft-lb)



18) Select the main shaft rear plate. <Ref. to 5MT-58, ADJUSTMENT, Main Shaft Assembly for Single-range.>

19) Install the clutch release lever and bearing. <Ref. to CL-15, INSTALLATION, Release Bearing and Lever.>

20) Install the transfer case together with the extension case assembly. <Ref. to 5MT-39, INSTALLATION, Transfer Case and Extension Case Assembly.>

21) Install the manual transmission assembly to the vehicle. <Ref. to 5MT-28, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

Check the transmission case for cracks, damage, or oil leaks.

Main Shaft Assembly for Single-range

MANUAL TRANSMISSION AND DIFFERENTIAL

16. Main Shaft Assembly for Single-range

A: REMOVAL

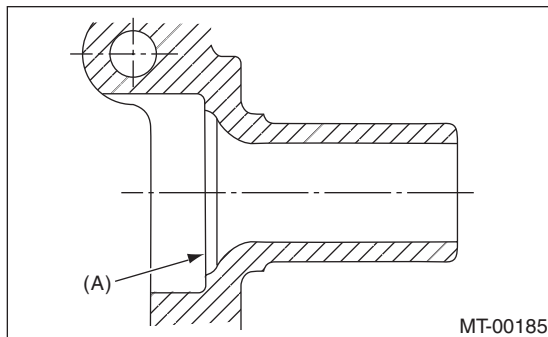
- 1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-26, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the transfer case together with the extension case assembly. <Ref. to 5MT-39, REMOVAL, Transfer Case and Extension Case Assembly.>
- 3) Remove the transmission case. <Ref. to 5MT-39, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove the drive pinion shaft assembly. <Ref. to 5MT-59, REMOVAL, Drive Pinion Shaft Assembly.>
- 5) Remove the main shaft assembly.

B: INSTALLATION

- 1) Wrap the clutch splined section with vinyl tape to prevent damage to the oil seal.
- 2) Apply UNILUBE #2 (or equivalent) to the sealing lip of the oil seal.
- 3) Install the needle bearing and new oil seal onto the front of the transmission main shaft assembly.
- 4) Attach the needle bearing outer race knock pin hole into the transmission case knock pin.

NOTE:

Align the end face of the seal with surface (A) when installing the oil seal.



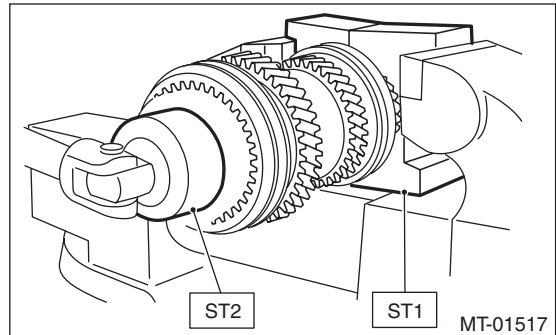
- 5) Install the drive pinion assembly. <Ref. to 5MT-59, INSTALLATION, Drive Pinion Shaft Assembly.>
- 6) Install the transmission case. <Ref. to 5MT-52, INSTALLATION, Transmission Case.>
- 7) Install the transfer case together with the extension case assembly. <Ref. to 5MT-39, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 8) Install the manual transmission assembly to the vehicle. <Ref. to 5MT-28, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

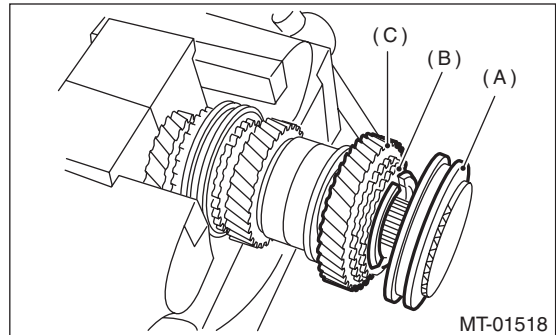
- 1) Apply vinyl tape around the main shaft splines to protect the oil seal from damage. Then pull out the oil seal and needle bearing by hand.
- 2) Remove the lock nut from transmission main shaft assembly.

NOTE:

Straighten the crimp before taking off lock nut.
ST1 498937000 TRANSMISSION HOLDER
ST2 499987003 SOCKET WRENCH (35)



- 3) Remove the 5th hub & sleeve No. 2, baulk lever, 5th baulk ring, 5th drive gear and 5th needle bearing from the transmission main shaft assembly.



- (A) 5th hub & sleeve No. 2
- (B) 5th baulk ring
- (C) 5th drive gear

Main Shaft Assembly for Single-range

MANUAL TRANSMISSION AND DIFFERENTIAL

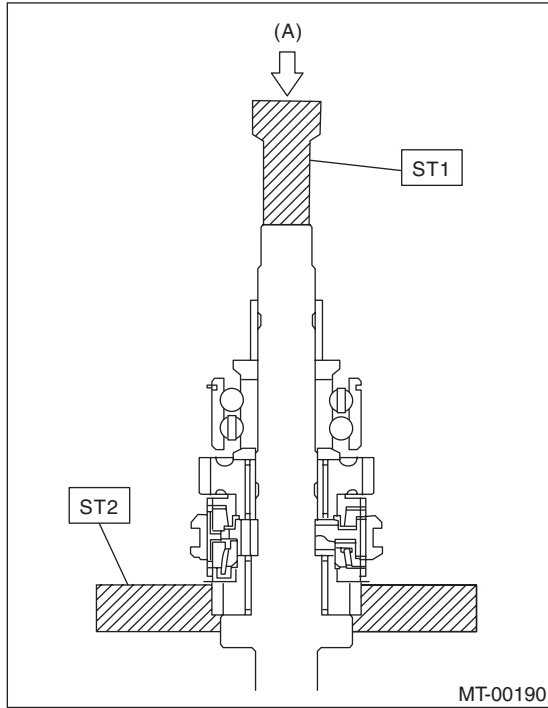
4) Using ST1 and ST2, remove the rest of parts.

NOTE:

If necessary, use the new sleeve gear & hub assembly, when replacing the sleeve or hub assembly. Do not attempt to disassemble as they must engage at a specified point. If they have to be disassembled, mark the engaging point beforehand.

ST1 899864100 REMOVER

ST2 899714110 REMOVER



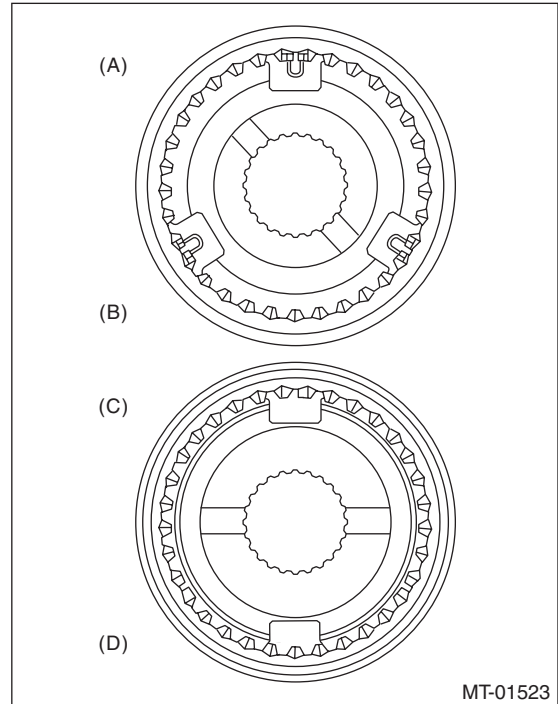
(A) Press

D: ASSEMBLY

1) Assemble individual sleeve and hub assemblies.

NOTE:

Position the open ends of the spring 120° apart.



- (A) 3rd-4th hub ASSY
- (B) 3rd gear side
- (C) 5th hub & sleeve No. 2
- (D) 5th gear side

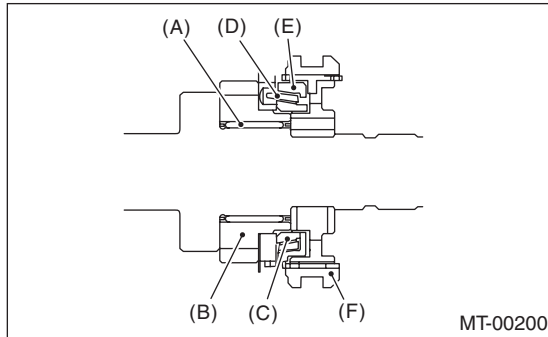
2) Install the 3rd drive gear, outer baulk ring, synchro cone, inner baulk ring, sleeve and hub assembly for the 3rd needle bearing, on the transmission main shaft.

Main Shaft Assembly for Single-range

MANUAL TRANSMISSION AND DIFFERENTIAL

NOTE:

Align the convex portion of baulk ring with the shifting insert.



- (A) 3rd needle bearing
- (B) 3rd drive gear
- (C) Inner baulk ring
- (D) Synchro cone
- (E) Outer baulk ring
- (F) Sleeve & hub ASSY

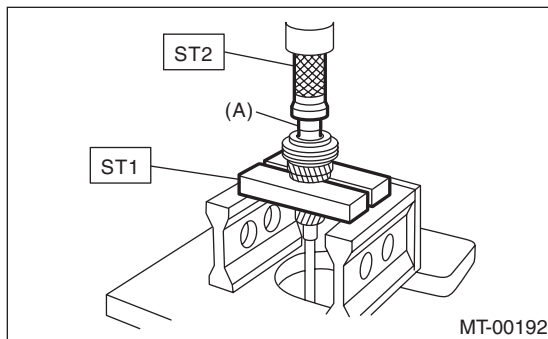
3) Install the 4th needle bearing race onto transmission main shaft using ST1, ST2 and press.

CAUTION:

Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

ST1 899714110 REMOVER

ST2 499877000 RACE 4-5 INSTALLER

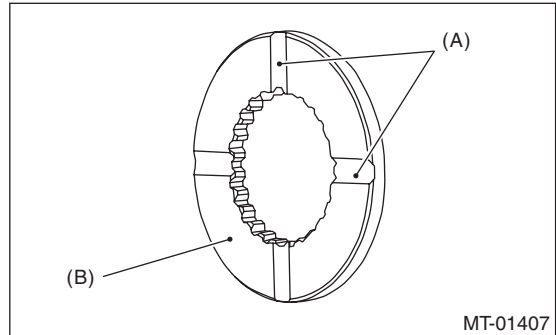


- (A) 4th needle bearing race

4) Install the baulk ring, needle bearing, 4th drive gear and 4th gear thrust washer to the transmission main shaft.

NOTE:

- Align the baulk ring and gear & hub assembly with key convex portion.
- Make sure the thrust washer is oriented in the correct direction.



- (A) Groove
- (B) Face this surface to 4th gear side.

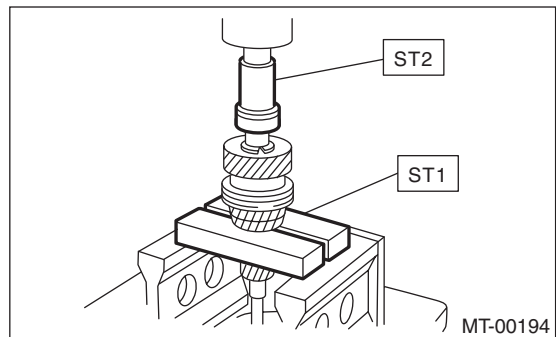
5) Press-fit the ball bearing into the rear section of transmission main shaft using ST1, ST2 and a press.

CAUTION:

Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

ST1 899714110 REMOVER

ST2 499877000 RACE 4-5 INSTALLER



Main Shaft Assembly for Single-range

MANUAL TRANSMISSION AND DIFFERENTIAL

6) Using the ST1 and ST2, install the 5th gear thrust washer and 5th needle bearing race onto the rear section of transmission main shaft.

CAUTION:

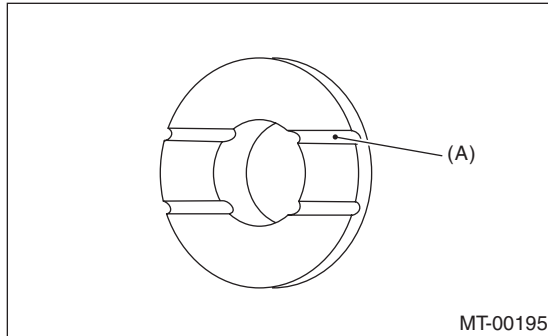
Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:

Make sure the thrust washer is oriented in the correct direction.

ST1 899714110 REMOVER

ST2 499877000 RACE 4-5 INSTALLER



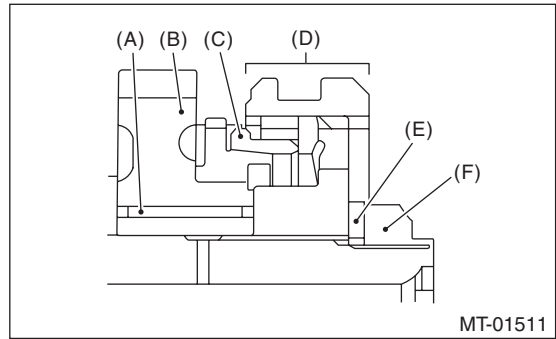
(A) Face this surface to the 5th gear side.

7) Install rest of the parts to the rear section of the transmission main shaft.

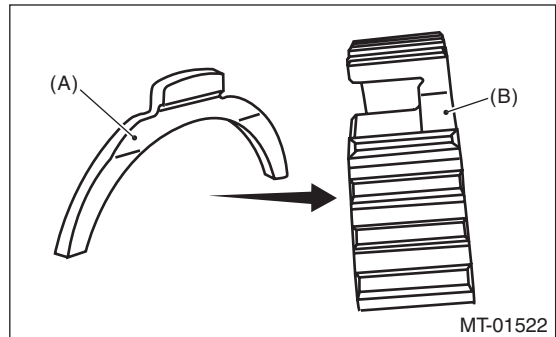
NOTE:

• Align the convex portion of the baulk ring between the baulk lever.

• Attach with the narrowed side of the baulk lever on the 5th hub side.



- (A) Needle bearing
- (B) 5th drive gear
- (C) Baulk ring
- (D) 5th hub & sleeve No. 2
- (E) Lock washer
- (F) Lock nut



- (A) Baulk lever
- (B) 5th hub

8) Tighten the lock nuts to the specified torque using ST1 and ST2.

9) Crimp lock nuts in two locations after tightening.

ST1 499987003 SOCKET WRENCH

ST2 498937000 TRANSMISSION HOLDER

Tightening torque:

120 N·m (12.2 kgf-m, 88.5 ft-lb)

Main Shaft Assembly for Single-range

MANUAL TRANSMISSION AND DIFFERENTIAL

E: INSPECTION

Disassembled parts should be washed clean first and then inspected carefully.

1) Bearing

Replace the bearings in the following cases.

- If the ball bearing, outer race or inner race is damaged or rusted
- In case of worn or damaged bearings
- In the case that the bearing fails to turn smoothly or makes an abnormal noise when turned, even after gear oil lubrication.
- When the bearing has other problems.

2) Bushing (each gear)

Replace the bushing in following cases.

- When the sliding surface is damaged or abnormally worn.
- When the inner wall is excessively worn.

3) Gear

- Replace the gear with new part if its tooth surfaces are broken, damaged or excessively worn.
- Correct or replace if the cone that contacts the baulk ring is rough or damaged.
- Correct or replace if the inner surface or end face is damaged.

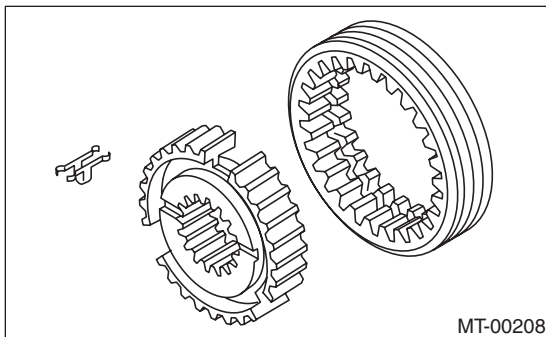
4) Baulk ring

Replace the baulk ring in following cases.

- When the inner surface and end face are damaged.
- When the baulk ring inner surface is excessively or partially worn down.
- When the contact surface of the synchronizer ring insert is scored or excessively worn down.

5) Shifting insert key

Replace the insert key if deformed, excessively worn or abnormal in any way.



6) Oil seal

Replace the oil seal if the lip is deformed, hardened, worn or abnormal in any way.

7) O-ring

Replace the O-ring if the sealing face is deformed, hardened, damaged, worn or abnormal in any way.

8) Gearshift mechanism

Repair or replace the gearshift mechanism if excessively worn, bent or abnormal in any way.

F: ADJUSTMENT

Selection of main shaft rear plate:

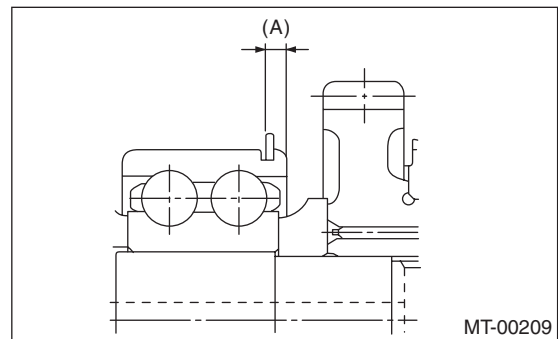
Using the ST, measure the protrusion amount (A) of ball bearing from transmission main case surface, and select a suitable plate in the following table.

NOTE:

Before measuring, tap the end of main shaft with a plastic hammer lightly in order to make the clearance zero between the main case surface and moving flange of bearing.

ST 498147000 DEPTH GAUGE

Dimension (A) mm (in)	Part No.	Mark
4.00 — 4.13 (0.1575 — 0.1626)	32294AA041	1
3.87 — 3.99 (0.1524 — 0.1571)	32294AA051	2



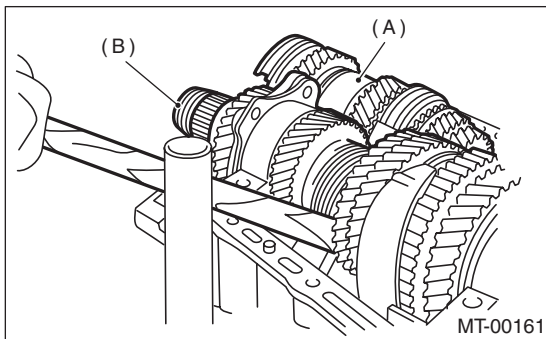
17. Drive Pinion Shaft Assembly

A: REMOVAL

- 1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-26, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the transfer case together with the extension case assembly. <Ref. to 5MT-39, REMOVAL, Transfer Case and Extension Case Assembly.>
- 3) Remove the transmission case. <Ref. to 5MT-51, REMOVAL, Transmission Case.>
- 4) Remove the drive pinion shaft assembly.

NOTE:

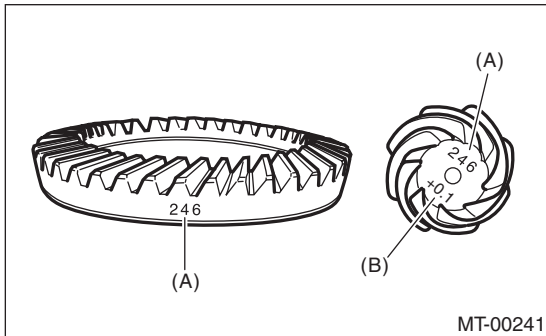
Use a hammer handle, etc. to remove if too tight.



- (A) Air assist injector solenoid valve
- (B) Drive pinion shaft ASSY

B: INSTALLATION

- 1) Remove the differential assembly.
- 2) Alignment marks/numbers on hypoid gear set:
The upper number on the drive pinion is a match (A) for combining it with hypoid drive gear. The lower number is for shim adjustment (B). If no lower number is shown, the value is zero. The number on hypoid driven gear indicates a number for mating with the drive pinion.



- (A) Alignment number
- (B) Number for shim adjustment

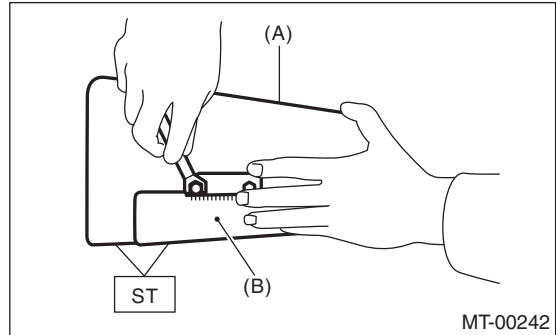
- 3) Place the drive pinion shaft assembly on transmission main case RH without shim and tighten the bearing mounting bolts.

- 4) Inspection and adjustment of ST:

NOTE:

- Loosen the two bolts and adjust so that the scale indicates 0.5 correctly when the plate end and the scale end are on the same level.
- Tighten the two bolts.

ST 499917500 DRIVE PINION GAUGE ASSY



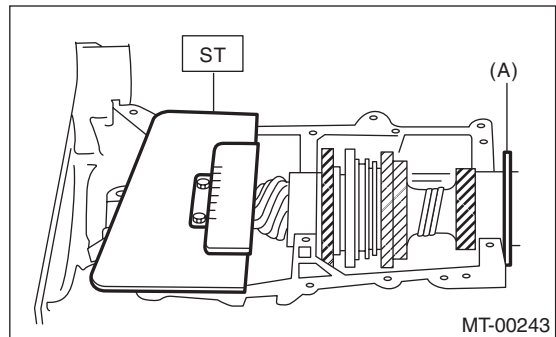
- (A) Plate
- (B) Scale

- 5) Position the ST by inserting the knock pin of ST into the knock hole of transmission case.

ST 499917500 DRIVE PINION GAUGE ASSY

- 6) Slide the drive pinion gauge scale with finger tip and read the value at the point where it matches with the end face of drive pinion.

ST 499917500 DRIVE PINION GAUGE ASSY



- (A) Adjust the clearance to zero without shim.

- 7) The thickness of shim shall be determined by adding the value indicated on drive pinion to the value indicated on the ST. (Add if the number on drive pinion is prefixed by +, and subtract if the number is prefixed by -.)

ST 499917500 DRIVE PINION GAUGE ASSY

Drive Pinion Shaft Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

8) Select one to three shims in the following table for the value determined as described above, and take the shim(s) which thickness is closest to the said value.

Drive pinion shim	
Part No.	Thickness mm (in)
32295AA031	0.150 (0.0059)
32295AA041	0.175 (0.0069)
32295AA051	0.200 (0.0079)
32295AA061	0.225 (0.0089)
32295AA071	0.250 (0.0098)
32295AA081	0.275 (0.0108)
32295AA091	0.300 (0.0118)
32295AA101	0.500 (0.0197)

9) Install the differential assembly. <Ref. to 5MT-67, INSTALLATION, Front Differential Assembly.>

10) Set the transmission main shaft assembly and drive pinion assembly in position. (So there is no clearance between the two when moved all the way to the front). Inspect the suitable 1st–2nd, 3rd–4th and 5th shifter fork so that the coupling sleeve and reverse driven gear are positioned in the center of their synchronizing mechanisms. <Ref. to 5MT-64, INSPECTION, Drive Pinion Shaft Assembly.>

11) Install the transmission case. <Ref. to 5MT-52, INSTALLATION, Transmission Case.>

12) Install the transfer case together with the extension case assembly. <Ref. to 5MT-39, INSTALLATION, Transfer Case and Extension Case Assembly.>

13) Install the manual transmission assembly to the vehicle. <Ref. to 5MT-28, INSTALLATION, Manual Transmission Assembly.>

C: DISASSEMBLY

NOTE:

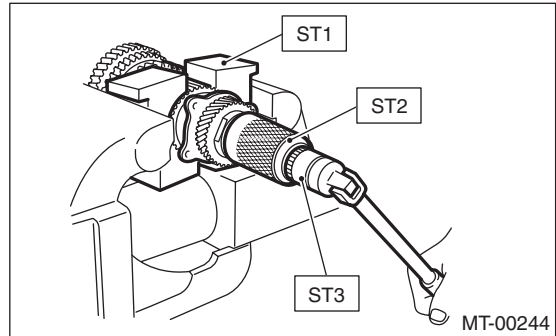
Attach a cloth to the end of driven shaft (on the frictional side of thrust needle bearing) to prevent damage during disassembly or reassembly.

1) Unlock the crimping of lock nut. Remove the lock nut with ST1, ST2 and ST3.

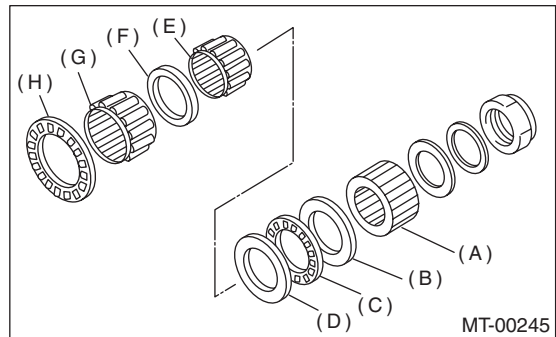
ST1 899884100 HOLDER

ST2 498427100 STOPPER

ST3 899988608 SOCKET WRENCH (27)



2) Draw out the drive pinion from driven shaft. Remove the differential bevel gear sleeve, adjusting washer No. 1, adjusting washer No. 2, thrust bearing, needle bearing and drive pinion collar.



- (A) Differential bevel gear sleeve
- (B) Adjusting washer No.1 (25 × 37.5 × t)
- (C) Thrust bearing (25 × 37.5 × 3)
- (D) Adjusting washer No. 2 (25 × 37.5 × 4)
- (E) Needle bearing (25 × 30 × 20)
- (F) Drive pinion collar
- (G) Needle bearing (30 × 37 × 23)
- (H) Thrust bearing (33 × 50 × 3)

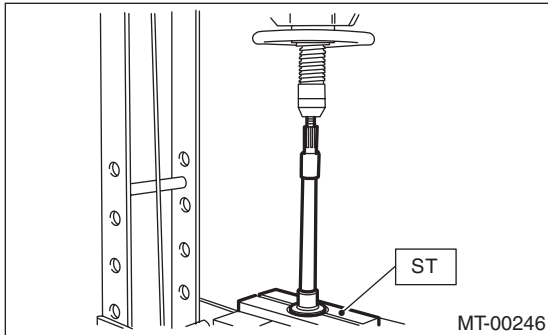
Drive Pinion Shaft Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

3) Remove the roller bearing and washer using ST and a press.

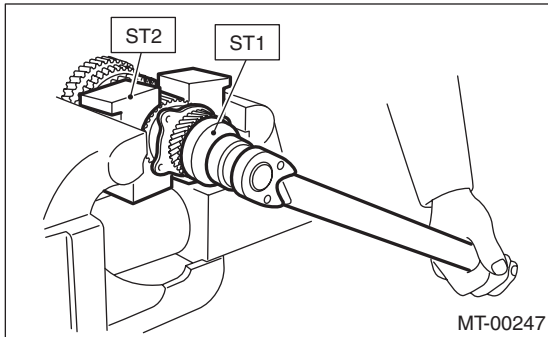
NOTE:

Do not reuse the roller bearing.
ST 498077000 REMOVER



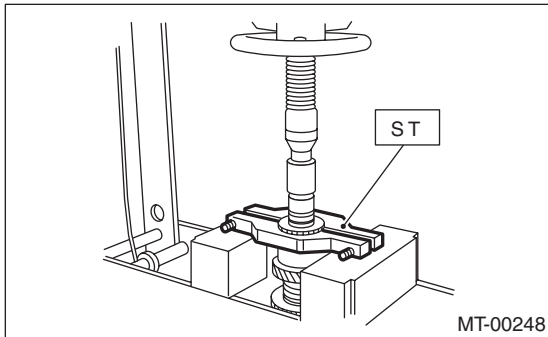
4) Unlock the crimping of lock nut. Remove the lock nut using ST1 and ST2.

ST1 499987300 SOCKET WRENCH (50)
ST2 899884100 HOLDER



5) Remove the 5th driven gear using ST.

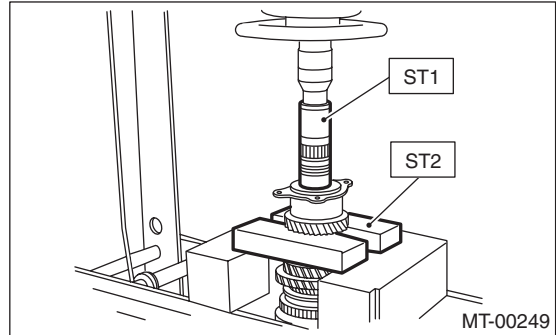
ST 499857000 5TH DRIVEN GEAR REMO-
VER



6) Remove the woodruff key.

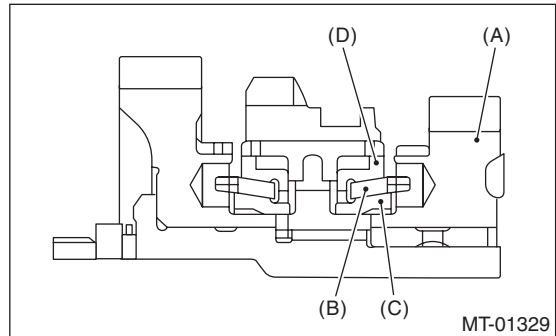
7) Remove the roller bearing, 3rd-4th driven gear using ST1 and ST2.

ST1 499757002 INSTALLER
ST2 899714110 REMOVER



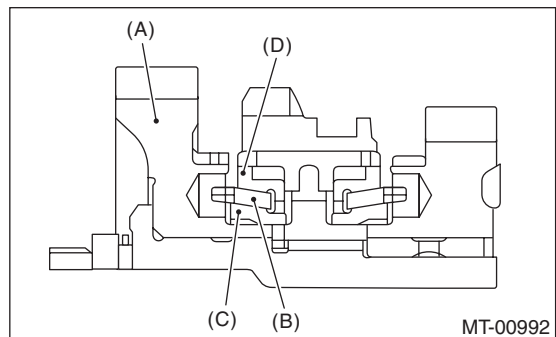
8) Remove the key.

9) Remove the 2nd driven gear, inner baulk ring, synchro cone and outer baulk ring.



- (A) 2nd driven gear
- (B) Inner baulk ring
- (C) Synchro cone
- (D) Outer baulk ring

10) Remove the 1st driven gear, inner baulk ring, synchro cone, outer baulk ring, 2nd driven gear bushing, gear & hub using ST1 and ST2.



- (A) 1st driven gear
- (B) Inner baulk ring
- (C) Synchro cone
- (D) Outer baulk ring

Drive Pinion Shaft Assembly

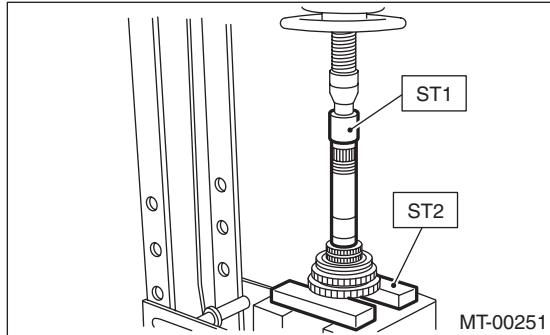
MANUAL TRANSMISSION AND DIFFERENTIAL

NOTE:

If necessary, use the new gear & hub assembly, when replacing the gear or hub assembly. Do not attempt to disassemble as they must engage at a specific point. If they have to be disassembled, mark the engaging point beforehand.

ST1 499757002 INSTALLER

ST2 899714110 REMOVER



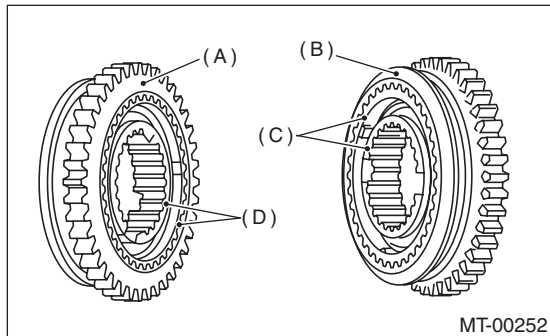
11) Remove the sub gear for 1st driven gear. (Non-turbo model)

D: ASSEMBLY

1) Install the sleeve and gear & hub assembly by matching alignment marks.

NOTE:

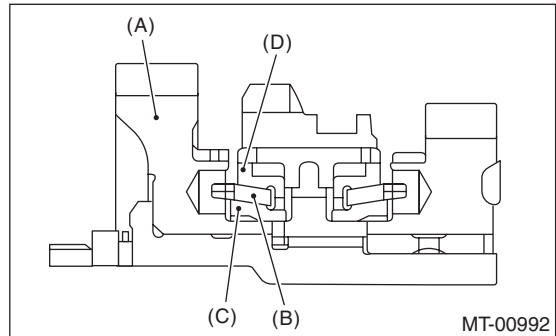
Use the new gear and hub assembly, if the gear & hub have been replaced.



- (A) 1st gear side
- (B) 2nd gear side
- (C) Flush surface
- (D) Stepped surface

2) Install the washer, snap ring and sub gear onto 1st driven gear.

3) Install the 1st driven gear, inner baulk ring, synchro cone, outer baulk ring, gear & hub assembly onto driven shaft.



- (A) 1st driven gear
- (B) Inner baulk ring
- (C) Synchro cone
- (D) Outer baulk ring

NOTE:

- Take care to install the gear & hub assembly in proper direction.
- Align the baulk ring and gear & hub assembly with key convex portion.

4) Install the 2nd driven gear bushing onto driven shaft using ST1, ST2 and a press.

CAUTION:

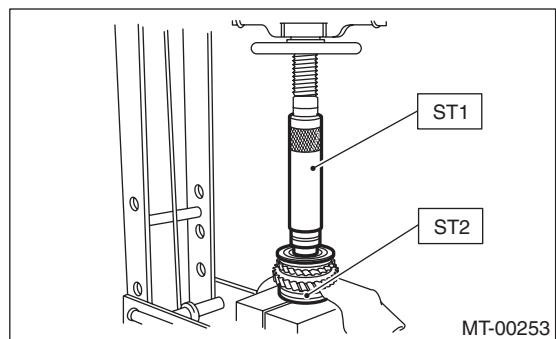
Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:

- Attach a cloth to the end of driven shaft to prevent damage.
- When press fitting, align the oil holes of shaft and bush.

ST1 499277200 INSTALLER

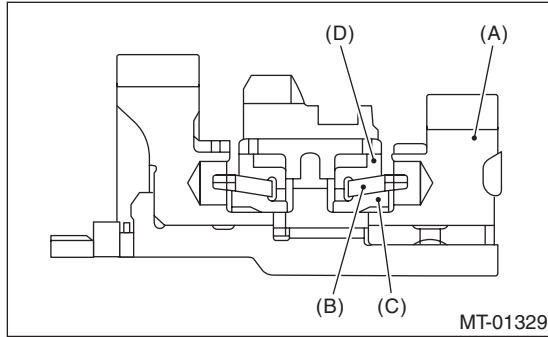
ST2 499587000 INSTALLER



Drive Pinion Shaft Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

5) Install the 2nd driven gear, inner baulk ring, synchro cone and outer baulk ring, and insert them onto driven shaft.



- (A) 2nd driven gear
- (B) Inner baulk ring
- (C) Synchro cone
- (D) Outer baulk ring

6) After installing key on driven shaft, install the 3rd-4th driven gear using ST and a press.

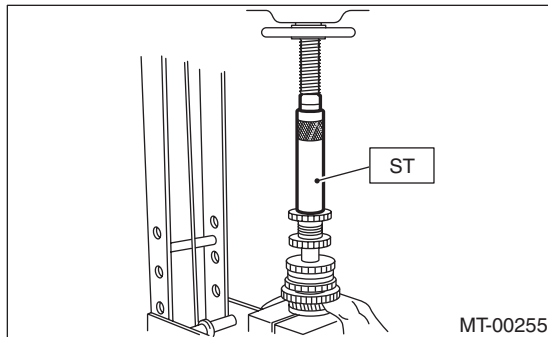
CAUTION:

Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

NOTE:

Align the convex portion of baulk ring with insert.

ST 499277200 INSTALLER

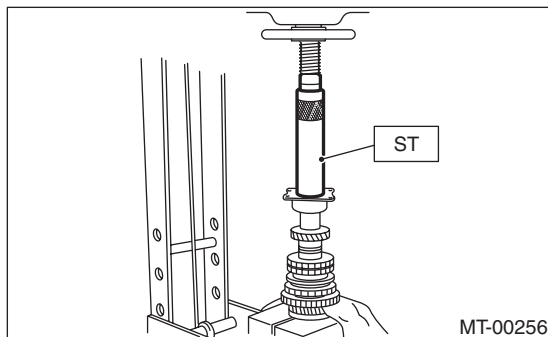


7) Install a set of roller bearings onto the driven shaft using ST and a press.

CAUTION:

Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

ST 499277200 INSTALLER

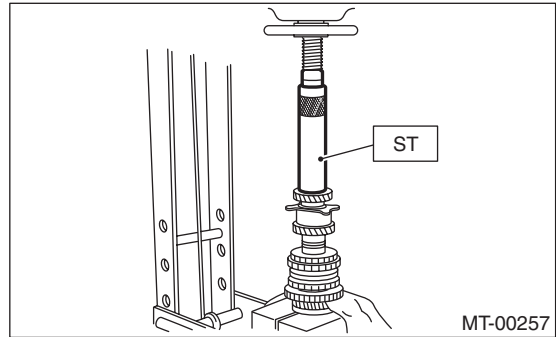


8) Position the woodruff key in groove of the rear of driven shaft. Install the 5th driven gear onto driven shaft using ST and a press.

CAUTION:

Do not apply a load in excess of 10 kN (1 ton, 1.1 US ton, 1.0 Imp ton).

ST 499277200 INSTALLER

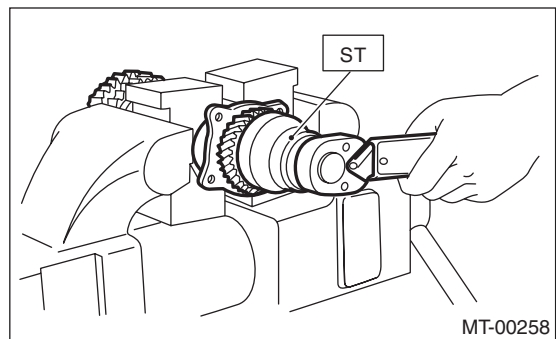


9) Install the lock washer. Install the lock nut and tighten to the specified torque using ST.

ST 499987300 SOCKET WRENCH (50)

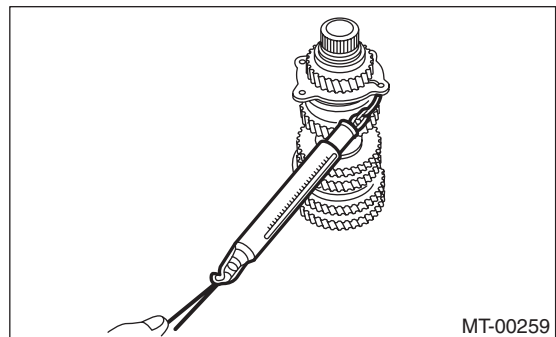
Tightening torque:

260 N·m (26.5 kgf·m, 192 ft·lb)



NOTE:

- Crimp the locknut in 2 locations.
- Using spring balancer, check that starting torque of roller bearing is 0.1 to 1.5 N (0.01 to 0.15 kgf, 0.02 to 0.33 ft).



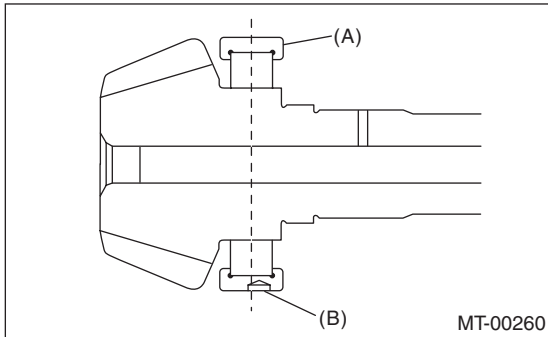
Drive Pinion Shaft Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

10) Install the roller bearing onto drive pinion.

NOTE:

When installing the roller bearing, note its directions (front and rear) because the knock pin hole of outer race is offset.



(A) Roller bearing
(B) Knock pin hole

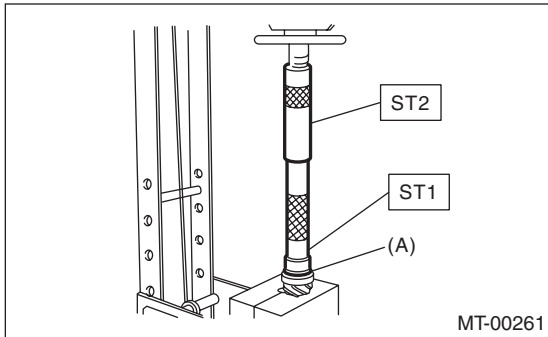
11) Install the washer using ST1, ST2 and a press.

NOTE:

- Replace lock nut with new parts.
- Crimp the locknut in 4 locations.

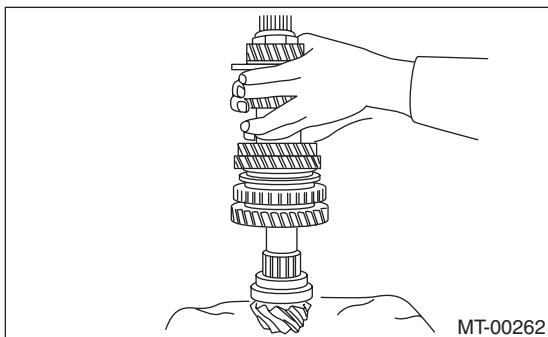
ST1 499277100 BUSHING 1-2 INSTALLER

ST2 499277200 INSTALLER



(A) Washer

12) Install the thrust bearing and needle bearing. Install the driven shaft assembly.

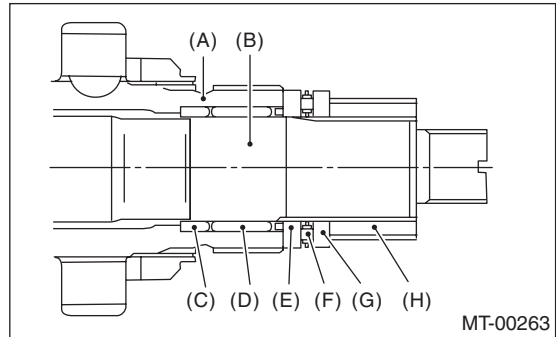


MT-00262

13) Install the drive pinion collar, needle bearing, adjusting washer No. 2, thrust bearing, adjusting washer No. 1 and differential bevel gear sleeve in this order.

NOTE:

Be careful to install the spacer in the proper direction.



MT-00263

(A) Driven shaft
(B) Drive pinion shaft
(C) Drive pinion collar
(D) Needle bearing (25 × 30 × 20)
(E) Adjusting washer No. 2 (25 × 36 × 4)
(F) Thrust bearing (25 × 37.5 × 3)
(G) Adjusting washer No. 1 (25 × 36 × t)
(H) Differential bevel gear sleeve

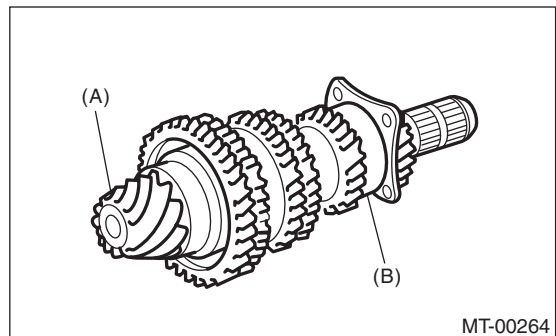
E: INSPECTION

Disassembled parts should be washed clean first and then inspected carefully.

1) Bearing

Replace the bearings in the following cases.

- If the ball bearing, outer race or inner race is damaged or rusted
- In case of worn or damaged bearings
- In the case that the bearing fails to turn smoothly or makes an abnormal noise when turned, even after gear oil lubrication.
- The roller bearing on the rear side of the drive pinion shaft should be checked for smooth rotation before the drive pinion assembly is disassembled. In this case, because a preload is working on the bearing, its rotation feels like it is slightly dragging unlike other bearings.



MT-00264

(A) Drive pinion shaft
(B) Roller bearing

- When the bearing has other problems.

Drive Pinion Shaft Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

2) Bushing (each gear)

Replace the bushing in following cases.

- When the sliding surface is damaged or abnormally worn.
- When the inner wall is excessively worn.

3) Gear

- Replace gears with new part if its tooth surfaces are broken, damaged or excessively worn.
- Correct or replace if the contact with the baulk ring cone is rough or damaged.
- Correct or replace if the inner surface or end face is damaged.

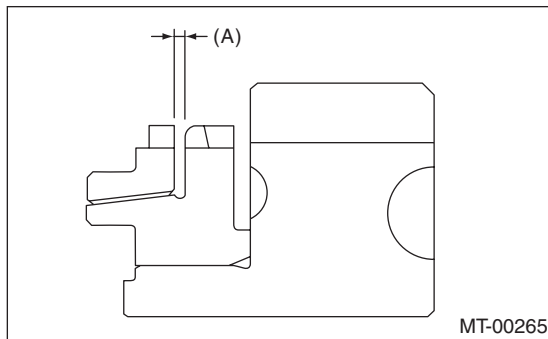
4) Baulk ring

Replace the ring in following cases.

- When the inner surface and end face are damaged.
- When the ring inner surface is excessively or partially worn down.
- If the gap between the end faces of the ring and the gear splined part is excessively small when the ring is pressed against the cone.

Clearance (A):

0.5 — 1.0 mm (0.020 — 0.040 in)

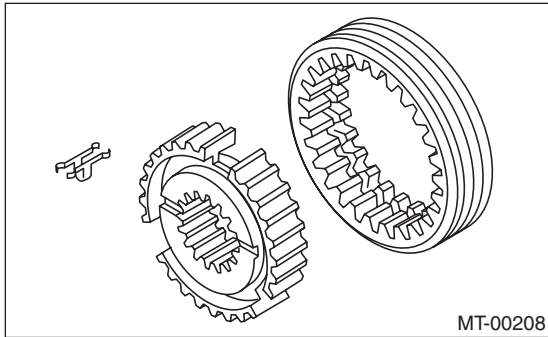


MT-00265

- When the contact surface of the synchronizer ring insert is damaged or excessively worn down.

5) Shifting insert key

Replace the insert if deformed, excessively worn or abnormal in any way.



MT-00208

6) Oil seal

Replace the oil seal if the lip is deformed, hardened, worn or abnormal in any way.

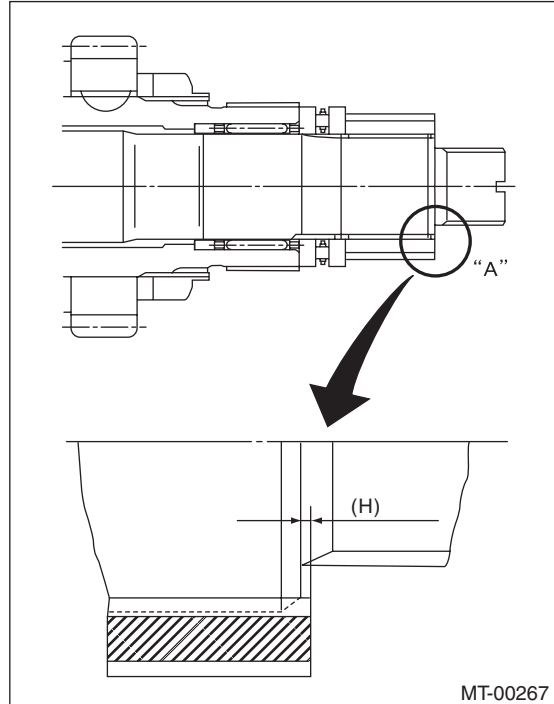
7) O-ring

Replace the O-ring if the sealing face is deformed, hardened, damaged, worn or abnormal in any way.

F: ADJUSTMENT

1. THRUST BEARING PRELOAD

1) Select adjusting washer No. 1 to adjust the dimension (H) to zero through a visual check. Position washer (18.3 × 30 × 4) and lock washer (18 × 30 × 2) and install lock nut (18 × 13.5).



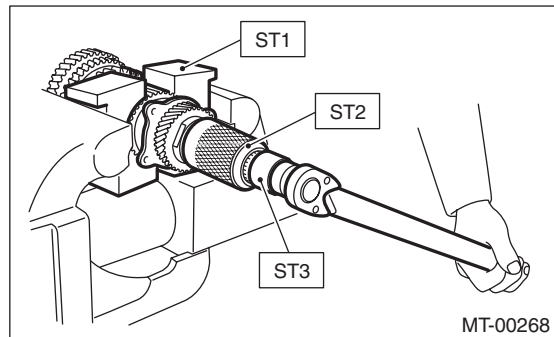
MT-00267

2) Using the ST1, ST2 and ST3, tighten the lock nut to the specified torque.

ST1 899884100 HOLDER
ST2 498427100 STOPPER
ST3 899988608 SOCKET WRENCH (27)

Tightening torque:

120 N·m (12.2 kgf·m, 88.5 ft·lb)



MT-00268

Drive Pinion Shaft Assembly

MANUAL TRANSMISSION AND DIFFERENTIAL

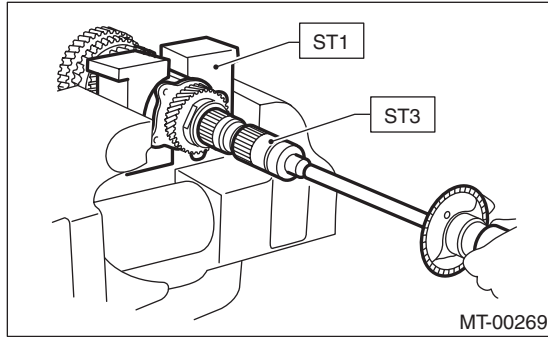
3) After removing the ST2, measure the starting torque using torque driver.

ST1 899884100 HOLDER

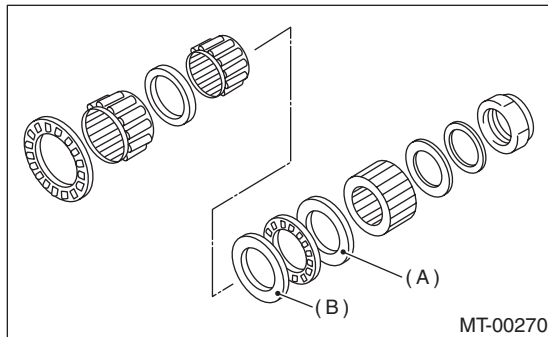
ST3 899988608 SOCKET WRENCH (27)

Starting torque:

0.3 — 0.8 N·m (0.03 — 0.08 kgf·m, 0.2 — 0.6 ft·lb)



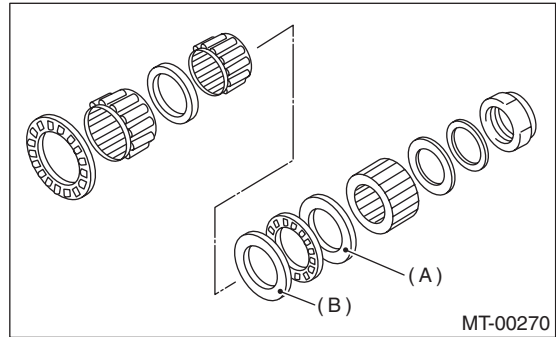
4) If the starting torque is not within the specified limit, select new adjusting washer No. 1 and recheck starting torque.



(A) Adjusting washer No. 1

(B) Adjusting washer No. 2

5) If specified starting torque range cannot be obtained, use a No. 1 adjusting washer and a suitable No. 2 adjusting washer which is selected from the following table. Repeat steps 1) through 4) to adjust starting torque.



(A) Adjusting washer No. 1

(B) Adjusting washer No. 2

Starting torque	Dimension H	Washer No. 2
Low	Small	Select thicker one.
High	Large	Select thinner one.

Adjusting washer No. 2	
Part No.	Thickness mm (in)
803025059	3.850 (0.1516)
803025054	4.000 (0.1575)
803025058	4.150 (0.1634)

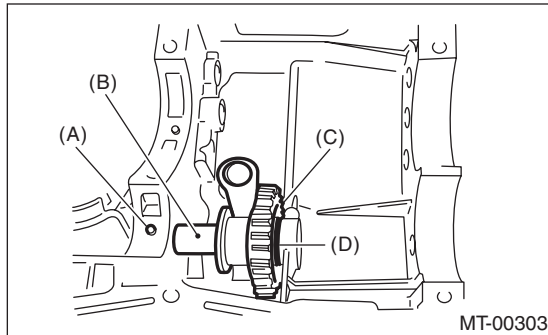
6) Recheck that the starting torque is within the specified range, then crimp the lock nut at four positions.

Adjusting washer No. 1	
Part No.	Thickness mm (in)
803025051	3.925 (0.1545)
803025052	3.950 (0.1555)
803025053	3.975 (0.1565)
803025054	4.000 (0.1575)
803025055	4.025 (0.1585)
803025056	4.050 (0.1594)
803025057	4.075 (0.1604)

20.Reverse Idler Gear

A: REMOVAL

- 1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-26, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the back-up light switch and the neutral position switch. <Ref. to 5MT-35, REMOVAL, Switches and Harness.>
- 3) Remove the transfer case together with the extension case assembly. <Ref. to 5MT-39, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove the transmission case. <Ref. to 5MT-59, REMOVAL, Drive Pinion Shaft Assembly.>
- 5) Remove the drive pinion shaft assembly. <Ref. to 5MT-59, REMOVAL, Drive Pinion Shaft Assembly.>
- 6) Remove the main shaft assembly. <Ref. to 5MT-54, REMOVAL, Main Shaft Assembly for Single-range.>
- 7) Remove the differential assembly. <Ref. to 5MT-67, REMOVAL, Front Differential Assembly.>
- 8) Remove the shifter forks and rods. <Ref. to 5MT-77, REMOVAL, Shifter Fork and Rod.>
- 9) Pull out the straight pin, and remove the reverse idler gear shaft, reverse idler gear and washer.



- (A) Straight pin
- (B) Reverse idler gear shaft
- (C) Reverse idler gear
- (D) Washer

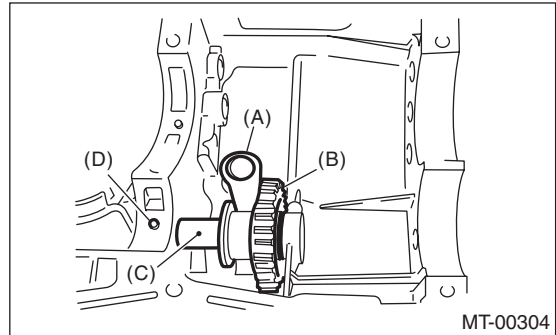
- 10) Remove the reverse shifter lever.

B: INSTALLATION

- 1) Install the reverse shifter lever, reverse idler gear and reverse idler gear shaft, and secure them with the straight pin.

NOTE:

Be sure to install the reverse idler shaft from rear side.



- (A) Reverse shifter lever
- (B) Reverse idler gear
- (C) Reverse idler gear shaft
- (D) Straight pin

- 2) Check and adjust clearance between the reverse idler gear and the transmission case wall surface. <Ref. to 5MT-76, INSPECTION, Reverse Idler Gear.> <Ref. to 5MT-76, ADJUSTMENT, Reverse Idler Gear.>
- 3) Install the shifter forks and rods. <Ref. to 5MT-77, INSTALLATION, Shifter Fork and Rod.>
- 4) Install the differential assembly. <Ref. to 5MT-67, INSTALLATION, Front Differential Assembly.>
- 5) Install the main shaft assembly. <Ref. to 5MT-54, INSTALLATION, Main Shaft Assembly for Single-range.>
- 6) Install the drive pinion shaft assembly. <Ref. to 5MT-59, INSTALLATION, Drive Pinion Shaft Assembly.>
- 7) Install the transmission case. <Ref. to 5MT-52, INSTALLATION, Transmission Case.>
- 8) Install the transfer case together with the extension case assembly. <Ref. to 5MT-39, INSTALLATION, Transfer Case and Extension Case Assembly.>
- 9) Install the back-up light switch and neutral position switch. <Ref. to 5MT-35, INSTALLATION, Switches and Harness.>
- 10) Install the manual transmission assembly to the vehicle. <Ref. to 5MT-28, INSTALLATION, Manual Transmission Assembly.>

Reverse Idler Gear

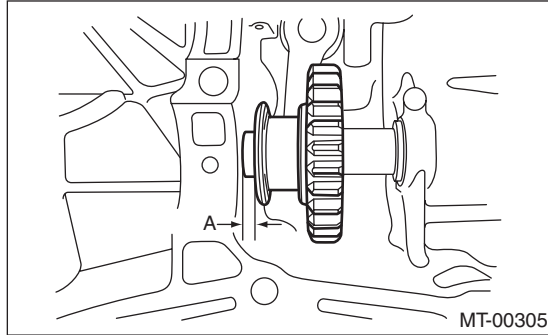
MANUAL TRANSMISSION AND DIFFERENTIAL

C: INSPECTION

1) Move the reverse shifter rod toward the reverse side. Check and adjust clearance between the reverse idler gear and the timing case wall surface. If out of specification, select an appropriate reverse shifter lever and adjust.

Clearance A:

6.0 — 7.5 mm (0.236 — 0.295 in)

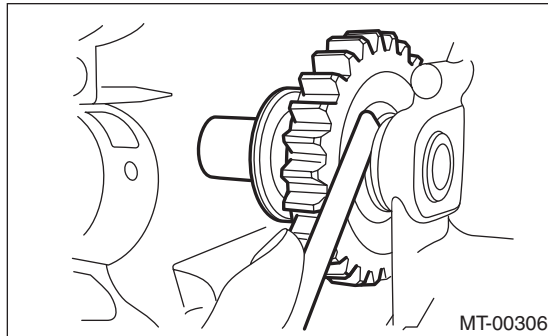


2) After installing a suitable reverse shifter lever, shift into neutral. Check and adjust clearance between the reverse idler gear and the timing case wall surface.

If out of specification, select the appropriate washer and adjust.

Clearance:

0 — 0.5 mm (0 — 0.020 in)



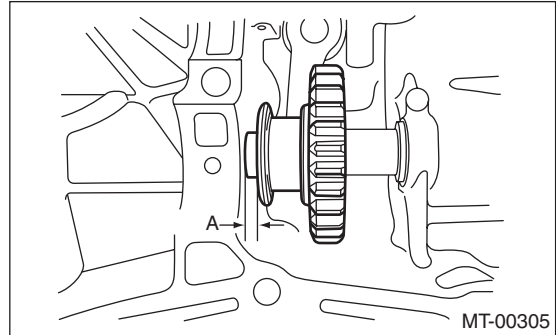
3) Check the reverse idler gear and shaft for damage. Replace if damaged.

D: ADJUSTMENT

1) Select the appropriate reverse shifter lever from the table below, and adjust until the gap between the reverse idler gear and transmission case wall is within specification.

Clearance A:

6.0 — 7.5 mm (0.236 — 0.295 in)

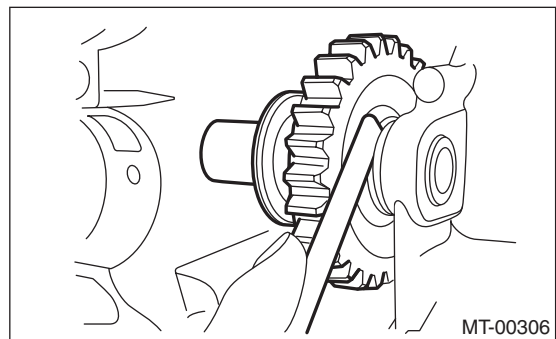


Reverse shifter lever		
Part No.	Mark	Remarks
32820AA070	7	Far from case wall
32820AA080	8	Standard
32820AA090	9	Closer to case wall

2) Select the appropriate washer from the table below, and adjust until the gap between the reverse idler gear and transmission case wall is within specification.

Clearance:

0 — 0.5 mm (0 — 0.020 in)



Washer	
Part No.	Thickness mm (in)
803020151	0.4 (0.016)
803020152	1.1 (0.043)
803020153	1.5 (0.059)
803020154	1.9 (0.075)
803020155	2.3 (0.091)

Shifter Fork and Rod

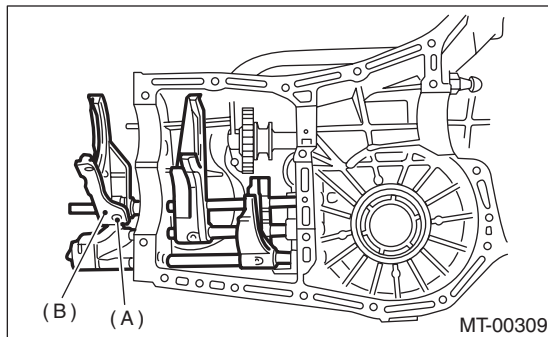
MANUAL TRANSMISSION AND DIFFERENTIAL

21. Shifter Fork and Rod

A: REMOVAL

- 1) Remove the manual transmission assembly from the vehicle. <Ref. to 5MT-26, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the back-up light switch and the neutral position switch. <Ref. to 5MT-35, REMOVAL, Switches and Harness.>
- 3) Remove the transfer case together with the extension case assembly. <Ref. to 5MT-39, REMOVAL, Transfer Case and Extension Case Assembly.>
- 4) Remove the transmission case. <Ref. to 5MT-51, REMOVAL, Transmission Case.>
- 5) Remove the drive pinion shaft assembly. <Ref. to 5MT-59, REMOVAL, Drive Pinion Shaft Assembly.>
- 6) Remove the main shaft assembly. <Ref. to 5MT-54, REMOVAL, Main Shaft Assembly for Single-range.>
- 7) Remove the differential assembly. <Ref. to 5MT-67, REMOVAL, Front Differential Assembly.>
- 8) Drive out the straight pin by tapping with the ST, and pull out the 5th shifter fork.

ST 398791700 STRAIGHT PIN REMOVER

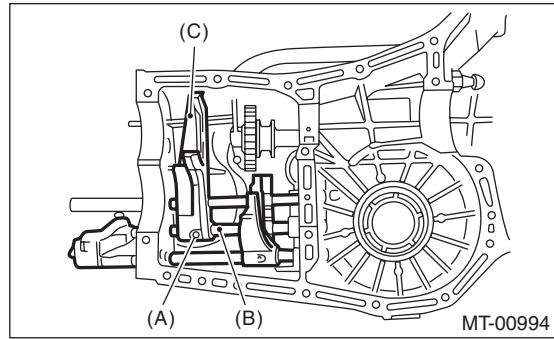


- (A) Straight pin
- (B) 5th shifter fork

- 9) Remove the plugs, springs and check balls.
- 10) Drive out the straight pin, and pull out the 3rd-4th fork rod and shifter fork.

NOTE:

When removing the rod, keep other rods in neutral.



- (A) Straight pin
- (B) 3rd-4th fork rod
- (C) Shifter fork

- 11) Drive out the straight pin, and pull out the 1st-2nd fork rod and shifter fork.
- 12) Remove the snap ring (outer), and pull out the reverse shifter rod arm and reverse fork rod. Then take out the ball, spring and interlock plunger from the rod. And then remove the rod.

NOTE:

When pulling out the reverse shifter rod arm, be careful not to let the ball pop out of arm.

- 13) Remove the reverse shifter lever.

B: INSTALLATION

- 1) Apply grease to the plunger.
ST 399411700 ACCENT BALL INSTALLER
- 2) Install the reverse arm fork spring, ball and interlock plunger to the reverse fork rod arm. Insert the reverse fork rod into the hole of the reverse fork rod arm, and hold it with snap ring (outer) using ST.
- 3) Position the ball, spring and new gasket in the reverse shifter rod hole on the left side of transmission case, and tighten the checking ball plug.
- 4) Install the 1st-2nd fork rod into 1st-2nd shifter fork through the hole on the rear of transmission case.
- 5) Align the holes in the rod and the fork, and drive the new straight pin into these holes using the ST.

NOTE:

- Set other rods to neutral.
- Make sure the interlock plunger is on the 3rd-4th fork rod side.

ST 398791700 STRAIGHT PIN REMOVER

- 6) Apply grease to the plunger.
- 7) Attach the interlock plunger on 3rd-4th fork rod.
- 8) Attach the 3rd-4th fork rod into 3rd-4th shifter fork through the hole on the rear of transmission case.

Shifter Fork and Rod

MANUAL TRANSMISSION AND DIFFERENTIAL

9) Align the holes in the rod and the fork, and drive the new straight pin into these holes.

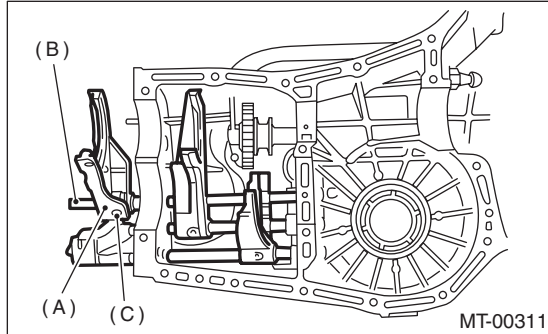
NOTE:

- Set the reverse fork rod to neutral.
- Make sure the interlock plunger (before installation) is on the reverse fork rod side.

ST 398791700 STRAIGHT PIN REMOVER

10) Install the 5th shifter fork onto the rear of reverse fork rod. Align the holes in the two parts and drive new straight pin into the specified place.

ST 398791700 STRAIGHT PIN REMOVER



- (A) 5th shifter fork
- (B) Reverse fork rod
- (C) Straight pin

11) Position the balls, checking ball springs and new gaskets into 3rd-4th fork rods and 1st-2nd fork rod holes, and install plugs.

12) Install the differential assembly. <Ref. to 5MT-67, INSTALLATION, Front Differential Assembly.>

13) Install the main shaft assembly. <Ref. to 5MT-54, INSTALLATION, Main Shaft Assembly for Single-range.>

14) Install the drive pinion shaft assembly. <Ref. to 5MT-59, INSTALLATION, Drive Pinion Shaft Assembly.>

15) Install the transmission case. <Ref. to 5MT-52, INSTALLATION, Transmission Case.>

16) Install the transfer case together with the extension case assembly. <Ref. to 5MT-39, INSTALLATION, Transfer Case and Extension Case Assembly.>

17) Install the back-up light switch and neutral position switch. <Ref. to 5MT-35, INSTALLATION, Switches and Harness.>

18) Install the manual transmission assembly to the vehicle. <Ref. to 5MT-28, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

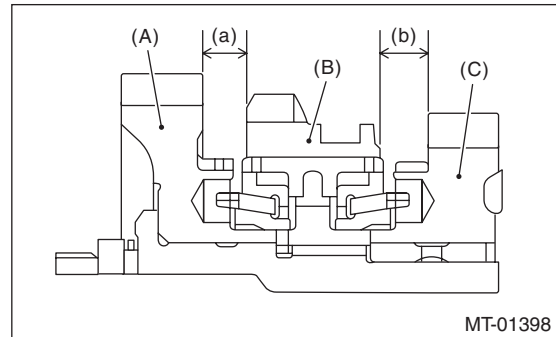
1) Check the shift shaft and shift rod for damage. Replace if damaged.

2) Gearshift mechanism

Repair or replace the gearshift mechanism if excessively worn, bent or abnormal in any way.

3) Inspect the clearance between 1st, 2nd driven gear and reverse driven gear. If any clearance is not within specifications, replace the shifter fork as required.

**Clearance (a) and (b):
9.5 mm (0.374 in)**



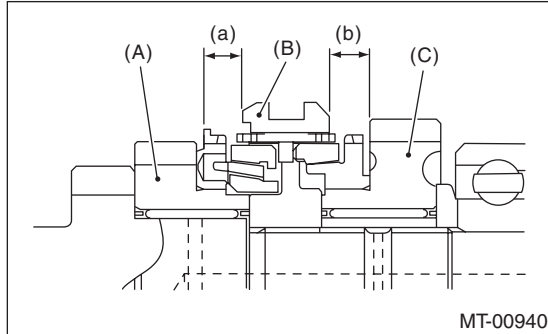
- (A) 1st driven gear
- (B) Reverse driven gear
- (C) 2nd driven gear

1st-2nd shifter fork		
Part No.	Mark	Remarks
32804AA060	1	0.2 mm on 1st gear Near (0.008 in)
32804AA070	No mark	Standard
32804AA080	3	0.2 mm on 2nd gear Near (0.008 in)

Shifter Fork and Rod

4) Inspect the clearance between the 3rd, 4th drive gear and the coupling sleeve. If any clearance is not within specifications, replace the shifter fork as required.

Clearance (a) and (b):
7.3 mm (0.287 in)

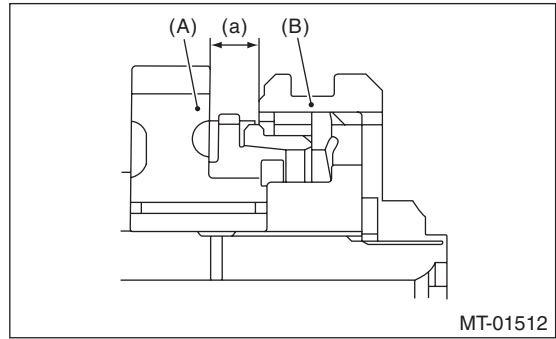


- (A) 3rd drive gear
- (B) Coupling sleeve
- (C) 4th drive gear

3rd-4th shifter fork		
Part No.	Mark	Remarks
32810AA061	1	0.2 mm on 4th gear Near (0.008 in)
32810AA071	No mark	Standard
32810AA101	3	0.2 mm on 3rd gear Near (0.008 in)

5) Inspect the clearance between 5th drive gear and coupling sleeve. If any clearance is not within specifications, replace the shifter fork as required.

Clearance (a):
9.3 mm (0.366 in)



- (A) 5th drive gear
- (B) Coupling sleeve

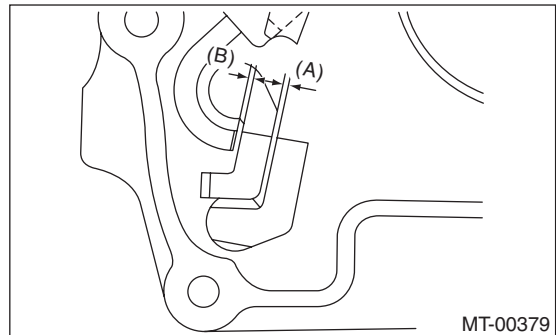
5th shifter fork (Non-turbo)		
Part No.	Mark	Remarks
32812AA201	7	Approaches 5th gear by 0.2 mm (0.008 in).
32812AA211	No mark	Standard
32812AA221	9	Moves away from 5th gear by 0.2 mm (0.008 in).

5th shifter fork (Turbo)		
Part No.	Mark	Remarks
32812AA231	7	Approaches 5th gear by 0.2 mm (0.008 in).
32812AA241	No mark	Standard
32812AA251	9	Moves away from 5th gear by 0.2 mm (0.008 in).

6) Inspect the rod end clearances (A) and (B). If any clearance is not within specifications, replace the rod or fork as required.

Clearance (B):
1st-2nd — 3rd-4th
0.4 — 1.4 mm (0.016 — 0.055 in)

Clearance (A):
3rd-4th — 5th
0.5 — 1.3 mm (0.020 — 0.051 in)



General Diagnostic Table

MANUAL TRANSMISSION AND DIFFERENTIAL

22. General Diagnostic Table

A: INSPECTION

1. MANUAL TRANSMISSION

Symptoms	Possible cause	Corrective action
1. The gears are not mating well. NOTE: The cause for difficulty in shifting gears can be classified into two kinds: One is a abnormal gear shift system and the other is abnormal transmission. However, if the operation is heavy and engagement of the gears is difficult, problem with clutch disengagement may also be responsible. Check whether the clutch is correctly functioning, before checking the gear shift system and transmission.	(a) Worn, damaged or burred chamfer at internal spline of sleeve and reverse driven gear	Replace.
	(b) Worn, damaged or burred chamfer of gear spline	Replace.
	(c) Worn or scratched bushings	Replace.
	(d) Incorrect contact or wear between synchronizer ring and gear cone	Correct or replace.
2. Gear slip-out <ul style="list-style-type: none"> • Gear slips out when coasting on rough road. • Gear slips out during acceleration. 	(a) Abnormal pitching stopper adjustment	Adjust.
	(b) Loose engine mounting bolts	Tighten or replace.
	(c) Worn fork shifter, broken shifter fork rail spring	Replace.
	(d) Worn or damaged ball bearing	Replace.
	(e) Excessive clearance between splines of synchronizer hub and synchronizer sleeve	Replace.
	(f) Synchronizer hub tooth step wear	Replace.
	(g) Worn 1st driven gear and driven shaft	Replace.
	(h) Worn 2nd driven gear and 2nd bushing	Replace.
	(i) Worn reverse idler gear and bushing	Replace.
3. Unusual noise comes from transmission. NOTE: If a noise is heard when the vehicle is parked with its engine idling and if a noise ceases when the clutch is disengaged, it may be considered that the noise is coming from the transmission.	(a) Insufficient or improper lubrication	Lubricate with specified oil or replace.
	(b) Worn or damaged gears and bearings NOTE: If the trouble is only wear of the gear teeth surfaces, only a high whirring noise will occur at high speeds, but if any part is broken, rhythmical clicking sounds will be heard even at low speeds.	Replace.

General Diagnostic Table

MANUAL TRANSMISSION AND DIFFERENTIAL

2. DIFFERENTIAL

Symptoms	Possible cause	Corrective action
<p>1. Broken differential (case, gear, bearing, etc.)</p> <p>NOTE: Noise will occur, and eventually the differential will not be able to operate due to broken pieces obstructing the gear revolution.</p>	(a) Insufficient or improper oil	Disassemble the differential and replace broken components. At the same time check other components for any trouble, and replace if necessary.
	(b) Use of vehicle under severe conditions such as excessive load and improper use of the clutch	Readjust the preload and backlash of the bearing, and the contact surface of gear.
	(c) Improper adjustment of taper roller bearing	Adjust.
	(d) Improper adjustment of the drive pinion and the hypoid driven gear	Adjust.
	(e) Excessive backlash of a vehicle under severe operating conditions due to worn differential side gear, washer or differential pinion.	Add recommended oil to the specified level. Do not use vehicle under severe operating conditions.
	(f) Loose hypoid driven gear clamping bolts	Tighten.
<p>2. Differential and hypoid gear noises</p> <p>Problems in the differential and hypoid gear always appear as noise problems. Therefore, the generation of noise is the first indication of a problem. However, noises from the engine, muffler, tire, exhaust gas, bearing, body, etc. are easily mistaken for the differential noise. Pay special attention to the hypoid gear noise because it is easily confused with other gear noises. There are the following four kinds of noises.</p> <ul style="list-style-type: none"> • Gear noise when driving: If noise increases as the vehicle speed increases, it may be due to insufficient gear oil, incorrect gear engagement, damaged gears, etc. • Gear noise when coasting: Damaged gears due to misadjusted bearings and incorrect shim adjustment. • Bearing noise when driving or coasting: Cracked, broken or damaged bearings • Noise mainly when turning: Noise from differential side gear, differential pinion or differential pinion shaft, etc. 	(a) Insufficient oil	Lubricate.
	(b) Improper adjustment of hypoid driven gear and drive pinion	Check the tooth contact.
	(c) Worn teeth of hypoid driven gear and drive pinion	Replace as a set. Readjust the bearing preload.
	(d) Loose roller bearing	Readjust the backlash of the hypoid driven gear to drive pinion, and check the tooth contact.
	(e) Distorted hypoid driven gear or differential case	Replace.
	(f) Worn washer and differential pinion shaft	Replace.

General Diagnostic Table

MANUAL TRANSMISSION AND DIFFERENTIAL

General Description

CLUTCH SYSTEM

1. General Description

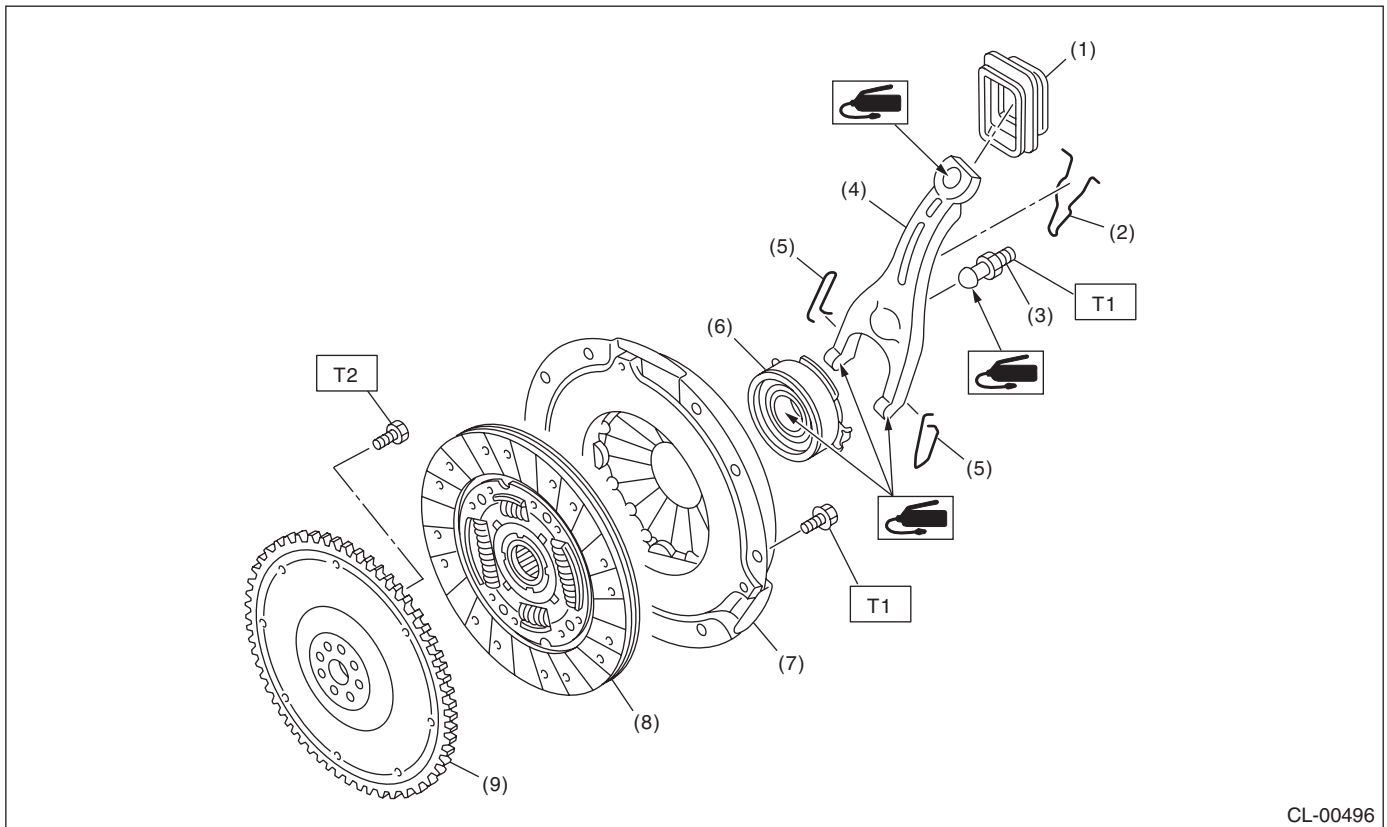
A: SPECIFICATION

Model		Non-turbo	Turbo	
Clutch cover	Type	Push type		
	Diaphragm set load	kgf (lbf)	580 (1,276)	800 (1,760)
Clutch disc	Facing material		Woven (Non asbestos)	
	O.D. × I.D. × thickness mm (in)	Flywheel side	225 × 150 × 3.5 (8.86 × 5.9 × 0.138)	230 × 155 × 3.2 (9.06 × 6.10 × 0.126)
		Pressure plate side		230 × 155 × 3.5 (9.06 × 6.10 × 0.138)
	Spline outer diameter		mm (in)	
		25.2 (0.992), (Number of teeth: 24)		
Clutch release lever ratio		1.6	1.6	
Release bearing		Grease-packed self-aligning		
Clutch pedal	Full stroke	mm (in)	130 — 135 (5.12 — 5.32)	
	Free play	mm (in)	4.35 — 11.1 (0.17 — 0.44)	
Clutch disc	Depth of rivet head	mm (in)	Standard	Flywheel side: 1.35 — 1.95 (0.053 — 0.077) Clutch cover side: 1.65 — 2.25 (0.065 — 0.089)
			Limit of sinking	0.3 (0.012)
	Limit of runout	mm (in)	0.7 (0.028) at R = 107.5 (4.23)	0.7 (0.028) at R = 110.0 (4.33)

B: COMPONENT

1. CLUTCH ASSEMBLY

NON-TURBO MODEL



CL-00496

- | | |
|------------------------------|---------------------|
| (1) Release lever dust cover | (6) Release bearing |
| (2) Lever spring | (7) Clutch cover |
| (3) Pivot | (8) Clutch disc |
| (4) Release lever | (9) Flywheel |
| (5) Clip | |

Tightening torque: N·m (kgf-m, ft-lb)

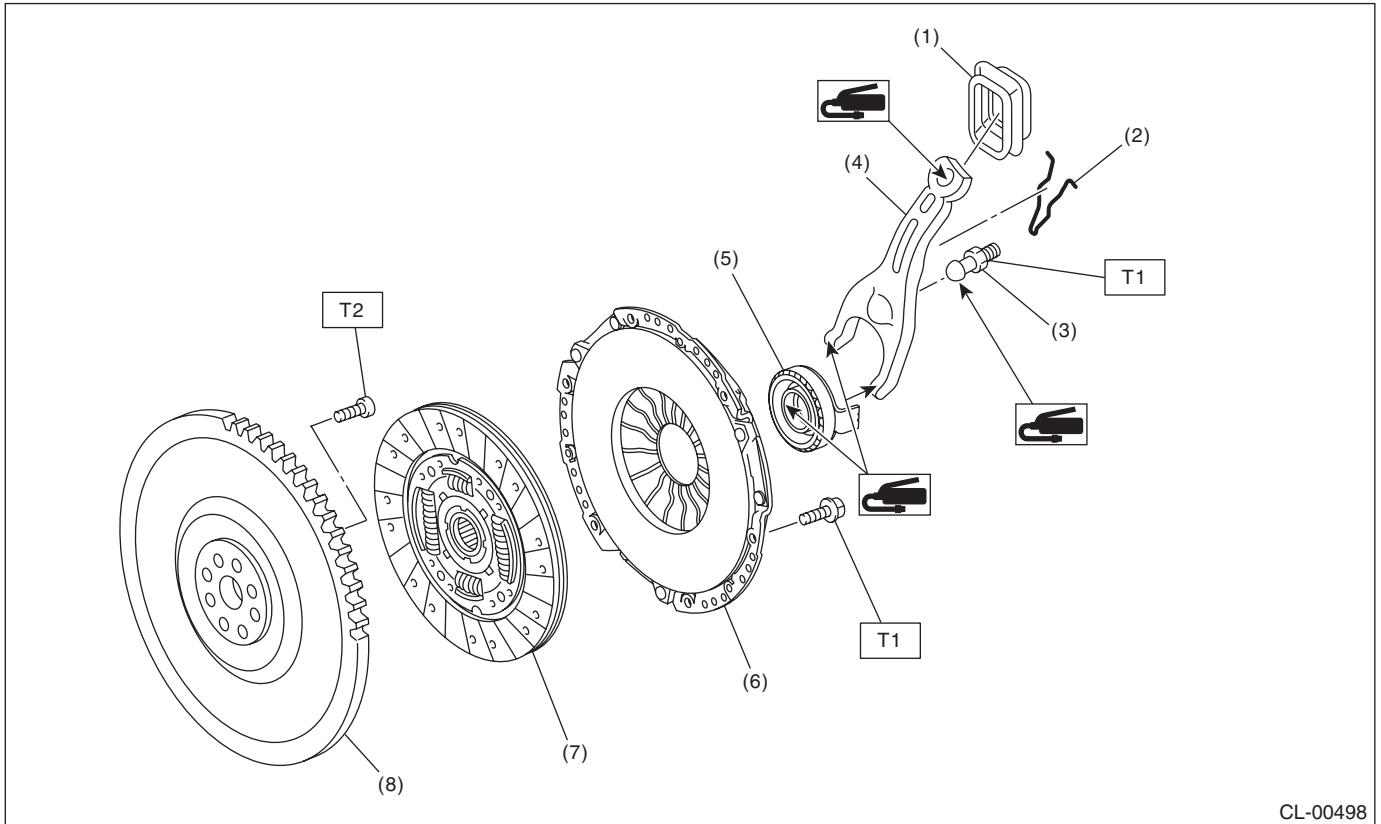
T1: 16 (1.6, 11.6)

T2: 72 (7.3, 52.8)

General Description

CLUTCH SYSTEM

TURBO MODEL



CL-00498

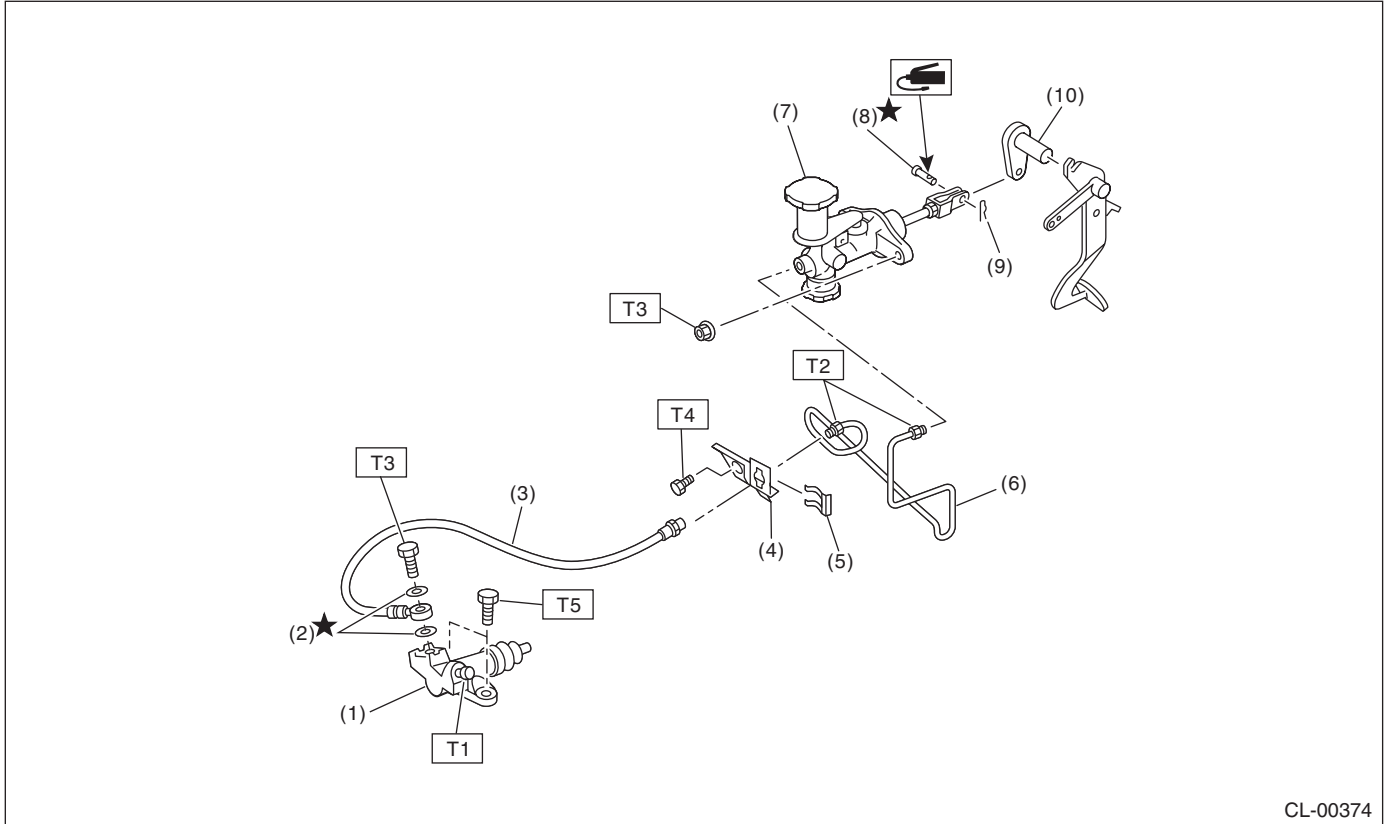
- | | |
|------------------------------|---------------------|
| (1) Release lever dust cover | (5) Release bearing |
| (2) Lever spring | (6) Clutch cover |
| (3) Pivot | (7) Clutch disc |
| (4) Release lever | (8) Flywheel |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 16 (1.6, 11.6)

T2: 72 (7.3, 52.8)

2. CLUTCH PIPE AND HOSE (NON-TURBO MODEL)



CL-00374

- | | |
|------------------------|--------------------------|
| (1) Operating cylinder | (6) Clutch pipe |
| (2) Washer | (7) Master cylinder ASSY |
| (3) Clutch hose | (8) Clevis pin |
| (4) Bracket | (9) Snap pin |
| (5) Clip | (10) Lever |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 7.8 (0.8, 5.8)

T2: 15 (1.5, 10.8)

T3: 18 (1.8, 13.0)

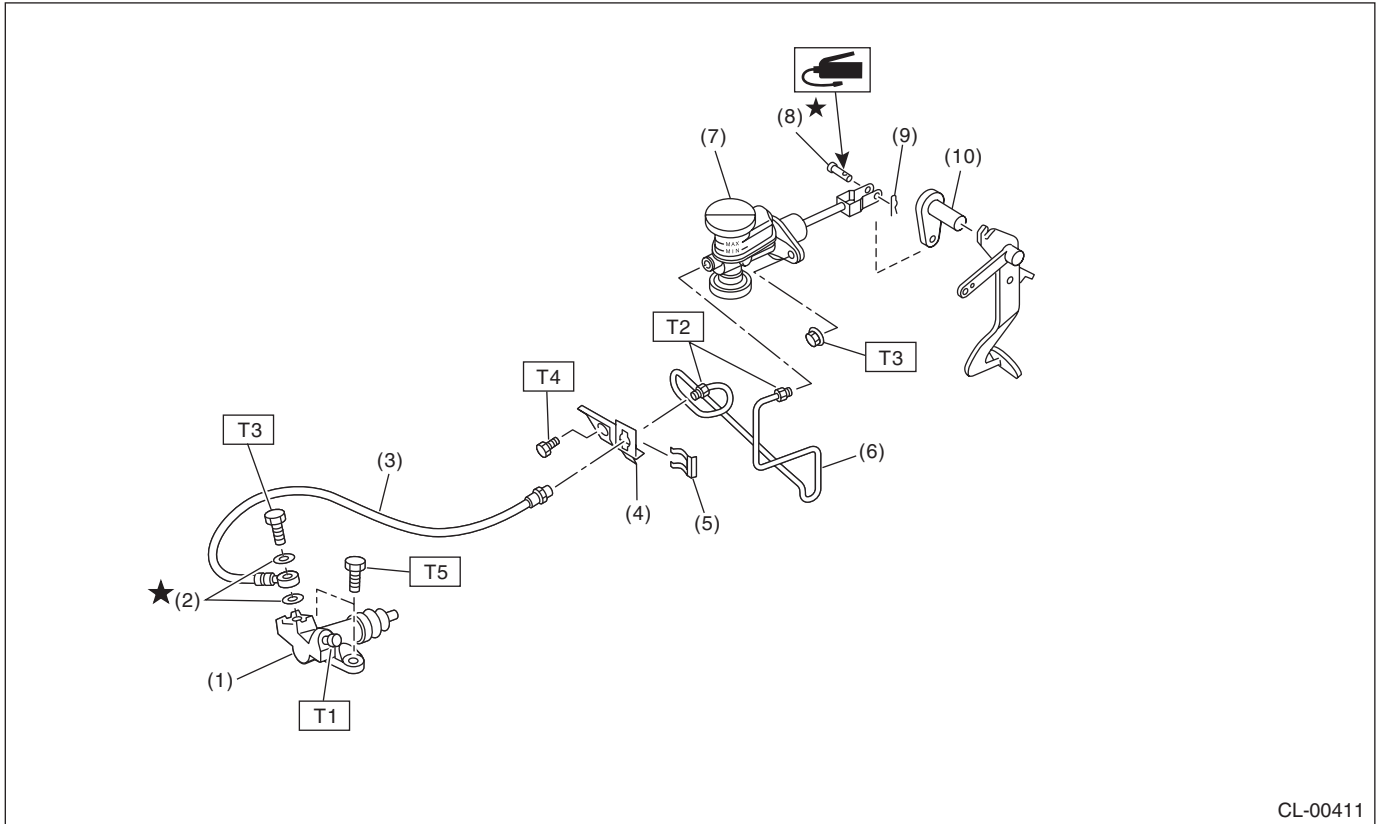
T4: 25 (2.5, 18.1)

T5: 37 (3.8, 27.5)

General Description

CLUTCH SYSTEM

3. CLUTCH PIPE AND HOSE (TURBO MODEL)



- | | |
|------------------------|--------------------------|
| (1) Operating cylinder | (6) Clutch pipe |
| (2) Washer | (7) Master cylinder ASSY |
| (3) Clutch hose | (8) Clevis pin |
| (4) Bracket | (9) Snap pin |
| (5) Clip | (10) Lever |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 7.8 (0.8, 5.8)

T2: 15 (1.5, 10.8)

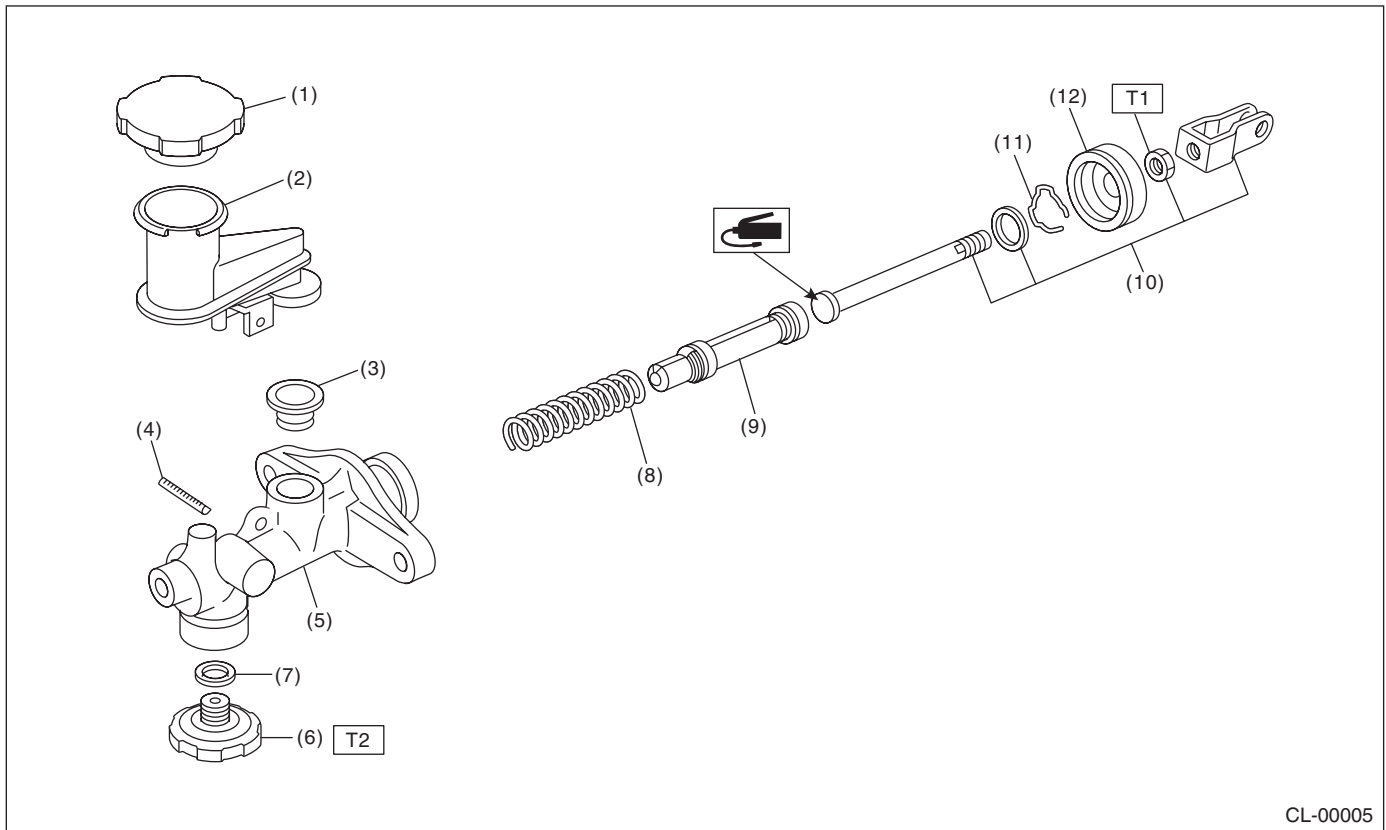
T3: 18 (1.8, 13.0)

T4: 25 (2.5, 18.1)

T5: 37 (3.8, 27.5)

4. MASTER CYLINDER

Non-turbo model



CL-00005

- | | |
|---------------------|-----------------------|
| (1) Reservoir cap | (7) Gasket |
| (2) Reservoir tank | (8) Return spring |
| (3) Oil seal | (9) Piston |
| (4) Straight pin | (10) Push rod |
| (5) Master cylinder | (11) Piston stop ring |
| (6) Clutch damper | (12) Cylinder boot |

Tightening torque: N-m (kgf-m, ft-lb)

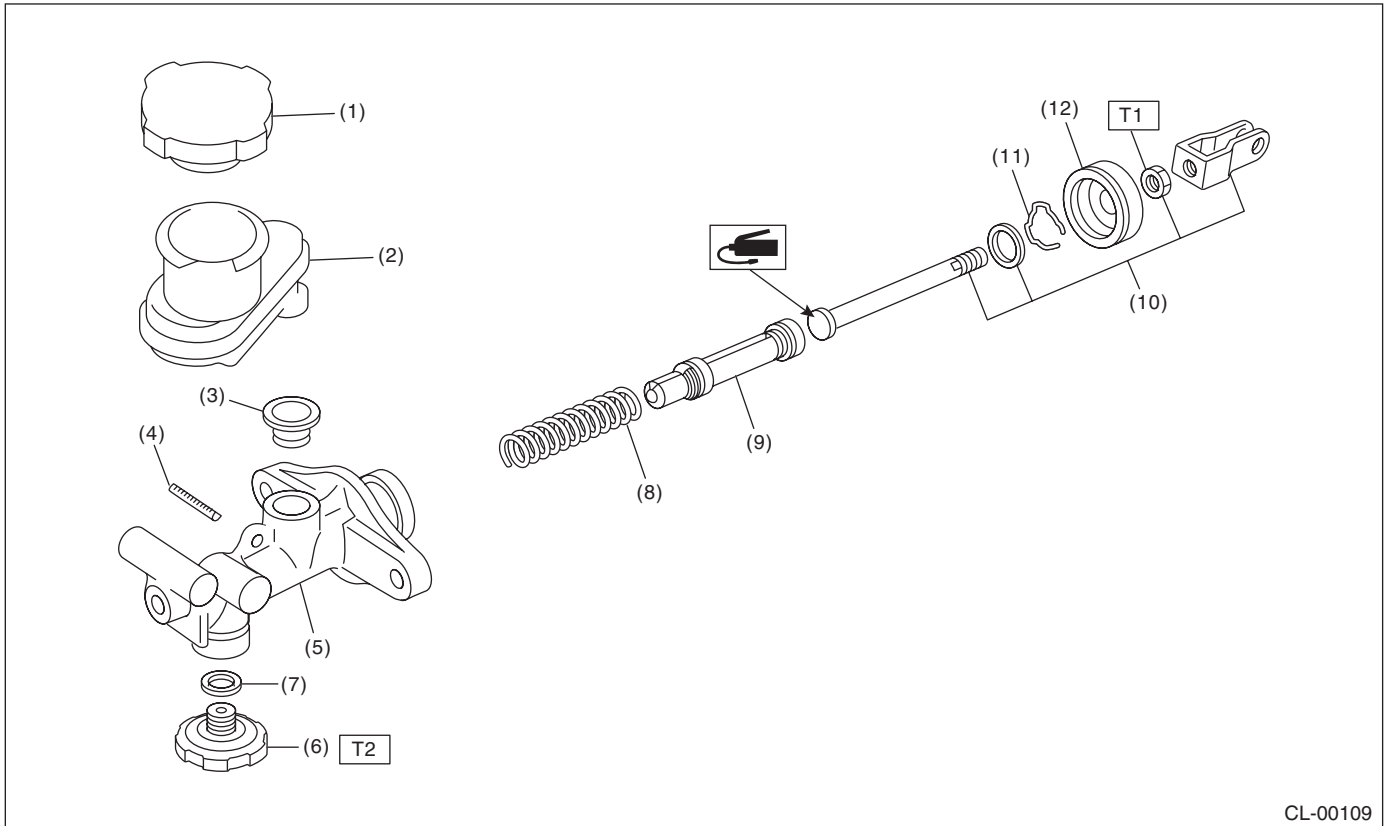
T1: 10 (1.0, 7)

T2: 46.6 (4.75, 34.4)

General Description

CLUTCH SYSTEM

Turbo model



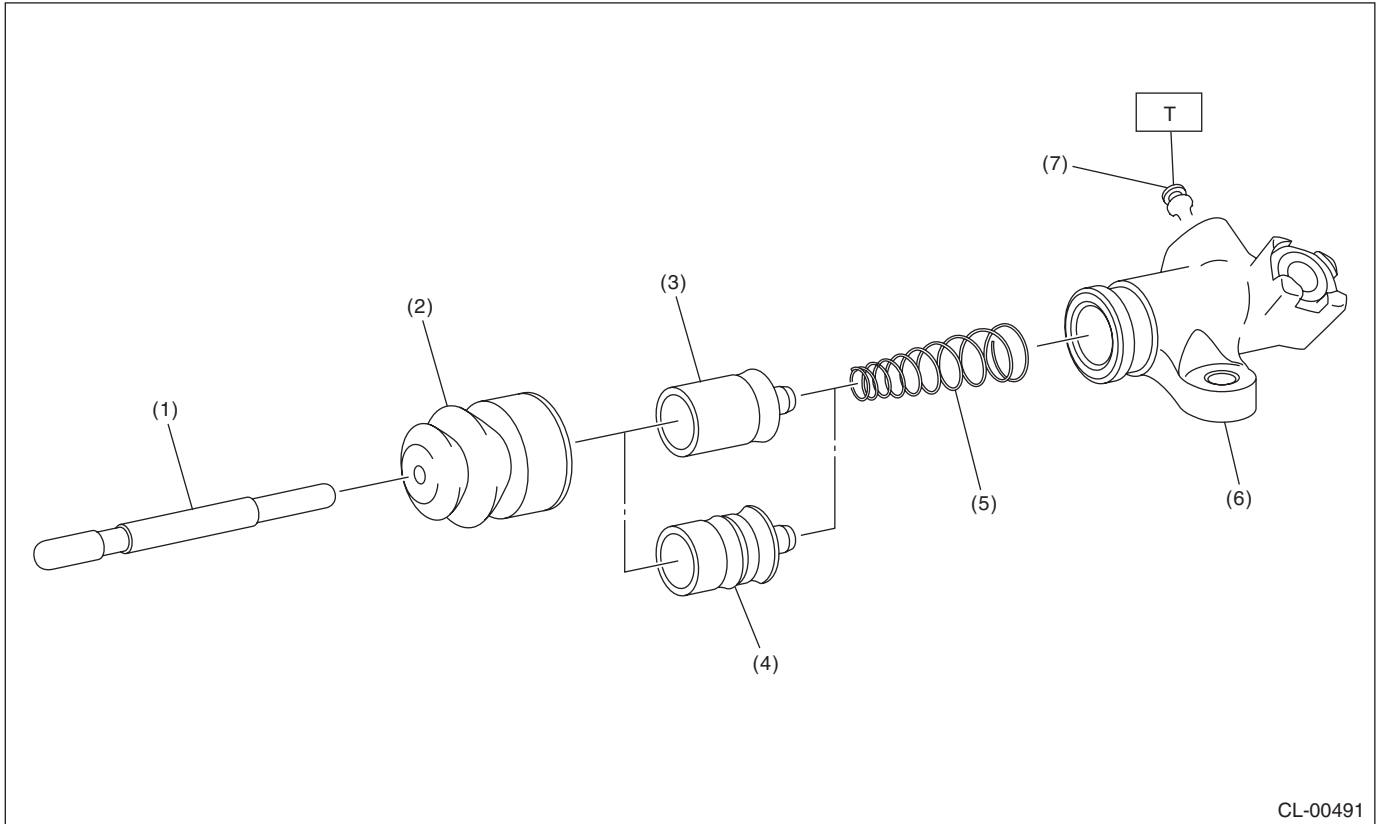
- | | |
|---------------------|-----------------------|
| (1) Reservoir cap | (7) Gasket |
| (2) Reservoir tank | (8) Return spring |
| (3) Oil seal | (9) Piston |
| (4) Straight pin | (10) Push rod |
| (5) Master cylinder | (11) Piston stop ring |
| (6) Clutch damper | (12) Cylinder boot |

Tightening torque: N-m (kgf-m, ft-lb)

T1: 10 (1.0, 7.2)

T2: 46.6 (4.75, 34.4)

5. OPERATING CYLINDER



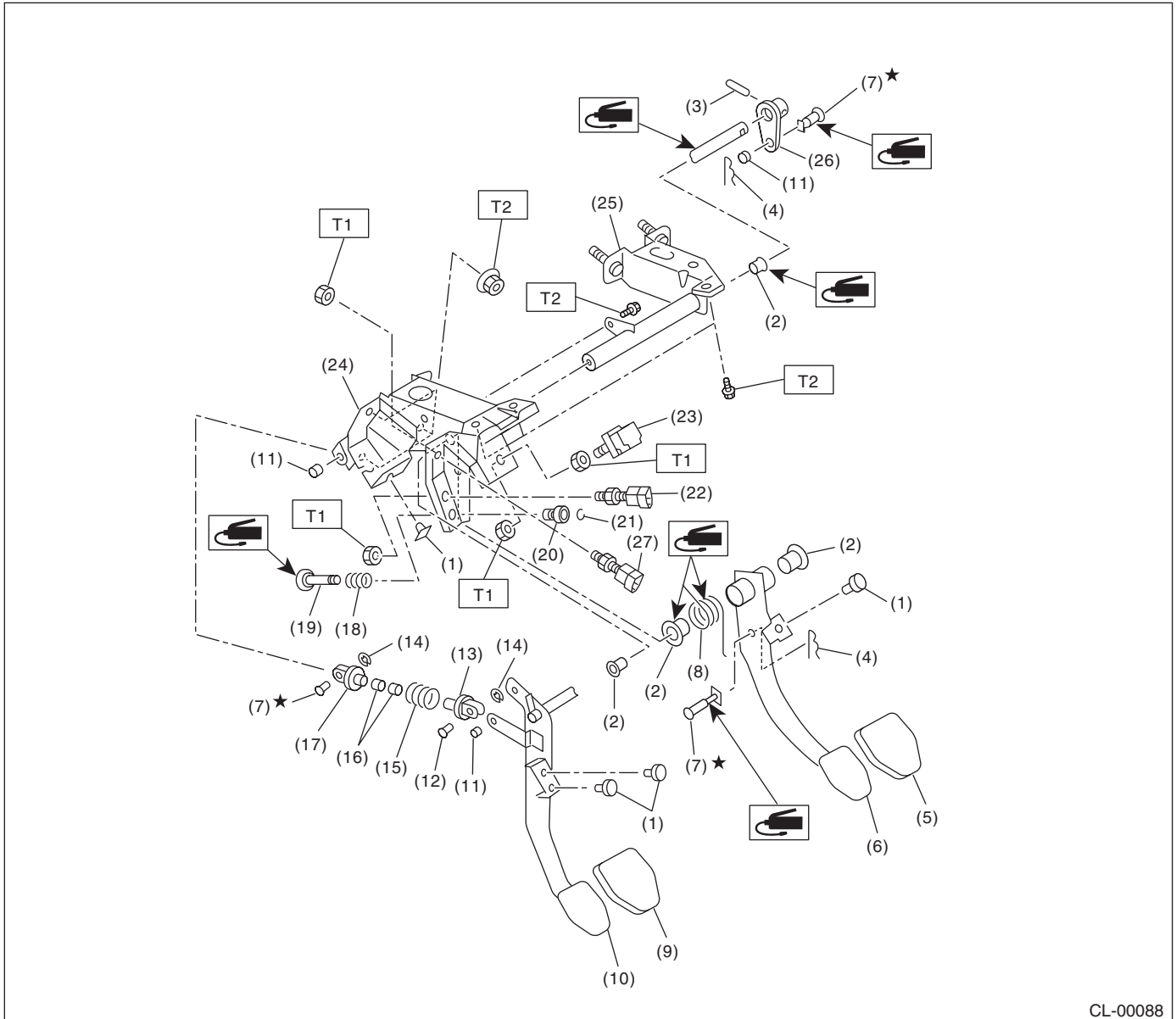
- | | |
|------------------------------|------------------------|
| (1) Push rod | (5) Piston spring |
| (2) Boot | (6) Operating cylinder |
| (3) Piston (Non-turbo model) | (7) Bleeder screw |
| (4) Piston (Turbo model) | |

Tightening torque: N·m (kgf·m, ft·lb)
T: 7.8 (0.8, 5.8)

General Description

CLUTCH SYSTEM

6. CLUTCH PEDAL



CL-00088

- | | | |
|------------------------|------------------------|-------------------------------------|
| (1) Stopper | (12) Clutch clevis pin | (22) Clutch switch |
| (2) Bushing | (13) Assist rod A | (23) Stop light switch |
| (3) Spring pin | (14) Clip | (24) Pedal bracket |
| (4) Snap pin | (15) Assist spring | (25) Clutch master cylinder bracket |
| (5) Brake pedal pad | (16) Assist bushing | (26) Lever |
| (6) Brake pedal | (17) Assist rod B | (27) Clutch switch (Clutch start) |
| (7) Clevis pin | (18) Spring S | |
| (8) Brake pedal spring | (19) Rod S | |
| (9) Clutch pedal pad | (20) Bushing S | |
| (10) Clutch pedal | (21) Clip | |
| (11) Bushing C | | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 8 (0.8, 5.8)

T2: 18 (1.8, 13.0)

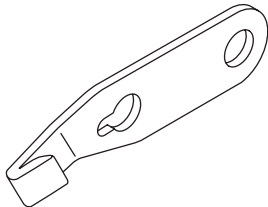
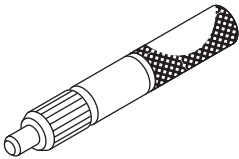
C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the problem. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Use SUBARU genuine fluid, grease etc. or equivalent. Do not mix fluid, grease, etc. of different grades or manufacturers.

- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Apply grease onto sliding or revolving surfaces before installation.
- Before installing O-rings or snap rings, apply sufficient amount of fluid to avoid damage and deformation.
- Before securing a part on a vise, set cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Keep fluids away from the vehicle body. If any fluid contacts the vehicle body, immediately flush the area with water.

D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST-498497100	498497100	CRANKSHAFT STOPPER	Used for stopping rotation of the flywheel when loosening/tightening bolts, etc.
 ST-499747100	499747100	CLUTCH DISC GUIDE	Used when installing the clutch disc to the flywheel.

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and ampere.
Dial gauge	Used for measuring clutch disc run-out.
Depth gauge	Used for measuring clutch disc wear.

Clutch Disc and Cover

CLUTCH SYSTEM

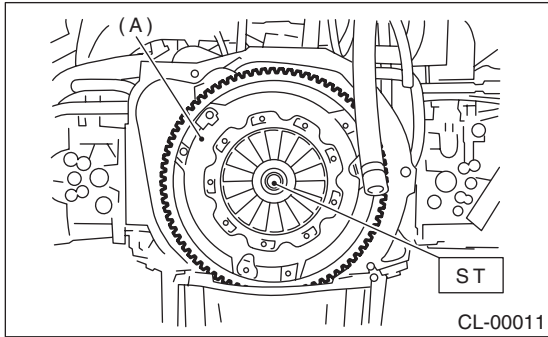
2. Clutch Disc and Cover

A: REMOVAL

1) Remove the transmission assembly from the vehicle body. <Ref. to 5MT-26, REMOVAL, Manual Transmission Assembly.>

2) Attach the ST on the flywheel.

ST 499747100 CRANKSHAFT STOPPER



(A) Clutch cover

3) Remove the clutch cover and clutch disc.

NOTE:

- Take care not to allow oil to touch the clutch disc face.
- Do not disassemble the clutch cover or clutch disc.
- Be sure to mark alignment marks on the flywheel and clutch cover before removing the clutch cover.

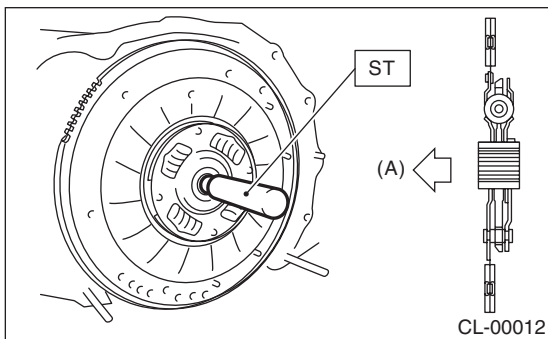
B: INSTALLATION

1) Insert the ST into the clutch disc and attach to the flywheel by inserting the ST end into pilot bearing.

NOTE:

When installing the clutch disc, be careful to attach in the correct direction.

ST 499747100 CLUTCH DISC GUIDE



(A) Flywheel side

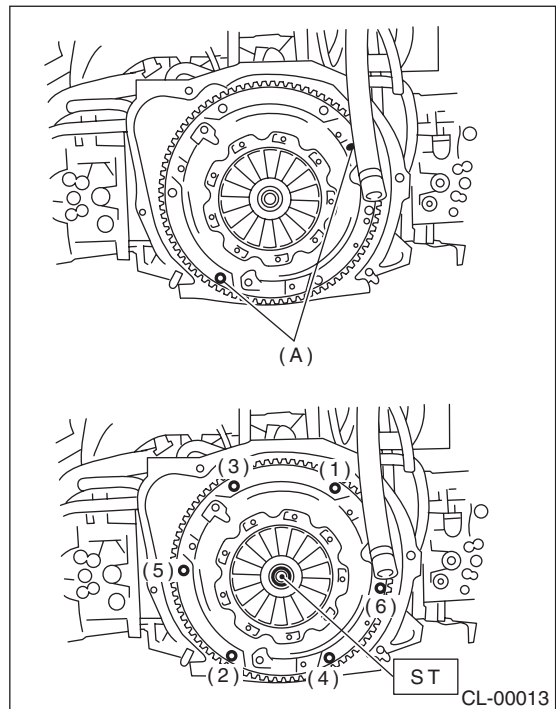
2) Install the clutch cover to the flywheel, and tighten the bolts to the specified torque.

NOTE:

- When installing the clutch cover to the flywheel, position the clutch cover in order to make the gap between imbalance marks (● paint mark) of flywheel and clutch cover 120 ° or more. (The imbalance marks show the residual imbalance direction.)
- Note the front and rear of the clutch disc when installing.
- Tighten the clutch cover installing bolts gradually. Each bolt should be tightened to the specified torque in a crisscross order.

Tightening torque:

16 N·m (1.6 kgf-m, 11.6 ft-lb)



(A) Unbalance mark (paint)

3) Remove the ST.

ST 499747100 CLUTCH DISC GUIDE

4) Install the transmission assembly. <Ref. to 5MT-28, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

1. CLUTCH DISC

1) Facing wear

Measure the depth of the rivet head from the surface of facing. Replace if the facings are worn locally or worn down to less than the specified value.

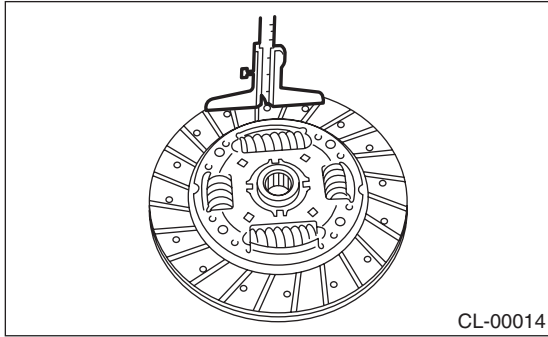
Depth of rivet head:

Limit of sinking

0.3 mm (0.012 in)

NOTE:

Do not wash the clutch disc with any cleaning fluid.

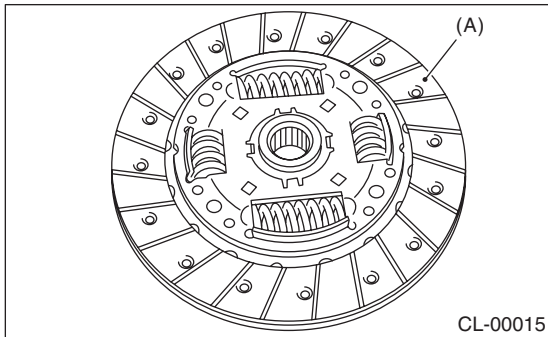


2) Hardened facing

Correct by using emery paper, or replace.

3) Oil soakage on facing

Replace the clutch disc and inspect transmission front oil seal, transmission case mating surface, engine rear oil seal and other points for oil leakage.



(A) Clutch facing

4) Facing runout

If runout exceeds the specified value at the outer circumference of facing, repair or replace.

ST 499747100 CLUTCH DISC GUIDE

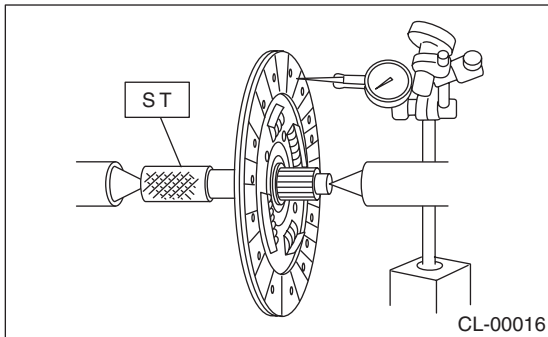
Limit of runout:

Non-turbo model

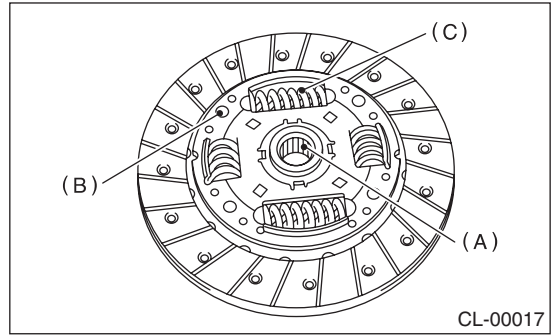
0.7 mm (0.028 in) at R = 107.5 mm (4.23 in)

2.0 L Turbo model

0.7 mm (0.028 in) at R = 110 mm (4.33 in)



5) Replace parts that have problems such as worn splines, loose rivets and torsion spring failure.



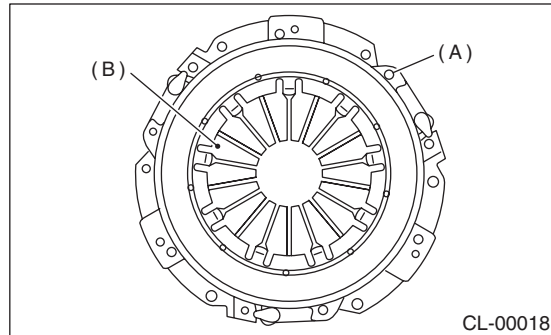
- (A) Spline
- (B) Rivet
- (C) Torsion spring

2. CLUTCH COVER

NOTE:

Visually check the following items without disassembling, and replace or repair if there is a problem.

- 1) Loose thrust rivet
- 2) Damaged or worn bearing contact area at the center of diaphragm spring



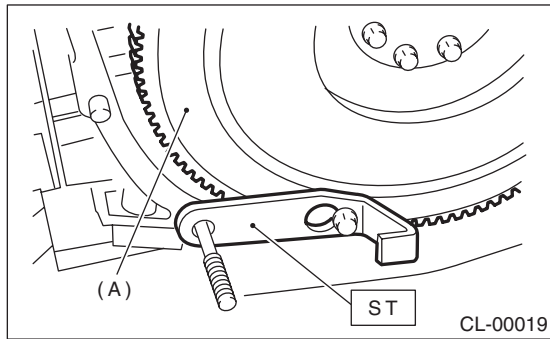
- (A) Thrust rivet
- (B) Diaphragm spring

3. Flywheel

A: REMOVAL

- 1) Remove the transmission assembly. <Ref. to 5MT-26, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the clutch cover and clutch disc. <Ref. to CL-12, REMOVAL, Clutch Disc and Cover.>
- 3) Using the ST, remove the flywheel.

ST 498497100 CRANKSHAFT STOPPER

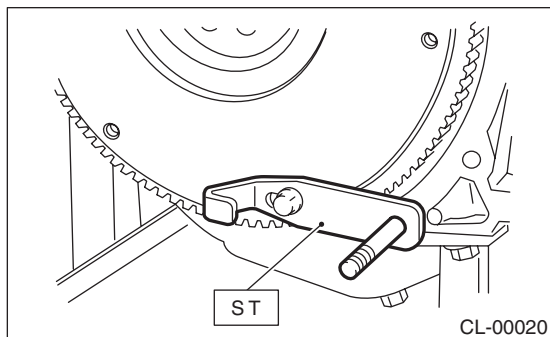


(A) Flywheel

B: INSTALLATION

- 1) Install the flywheel and ST.

ST 498497100 CRANKSHAFT STOPPER



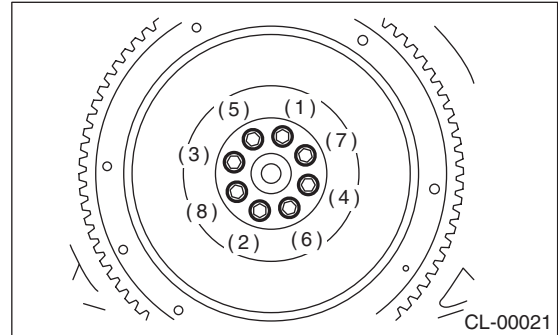
- 2) Tighten the flywheel attaching bolts to the specified torque.

NOTE:

Tighten the flywheel attachment bolts gradually. Each bolt should be tightened to the specified torque in crisscross order.

Tightening torque:

72 N·m (7.3 kgf-m, 52.8 ft-lb)



- 3) Install the clutch disc and cover. <Ref. to CL-12, INSTALLATION, Clutch Disc and Cover.>

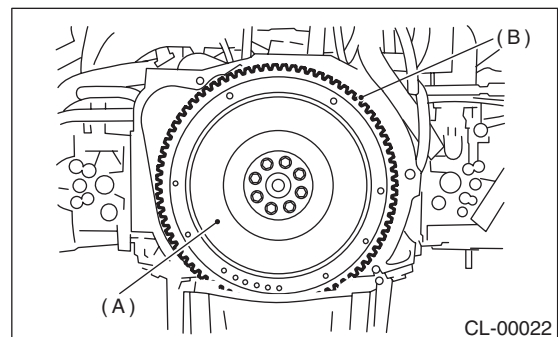
- 4) Install the transmission assembly. <Ref. to 5MT-28, INSTALLATION, Manual Transmission Assembly.>

C: INSPECTION

CAUTION:

Since this bearing is grease-sealed and is a non-lubrication type, do not wash with gasoline or any solvents.

- 1) Damage of facing and ring gear
If there is a problem, replace the flywheel.



(A) Flywheel

(B) Ring gear

- 2) Smoothness of rotation

Rotate the ball bearing while applying pressure in thrust direction.

- 3) If noise or excessive play is noted, replace the flywheel.

4. Release Bearing and Lever

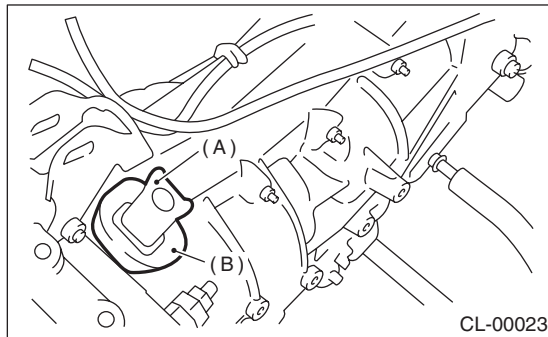
A: REMOVAL

- 1) Remove the transmission assembly from vehicle body.
<Ref. to 5MT-26, REMOVAL, Manual Transmission Assembly.>
- 2) Remove the two clips from the release lever and remove the release bearing. (Non-turbo model)
- 3) Remove the release bearing from release lever. (Turbo model)

CAUTION:

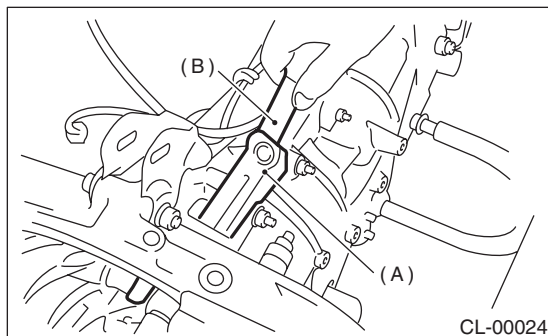
Be careful not to deform the clips.

- 4) Remove the release lever dust cover.



(A) Release lever
(B) Release lever dust cover

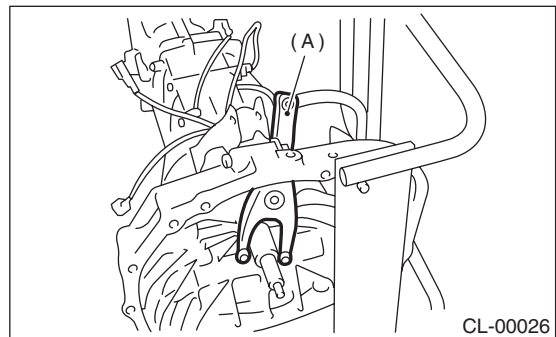
- 5) Remove the lever spring from release lever pivot with a screwdriver, by accessing it through the clutch housing release lever hole. Then remove the release lever.



(A) Release lever
(B) Screwdriver

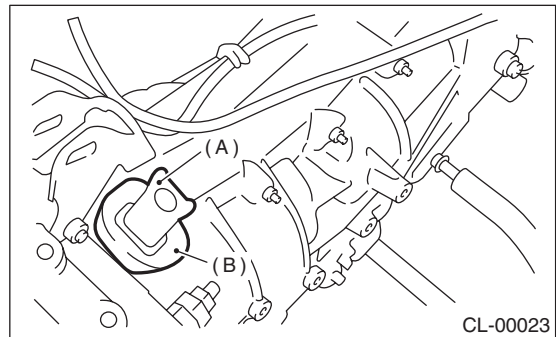
B: INSTALLATION

- 1) Lubricate the following points with the specified grease prior to assembly.
 - Contact surface of release lever and pivot
 - Contact surface of release lever and bearing
 - Transmission main shaft spline (Use grease containing molybdenum disulphide.)
 - Contact surface of release lever and operating cylinder
- 2) While pushing the release lever against the pivot and twisting left and right, fit the spring onto the stepped portion of pivot. Apply grease (KOPR-KOTE: Part No. 003603001) to the contact point of the release lever and the operating cylinder.
- 3) Confirm that the lever spring is securely fitted by observing it through the main case hole.



(A) Release lever

- 4) Install the release bearing and fasten it with two clips. (Non-turbo model)
- 5) Install the release bearing. (Turbo model)
- 6) Install the release lever dust cover.



(A) Release lever
(B) Release lever dust cover

- 7) Check the bearing for smooth movement by operating the release lever.
- 8) Install the transmission assembly.
<Ref. to 5MT-28, INSTALLATION, Manual Transmission Assembly.>

Release Bearing and Lever

CLUTCH SYSTEM

C: INSPECTION

1. RELEASE BEARING

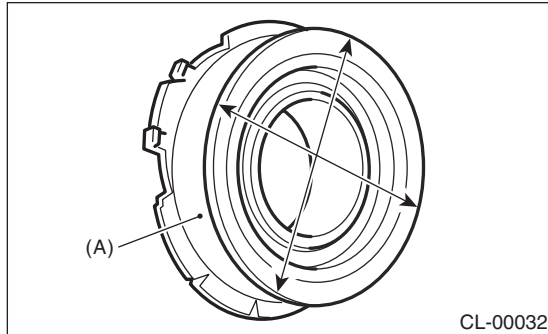
CAUTION:

Since this bearing is grease-sealed and is a non-lubrication type, do not wash with gasoline or any other solvent when servicing the clutch.

1) Check the bearing for smooth movement by applying force to the bearing in radial direction.

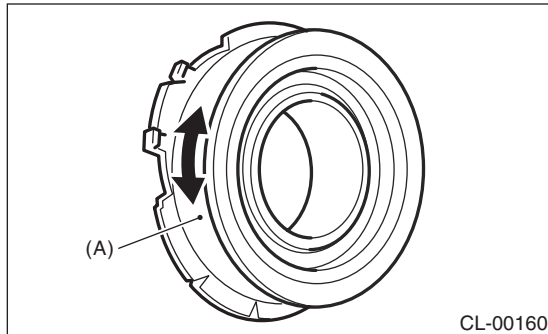
Radial direction stroke:

1.6 mm (0.063 in)



(A) Bearing case

2) While applying force to the bearing in the direction of rotation, check the bearing for smooth rotation.

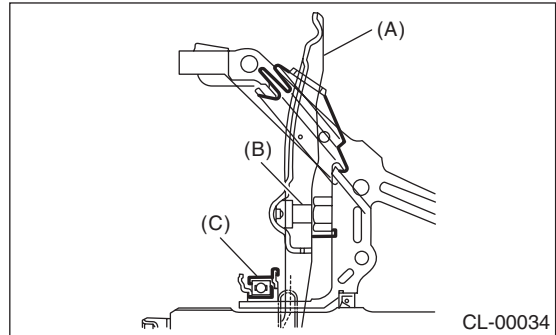


(A) Bearing case

3) Check wear and damage of the bearing case surface in contact with the lever.

2. RELEASE LEVER

Check the pivot portion of the lever and the contact area with the release bearing case for wear.



- (A) Release lever
- (B) Pivot
- (C) Release bearing

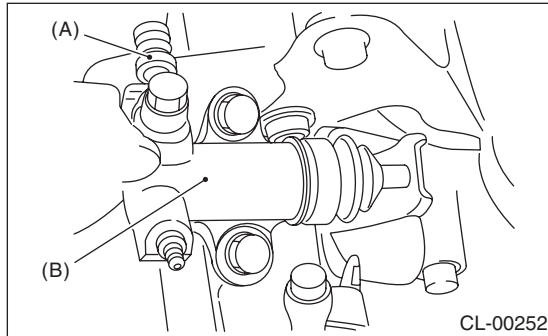
5. Operating Cylinder

A: REMOVAL

- 1) Remove the air intake chamber. (Non-turbo model) <Ref. to IN (H4SO)-6, REMOVAL, Air Intake Chamber.>
- 2) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 3) Remove the clutch hose from operating cylinder.

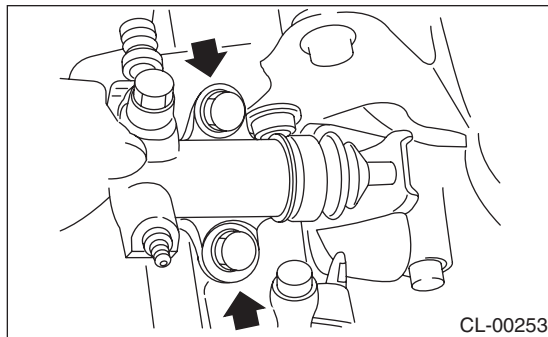
NOTE:

Cover the hose joint to prevent the clutch fluid from flowing out.



- (A) Clutch hose
- (B) Operating cylinder

- 4) Remove the operating cylinder from the transmission.



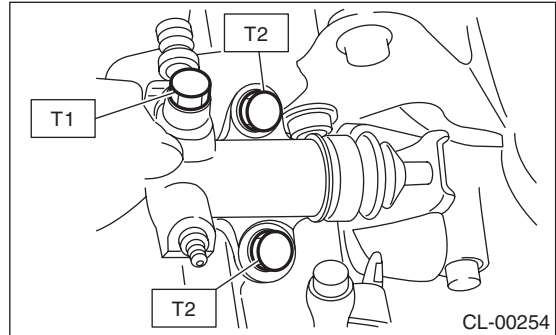
B: INSTALLATION

- 1) Apply grease (KOPR-KOTE: Part No. 003603001) to the contact point of the release lever and the operating cylinder.
- 2) Install in the reverse order of removal.

Tightening torque:

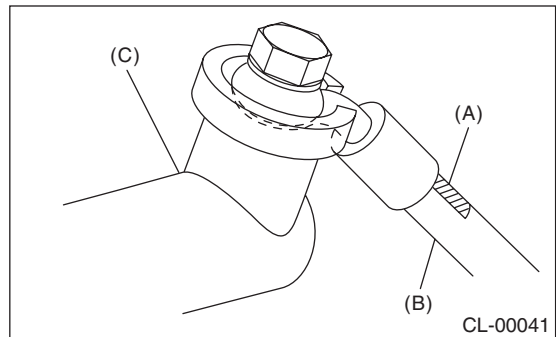
T1: 18 N·m (1.8 kgf-m, 13.0 ft-lb)

T2: 37 N·m (3.8 kgf-m, 27.5 ft-lb)



NOTE:

- Be sure to install the clutch hose with the mark side facing upward.
- Be careful not to twist the clutch hose during installation.



- (A) Mark
- (B) Clutch hose
- (C) Operating cylinder

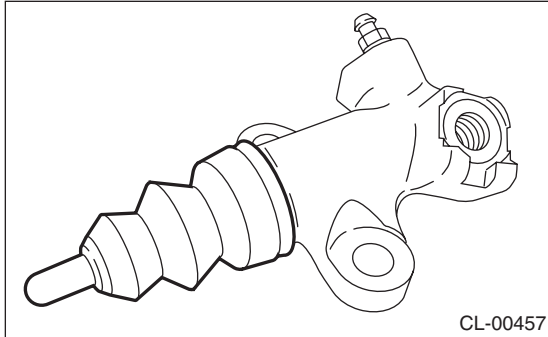
- 3) After bleeding air from the operating cylinder, ensure that the clutch operates properly. <Ref. to CL-23, Clutch Fluid Air Bleeding.>

Operating Cylinder

CLUTCH SYSTEM

C: DISASSEMBLY

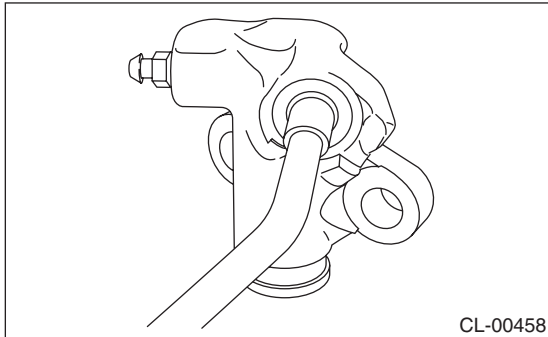
- 1) Remove the boot and push rod.



- 2) Blow in compressed air from the clutch hose attachment hole.

NOTE:

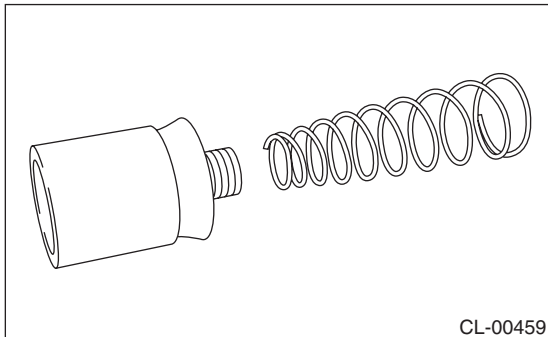
To prevent the piston from shooting out, face the piston hole towards the ground, and place a wooden block to prevent damage.



- 3) Separate the piston and piston spring.

NOTE:

The illustration below is for a non-turbo model.



D: ASSEMBLY

NOTE:

When assembling, apply operating oil on all parts while performing work.

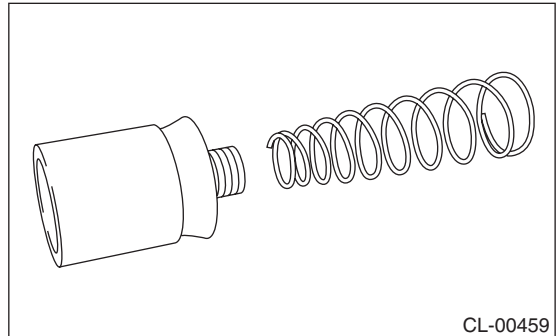
Recommended brake fluid

FMVSS No. 116, new DOT3 or DOT4 brake fluid

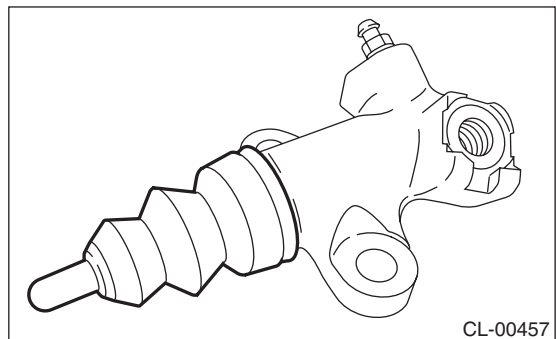
- 1) Attach the piston spring onto the piston.

NOTE:

The illustration below is for a non-turbo model.



- 2) Insert the piston into the operating cylinder.
- 3) Attach the boot to the push rod.
- 4) Install the boot and push rod to the operating cylinder.



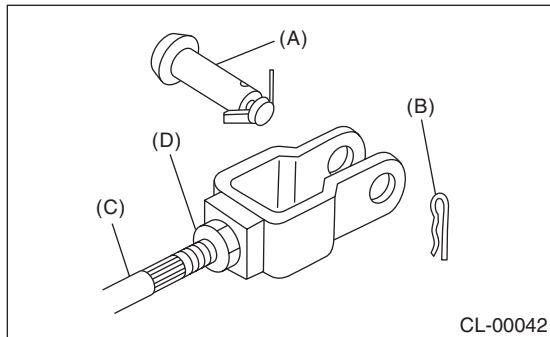
E: INSPECTION

- 1) Check the operating cylinder for damage. If operating cylinder is damaged, replace it.
- 2) Check the operating cylinder for fluid leakage or damage on the boot. If any leakage or damage is found, replace the operating cylinder.

6. Master Cylinder

A: REMOVAL

- 1) Thoroughly drain the brake fluid from the reservoir tank.
- 2) Remove the snap pin and clevis pin, and then separate the push rod of the master cylinder from clutch pedal.

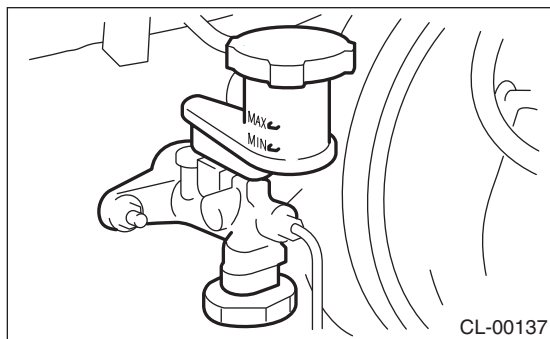


- (A) Clevis pin
- (B) Snap pin
- (C) Push rod
- (D) Push rod lock nut

- 3) Remove the air intake chamber. (Non-turbo model) <Ref. to IN (H4SO)-6, REMOVAL, Air Intake Chamber.>
- 4) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 5) Remove the clutch pipe from master cylinder.
- 6) Remove the master cylinder together with the reservoir tank.

CAUTION:

Be careful not to spill the brake fluid. Immediately wash off with water and wipe clean any brake fluid spilled on the vehicle body, as brake fluid will damage the painted surface.



B: INSTALLATION

- 1) Install the master cylinder to the body, and attach the clutch pipe to the master cylinder.

NOTE:

Check that the pipe is routed properly.

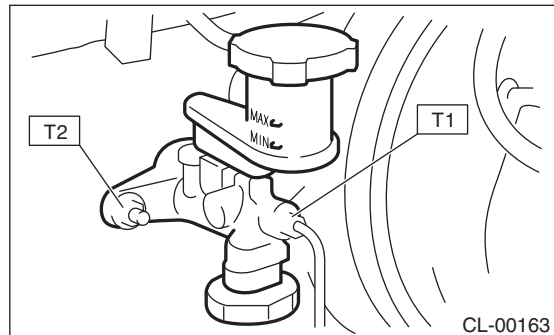
Tightening torque:

Clutch pipe

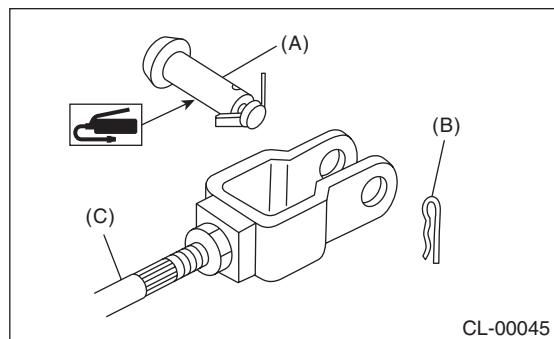
15 N·m (1.5 kgf-m, 10.8 ft-lb)

Master cylinder

18 N·m (1.8 kgf-m, 13.0 ft-lb)



- 2) Apply grease to the clevis pin.
- 3) Connect the push rod of master cylinder to clutch pedal, and install the new clevis pin and snap pin.



- (A) Clevis pin
- (B) Snap pin
- (C) Push rod

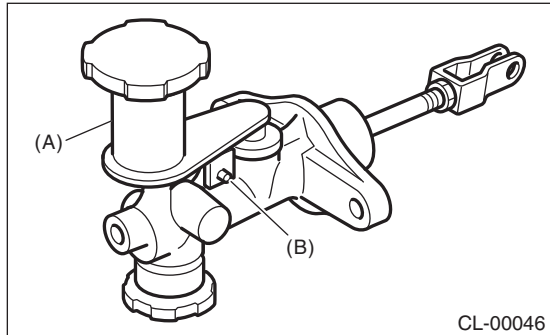
- 4) After bleeding air from system, ensure that the clutch operates properly. <Ref. to CL-23, Clutch Fluid Air Bleeding.>
- 5) Install the air intake chamber. (Non-turbo model) <Ref. to IN (H4SO)-6, INSTALLATION, Air Intake Chamber.>
- 6) Install the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, INSTALLATION, Intercooler.>

Master Cylinder

CLUTCH SYSTEM

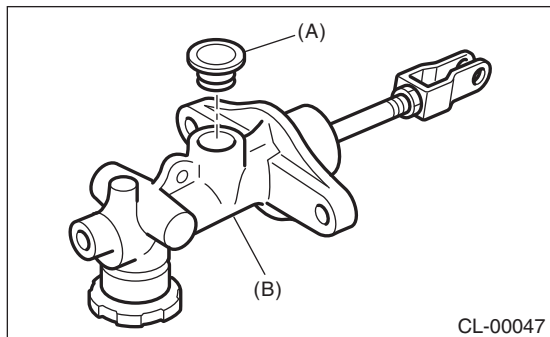
C: DISASSEMBLY

1) Remove the straight pin and reservoir tank.



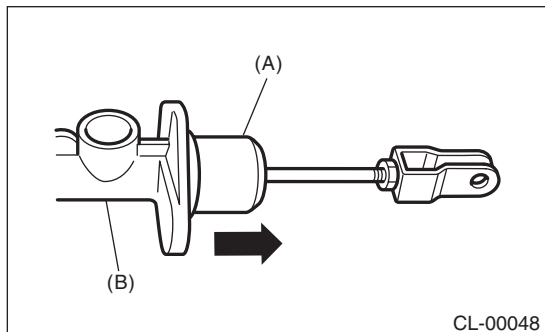
- (A) Reservoir tank
- (B) Straight pin

2) Remove the oil seal.



- (A) Oil seal
- (B) Master cylinder

3) Move the cylinder boot towards the rear.



- (A) Cylinder boot
- (B) Master cylinder

4) Remove the snap ring.

CAUTION:

Be careful when removing the snap ring to prevent the rod, washer, piston and return spring from flying out.

D: ASSEMBLY

1) Install the clutch damper.

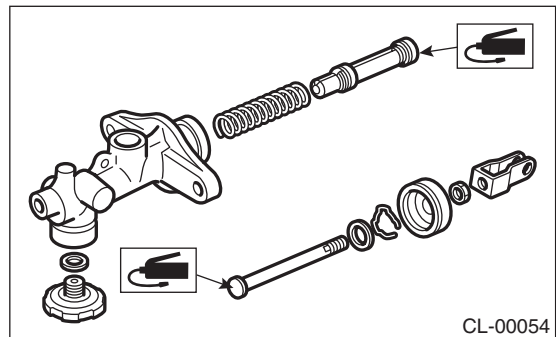
Tightening torque:

46.6 N·m (4.75 kgf-m, 34.4 ft-lb)

2) Apply a coat of grease to the contact surfaces of the push rod and piston before installation.

Grease:

SILICONE GREASE G40M (Part No. 004404003)



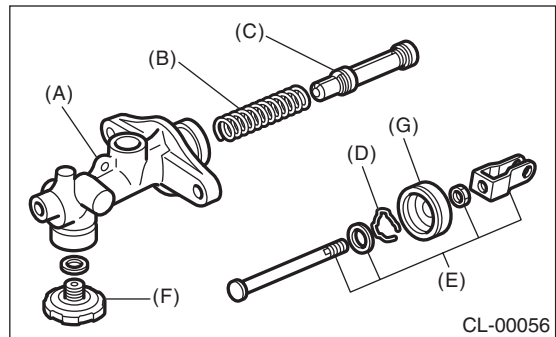
3) Assemble in the reverse order of disassembly.

Tightening torque:

10 N·m (1.0 kgf-m, 7 ft-lb)

E: INSPECTION

If any damage, deformation, wear, swelling, rust or other problems are found on the cylinder, piston, push rod, fluid reservoir, return spring, gasket, cylinder boot or hose, replace the faulty part.

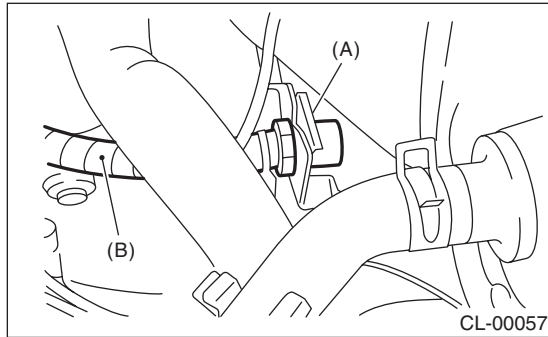


- (A) Master cylinder body
- (B) Return spring
- (C) Piston
- (D) Stop ring
- (E) Rod ASSY
- (F) Clutch damper
- (G) Cylinder boot

7. Clutch Pipe and Hose

A: REMOVAL

- 1) Remove the air cleaner chamber and the air intake duct. (Non-turbo model) <Ref. to IN (H4SO)-6, REMOVAL, Air Intake Chamber.>
- 2) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 3) Drain the clutch fluid. <Ref. to CL-22, Clutch Fluid.>
- 4) Remove the clutch pipe from the clutch hose and master cylinder.
- 5) Pull out the clamp, then remove the clutch hose from the bracket.



- (A) Clamp
- (B) Clutch hose

- 6) Remove the hose from operating cylinder.
- 7) Remove the bracket.

B: INSTALLATION

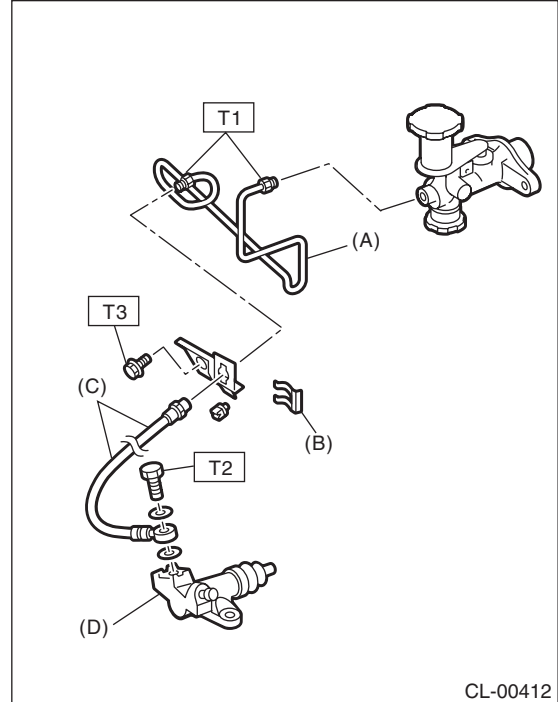
Install in the reverse order of removal.

Tightening torque:

T1: 15 N·m (1.5 kgf·m, 10.8 ft·lb)

T2: 18 N·m (1.8 kgf·m, 13.0 ft·lb)

T3: 25 N·m (2.5 kgf·m, 18.1 ft·lb)



- (A) Clutch pipe
- (B) Clip
- (C) Clutch hose
- (D) Operating cylinder

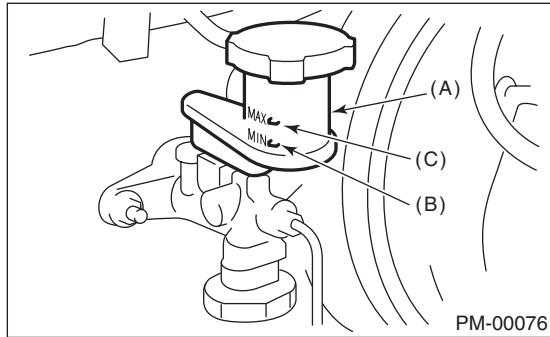
C: INSPECTION

Check pipes and hoses for cracks, breakage or damage. Check joints for fluid leakage. If any cracks, breakage, damage or leakage is found, repair or replace the abnormal pipe or hose.

8. Clutch Fluid

A: INSPECTION

- 1) Park the vehicle on a level surface.
- 2) Inspect the fluid level using the scale on the outside of the reservoir tank. If the level is below "MIN", add fluid to bring it up to "MAX", and also inspect for leakage.



(A) Reservoir tank

B: REPLACEMENT

CAUTION:

- Use new SUBARU genuine brake fluid.
- Cover the bleeder with cloth to prevent brake fluid from being splashed on surrounding parts when loosening the bleeder.
- Avoid mixing different brands of brake fluid to prevent the quality of fluid from degrading.
- Be careful not to allow dirt or dust to get into the reservoir tank.

NOTE:

- During bleeding operation, keep the clutch reservoir tank filled with brake fluid to prevent entry of air.
 - Clutch pedal must be operated very slowly.
 - Bleed air from the oil line with help of a co-worker.
 - The amount of brake fluid required is approximately 70 mℓ (2.4 US fl oz, 2.5 Imp fl oz) for total clutch system.
- 1) Remove the air intake chamber. (Non-turbo model) <Ref. to IN (H4SO)-6, REMOVAL, Air Intake Chamber.>
 - 2) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
 - 3) Drain the brake fluid from the reservoir tank.
 - 4) Refill the reservoir tank with recommended brake fluid.

Recommended brake fluid:

FMVSS No. 116, new DOT3 or DOT4 brake fluid

- 5) Drain all contaminated fluid using the same method as for air bleeding.

NOTE:

Keep the clutch reservoir tank filled with brake fluid to prevent entry of air.

9. Clutch Fluid Air Bleeding

A: PROCEDURE

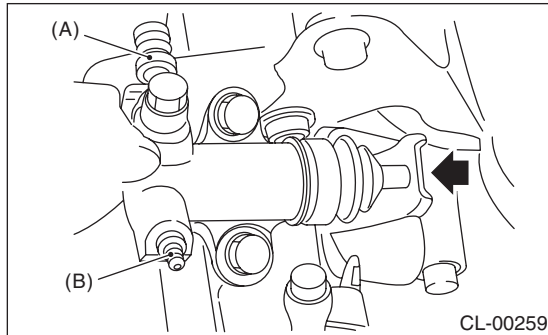
NOTE:

Bleed air from the oil line with help of a co-worker.

1) Remove the air intake chamber. (Non-turbo model) <Ref. to IN (H4SO)-6, REMOVAL, Air Intake Chamber.>

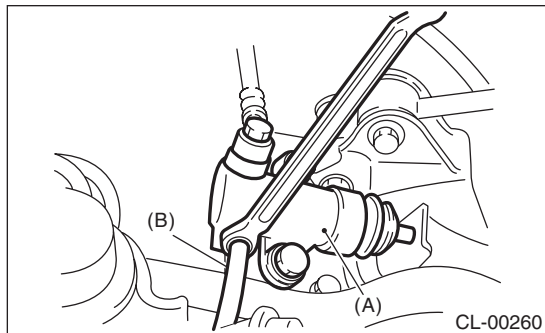
2) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>

3) Fit one end of a vinyl tube into the air bleeder of the operating cylinder, and put the other end into a brake fluid container.



- (A) Clutch hose
- (B) Air bleeder

4) Slowly depress the clutch pedal and keep it depressed. Then open the air bleeder to discharge air together with the fluid. Release the air bleeder for 1 or 2 seconds. Next, with the bleeder closed, slowly release the clutch pedal.



- (A) Operating cylinder
- (B) Vinyl tube

5) Repeat these steps until there are no more air bubbles in the vinyl tube.

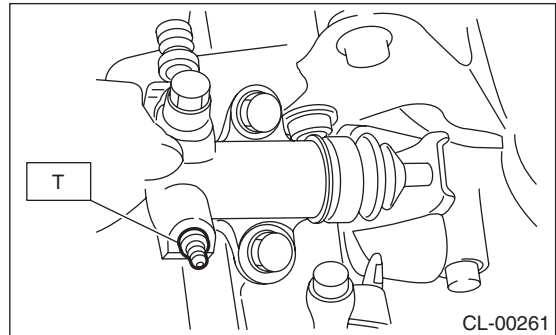
CAUTION:

Cover the bleeder with cloth to prevent brake fluid from being splashed on surrounding parts when loosening the bleeder.

6) Tighten the air bleeder.

Tightening torque:

T: 7.8 N·m (0.8 kgf·m, 5.8 ft·lb)



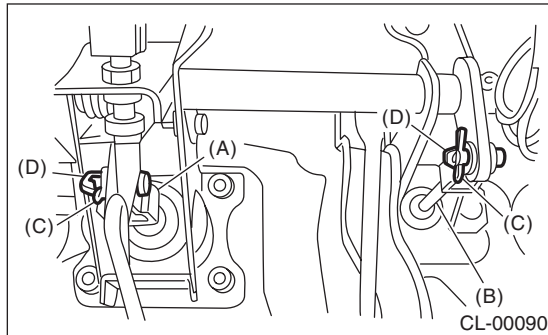
7) After depressing the clutch pedal, make sure that there are no leaks evident in the entire system.

8) After bleeding air from system, ensure that the clutch operates properly.

10. Clutch Pedal

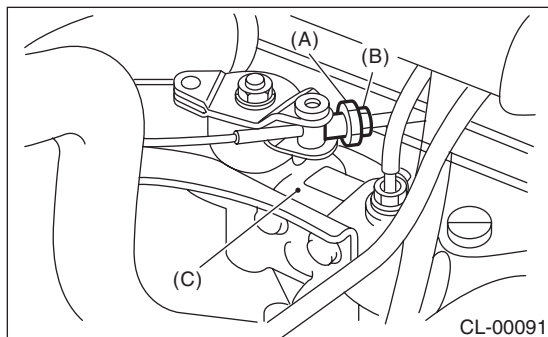
A: REMOVAL

- 1) Remove the steering column. <Ref. to PS-16, REMOVAL, Tilt Steering Column.>
- 2) Disconnect the connector from the stop light switch and clutch switch.
- 3) Remove the snap pin that fastens the lever and push rod to the operating rod.
- 4) Remove the clevis pin that fastens the lever and push rod to the operating rod.



- (A) Operating rod
- (B) Push rod
- (C) Snap pin
- (D) Clevis pin

- 5) Remove the accelerator pedal. <Ref. to SP (H4SO)-3, REMOVAL, Accelerator Pedal.>
- 6) Remove the air cleaner case and intake duct. (Non-turbo model) <Ref. to IN (H4SO)-5, REMOVAL, Air Cleaner Case.> <Ref. to IN (H4SO)-7, REMOVAL, Air Intake Duct.>
- 7) Remove the intercooler. (Turbo model) <Ref. to IN(H4DOTC)-11, REMOVAL, Intercooler.>
- 8) Remove the PHV adjustment nut and lock nut.

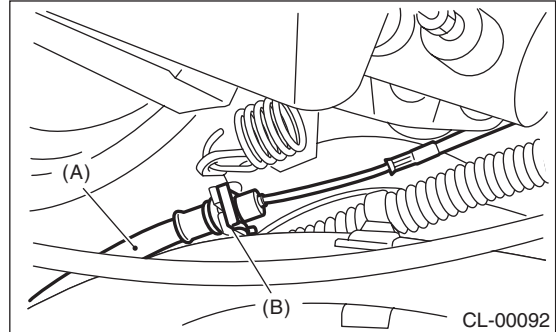


- (A) Adjustment nut
- (B) Lock nut
- (C) PHV

- 9) Remove the cable clamp and disconnect the PHV cable from the PHV.

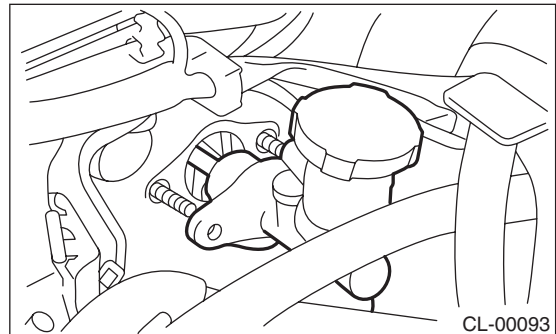
CAUTION:

When disconnecting the PHV cable, carefully protect the boot and inner cable so that they do not get damaged.



- (A) PHV cable
- (B) Clamp

- 10) Remove the nut that fastens the clutch master cylinder.



- 11) Remove the bolt and nut that fastens the brake pedal and clutch pedal and remove the pedal assembly.

B: INSTALLATION

- 1) Install in the reverse order of removal.

Tightening torque:

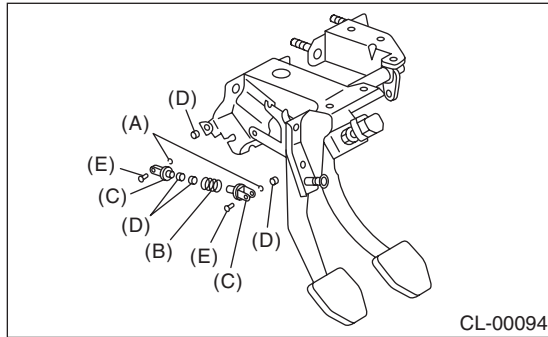
18 N·m (1.8 kgf-m, 13.0 ft-lb)

NOTE:

- If the cable clamp is damaged, replace it with a new part.
 - Always cover the outer cable end with the boot.
 - Be careful not to twist the accelerator cable.
 - Always use a new clevis pin.
- 2) Adjust the clutch pedal after installation. <Ref. to CL-26, ADJUSTMENT, Clutch Pedal.>
 - 3) Adjust the clutch switch (clutch start). <Ref. to CL-29, ADJUSTMENT, Clutch Switch.>
 - 4) Adjust the hill holder. (Model with hill holder) <Ref. to BR-52, ADJUSTMENT, Hill Holder.>

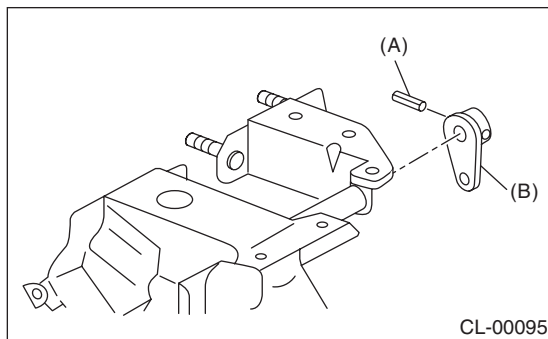
C: DISASSEMBLY

1) Remove the clip, assist spring, rod and bushing.



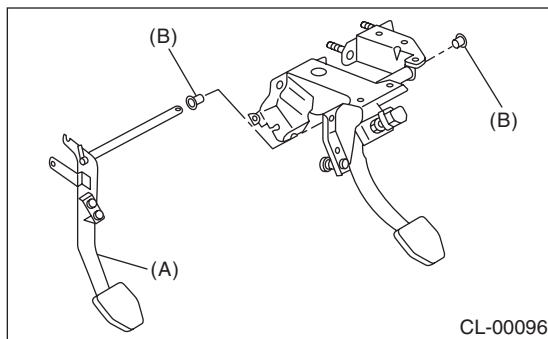
- (A) Clip
- (B) Assist spring
- (C) Assist rod
- (D) Bushing
- (E) Clevis pin

2) Remove the spring pin and lever.



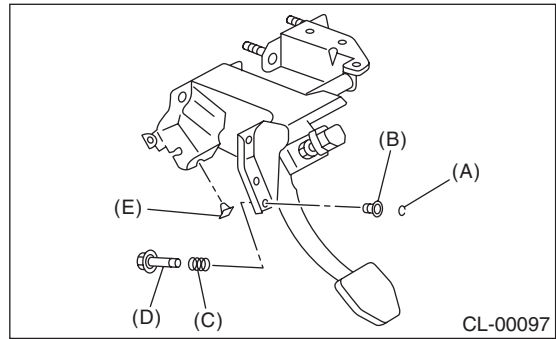
- (A) Pin
- (B) Lever

3) Remove the clutch pedal and bushing.



- (A) Clutch pedal
- (B) Bushing

4) Remove the stopper, clip, O-ring and rod S, and remove the spring S and bushing S.



- (A) Clip
- (B) Bushing S
- (C) Spring S
- (D) Rod S
- (E) Stopper

5) Remove the stopper from the clutch pedal.

6) Remove the clutch pedal pad.

D: ASSEMBLY

1) Install the stopper, etc., temporarily to the pedal bracket.

2) Clean the clutch pedal and inside the brake pedal bore, apply grease and set the bushing inside the bore.

Grease:

KOPR-KOTE (Part No. 003603001) or equivalent

3) Align the pedal bracket, clutch pedal and brake pedal bore, and install the brake pedal return spring, assist rod, spring and bushing.

NOTE:

Clean the inside of the bushings and apply grease before installing the spacer.

4) Install the hill holder cable to the clutch pedal.

Clutch Pedal

CLUTCH SYSTEM

E: INSPECTION

1. CLUTCH PEDAL

Move the clutch pedal pads in the lateral direction with a force of approximately 10 N (1 kgf, 2 lb) to check that the pedal deflection is within the service limit.

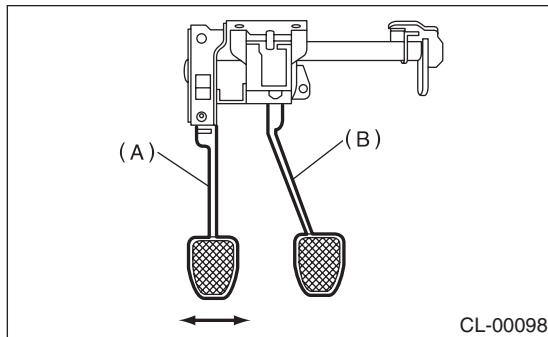
NOTE:

If excessive deflection is found, replace the bushing with new part.

Deflection of clutch pedal:

Service limit:

5.0 mm (0.197 in) or less



- (A) Clutch pedal
- (B) Brake pedal

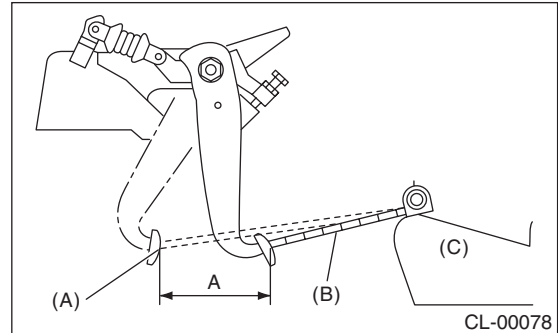
F: ADJUSTMENT

1) Measure the full stroke amount of the clutch pedal.

NOTE:

- Measure the leading end of the seat cushion and center of the pedal.
- Align the seat with the seventh notch position from the position at the very front.

Clutch pedal standard full stroke: A
130 — 135 mm (5.12 — 5.31 in)



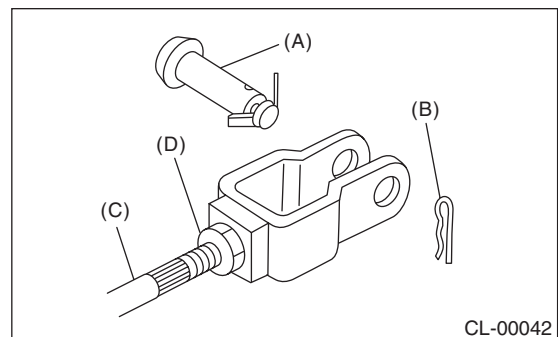
- (A) Clutch pedal (Full stroke condition)
- (B) Scale
- (C) Seats

2) If the full stroke is not within the specified value, loosen the clutch stopper nut to adjust.

Tightening torque:

8 N·m (0.8 kgf·m, 5.8 ft·lb)

3) Loosen the push rod lock nuts.

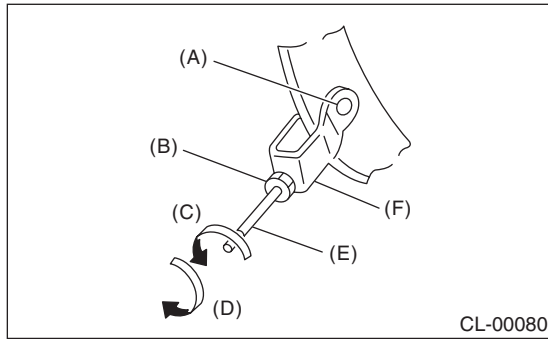


- (A) Clevis pin
- (B) Snap pin
- (C) Push rod
- (D) Push rod lock nut

4) Rotate the push rod to adjust.

(1) Make sure that the clutch pedal hits the stopper bolt side when returning the clutch pedal.

(2) Check that the clutch pedal hits the clutch pedal bracket stopper at full stroke.



- (A) Clevis hole
- (B) Push rod lock nut
- (C) In the longer direction
- (D) In the shorter direction
- (E) Push rod
- (F) Clevis

8) Check that the clevis pin moves smoothly by moving it in the left and right directions.

9) Tighten the push rod lock nut.

Tightening torque:

10 N·m (1.0 kgf·m, 7.2 ft·lb)

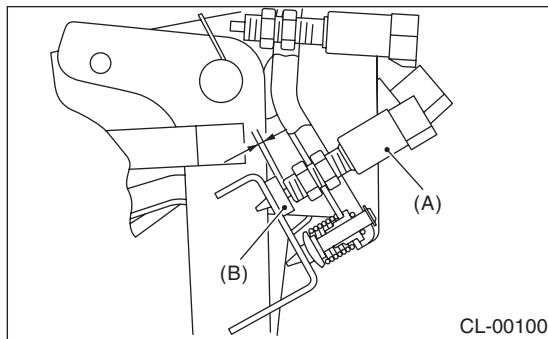
10) Measure the full stroke amount of the clutch pedal again.

Clutch pedal standard full stroke: A

130 — 135 mm (5.12 — 5.31 in)

11) Install the clutch switch. <Ref. to CL-28, INSTALLATION, Clutch Switch.>

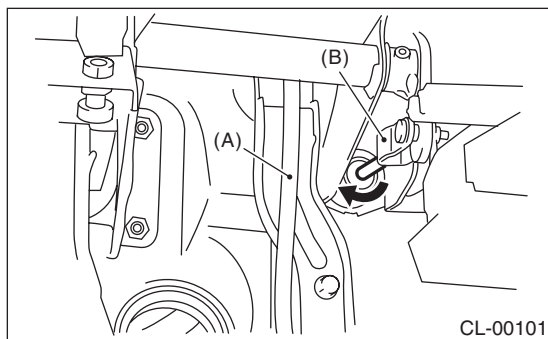
5) Rotate the push rod in the shorter direction to create clearance in the stopper bolt or the clutch switch side.



- (A) Clutch switch
- (B) Stopper

6) Rotate the push rod in the shorter direction until the clutch pedal hits the stopper bolt.

7) Rotate the push rod further in the longer direction 270° (in the direction of the arrow in the drawing).



- (A) Accelerator pedal
- (B) Clevis

Clutch Switch

CLUTCH SYSTEM

11. Clutch Switch

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the instrument panel lower cover.
- 3) Disconnect the connector from the clutch switch.
- 4) Remove the clutch switches.

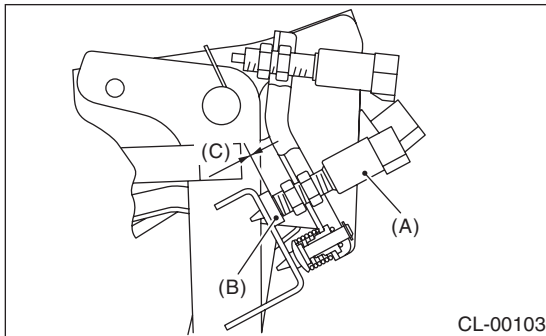
B: INSTALLATION

1. CLUTCH SWITCH

- 1) Install so that the gap between the clutch switch and clutch pedal stopper is 0 mm (0 in).

Tightening torque:

8 N·m (0.8 kgf·m, 5.8 ft·lb)



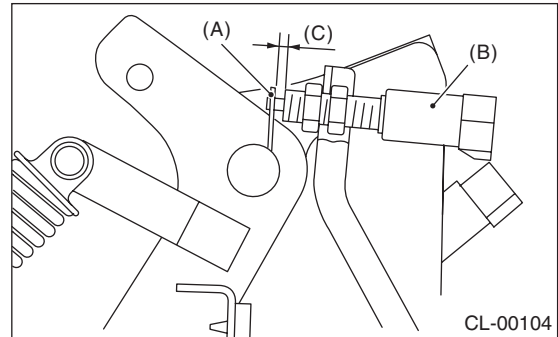
- (A) Clutch switch
- (B) Stopper
- (C) 0 mm (0 in)

2. CLUTCH SWITCH (CLUTCH START)

- 1) Fully depress the clutch and hold it.
- 2) Set the clearance of clutch pedal plate and clutch switch to 3 — 3.5 mm (0.12 — 0.14 in) and tighten the lock nut.

Tightening torque:

8 N·m (0.8 kgf·m, 5.8 ft·lb)



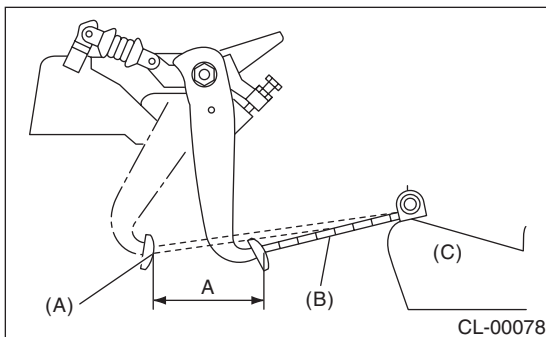
- (A) Plate
- (B) Clutch switch
- (C) 3 — 3.5 mm (0.12 — 0.14 in)

- 3) Connect the clutch switch connector.
- 4) Make sure that engine does not start with clutch pedal not depressed.
- 5) Make sure that engine starts with clutch pedal fully depressed.

- 2) Measure the stroke of the clutch pedal.

Clutch pedal standard full stroke: A

130 — 135 mm (5.12 — 5.31 in)



- (A) Clutch pedal (Full stroke condition)
- (B) Scale
- (C) Seat

- 3) If the clutch pedal stroke is out of specification, adjust the stroke. <Ref. to CL-26, ADJUSTMENT, Clutch Pedal.>

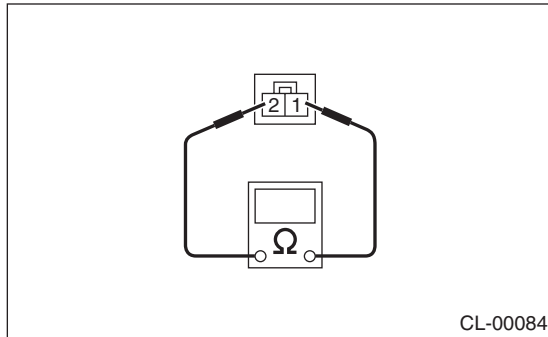
- 4) Connect the clutch switch connector.

C: INSPECTION

- 1) Make sure that engine does not start with clutch pedal not depressed. Inspect the adjustment of clutch switch and check the clutch start circuit when the engine starts.
- 2) Make sure that engine starts with clutch pedal fully depressed. Inspect the adjustment of clutch switch and check the clutch start circuit when the engine does not start.
- 3) Check the clutch switch for continuity. If the resistance is not at the standard value, replace the switch.

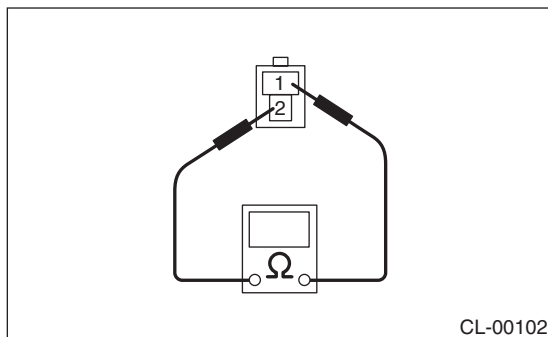
- (1) Disconnect the clutch switch connector.
- (2) Measure the resistance between terminal 1 and 2 of the switch.
 - Clutch switch

Condition	Terminal No.	Specified resistance
When clutch pedal is depressed	No. 1 — No. 2	1 MΩ or more
When the clutch pedal is not depressed	No. 1 — No. 2	Less than 1 Ω



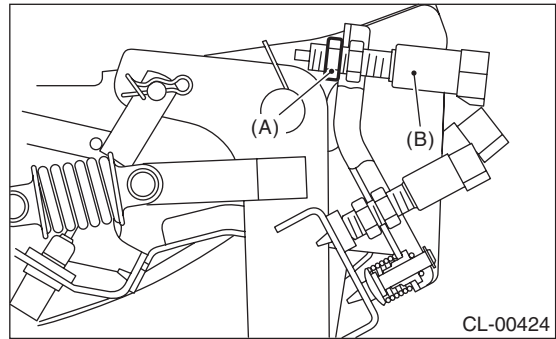
- Clutch switch (Clutch start)

Condition	Terminal No.	Specified resistance
When clutch pedal is depressed	No. 1 — No. 2:	Less than 1 Ω
When the clutch pedal is not depressed	No. 1 — No. 2:	1 MΩ or more



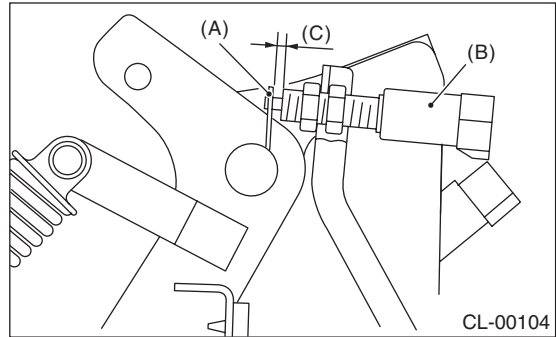
D: ADJUSTMENT

- 1) Loosen the lock nut of clutch switch (clutch start).



- (A) Lock nut
- (B) Clutch switch (Clutch start)

- 2) Fully depress the clutch and hold it.
- 3) Adjust the gap of the clutch pedal plate and the clutch switch to be 3 — 3.5 mm (0.12 — 0.14 in).



- (A) Plate
- (B) Clutch switch (Clutch start)
- (C) 3 — 3.5 mm (0.12 — 0.14 in)

- 4) Tighten the lock nut.

Tightening torque:
8 N·m (0.8 kgf·m, 5.8 ft·lb)

General Diagnostic Table

CLUTCH SYSTEM

12. General Diagnostic Table

A: INSPECTION

1. CLUTCH

Symptoms	Possible cause	Corrective action
<p>1. Clutch slippage. It is hard to perceive clutch slippage in the early stage, but pay attention to the following symptoms.</p> <ul style="list-style-type: none"> • Engine speeds up when shifting. • High-speed driving is not possible; especially rapid acceleration is not possible and vehicle speed does not increase in proportion to the increase in engine speed. • Power drops particularly when ascending a slope, and there is a burning smell of the clutch plate. • Method of testing: Park the vehicle and fully apply the parking brake. Disengage the clutch and shift the transmission gear into the 1st. Gradually increase the engine speed while gradually allowing the clutch to engage. The clutch function is satisfactory if the engine stalls. However, the clutch is slipping if the vehicle does not move forward and the engine does not stall. 	(a) Oil on the clutch face	Replace.
	(b) Worn clutch face	Replace.
	(c) Deteriorated diaphragm spring	Replace.
	(d) Warped pressure plate or flywheel	Replace.
	(e) Defective release bearing holder	Replace.
<p>2. Clutch drags. As a symptom of this problem, a harsh scratching noise occurs and control becomes difficult when shifting gears. The symptom becomes more apparent when shifting into the 1st gear. However, because most trouble of this sort is due to a defective synchronization mechanism, perform the following tests.</p> <ul style="list-style-type: none"> • Method of testing: <Ref. to CL-31, DIAGNOSTIC DIAGRAM OF CLUTCH DRAG, INSPECTION, General Diagnostic Table.> <p>The problem is caused by insufficient disengagement of the clutch if a noise occurs during this test.</p>	(a) Worn or rusty clutch disc hub spline	Replace the clutch disc.
	(b) Excessive deflection of clutch disc face	Replace.
	(c) Seized crankshaft pilot bearing	Replace.
	(d) Cracked clutch disc face	Replace.
	(e) Stuck clutch disc (smeared by oil or water)	Replace.
<p>3. Clutch chatters. Clutch chattering is an unpleasant vibration to the whole vehicle when the vehicle is just started with clutch partially engaged.</p>	(a) Adhesion of oil on the clutch face	Replace the clutch disc.
	(b) Weak or broken torsion spring	Replace the clutch disc.
	(c) Poor contact of the disc surface or excessively worn disc	Replace the problem clutch disc.
	(d) Deformed pressure plate or flywheel	Replace.
	(e) Loose disc rivets	Replace the clutch disc.
	(f) Loose engine mounting	Retighten or replace mounting.
	(g) Improper adjustment of the pitching stopper	Adjust.

General Diagnostic Table

CLUTCH SYSTEM

Symptoms	Possible cause	Corrective action
4. Noisy clutch Examine whether the noise is generated when the clutch is disengaged, engaged, or partially engaged.	(a) Broken, worn or insufficiently lubricated release bearing	Replace the release bearing.
	(b) Insufficient lubrication of the pilot bearing	Replace the pilot bearing.
	(c) Loose clutch disc hub	Replace the clutch disc.
	(d) Loose torsion spring retainer	Replace the clutch disc.
	(e) Deteriorated or broken torsion spring	Replace the clutch disc.
5. Clutch grabs suddenly. When starting the vehicle with the clutch partially engaged, the clutch engages suddenly and the vehicle jumps instead of making a smooth start.	(a) Grease or oil on facing	Replace the clutch disc.
	(b) Deteriorated cushioning spring	Replace the clutch disc.
	(c) Worn or rusted spline of clutch disc or main shaft	Take off rust, apply grease or replace clutch disc or main shaft.
	(d) Deteriorated or broken torsion spring	Replace the clutch disc.
	(e) Loose engine mounting	Retighten or replace mounting.
	(f) Deteriorated diaphragm spring	Replace.

2. CLUTCH PEDAL

Symptoms	Corrective action
Insufficient pedal play	Adjust the free play of the pedal.
Insufficient clutch pedal free play	Adjust the free play of the pedal.
Excessively worn and damaged pedal shaft and/or bushing	Replace with new bushing or shaft.

3. DIAGNOSTIC DIAGRAM OF CLUTCH DRAG

Step	Check	Yes	No
1 CHECK GEAR NOISE. 1) Start the engine. 2) Quickly shift from neutral to reverse when idling.	Is there any abnormal noise from the transmission gear?	Go to step 2.	Clutch is normal.
2 CHECK GEAR NOISE. Depress the clutch pedal when idling and shift from neutral to reverse within 0.5 — 1.0 second.	Is there any abnormal noise from the transmission gear?	Go to step 3.	Defective transmission or excessive clutch drag torque. Inspect Pilot bearing, clutch disc, transmission and clutch disc hub spline.
3 CHECK GEAR NOISE. 1) Depress the clutch pedal when idling and shift from neutral to reverse within 0.5 — 1.0 second. 2) With the clutch pedal depressed, shift from neutral to reverse, reverse to neutral several times.	Is there any abnormal noise from the transmission gear?	Inadequate clutch disengage. Inspect the clutch disc, clutch cover, release lever, and clutch pedal free play.	Clutch and flywheel seizure. Inspect the clutch disc and the spline of the clutch disc hub.

General Diagnostic Table

CLUTCH SYSTEM

General Description

FRONT SUSPENSION

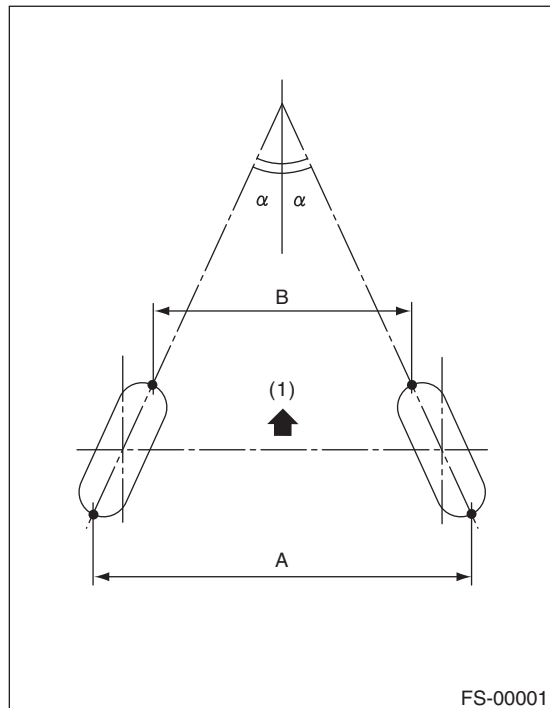
1. General Description

A: SPECIFICATION

Model		Non-turbo	Turbo
Front	Camber (Tolerance: $\pm 0^{\circ}45'$ Differences between RH and LH 45' or less)	$-0^{\circ}25'$	
	Caster (Reference)	$3^{\circ}03'$	
	Toe-in	0 ± 3 mm (0 ± 0.12 in) Toe angle (sum of both wheels): $0^{\circ} \pm 0^{\circ}15'$	
	Kingpin angle (Reference)	$13^{\circ}12'$	
	Wheel arch height (Tolerance: $+^{12}/_{-24}$ mm ($+^{0.47}/_{-0.94}$ in))	437 mm (17.20 in)	
Rear	Camber (Tolerance: $\pm 0^{\circ}45'$ Differences between RH and LH 45' or less)	$-0^{\circ}50'$	$-0^{\circ}55'$
	Toe-in	2 ± 3 mm (0.079 ± 0.12 in) Toe angle (sum of both wheels): $0^{\circ}10' \pm 0^{\circ}15'$	
	Thrust angle	$0^{\circ} \pm 30'$	
	Wheel arch height (Tolerance: $+^{12}/_{-24}$ mm ($+^{0.47}/_{-0.94}$ in))	440 mm (17.32 in)	435 mm (17.13 in)

NOTE:

- Front and rear toe-in and front camber can be adjusted. If the toe-in or camber tolerance exceeds specifications, adjust toe-in and camber to the middle value of specification.
- Other items indicated in the specifications table cannot be adjusted. If other items exceed specifications, check suspension parts and connections for deformation, and replace with new parts as required.

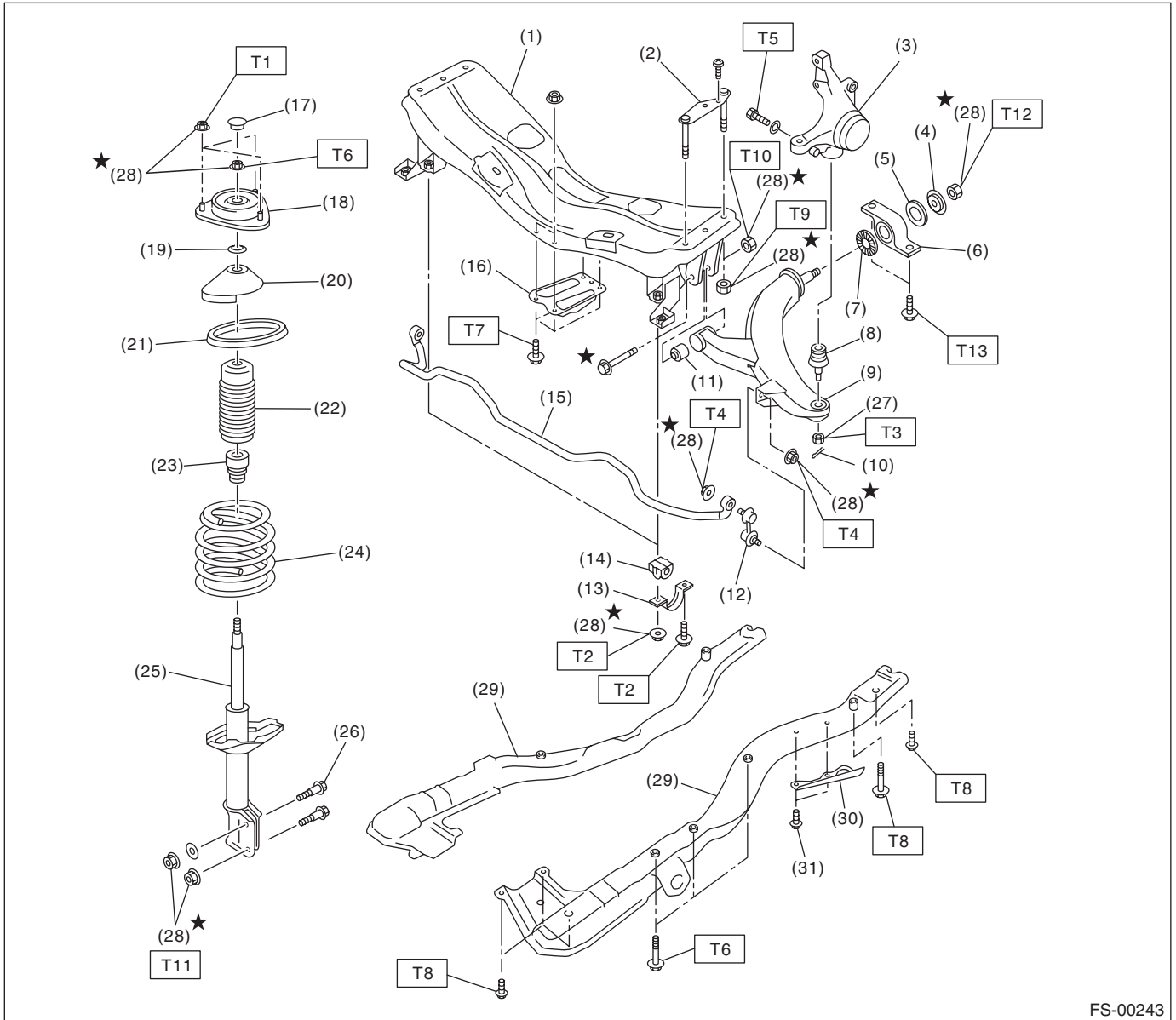


(1) Front

A – B = Positive: Toe-in, Negative: Toe-out

α = Individual toe angles

B: COMPONENT



FS-00243

General Description

FRONT SUSPENSION

(1) Front crossmember	(17) Dust seal
(2) Bolt ASSY	(18) Strut mount
(3) Housing	(19) Spacer
(4) Washer	(20) Upper spring seat
(5) Stopper rubber (Rear)	(21) Rubber seat
(6) Rear bushing	(22) Dust cover
(7) Stopper rubber (Front)	(23) Helper
(8) Ball joint	(24) Coil spring
(9) Transverse link	(25) Damper strut
(10) Cotter pin	(26) Adjusting bolt
(11) Front bushing	(27) Castle nut
(12) Stabilizer link	(28) Self-locking nut
(13) Clamp	(29) Sub frame
(14) Bushing	(30) Cover
(15) Stabilizer	(31) Clip
(16) Jack-up plate	

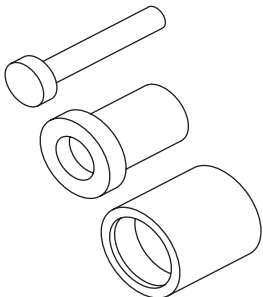
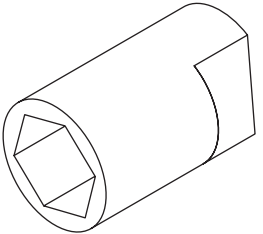
Tightening torque:N·m (kgf-m, ft-lb)**T1: 20 (2.0, 14.5)****T2: 25 (2.5, 18.1)****T3: 40 (4.1, 30) (Tighten an additional 60°)****T4: 45 (4.6, 33)****T5: 50 (5.1, 37)****T6: 55 (5.6, 41)****T7: 70 (7.1, 52)****T8: 71 (7.2, 52)****T9: 100 (10.2, 74)****T10: 125 (12.7, 92.3)****T11: 175 (17.8, 129)****T12: 190 (19.4, 140)****T13: 250 (25.5, 184)**

C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Use SUBARU genuine grease etc. or equivalent. Do not mix grease with another grade or from other manufacturers.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.

D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-927680000</p>	927680000	INSTALLER & REMOVER SET	Used for replacing the transverse link bushing.
 <p style="text-align: center;">ST-927760000</p>	927760000	STRUT MOUNT SOCKET	Used for disassembling and assembling the strut and shock mount.

2. GENERAL TOOL

TOOL NAME	REMARKS
Alignment gauge	Used for measuring wheel alignment.
Alignment gauge adapter	Used for measuring wheel alignment.
Turning radius gauge	Used for measuring wheel alignment.
Toe-in gauge	Used for toe-in measurement.
Dial gauge	Used for damper strut measurement.
Coil spring compressor	Used for strut assembly/disassembly.

Wheel Alignment

FRONT SUSPENSION

2. Wheel Alignment

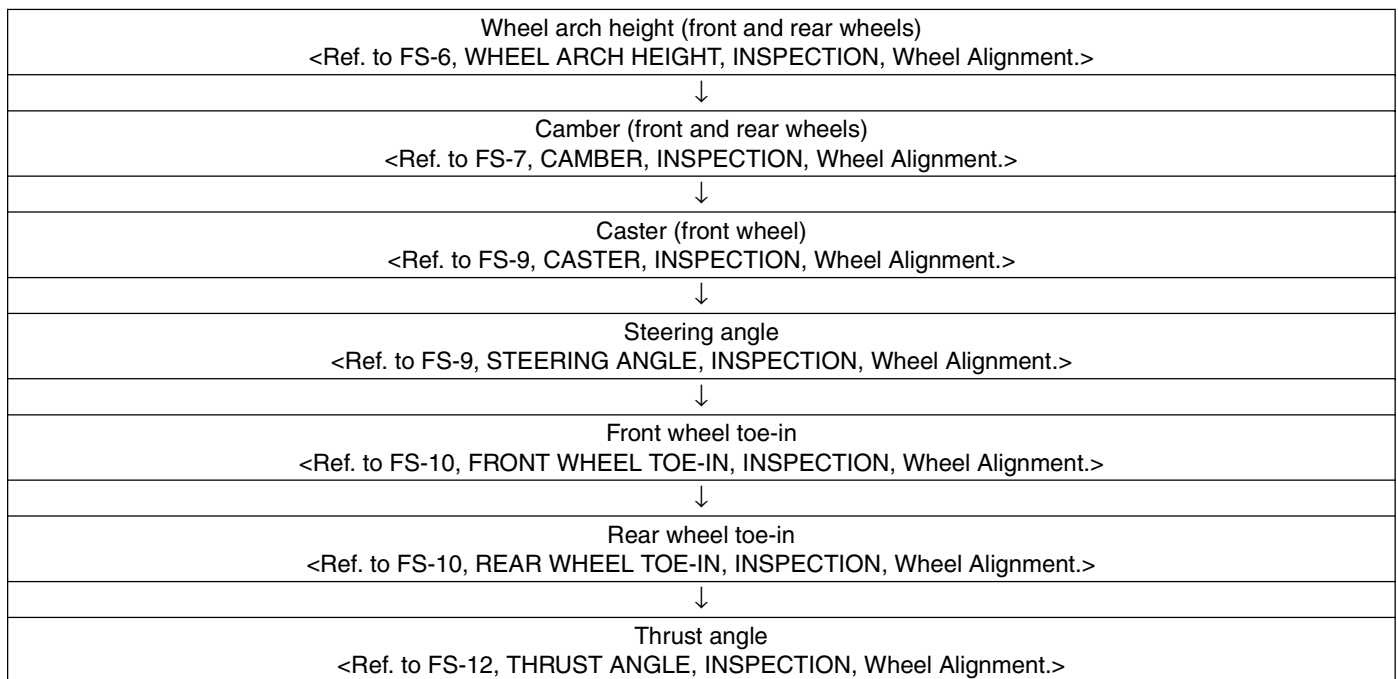
A: INSPECTION

Check the following items before performing the wheel alignment measurement.

Check items before measuring wheel alignment:

- Tire inflation pressure
- Uneven wear of RH and LH tires, or difference of sizes
- Tire runout
- Excessive play and wear of ball joint
- Excessive play and wear of tie rod end
- Excessive play of wheel bearing
- Right and left wheel base imbalance
- Deformation and excessive play of steering link
- Deformation and excessive play of suspension parts

Check, adjust and measure the wheel alignment in accordance with the procedures indicated in the figure.

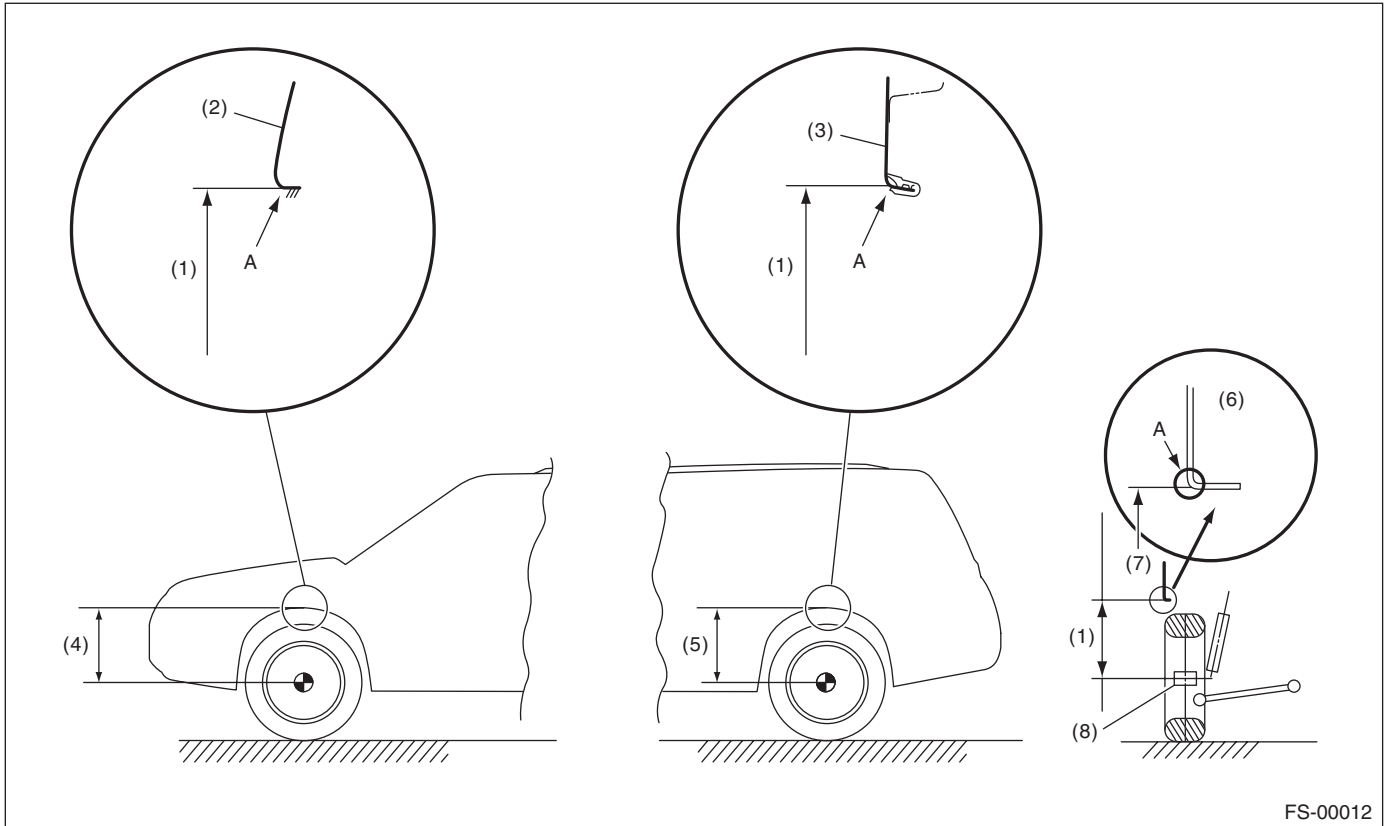


1. WHEEL ARCH HEIGHT

- 1) Park the vehicle on a level surface.
- 2) Empty the vehicle so that it is at “curb weight”. (Empty the luggage compartment, load the spare tire, jack and service tools, and fill up the fuel tank.)
- 3) Set the steering wheel in a straight-ahead position, and stabilize the suspensions by moving the vehicle in a straight line for more than 5 m (16 ft).
- 4) Suspend a thread from the wheel arch (point “A” in the figure below) and affix at a position directly above the center of wheel.

Wheel Alignment

5) Measure the distance between the point "A" and the center of wheel.



FS-00012

- | | | |
|-----------------------|-----------------------------|--------------------------|
| (1) Wheel arch height | (4) Front wheel arch height | (7) Point of measurement |
| (2) Front fender | (5) Rear wheel arch height | (8) End of spindle |
| (3) Rear quarter | (6) Flange bend line | |

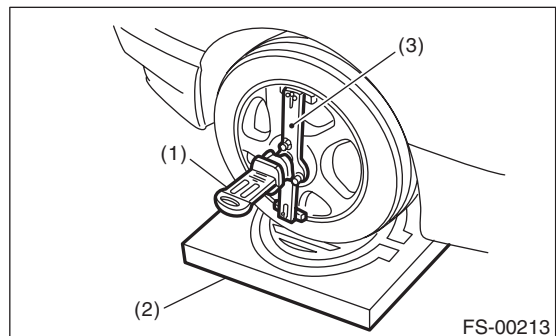
Model	Specified wheel arch height	
	Front	Rear
Non-turbo	437 ⁺¹² / ₋₂₄ mm (17.20 ^{+0.47} / _{-0.94} in)	440 ⁺¹² / ₋₂₄ mm (17.32 ^{+0.47} / _{-0.94} in)
Turbo		435 ⁺¹² / ₋₂₄ mm (17.13 ^{+0.47} / _{-0.94} in)

2. CAMBER

• INSPECTION

1) Place the front wheel on the turning radius gauge. Make sure the ground contacting surfaces of the front and rear wheels are at the same height.

2) Set the adapter into the center of wheel, and then set the wheel alignment gauge.



FS-00213

- | |
|--------------------------|
| (1) Alignment gauge |
| (2) Turning radius gauge |
| (3) Adapter |

Wheel Alignment

FRONT SUSPENSION

3) Measure the camber angle in accordance with the operation manual for wheel alignment gauge.

Model		Camber (Difference between RH and LH is 45' or less)
Front	Non-turbo, Turbo	$-0^{\circ}25' \pm 0^{\circ}45'$
Rear	Non-turbo	$-0^{\circ}50' \pm 0^{\circ}45'$
	Turbo	$-0^{\circ}55' \pm 0^{\circ}45'$

• FRONT CAMBER ADJUSTMENT

1) When adjusting the front camber, adjust it to the following value.

Model		Camber (Difference between RH and LH is 45' or less)
Front	Non-turbo, Turbo	$-0^{\circ}25' \pm 0^{\circ}30'$

2) Loosen the two self-locking nuts located at the lower front portion of the strut.

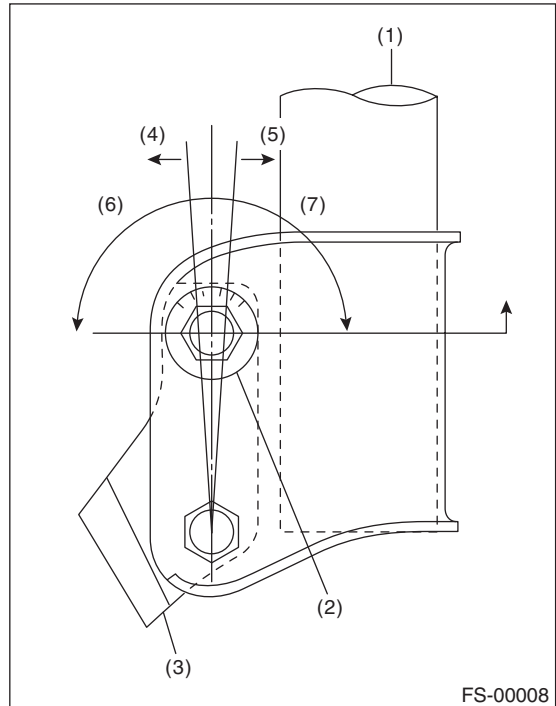
NOTE:

When the adjusting bolt needs to be loosened or tightened, hold its head with a wrench and turn the self-locking nut.

3) Turn the camber adjusting bolt so that the camber is set at specification.

NOTE:

Moving the adjusting bolt by one scale changes the camber by approximately $0^{\circ}10'$.

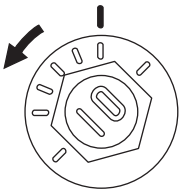
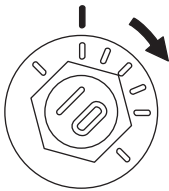


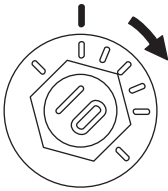
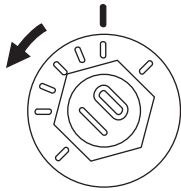
FS-00008

- (1) Strut
- (2) Adjusting bolt
- (3) Housing
- (4) Outer
- (5) Inner
- (6) Camber is increased.
- (7) Camber is decreased.

Wheel Alignment

FRONT SUSPENSION

To increase camber.	
Rotate the left side counterclockwise.	Rotate the right side clockwise.
	
FS-00009	FS-00010

To decrease camber.	
Rotate the left side clockwise.	Rotate the right side counterclockwise.
	
FS-00010	FS-00009

4) Tighten two new self-locking nuts.

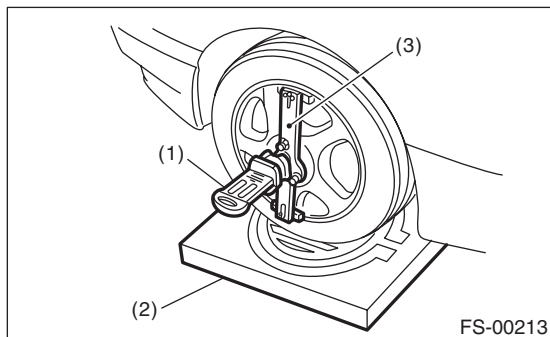
Tightening torque:

175 N·m (17.8 kgf·m, 129 ft·lb)

3. CASTER

• INSPECTION

- 1) Place the front wheel on the turning radius gauge. Make sure the ground contacting surfaces of the front and rear wheels are at the same height.
- 2) Set the adapter into the center of wheel, and then set the wheel alignment gauge.



- (1) Alignment gauge
- (2) Turning radius gauge
- (3) Adapter

3) Measure the caster angle in accordance with the operation manual for wheel alignment gauge.

Model	Caster
Non-turbo, Turbo	3°03'

4. STEERING ANGLE

• INSPECTION

- 1) Place the vehicle on turning radius gauge.
- 2) While depressing the brake pedal, turn the steering wheel fully to the left and right. With the steering wheel held at each fully turned position, measure both the inner and outer wheel steering angles.

Steering angle:

Model	Non-turbo	Turbo
Inner wheel	36°25'±1°30'	35°00'±1°30'
Outer wheel	32°00'±1°30'	30°54'±1°30'

Wheel Alignment

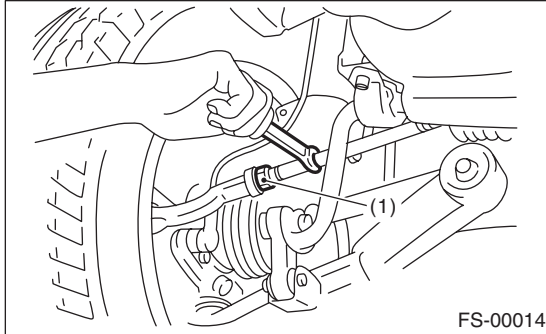
FRONT SUSPENSION

• ADJUSTMENT

- 1) Turn the tie-rod to adjust the steering angle of both inner and outer wheels.
- 2) Check the toe-in.

NOTE:

Correct the boot if it is twisted.



(1) Lock nut

5. FRONT WHEEL TOE-IN

• INSPECTION

Toe-in (tolerance):

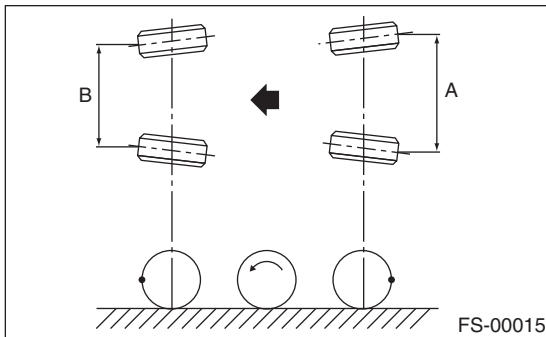
$0 \pm 3 \text{ mm } (0 \pm 0.12 \text{ in})$

- 1) Set the toe-in gauge at the height of wheel axis center, behind the right and left front tires.
- 2) Mark the centers of both right and left tires, and measure the distance "A" between the marks.
- 3) Move the vehicle forward to rotate the tires 180° .

NOTE:

Be sure to rotate the tires in the forward direction.
4) Measure the distance "B" between the left and right marks. Find toe-in using the following equation:

$$A - B = \text{Toe-in}$$



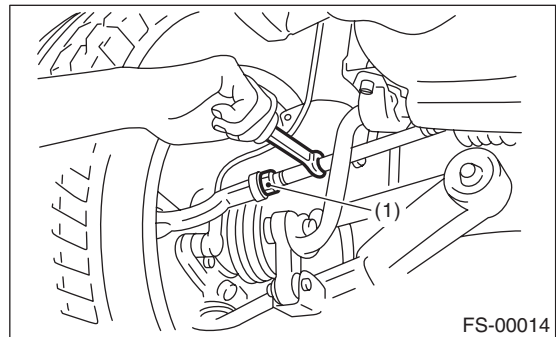
• ADJUSTMENT

Adjust the toe-in to be within the adjustment standard value if it exceeds the allowable value.

Toe-in (adjustment standard):

$0 \pm 2 \text{ mm } (0 \pm 0.08 \text{ in})$

- 1) Check that the left and right wheel steering angles are within specification.
 - 2) Loosen the left and right side steering tie-rod lock nuts.
 - 3) Turn the left and right tie-rods by equal amounts until the toe-in is at the specified value.
- Both the left and right tie-rods are right-hand threaded. To increase toe-in, turn both tie-rods clockwise by equal amount (viewing from the inside of vehicle).



(1) Lock nut

- 4) Tighten the tie-rod lock nut.

Tightening torque:

$85 \text{ N}\cdot\text{m } (8.7 \text{ kgf}\cdot\text{m}, 62.9 \text{ ft}\cdot\text{lb})$

NOTE:

Check and correct the tie rod boot if twisted.

6. REAR WHEEL TOE-IN

• INSPECTION

Toe-in (tolerance):

$2 \pm 3 \text{ mm } (0.08 \pm 0.12 \text{ in})$

Refer to "FRONT WHEEL TOE-IN" for rear toe-in inspection procedures.

<Ref. to FS-10, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>

• ADJUSTMENT

Adjust the toe-in to be within the adjustment standard value if it exceeds the allowable value.

Toe-in (adjustment standard):

$2 \pm 2 \text{ mm } (0.08 \pm 0.08 \text{ in})$

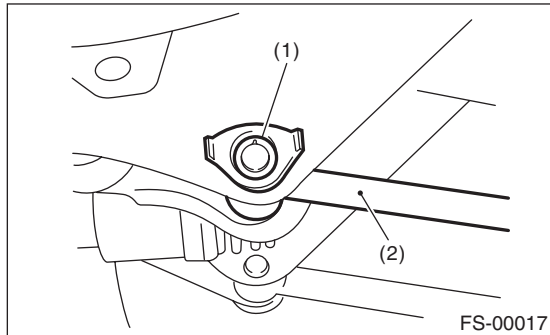
Wheel Alignment

FRONT SUSPENSION

1) Loosen the self-locking nut on the inner side of link rear.

NOTE:

When loosening or tightening the adjusting bolt, hold the bolt head and turn the self-locking nut.



(1) Adjusting bolt

(2) Link rear

2) Turn the adjusting bolt until toe-in is within the specification.

NOTE:

When the left and right wheels are adjusted for toe-in at the same time, the movement of one scale graduation changes toe-in by approx. 1.5 mm (0.6 in).

To increase toe-in.	
Rotate the left side clockwise.	Rotate the right side counterclockwise.
FS-00018	FS-00019

To decrease toe-in.	
Rotate the left side counterclockwise.	Rotate the right side clockwise.
FS-00019	FS-00018

3) Replace with a new self-locking nut and tighten.

Tightening torque:

100 N·m (10.2 kgf·m, 74 ft·lb)

Wheel Alignment

FRONT SUSPENSION

7. THRUST ANGLE

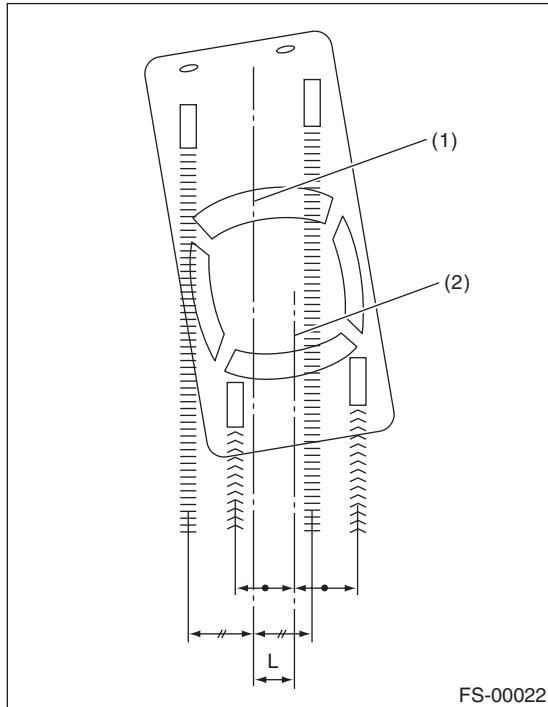
• INSPECTION

- 1) Park the vehicle on a level surface.
- 2) Move the vehicle 3 to 4 meters (10 to 13 feet) straight forward.
- 3) Draw the center of loci for both the front and rear axles.
- 4) Measure distance "L" between the center lines of the axle loci.

Thrust angle

Allowable value:

$0^{\circ} \pm 30'$ (when "L" is less than 23 mm (0.9 in), less than 30').



- (1) Center line of loci (front axle)
- (2) Center line of loci (rear axle)

• ADJUSTMENT

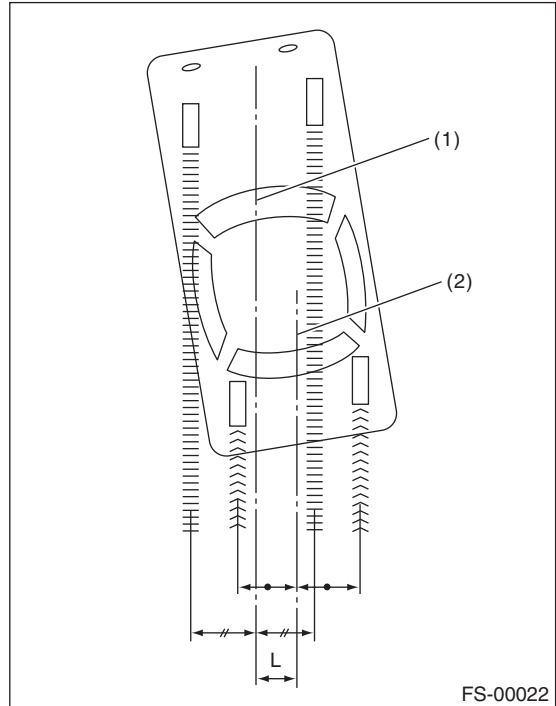
Adjust to be within the adjustment standard if it exceeds the allowed value.

Thrust angle

Adjustment specifications:

$0^{\circ} \pm 20'$ (When "L" is less than 15 mm (0.6 in), under 20').

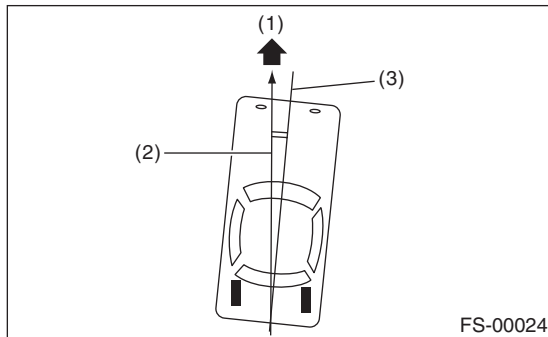
- 1) Make thrust angle adjustments by turning the toe-in adjusting bolts of the rear suspension equally in the same direction.
- 2) When one rear wheel is adjusted in a toe-in direction, adjust the other rear wheel equally in toe-out direction, in order to make the thrust angle adjustment.
- 3) When the left and right adjusting bolts are turned by one graduation, the thrust angle will change approx. 16'. ["L": Approximately 12 mm (0.472 in)]



- (1) Center line of loci (front axle)
- (2) Center line of loci (rear axle)

NOTE:

The thrust angle is the average value of the right and left wheel toe angles with regard to the center line of the body. The vehicle will advance towards the thrust angle direction while swaying in a angle direction.



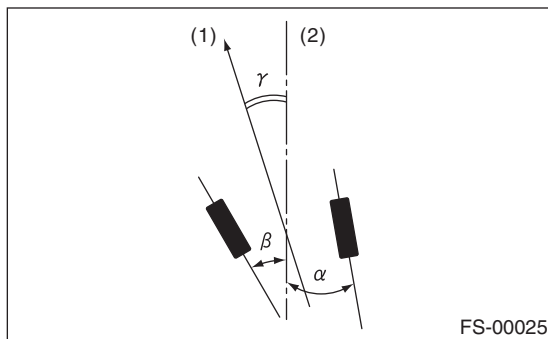
- (1) Front
- (2) Thrust angle
- (3) Body center line

Thrust angle: $\gamma = (\alpha - \beta)/2$

α : Rear RH wheel toe-in angle

β : Rear LH wheel toe-in angle

Substitute only the positive toe-in values from each wheel into α and β in the equation.



- (1) Front
- (2) Body center line

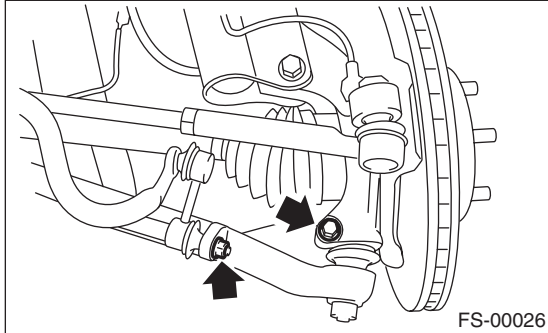
Front Transverse Link

FRONT SUSPENSION

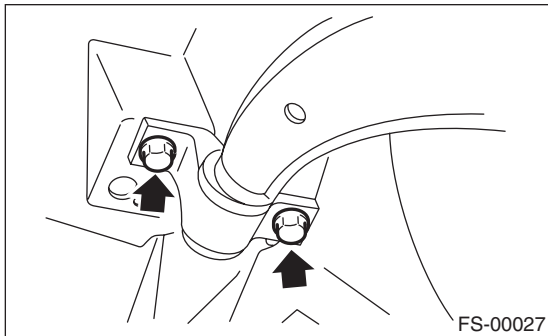
3. Front Transverse Link

A: REMOVAL

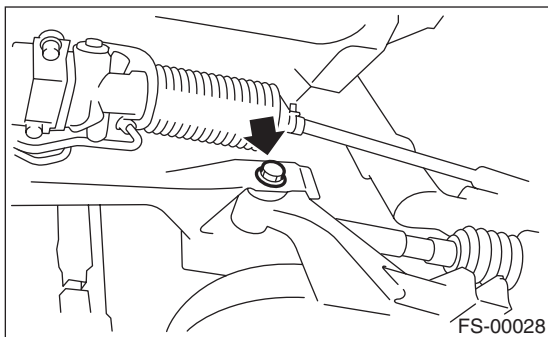
- 1) Set the vehicle on a lift.
- 2) Lift up the vehicle, and remove the wheels.
- 3) Remove the sub frame. <Ref. to FS-23, REMOVAL, Sub Frame.>
- 4) Remove the stabilizer link from the transverse link.
<Ref. to FS-21, REMOVAL, Front Stabilizer.>
- 5) Remove the bolt securing the ball joint of the transverse link to the housing.



- 6) Remove the nut securing the transverse link to the crossmember. (Do not remove the bolt.)
- 7) Remove the two bolts securing the bushing bracket of the transverse link to the rear bushing location on the body.



- 8) Extract the ball joint from housing.
- 9) Remove the bolt securing the transverse link to crossmember and extract the transverse link from the crossmember.



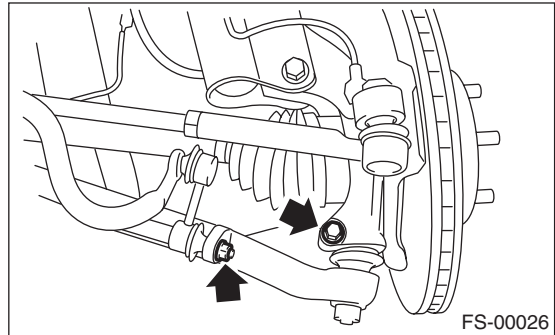
B: INSTALLATION

- 1) Temporarily tighten the two bolts used to secure the transverse link to the body.

NOTE:

These bolts securing the bushings are tightened to a point where they can still move back and forth in the oblong shaped hole in the bracket.

- 2) Install the bolts which connect the transverse link to the crossmember, and temporarily tighten with a new self-locking nut.
- 3) Insert the ball joint into housing.
- 4) Connect the stabilizer link to the transverse link, and temporarily tighten the new self-locking nuts.



- 5) Tighten the following points in the order shown below when the wheels are in full contact with the ground and vehicle is at curb weight (empty).
 - (1) Between transverse link and stabilizer

Tightening torque:

45 N·m (4.6 kgf-m, 33 ft-lb)

- (2) Between transverse link and crossmember

Tightening torque:

125 N·m (12.7 kgf-m, 92.3 ft-lb)

- (3) Between transverse link rear bushing and body

Tightening torque:

250 N·m (25.5 kgf-m, 184 ft-lb)

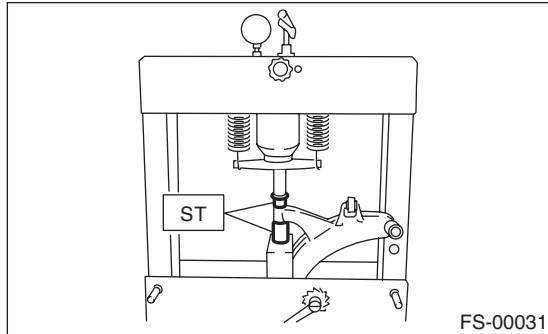
- 6) Inspect the wheel alignment and adjust if necessary.

C: DISASSEMBLY

1. FRONT BUSHING

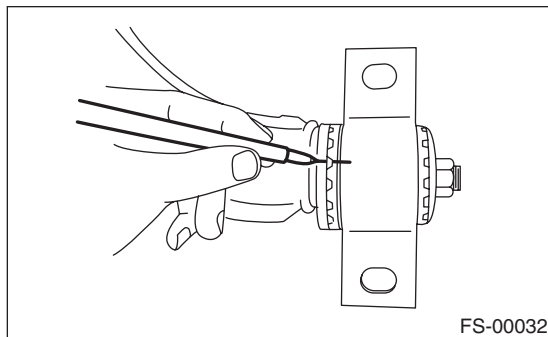
Using the ST, press the front bushing out of place.

ST 927680000 INSTALLER & REMOVER SET



2. REAR BUSHING

- 1) Place alignment marks on the transverse link and rear bushing.
- 2) Loosen the nut and remove the rear bushing.



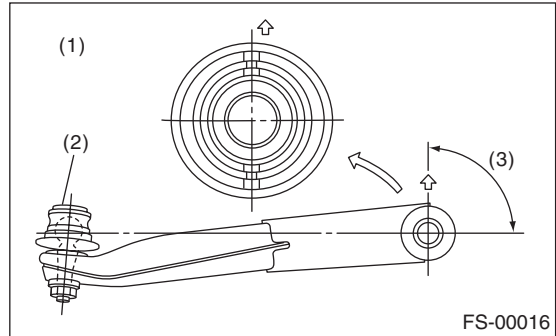
D: ASSEMBLY

1. FRONT BUSHING

Assemble in the reverse order of disassembly.

CAUTION:

Install the front bushing in proper direction as shown in the figure.



- (1) Face the bushing toward the center of ball joint.
- (2) Ball joint
- (3) $90^{\circ} \pm 3^{\circ}$

2. REAR BUSHING

- 1) Attach the rear bushing to the transverse link and align to the aligning marks.
- 2) Attach and tighten a new self-locking nut.

NOTE:

While holding the rear bushing so as not to change position of aligning marks, tighten the self-locking nut.

Tightening torque:

190 N·m (19.4 kgf-m, 140 ft-lb)

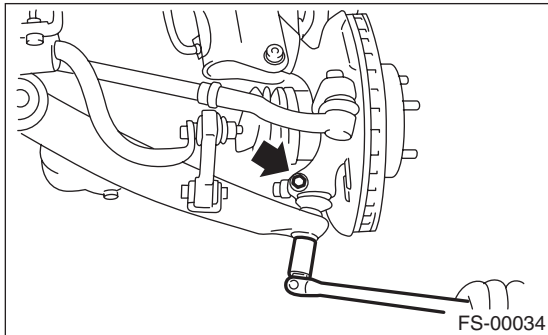
E: INSPECTION

- 1) Check the transverse link for wear, damage and cracks, and correct or replace if defective.
- 2) Check the bushing for abnormal fatigue or damage.
- 3) Check the rear bushing for oil leaks.

4. Front Ball Joint

A: REMOVAL

- 1) Remove the wheels.
- 2) Pull out the cotter pin from the ball stud, remove the castle nut, and extract the ball stud from the transverse link.
- 3) Remove the bolts which secure the ball joint to the housing.



- 4) Extract the ball joint from housing.

B: INSTALLATION

- 1) Insert the ball joint into housing.

Tightening torque (Bolt):
50 N·m (5.1 kgf·m, 37 ft·lb)

CAUTION:

Do not apply grease to the tapered portion of ball stud.

- 2) Connect the ball joint to transverse link.

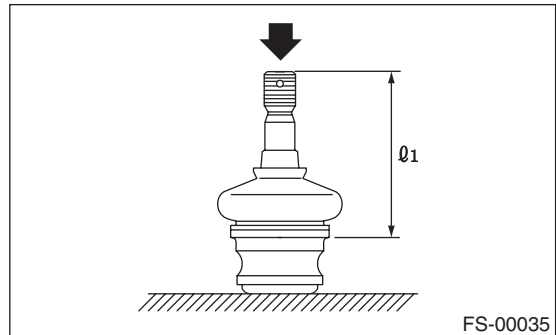
Tightening torque (Castle nut):
40 N·m (4.1 kgf·m, 30 ft·lb)

- 3) Tighten the castle nut further but within 60° until the hole in ball stud is aligned with a slot in castle nut. Then, insert a new cotter pin and bend it around the castle nut.
- 4) Install the front wheels.

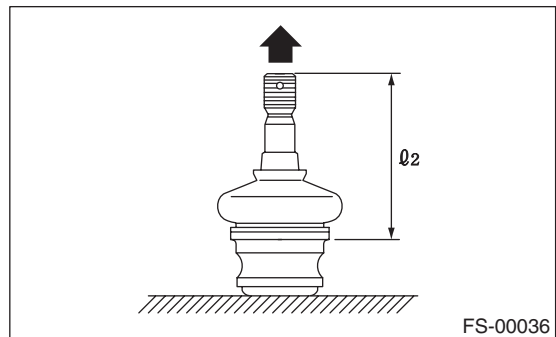
C: INSPECTION

- 1) Measure the play of the ball joint using the following procedures. Replace with a new part if the play exceeds the specified value.

- (1) While applying 686 N (70 kgf, 154 lb) of force in the direction shown in the figure, measure dimension l_1 .



- (2) While applying 686 N (70 kgf, 154 lb) of force in the direction shown in the figure, measure dimension l_2 .



- (3) Determine free play using the following formula.

$$S = l_2 - l_1$$

- (4) Replace with a new part if the play exceeds the specified value.

Front ball joint

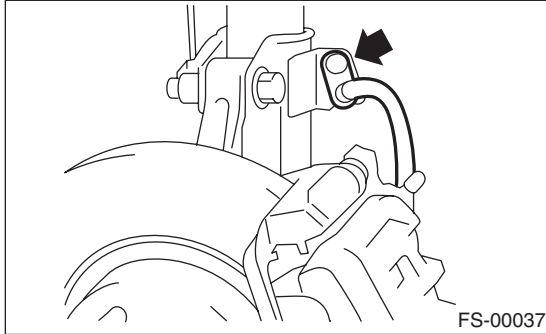
Specification for replacement: S
Less than 0.3 mm (0.012 in)

- 2) If the play is within specification, visually check the dust cover.
- 3) Remove the ball joint and cover, and check for wear, damage or cracks. If any damage is found, replace the corresponding part.
- 4) If the dust cover is damaged, replace with a new ball joint.

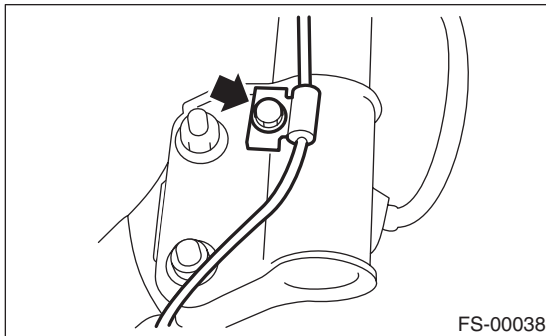
5. Front Strut

A: REMOVAL

- 1) Remove the wheels.
- 2) Remove the bolt securing the brake hose from the strut.



- 3) Scribe an alignment mark on the camber adjusting bolt that secures the strut to the housing.
- 4) Remove the bolt securing the ABS wheel speed sensor harness.

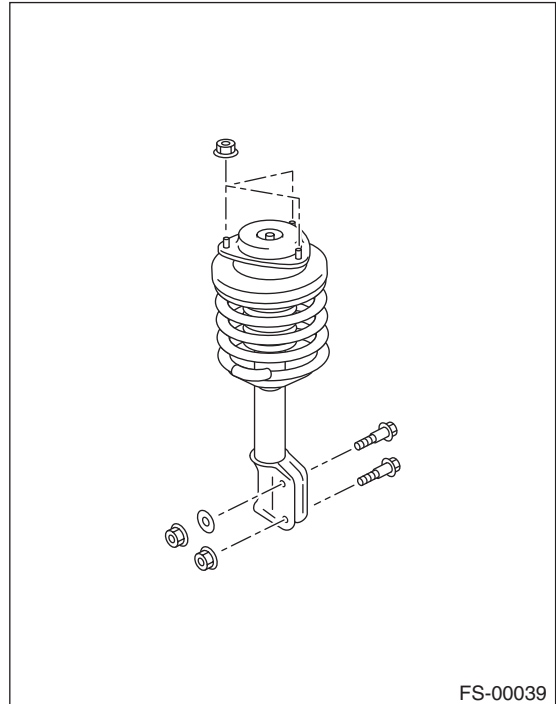


- 5) Remove the two bolts securing the housing to the strut.

NOTE:

While holding the head of the adjusting bolt, loosen the self-locking nut.

- 6) Remove the three nuts securing strut mount to body.



Front Strut

FRONT SUSPENSION

B: INSTALLATION

1) Install the strut mount at upper side of strut to the body, and tighten it with new nuts.

Tightening torque:

20 N·m (2.0 kgf-m, 14.5 ft-lb)

2) Align to the alignment marks on the camber adjusting bolt and strut bottom. Using new self-locking nuts, install the strut to the housing.

NOTE:

While holding the head of adjusting bolt, tighten the self-locking nut.

Tightening torque:

175 N·m (17.8 kgf-m, 129 ft-lb)

3) Secure the ABS wheel speed sensor harness to the strut.

Tightening torque:

33 N·m (3.4 kgf-m, 24.3 ft-lb)

4) Install the bolts which secure the brake hose to the strut.

Tightening torque:

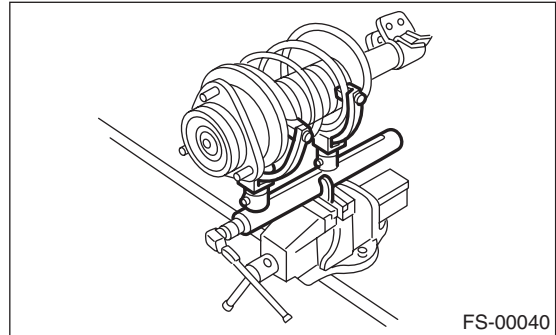
33 N·m (3.4 kgf-m, 24.3 ft-lb)

5) Install the wheel.

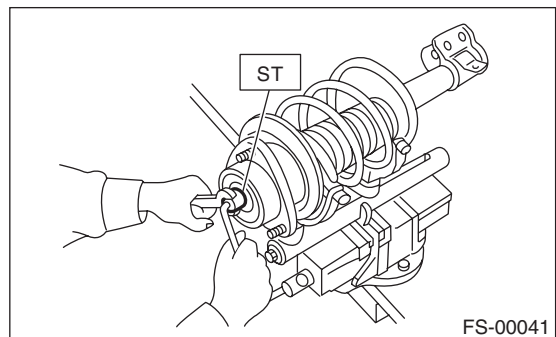
6) Inspect the wheel alignment and adjust if necessary.

C: DISASSEMBLY

1) Using a coil spring compressor, compress the coil spring.



2) Using the ST, remove the self-locking nut.
ST 927760000 STRUT MOUNT SOCKET



3) Remove the strut mount, upper spring seat and rubber seat from the strut.

4) Gradually decrease the compression force of compressor, and remove the coil spring.

5) Remove the dust cover and helper spring.

D: ASSEMBLY

- 1) Before installing the coil spring, strut mount, etc. on the strut, check the condition of air inside the strut damper mechanism to make sure that excessive air is not inhibiting the creation of appropriate damping force.
- 2) Checking for presence of air
 - (1) Place the strut vertically with the piston rod facing up.
 - (2) Move the piston rod to the center of its entire stroke.
 - (3) While holding the piston rod end with fingers, move the rod up and down.
 - (4) If the piston rod moves more than 10 mm (0.39 in) in the former step, purge air from the strut.
- 3) Air purging procedure
 - (1) Place the strut vertically with the piston rod facing up.
 - (2) Fully extend the piston rod.
 - (3) With the piston rod fully extended, place the piston rod side down. The strut must stand vertically.
 - (4) Fully retract the piston rod.
 - (5) Repeat 3 or 4 times from the first step.

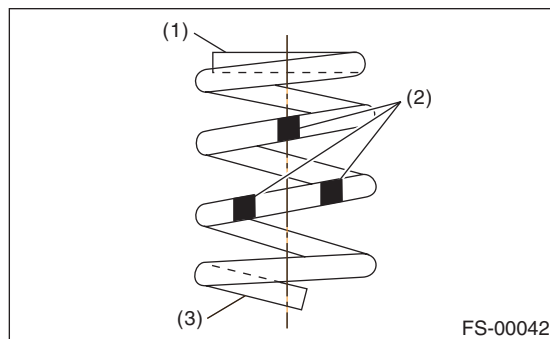
NOTE:

After purging air from the strut, be sure to place the strut with the piston rod facing up. If the strut is laid down for any reason, check for the entry of air in accordance with "Checking for presence of air"

- 4) Using a coil spring compressor, compress the coil spring.

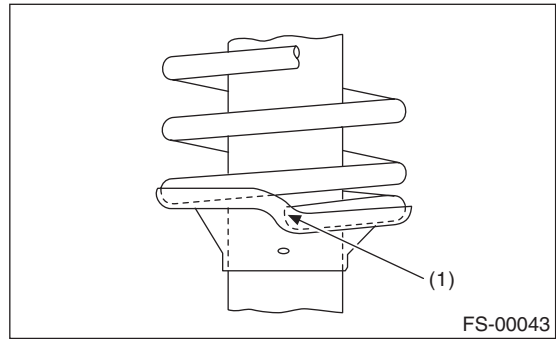
NOTE:

Make sure that the vertical installing direction of coil spring is as shown in the figure.



- (1) Flat (top side)
- (2) Identification paint
- (3) Inclined (bottom side)

- 5) Set the coil spring correctly so that its end face seats well in the spring seat as shown in the figure.

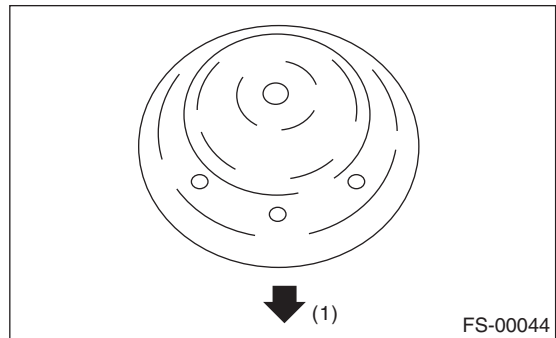


(1) Coil spring end face

- 6) Install the helper and dust cover to the piston rod.
- 7) Pull the piston rod fully upward, and install the rubber seat and spring seat.

NOTE:

Position the upper spring seat as shown in the figure.

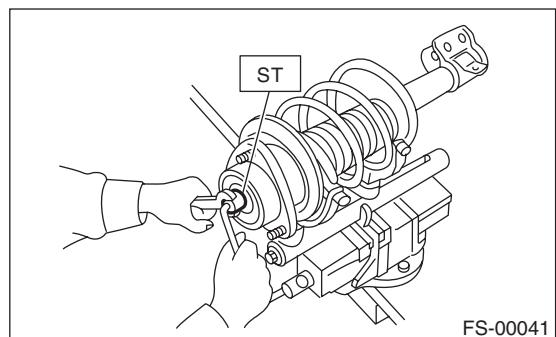


(1) Outside the vehicle

- 8) Install the strut mount to piston rod, and temporarily attach and tighten a new self locking nut.
- 9) Using a hex wrench to prevent strut rod from turning, tighten the self-locking nut with the ST. ST 927760000 STRUT MOUNT SOCKET

Tightening torque:

55 N·m (5.6 kgf·m, 41 ft·lb)



- 10) Loosen the coil spring carefully.

Front Strut

FRONT SUSPENSION

E: INSPECTION

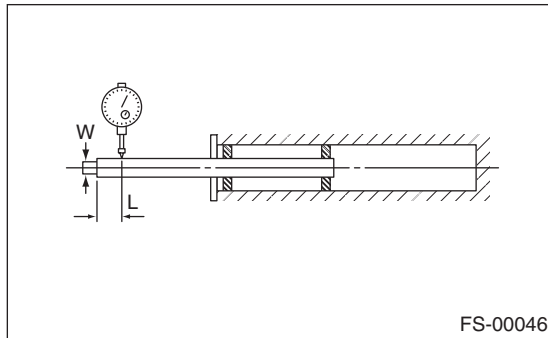
Check the removed part for wear, damage and cracks, and then repair or replace it if defective.

1. DAMPER STRUT

- 1) Check for oil leaks.
- 2) Move the piston rod up and down to check that it operates smoothly.
- 3) Piston rod play

- Measure the play as follows:

Fix the outer shell in place and fully extend the rod. Set a dial gauge at the end of rod L [10 mm (0.39 in)], and then read the dial gauge indication P_1 while applying a force of W [20 N (2 kgf, 4 lb)] to the threaded portion. Apply a force of 20 N (2 kgf, 4 lb) from the opposite direction of "W", and then read the dial gauge indication P_2 .



Play limit ($P_1 + P_2$):
0.8 mm (0.031 in)

If the play exceeds the limit, replace the strut.

2. STRUT MOUNT

Check the rubber part for abnormal deformation, cracks or deterioration. Replace it with a new part if defective.

3. DUST COVER

Replace with a new part if abnormally cracked or damaged.

4. COIL SPRING

If a permanent strain is found, replaced it with a new part. Refer to the specifications to inspect the wheel arch height even if the vehicle is not inclined because of a flat tire or a biased load. If the tolerance is out of specifications, replace with a new part.

5. HELPER

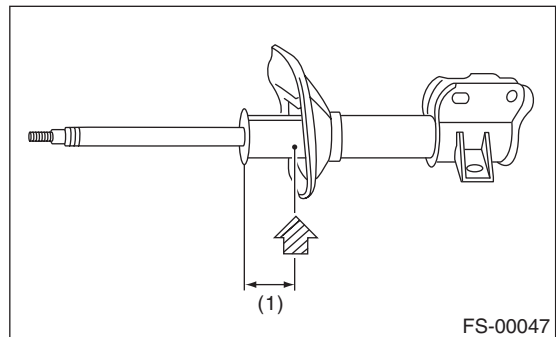
Replace with a new part if abnormally cracked or damaged.

F: DISPOSAL

CAUTION:

- Before handling struts filled with gas, be sure to wear goggles to protect eyes from gas, oil and metal shavings.
- Do not disassemble the strut damper or throw into flames.
- When discarding gas filled struts, drill holes in them to purge the gas.

- 1) Place the gas-filled strut on a level surface with the piston rod fully extended.
- 2) Using a 2 — 3 mm (0.08 — 0.12 in) dia. drill, make the holes in areas shown in the figure.

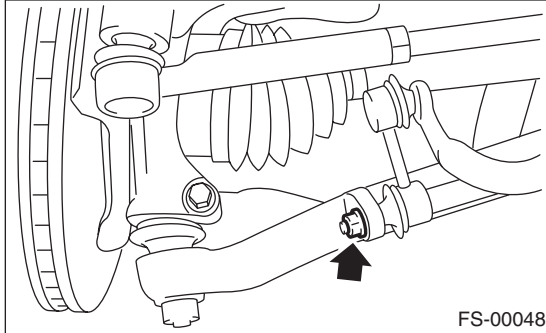


(1) 40 mm (1.57 in)

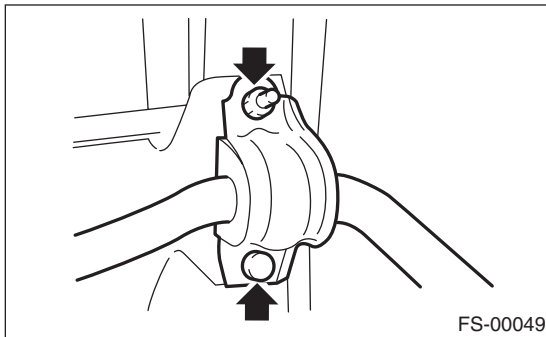
6. Front Stabilizer

A: REMOVAL

- 1) Jack-up the vehicle front end and support it with rigid racks.
- 2) Remove the jack-up plate from lower part of the crossmember.
- 3) Remove the sub frame. <Ref. to FS-23, REMOVAL, Sub Frame.>
- 4) Remove the nuts which secure the stabilizer link to front transverse link.



- 5) Remove the bolt and nut which secures the stabilizer to the crossmember.

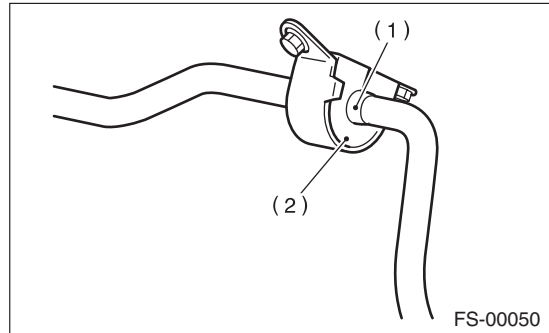


B: INSTALLATION

- 1) Install in the reverse order of removal.

NOTE:

- Use a new self-locking nut.
- Install the bushing (on front crossmember side) while aligning it with the paint mark on the stabilizer.
- Make sure the bushing and stabilizer have the same identification colors when installing.



- (1) Paint mark of the stabilizer
- (2) Bushing identification color

- 2) Always tighten the rubber bushings with wheels in full contact with the ground and the vehicle at curb weight.

Tightening torque:

Jack-up plate to crossmember

70 N·m (7.1 kgf-m, 52 ft-lb)

Stabilizer link to front transverse link:

45 N·m (4.6 kgf-m, 33 ft-lb)

Stabilizer to crossmember

25 N·m (2.5 kgf-m, 18.1 ft-lb)

C: INSPECTION

- 1) Check the bushing for abnormal fatigue or damage.
- 2) Check that there is no deformation, cracks or damage on the stabilizer link.
- 3) Make sure that the bushing is not protruding from the hole in the stabilizer link.

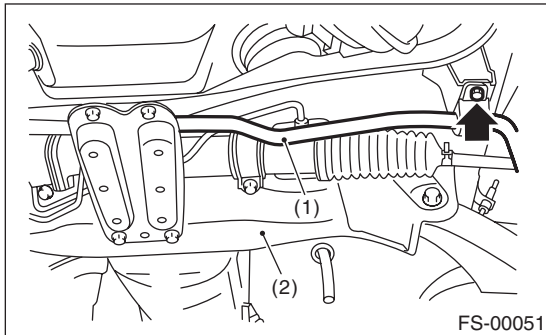
Front Crossmember

FRONT SUSPENSION

7. Front Crossmember

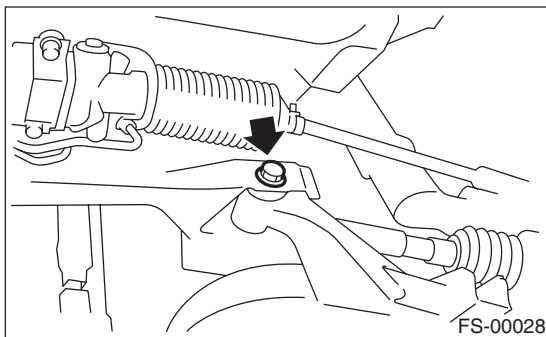
A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Lift-up the vehicle, and remove the front wheels.
- 3) Remove the sub frame. <Ref. to FS-23, REMOVAL, Sub Frame.>
- 4) Remove the stabilizer and jack-up plate.



- (1) Front stabilizer
(2) Front crossmember

- 5) Disconnect the tie-rod end from the housing.
- 6) Remove the front exhaust pipe.
- 7) Remove the front transverse link from the front crossmember and body.



- 8) Remove the bolts attaching the engine mount cushion rubber to crossmember.
- 9) Remove the steering universal joint.
- 10) Disconnect the power steering pipe from steering gearbox.
- 11) Lift the engine approx. 10 mm (0.39 in) using a chain block.
- 12) Support the crossmember with a jack, remove the nuts securing the crossmember to body and lower the crossmember gradually along with the steering gearbox.

CAUTION:

When pulling the crossmember downward to remove, be careful that the tie-rod end does not interfere with SFJ boot.

B: INSTALLATION

- 1) Install in the reverse order of removal.

CAUTION:

Always tighten bushings with wheels in full contact with the ground and the vehicle at curb weight.

Tightening torque:

Transverse link bushing to crossmember
125 N·m (12.7 kgf-m, 92.3 ft-lb)

Stabilizer to bushing:
25 N·m (2.5 kgf-m, 18.1 ft-lb)

Tie-rod end to housing:
27 N·m (2.75 kgf-m, 19.9 ft-lb)

Front cushion rubber to crossmember
85 N·m (8.7 kgf-m, 62.7 ft-lb)

Universal joint to pinion shaft:
24 N·m (2.4 kgf-m, 17.4 ft-lb)

Crossmember to body:
100 N·m (10.2 kgf-m, 74 ft-lb)

- 2) Purge air from the power steering system. <Ref. to PS-49, Power Steering Fluid.>
- 3) Inspect the wheel alignment and adjust if necessary.

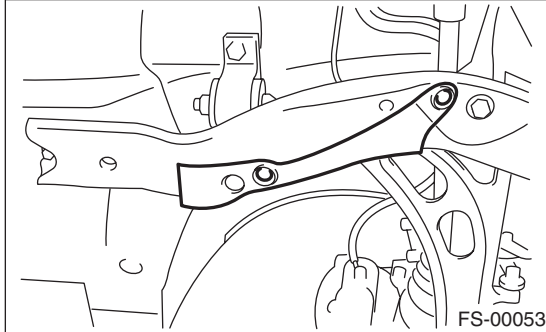
C: INSPECTION

Check the crossmember for wear, damage or cracks, and then repair or replace if faulty.

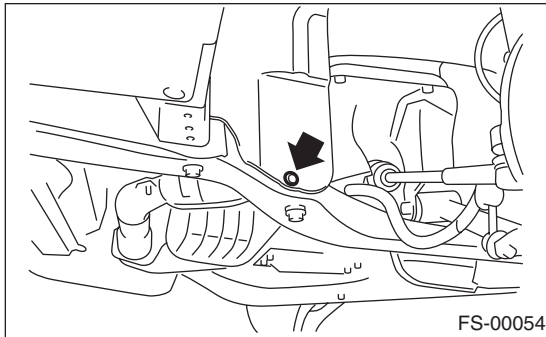
8. Sub Frame

A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Remove the under cover.
- 3) Remove the bolt cover.



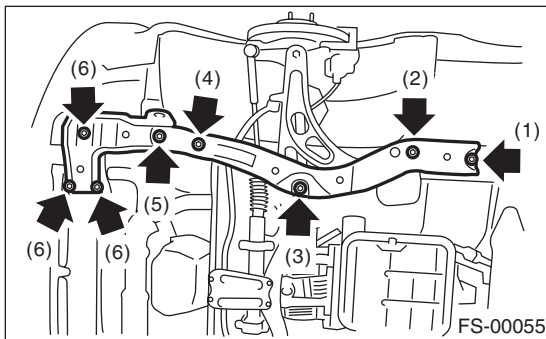
- 4) Remove the clip.



- 5) Remove the sub frame.

NOTE:

Loosen bolt (1) and leave a few threads caught, then remove the bolts in the order of (2), (3), (4), (5), and (6).



B: INSTALLATION

Install in the reverse order of removal.

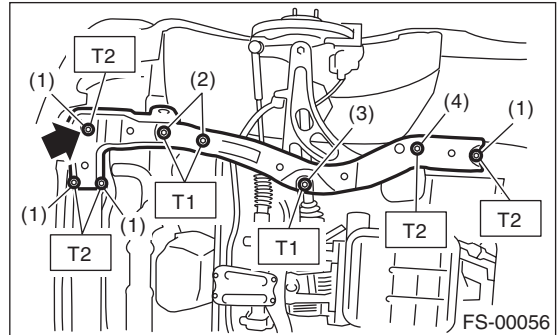
NOTE:

Replace with a new M12 bolt.

Tightening torque:

T1: 55 N·m (5.6 kgf·m, 41 ft·lb)

T2: 71 N·m (7.2 kgf·m, 52 ft·lb)



- (1) M10 × 30 bolts
- (2) M12 × 87 bolts (with wax)
- (3) M12 × 65 bolts (with wax)
- (4) M10 × 90 bolts

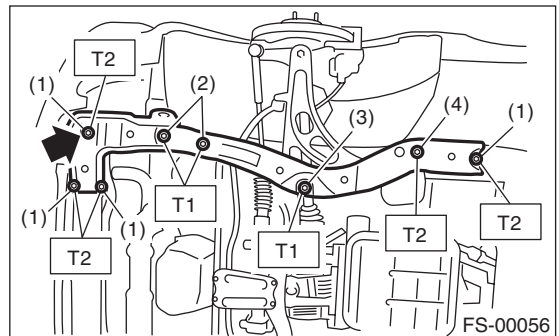
C: INSPECTION

- 1) Check that there is no damage or distortion of the sub frame.
- 2) Check that the bolts are tightened with the specified torque. If there is looseness, tighten to the specified torque.

Tightening torque:

T1: 55 N·m (5.6 kgf·m, 41 ft·lb)

T2: 71 N·m (7.2 kgf·m, 52 ft·lb)



- (1) M10 × 30 bolts
- (2) M12 × 87 bolts (with wax)
- (3) M12 × 65 bolts (with wax)
- (4) M10 × 90 bolts

General Diagnostic Table

FRONT SUSPENSION

9. General Diagnostic Table

A: INSPECTION

1. IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

Possible cause	Corrective action
(1) Permanent distortion or damaged coil spring	Replace.
(2) Rough operation of damper strut or shock absorber	Replace.
(3) Installation of non-compatible strut or shock absorber	Replace with appropriate parts.
(4) Installation of non-compatible coil spring	Replace with appropriate parts.

2. POOR RIDE COMFORT

- 1) Large rebound shock
- 2) Rocking of vehicle continues too long after running over bump and/or hump.
- 3) Excessive shock in bumping

Possible cause	Corrective action
(1) Damaged coil spring	Replace.
(2) Overinflation of tires	Adjust.
(3) Improper wheel arch height	Adjust or replace coil springs with new parts.
(4) Fault in operation of damper strut or shock absorber	Replace.
(5) Abnormal damage or deformation of strut mount or shock absorber mount	Replace.
(6) Improper length (maximum or minimum) of damper strut or shock absorber	Replace with proper parts.
(7) Abnormal damage or deformation of bushing	Replace.
(8) Deformation or damage of helper in strut assembly or shock absorber	Replace.
(9) Oil leakage from the damper strut or shock absorber	Replace.

3. NOISE

Possible cause	Corrective action
(1) Worn or damaged damper strut	Replace.
(2) Wear or damage of shock absorber components	Replace.
(3) Loosening of the suspension link installing bolt	Tighten to the specified torque.
(4) Loss or abnormal deformation of bushing	Replace.
(5) Improper length (maximum or minimum) of damper strut or shock absorber	Replace with proper parts.
(6) Damaged coil spring	Replace.
(7) Wear or damage of the ball joint	Replace.
(8) Deformation of the stabilizer clamp	Replace.

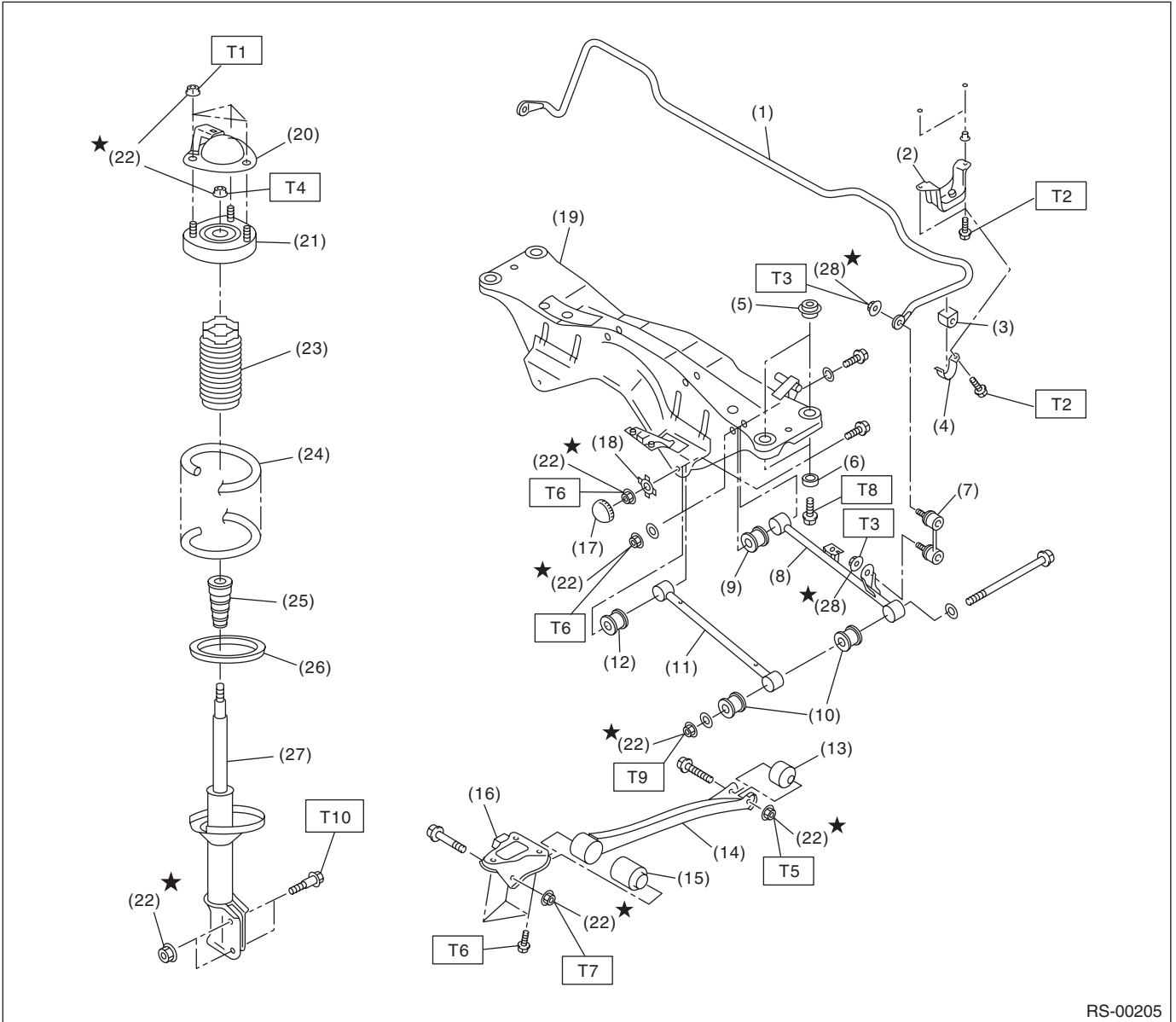
1. General Description

A: SPECIFICATION

Refer to "FS" section for rear suspension specifications. <Ref. to FS-2, SPECIFICATION, General Description.>

B: COMPONENT

1. REAR SUSPENSION



RS-00205

- | | | |
|---------------------------------|----------------------------------|-----------------|
| (1) Stabilizer | (15) Trailing link front bushing | (28) Flange nut |
| (2) Stabilizer bracket | (16) Trailing link bracket | |
| (3) Stabilizer bushing | (17) Cap (Protection) | |
| (4) Clamp | (18) Washer | |
| (5) Floating bushing | (19) Rear crossmember | |
| (6) Stopper | (20) Strut mount cap | |
| (7) Stabilizer link | (21) Strut mount | |
| (8) Rear lateral link | (22) Self-locking nut | |
| (9) Bushing | (23) Dust cover | |
| (10) Bushing | (24) Coil spring | |
| (11) Front lateral link | (25) Helper | |
| (12) Bushing | (26) Rubber seat lower | |
| (13) Trailing link rear bushing | (27) Damper strut | |
| (14) Trailing link | | |

Tightening torque: N-m (kgf-m, ft-lb)

- T1: 20 (2.0, 14.5)**
- T2: 25 (2.5, 18.1)**
- T3: 45 (4.6, 33.2)**
- T4: 60 (6.1, 44)**
- T5: 90 (9.2, 66)**
- T6: 100 (10.2, 74)**
- T7: 115 (11.7, 85)**
- T8: 130 (13.3, 96)**
- T9: 140 (14.3, 103)**
- T10: 200 (20.4, 148)**

General Description

REAR SUSPENSION

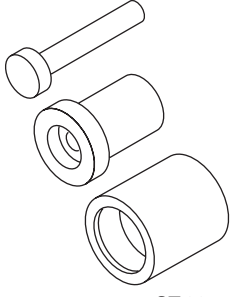
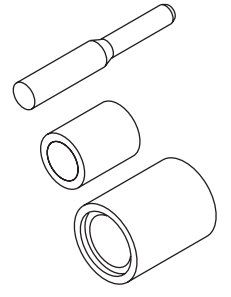
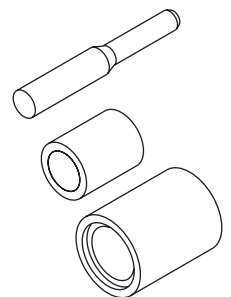
C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Before disposing of shock absorbers, be sure to bleed the gas out completely. Also, do not expose to flames or fire.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.

- Use SUBARU genuine grease etc. or equivalent. Do not mix grease with another grade or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

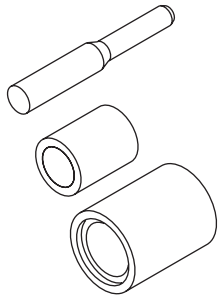
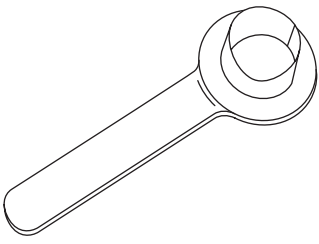
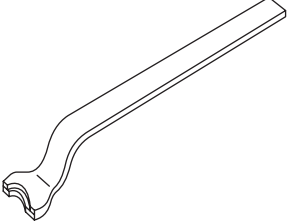
D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST-927720000</p>	927720000	INSTALLER & REMOVER	Used for replacing the front bushing.
 <p>ST-927730000</p>	927730000	INSTALLER & REMOVER	Used for replacing the rear bushing.
 <p>ST-927700000</p>	927700000	INSTALLER & REMOVER	Used for replacing the lateral link bushing.

General Description

REAR SUSPENSION

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST-927690000</p>	927690000	INSTALLER & REMOVER	Used for replacing the lateral link bushing.
 <p>ST28099PA090</p>	28099PA090	OIL SEAL PROTECTOR	<ul style="list-style-type: none"> • Used for installing the rear drive shaft into the rear differential. • For oil seal protection
 <p>ST28099PA100</p>	28099PA100	REMOVER	Used for removing the rear drive shaft from the rear differential.

2. GENERAL TOOL

TOOL NAME	REMARKS
Alignment gauge	Used for measuring wheel alignment.
Alignment gauge adapter	Used for measuring wheel alignment.
Turning radius gauge	Used for measuring wheel alignment.
Toe-in gauge	Used for toe-in measurement.
Transmission jack	Used for removing and installing the suspension.
Bearing puller	Used for removing bushings.
Coil spring compressor	Used for strut assembly/disassembly.

Wheel Alignment

REAR SUSPENSION

2. Wheel Alignment

A: INSPECTION

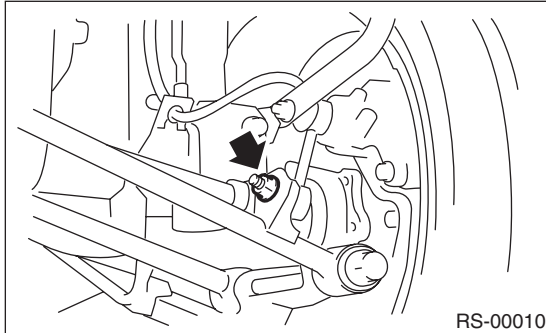
NOTE:

Measure and adjust the front and rear wheel alignment together. Refer to "FS" section for measurement and adjustment of wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>

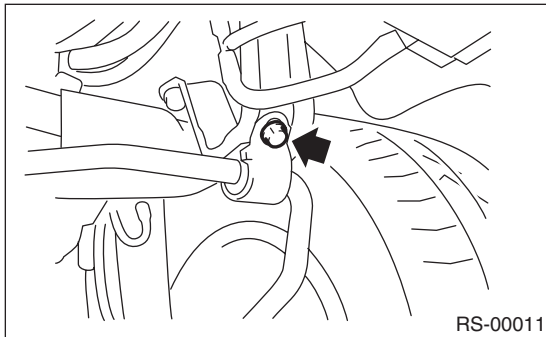
3. Rear Stabilizer

A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Remove the stabilizer link.



- 3) Remove the bolt which secures the stabilizer to the stabilizer bracket.

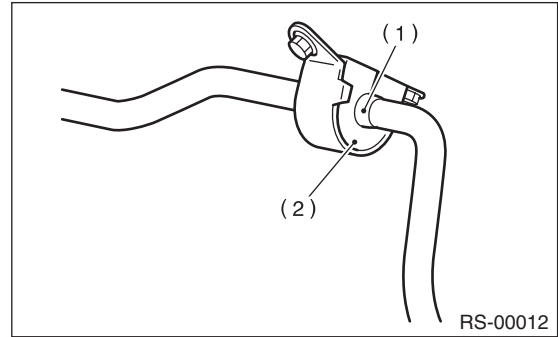


B: INSTALLATION

- 1) Install in the reverse order of removal.

NOTE:

- Use a new nut.
- Install the stabilizer bushing while aligning it with the paint mark on the stabilizer.
- Make sure the stabilizer bushing and stabilizer have the same identification colors (paint mark) when installing.



- (1) Paint mark of the stabilizer
- (2) Stabilizer bushing identification color

- 2) Always tighten the stabilizer bushing in the state where the vehicle is at curb weight and the wheels are in full contact with the ground.

Tightening torque:

Stabilizer link to rear lateral link

45 N·m (4.6 kgf-m, 33.2 ft-lb)

Stabilizer to stabilizer bracket

25 N·m (2.5 kgf-m, 18.1 ft-lb)

C: INSPECTION

- 1) Check the bushing for abnormal cracks, fatigue or damage.
- 2) Check that there is no deformation, cracks or damage on the stabilizer link.

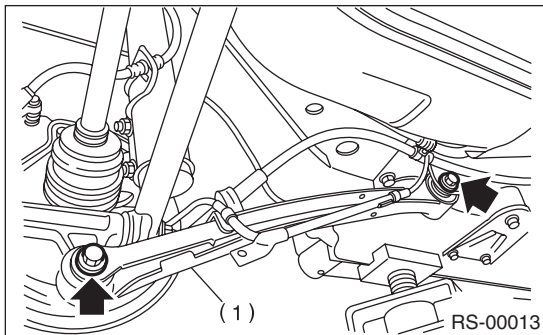
Rear Trailing Link

REAR SUSPENSION

4. Rear Trailing Link

A: REMOVAL

- 1) Loosen the rear wheel nuts.
- 2) Lift-up the vehicle, and then remove the rear wheels.
- 3) Remove both the rear parking brake clamp and the ABS wheel speed sensor harness.
- 4) Remove the bolt which attaches the trailing link to the trailing link bracket.



(1) Trailing link

- 5) Remove the bolt which attaches the trailing link to the rear housing.

B: INSTALLATION

NOTE:

Use a new self-locking nut.

- 1) Install in the reverse order of removal.

Tightening torque:

Refer to "COMPONENT" of "General Description" for tightening torque values. <Ref. to RS-3, COMPONENT, General Description.>

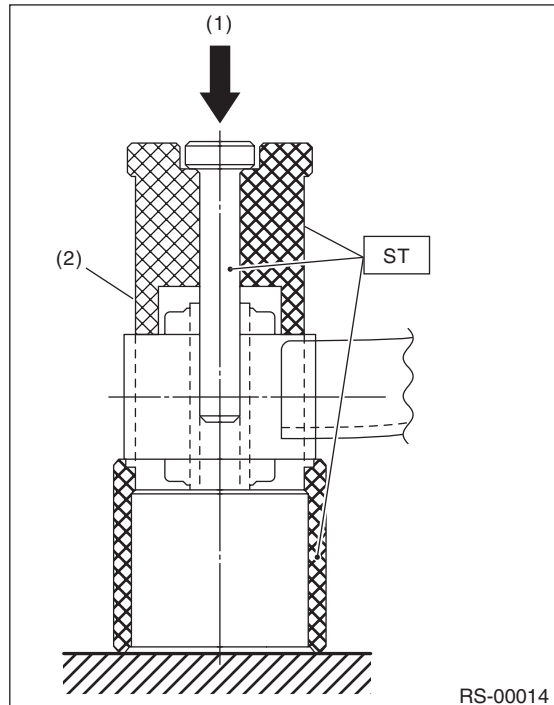
- 2) Always tighten bushings with wheels in full contact with the ground and the vehicle at curb weight.
- 3) Inspect the wheel alignment and adjust if necessary.

C: DISASSEMBLY

1. FRONT BUSHING

Using the ST, press the front bushing out of place.

ST 927720000 INSTALLER & REMOVER SET



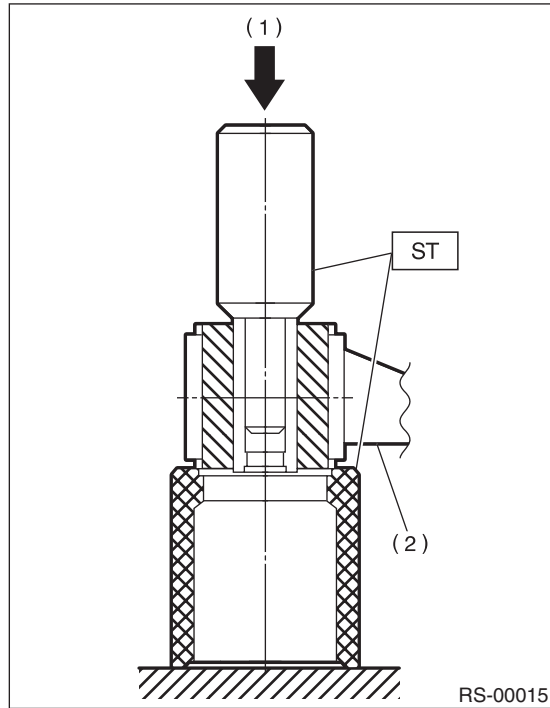
- (1) Press
- (2) Trailing link

2. REAR BUSHING

1) Remove the housing. <Ref. to DS-21, REMOVAL, Rear Axle.>

2) Using the ST, press the rear bushing out.

ST 927730000 INSTALLER & REMOVER SET



- (1) Press
- (2) Housing

D: ASSEMBLY

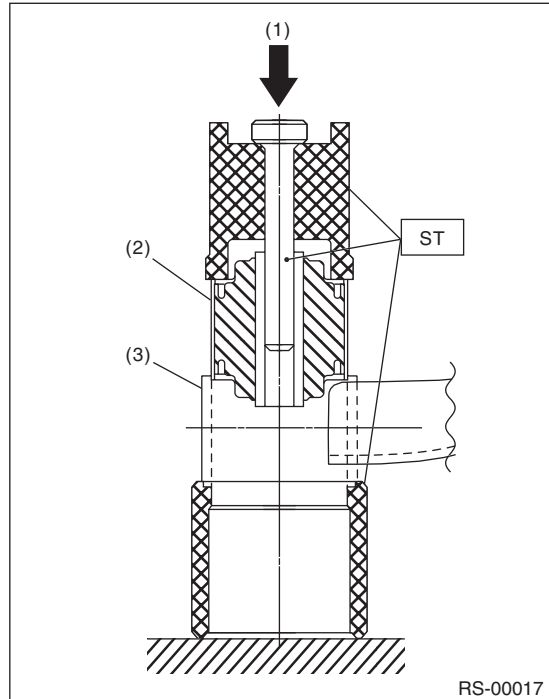
1. FRONT BUSHING

Using the ST, press the bushing into the trailing link.

ST 927720000 INSTALLER & REMOVER SET

CAUTION:

Turn ST plunger upside down and press it until the plunger end surface contacts the trailing link end surface.



- (1) Press
- (2) Front bushing
- (3) Trailing link

Rear Trailing Link

REAR SUSPENSION

2. REAR BUSHING

1) Using the ST, press the bushing into the trailing link.

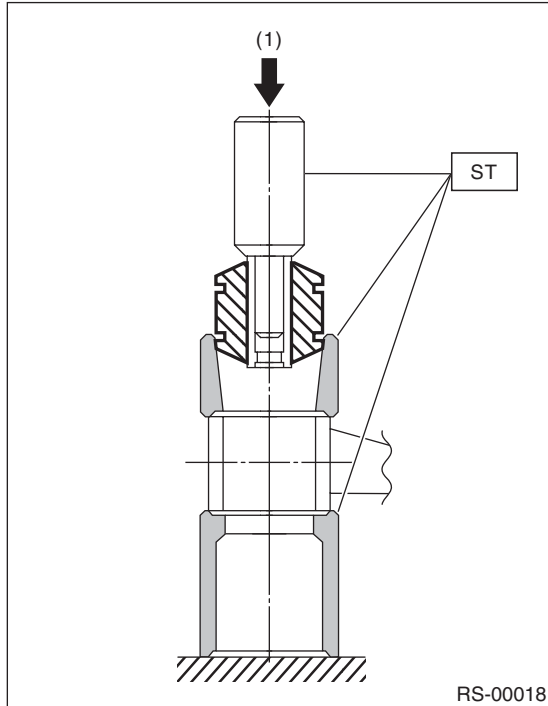
ST 927730000 INSTALLER & REMOVER SET

NOTE:

If it is difficult to press the bushing into the trailing link, dilute TIRE LUBE with water and apply it to the inner surface of ST as a lubricant.

Specified lubricant:

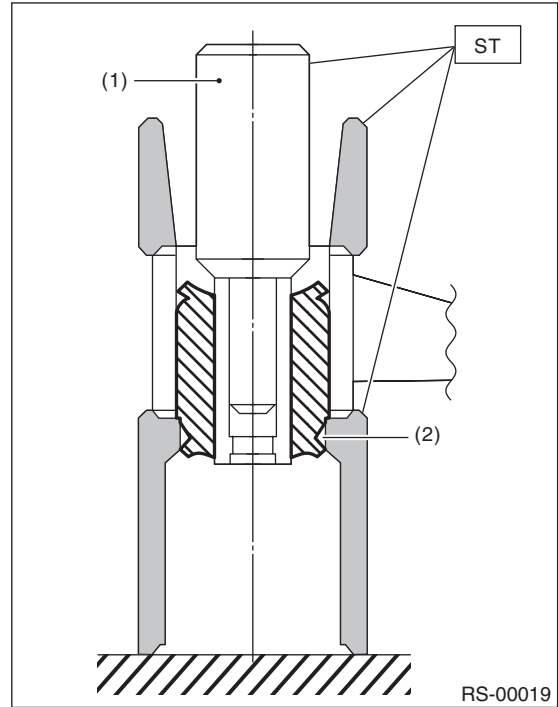
TIRE LUBE : Water = 1 : 3



(1) Press

2) Press the ST plunger until bushing flange protrudes beyond the trailing link.

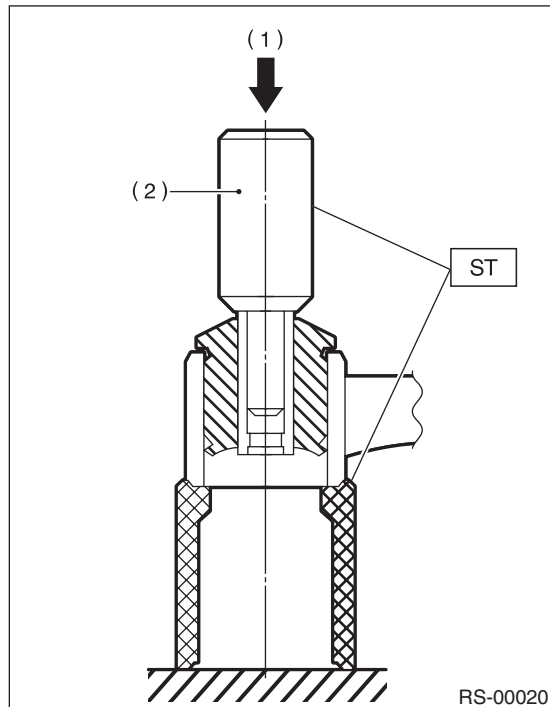
ST 927730000 INSTALLER & REMOVER SET



- (1) Plunger
- (2) Flange

3) Turn the trailing link upside down. Press the ST plunger in the direction opposite that outlines in the former procedure until bushing is correctly positioned in trailing link.

ST 927730000 INSTALLER & REMOVER SET



- (1) Press
- (2) Plunger

4) Install the housing. <Ref. to DS-24, INSTALLATION, Rear Axle.>

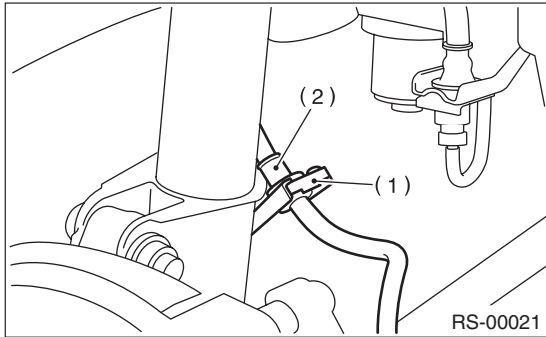
E: INSPECTION

Check the trailing link for bending, corrosion or damage.

5. Rear Strut

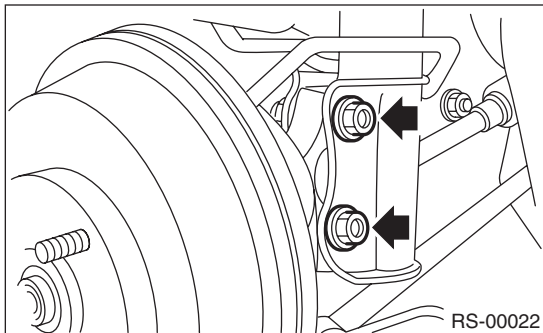
A: REMOVAL

- 1) Remove the strut cap of the quarter trim.
- 2) Loosen the rear wheel nuts.
- 3) Lift-up the vehicle, and then remove the rear wheels.
- 4) Remove the brake hose clip and remove the brake hose from rear strut.



- (1) Brake hose clip
- (2) Brake hose

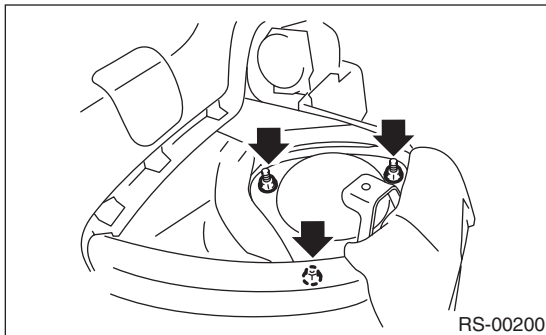
- 5) Remove the bolts which secure the rear strut to the housing.



CAUTION:

Do not apply excessive tension to the brake hose and ABS wheel speed sensor harness.

- 6) Remove the nuts which secure the strut mount to the vehicle body.



B: INSTALLATION

- 1) Using new self-locking nuts, and attach the strut mount to the body.

Tightening torque:

20 N·m (2.0 kgf-m, 14.5 ft-lb)

- 2) Using new self-locking nuts, and attach the rear strut to housing.

Tightening torque:

200 N·m (20.4 kgf-m, 148 ft-lb)

- 3) Attach the brake hose to lower side of the strut, then insert brake hose clip.
- 4) Lower the vehicle and tighten wheel nut.

Tightening torque:

90 N·m (9.2 kgf-m, 66 ft-lb)

- 5) Attach the strut cap to the rear quarter trim.
- 6) Inspect the wheel alignment and adjust if necessary.

C: DISASSEMBLY

Refer to the Front Struts for the procedures to disassemble the rear strut. <Ref. to FS-18, DISASSEMBLY, Front Strut.>

D: ASSEMBLY

Refer to Front Strut for assembly procedures. <Ref. to FS-19, ASSEMBLY, Front Strut.>

E: INSPECTION

Refer to Front Strut for inspection procedures. <Ref. to FS-20, INSPECTION, Front Strut.>

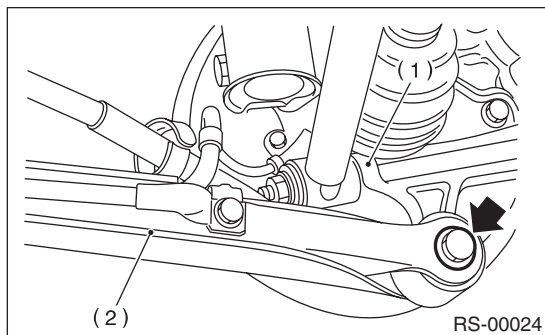
F: DISPOSAL

Refer to Front Strut for disposal procedures. <Ref. to FS-20, DISPOSAL, Front Strut.>

6. Lateral Link

A: REMOVAL

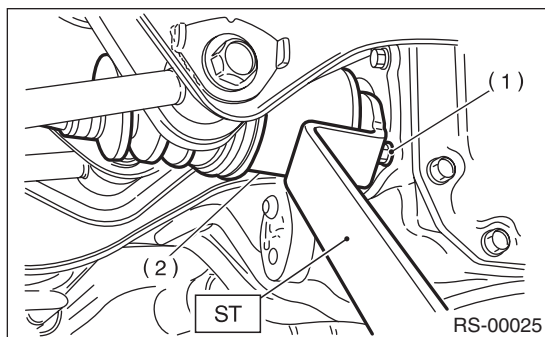
- 1) Loosen the wheel nuts. Lift up the vehicle, and remove the wheels.
- 2) Remove the stabilizers.
- 3) Remove the ABS wheel speed sensor harness from the trailing link.
- 4) Remove the bolts which secure the trailing link to the housing.



- (1) Rear housing
- (2) Trailing link

- 5) Remove the bolts which secure the lateral link assembly to the rear housing.
- 6) Remove the DOJ from rear differential using the ST.

ST 28099PA100 REMOVER



- (1) Bolt
- (2) DOJ

CAUTION:

Be careful not to damage the side bearing retainer. Always use the bolt shown in figure, as supporting points for the ST during removal.

- 7) Scribe an alignment mark on the lateral link adjustment bolt and crossmember.
- 8) Remove the bolts securing the front and rear lateral links to the crossmember, and detach the lateral link.

CAUTION:

To loosen the adjusting bolt, always loosen the nut while holding the head of adjusting bolt.

B: INSTALLATION

- 1) Install in the reverse order of removal. Observe the following instructions.
 - Attaching the DOJ to the differential <Ref. to DS-35, INSTALLATION, Rear Drive Shaft.>
 - Always tighten bushings with wheels in full contact with the ground and the vehicle at curb weight.
 - Tighten the nut with the bolt head fixed in place when installing the adjusting bolt.

CAUTION:

- Always use a new self-locking nut and DOJ circlip.
- Always use the ST so that DOJ splines do not damage the side oil seal.

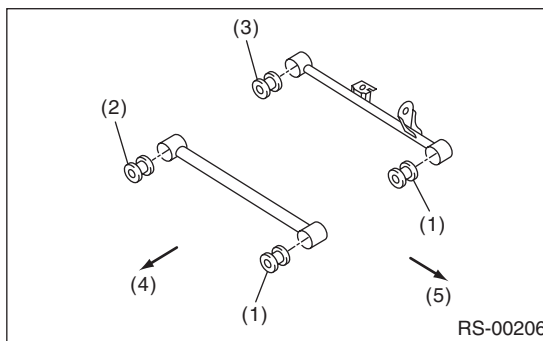
ST 28099PA090 OIL SEAL PROTECTOR

- 2) Inspect the wheel alignment and adjust if necessary.

C: DISASSEMBLY

- 1) Check the bushing type by referring to the following table.
- 2) Select the ST according to the type of bushings used.

Bushing	ST: INSTALLER & REMOVER SET
Bushing A	927700000
Bushing B	927690000
Bushing C	927700000

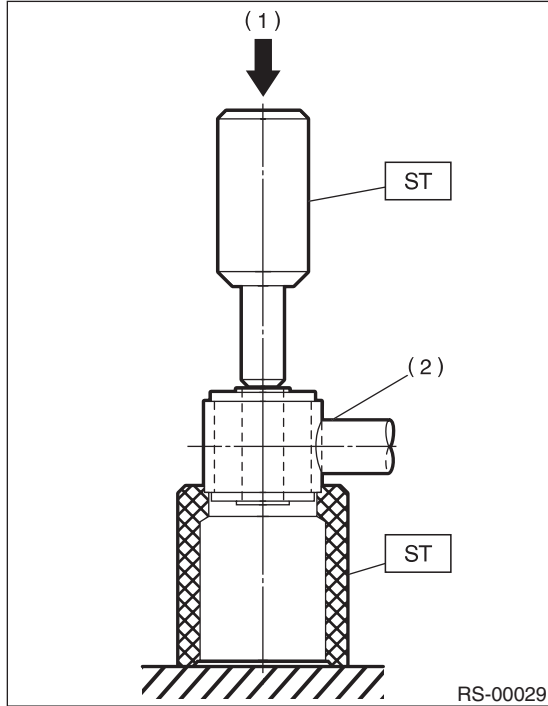


- (1) Bushing A
- (2) Bushing B
- (3) Bushing C
- (4) Front
- (5) Outside of body

Lateral Link

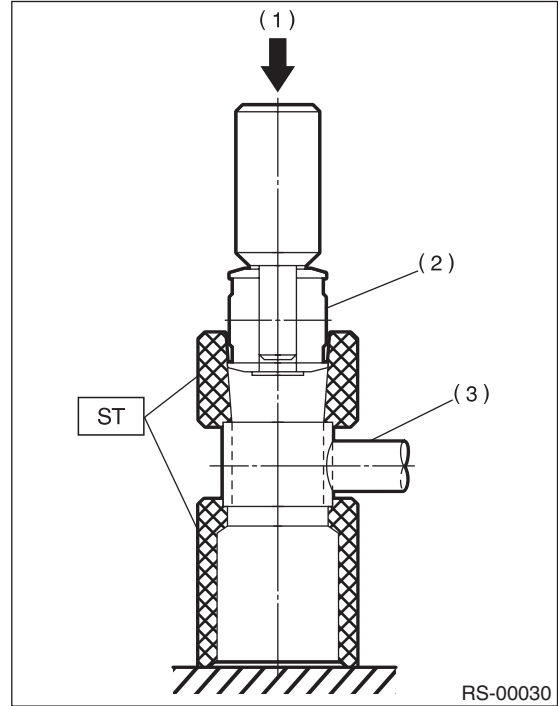
REAR SUSPENSION

3) Using the ST, press the bushing out.



- (1) Press
- (2) Lateral link

3) Using the ST, press the bushing into place.



- (1) Press
- (2) Bushing
- (3) Lateral link

D: ASSEMBLY

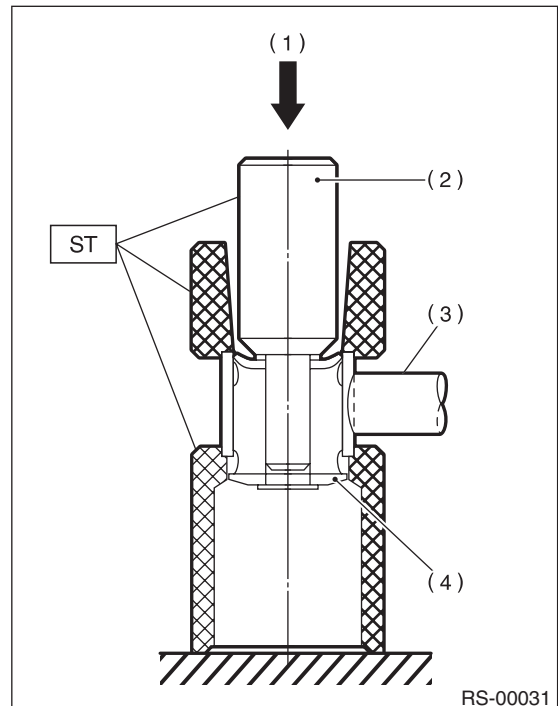
1) Use the same ST as the one used during disassembly.

2) If it is difficult to press the bushing into the trailing link, dilute TIRE LUBE with water and apply it to the inner surface of ST as a lubricant.

Specified lubricant:

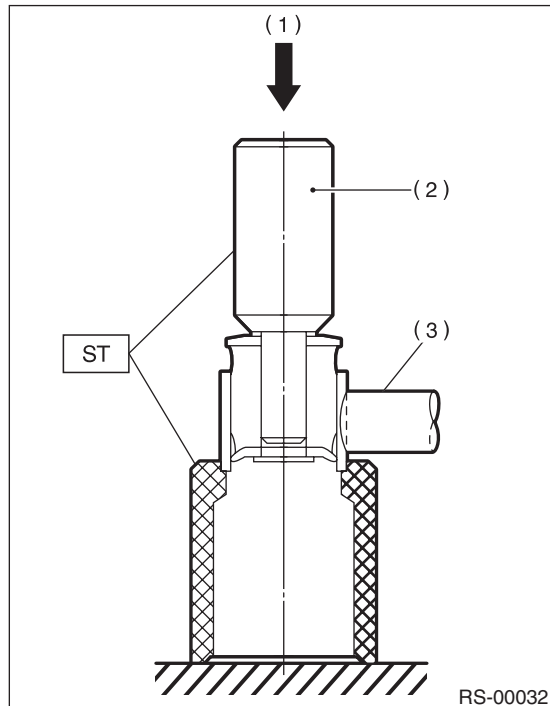
TIRE LUBE: Water = 1 : 3

4) Press the ST plunger until bushing flange protrudes beyond the trailing link.



- (1) Press
- (2) Plunger
- (3) Lateral link
- (4) Flange

5) Turn the lateral link upside down. Press the ST plunger in the direction opposite that outlines in the former procedure until bushing is correctly positioned in trailing link.



- (1) Press
- (2) Plunger
- (3) Lateral link

E: INSPECTION

Visually check the lateral link for damage and deformation.

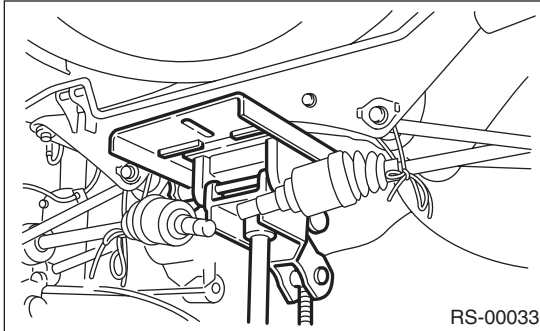
7. Rear Crossmember

A: REMOVAL

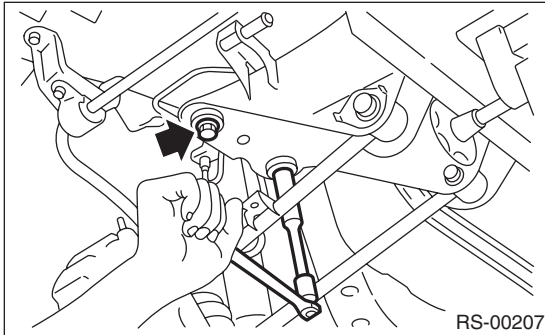
CAUTION:

Do not apply excessive tension to the ABS wheel speed sensor harness.

- 1) Separate the front exhaust pipe from the rear exhaust pipe.
- 2) Remove the rear exhaust pipe and muffler.
- 3) Remove the rear differential.
<Ref. to DI-19, REMOVAL, Rear Differential.>
- 4) Place a transmission jack under the rear crossmember.



- 5) Remove the bolts securing the crossmember to the vehicle body, and remove the crossmember.



- 6) Scribe an alignment mark on the rear lateral link cam bolt and crossmember.
- 7) Remove the front and rear lateral links by loosening the nuts.

B: INSTALLATION

- 1) Install in the reverse order of removal.

NOTE:

- Discard the removed self-locking nut and replace it with a new part.
 - Tighten the nut with the bolt head secured when installing the adjusting bolt.
- 2) Install the rear differential.
<Ref. to DI-20, INSTALLATION, Rear Differential.>
 - 3) Always tighten bushings with wheels in full contact with the ground and the vehicle at curb weight.
 - 4) Inspect the wheel alignment and adjust if necessary.

C: INSPECTION

Inspect the removed parts for wear and damage. Repair or replace if defective.

8. General Diagnostic Table

A: INSPECTION

1. IMPROPER VEHICLE POSTURE OR IMPROPER WHEEL ARCH HEIGHT

Possible cause	Corrective action
(1) Permanent distortion or damaged coil spring	Replace.
(2) Rough operation of damper strut or shock absorber	Replace.
(3) Improper installation of strut or shock absorber	Replace with proper parts.
(4) Installation of the wrong coil spring	Replace with proper parts.

2. POOR RIDE COMFORT

- 1) Large rebound shock
- 2) Rocking of vehicle continues too long after running over bump and/or hump.
- 3) Excessive shock in bumping

Possible cause	Corrective action
(1) Damaged coil spring	Replace.
(2) Overinflation of tires	Adjust.
(3) Improper wheel arch height	Adjust or replace the coil springs with new parts.
(4) Fault in operation of damper strut or shock absorber	Replace.
(5) Damage or deformation of strut mount or shock absorber mount	Replace.
(6) Improper installation (maximum or minimum) of damper strut or shock absorber	Replace with proper parts.
(7) Damage or deformation of bushing	Replace.
(8) Deformation or damage of helper in strut assembly or shock absorber	Replace.
(9) Oil leakage from the damper strut or shock absorber	Replace.

3. NOISE

Possible cause	Corrective action
(1) Worn or damaged damper strut	Replace.
(2) Wear or damage of shock absorber components	Replace.
(3) Loosening of the suspension link installing bolt	Tighten to the specified torque.
(4) Damage or deformation of bushing	Replace.
(5) Improper length (maximum or minimum) of damper strut or shock absorber	Replace with proper parts.
(6) Damaged coil spring	Replace.
(7) Wear or damage of the ball joint	Replace.
(8) Deformation of the stabilizer clamp	Replace.

General Diagnostic Table

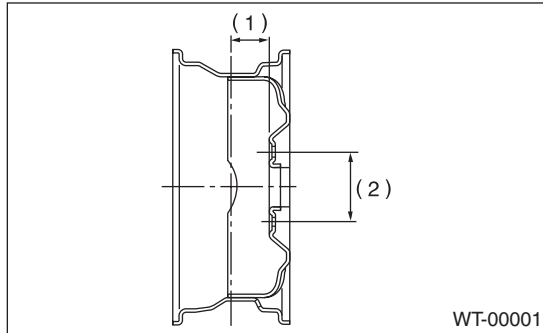
REAR SUSPENSION

General Description

WHEEL AND TIRE SYSTEM

1. General Description

A: SPECIFICATION



(1) Offset

(2) P.C.D.

	Model	Tire size	Rim size	Rim offset mm (in)	P.C.D. mm (in)
Front and rear	X	P215/60 R16 94H	16 × 61/2JJ, 16 × 61/2J	48 (1.89)	100 (3.94) Dia.
	XS		16 × 61/2JJ		
	XT	P215/55 R17 93H	17 × 7JJ		
	L.L.Bean	P215/60 R16 94H	16 × 61/2JJ		
Spare tire	X, XS, XT L.L.Bean	T135/80 D16	16 × 4T	50 (1.97)	100 (3.94) Dia.
	*1 X, *1 XS	Equipped with a spare tire of the same size as the front and rear tire.			

*1: Vehicle for Canada

NOTE:

Vehicles for Canada excluding non-turbo model are supplied with "T-type" spare tires for temporary use.

	Model	Tire size	Tire inflation pressure kPa (kgf/cm ² , psi)	
			Low load	Full load
Front and rear	X, XS, L.L.Bean	P215/60 R16 94H	Front: 200 (2.0, 29) Rear: 190 (1.9, 28)	Front: 200 (2.0, 29) Rear: 250 (2.5, 36)
	XT	P215/55 R17 93H	Front: 220 (2.2, 32) Rear: 210 (2.1, 30)	Front: 220 (2.2, 32) Rear: 220 (2.2, 32)
"T-type" Tire	XT	T135/80 D16	420 (4.2, 60)	—

NOTE:

Rear tire inflation pressure when towing a trailer

16-inch tire	280 kPa (2.8 kg/cm ² , 41 psi)
17-inch tire	250 kPa (2.5 kg/cm ² , 36 psi)

1. SERVICE DATA

Part	Axial runout	Radial runout
Steel wheel	1.5 mm (0.059 in)	
Aluminum wheel	1.0 mm (0.039 in)	

General Description

WHEEL AND TIRE SYSTEM

2. ADJUSTING PARTS

Wheel balancing	Standard:	Service limit
Dynamic unbalance	5 g (0.18 oz) or less	

Balance weight part number (For steel wheel)	Weight
28101TC000	5 g (0.18 oz)
28101SA060	10 g (0.35 oz)
28101SA070	15 g (0.53 oz)
28101SA080	20 g (0.71 oz)
28101SA090	25 g (0.88 oz)
28101SA160	30 g (1.06 oz)
28101SA170	35 g (1.23 oz)
28101SA180	40 g (1.41 oz)
28101SA190	45 g (1.59 oz)
28101SA200	50 g (1.76 oz)
28101SA210	55 g (1.94 oz)
28101SA220	60 g (2.12 oz)

Balance weight part number (Knock-on type weight for aluminum wheel)	Weight
28101SA000	5 g (0.18 oz)
28101SA010	10 g (0.35 oz)
28101SA020	15 g (0.53 oz)
28101SA030	20 g (0.71 oz)
28101SA040	25 g (0.88 oz)
28101SA100	30 g (1.06 oz)
28101SA110	35 g (1.23 oz)
28101SA120	40 g (1.41 oz)
28101SA130	45 g (1.59 oz)
28101SA140	50 g (1.76 oz)
—	55 g (1.94 oz)
28101SA150	60 g (2.12 oz)

Balance weight part number (Adhesive type weight for aluminum wheel)	Weight
28101AG001	5 g (0.18 oz)
28101AG011	7.5 g (0.26 oz)
28101AG021	10 g (0.35 oz)
28101AG031	12.5 g (0.44 oz)
28101AG041	15 g (0.53 oz)
28101AG051	17.5 g (0.62 oz)
28101AG061	20 g (0.71 oz)
28101AG071	22.5 g (0.79 oz)
28101AG081	25 g (0.88 oz)
28101AG091	27.5 g (0.97 oz)
28101AG101	30 g (1.06 oz)
28101AG111	32.5 g (1.15 oz)
28101AG121	35 g (1.23 oz)

Balance weight part number (Adhesive type weight for aluminum wheel)	Weight
28101AG131	37.5 g (1.32 oz)
28101AG141	40 g (1.41 oz)
28101AG151	42.5 g (1.50 oz)
28101AG161	45 g (1.59 oz)
28101AG171	47.5 g (1.68 oz)
28101AG181	50 g (1.76 oz)
28101AG191	52.5 g (1.85 oz)
28101AG201	55 g (1.94 oz)
28101AG211	57.5 g (2.03 oz)
28101AG221	60 g (2.12 oz)
28101AG231	62.5 g (2.20 oz)
28101AG241	65 g (2.29 oz)
28101AG251	67.5 g (2.38 oz)
28101AG261	70 g (2.47 oz)
28101AG271	72.5 g (2.56 oz)
28101AG281	75 g (2.65 oz)
28101AG291	77.5 g (2.73 oz)
28101AG301	80 g (2.82 oz)
28101AG311	82.5 g (2.91 oz)
28101AG321	85 g (3.00 oz)
28101AG331	87.5 g (3.09 oz)
28101AG341	90 g (3.17 oz)
28101AG351	92.5 g (3.26 oz)
28101AG361	95 g (3.35 oz)
28101AG371	97.5 g (3.44 oz)
28101AG381	100 g (3.53 oz)

B: PREPARATION TOOL

1. GENERAL TOOL

TOOL NAME	REMARKS
Air pressure gauge	Used for measuring tire air pressure.
Dial gauge	Used for measuring wheel runout.

2. Tire

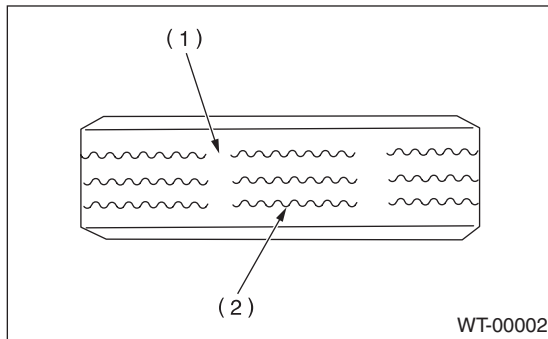
A: INSPECTION

- 1) Take stones, glass, nails etc. out of the tread groove.
- 2) Replace the tire.

CAUTION:

When replacing a tire, make sure to use only tires of the same size, construction and load range as originally installed.

- (1) If large cracks on side wall, damage or cracks on the tread is found.
- (2) When the “tread wear indicator” appears as a solid band across the tread.
- (3) If a crack is found on the tire valve, replace the valve.

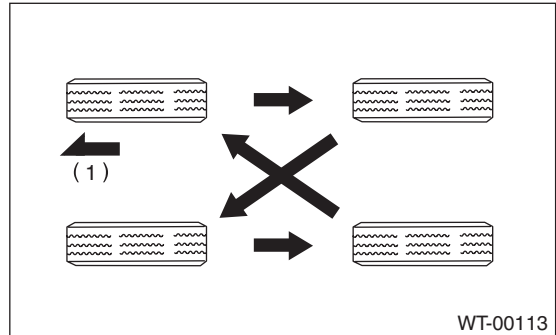


- (1) Tread wear indicator
- (2) Tire tread

1. TIRE ROTATION

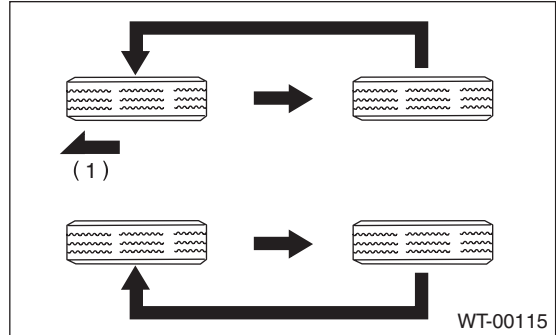
Rotate tires periodically (12,500 km/7,500 miles) as shown in the figure, in order to prevent uneven wear and to prolong life.

- When the direction of tire rotation is not specified



- (1) Front

- When the direction of tire rotation is specified



- (1) Front

3. Steel Wheel

A: REMOVAL

- 1) Apply the parking brake, and position select lever to "P" or "LOW".
- 2) Set the shop jacks or a lift to the specified points, and support the vehicle with its wheels slightly contacting the floor.
- 3) Loosen the wheel nuts.
- 4) Raise the vehicle until its wheels are off the ground using the jack or a lift.
- 5) Remove the wheel nuts and wheels.

NOTE:

- When removing the wheels, be careful not to damage the hub bolts.
- Place the wheels with their outer sides facing upward to prevent wheels from being damaged.

B: INSTALLATION

- 1) Remove dirt from the mating surface of the wheel and brake rotor.
- 2) Attach the wheel to the hub by aligning the wheel bolt holes with the hub bolts.
- 3) Temporarily attach the wheel nuts to the hub bolts. (In the case of aluminum wheels, use SUBARU genuine wheel nuts for aluminum wheels.)
- 4) Tighten the nuts by hand, making sure the wheel hub hole is aligned correctly to the guide portion of hub.
- 5) Tighten opposing wheel nuts in sequence to the specified torque. Use a wheel nut wrench.

Wheel nut tightening torque:

100 N·m (10.2 kgf·m, 73.8 ft·lb)

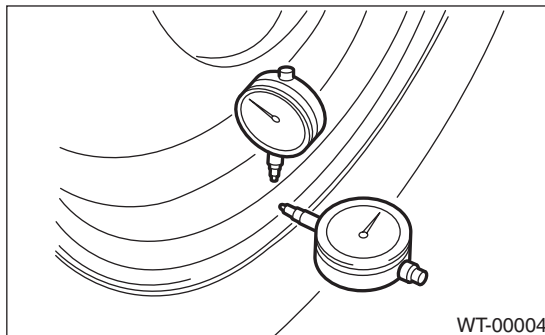
CAUTION:

- **Tighten the wheel nuts in two or three steps by gradually increasing the torque on opposing nuts, until they reach the specified torque. For drum brake model, excess tightening of wheel nuts may cause wheels to "judder".**
- **Do not push the wrench by foot. Always use both hands when tightening the nuts.**
- **Make sure the bolt, nut and the nut seating surface of the wheel are free from oil.**

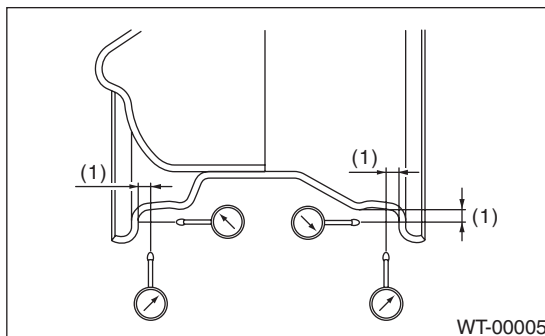
- 6) If a wheel is removed for replacement or for repair of a puncture, retighten the wheel nuts to the specified torque after driving 1,000 km (600 miles).

C: INSPECTION

- 1) Deformation or damage to the rim may cause air leakage. Check the rim flange for deformation, cracks or damage, and repair or replace as necessary.
- 2) Jack-up the vehicle until tires clear the floor.
- 3) Slowly rotate the wheel to check rim "runout" using a dial gauge.



Axial runout limit	Radial runout limit
1.5 mm (0.059 in)	



(1) Approx. 7 mm (0.28 in)

- 4) If the rim runout exceeds specifications, remove the tire from wheel and check runout with the dial gauge attached to positions shown in the figure.
- 5) If the measured runout still exceeds specifications, replace the wheel.

4. Aluminum Wheel

A: REMOVAL

Refer to “Steel Wheels” for removal procedure of aluminum wheels. <Ref. to WT-5, REMOVAL, Steel Wheel.>

B: INSTALLATION

Refer to “Steel Wheels” for installation procedure of aluminum wheels. <Ref. to WT-5, INSTALLATION, Steel Wheel.>

C: INSPECTION

Refer to “Steel Wheels” for inspection procedure of aluminum wheels. <Ref. to WT-5, INSPECTION, Steel Wheel.>

Rim runout:

Axial runout limit	Radial runout limit
1.0 mm (0.039 in)	

D: CAUTION

Aluminum wheels are easily scratched. To maintain their appearance and safety, be careful of the following:

- 1) Be careful not to damage the aluminum wheels during removal, installation, wheel balancing, etc. After removing aluminum wheels, place them on a rubber mat etc.
- 2) When washing the aluminum wheel, use neutral synthetic detergent and water. Avoid using the cleansers containing abrasives, hard brushes or an automatic car washer.

5. Wheel Balancing

A: ADJUSTMENT

NOTE:

Change the setting of wheel balancer to adhesive type weight if adhesive type weight is adopted.

1) Remove the balance weights.

CAUTION:

- **Be careful not to damage the wheel.**
- **Completely remove the two-sided tape of the adhesive type weight from the wheel.**

2) Using the wheel balancer, measure wheel balance.

3) Select a weight close to the value measured by wheel balancer.

Balance weight part number (For steel wheel)	Weight
28101TC000	5 g (0.18 oz)
28101SA060	10 g (0.35 oz)
28101SA070	15 g (0.53 oz)
28101SA080	20 g (0.71 oz)
28101SA090	25 g (0.88 oz)
28101SA160	30 g (1.06 oz)
28101SA170	35 g (1.23 oz)
28101SA180	40 g (1.41 oz)
28101SA190	45 g (1.59 oz)
28101SA200	50 g (1.76 oz)
28101SA210	55 g (1.94 oz)
28101SA220	60 g (2.12 oz)

Balance weight part number (Knock-on type weight for aluminum wheel)	Weight
28101SA000	5 g (0.18 oz)
28101SA010	10 g (0.35 oz)
28101SA020	15 g (0.53 oz)
28101SA030	20 g (0.71 oz)
28101SA040	25 g (0.88 oz)
28101SA100	30 g (1.06 oz)
28101SA110	35 g (1.23 oz)
28101SA120	40 g (1.41 oz)
28101SA130	45 g (1.59 oz)
28101SA140	50 g (1.76 oz)
—	55 g (1.94 oz)
28101SA150	60 g (2.12 oz)

Balance weight part number (Adhesive type weight for aluminum wheel)	Weight
28101AG001	5 g (0.18 oz)
28101AG011	7.5 g (0.26 oz)
28101AG021	10 g (0.35 oz)

Balance weight part number (Adhesive type weight for aluminum wheel)	Weight
28101AG031	12.5 g (0.44 oz)
28101AG041	15 g (0.53 oz)
28101AG051	17.5 g (0.62 oz)
28101AG061	20 g (0.71 oz)
28101AG071	22.5 g (0.79 oz)
28101AG081	25 g (0.88 oz)
28101AG091	27.5 g (0.97 oz)
28101AG101	30 g (1.06 oz)
28101AG111	32.5 g (1.15 oz)
28101AG121	35 g (1.23 oz)
28101AG131	37.5 g (1.32 oz)
28101AG141	40 g (1.41 oz)
28101AG151	42.5 g (1.50 oz)
28101AG161	45 g (1.59 oz)
28101AG171	47.5 g (1.68 oz)
28101AG181	50 g (1.76 oz)
28101AG191	52.5 g (1.85 oz)
28101AG201	55 g (1.94 oz)
28101AG211	57.5 g (2.03 oz)
28101AG221	60 g (2.12 oz)
28101AG231	62.5 g (2.20 oz)
28101AG241	65 g (2.29 oz)
28101AG251	67.5 g (2.38 oz)
28101AG261	70 g (2.47 oz)
28101AG271	72.5 g (2.56 oz)
28101AG281	75 g (2.65 oz)
28101AG291	77.5 g (2.73 oz)
28101AG301	80 g (2.82 oz)
28101AG311	82.5 g (2.91 oz)
28101AG321	85 g (3.00 oz)
28101AG331	87.5 g (3.09 oz)
28101AG341	90 g (3.17 oz)
28101AG351	92.5 g (3.26 oz)
28101AG361	95 g (3.35 oz)
28101AG371	97.5 g (3.44 oz)
28101AG381	100 g (3.53 oz)

Wheel Balancing

WHEEL AND TIRE SYSTEM

4) Install the selected weight to the point designated by the wheel balancer.

CAUTION:

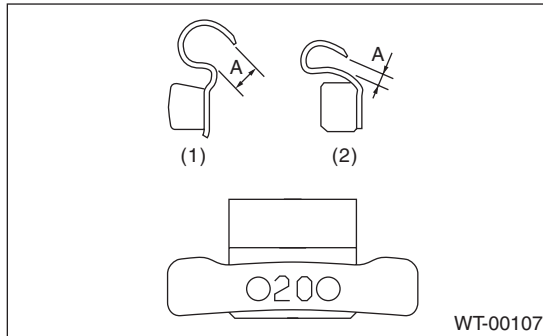
- Remove grease from the applying surface of adhesive type weight for wheel.
- Press the adhesive type weight by 25 N (2.5 kgf, 5.6 lbf) or more per 5 g (0.18 oz) for 2 seconds or more to attain close contact.
- Total application of the adhesive type weight should be 100 g (3.53 oz) or less.

5) Using the wheel balancer, measure the wheel balance again. Check that wheel balance is correctly adjusted.

6) Use Subaru genuine balance weights.

NOTE:

- 55 g (1.94 oz) weight used with aluminum wheel is not available.
- Knock-on type balance weight can be used for any of 15- to 16-inch wheels.



- (1) Knock-on type weight for aluminum wheel
(2) Knock-on type weight for steel wheel

Service limit: A

Knock-on type weight for steel wheel:

2.0 mm (0.079 in)

Knock-on type weight for aluminum wheel:

5.0 mm (0.197 in)

6. “T-type” Tire

A: NOTE

Vehicles for Canada excluding non-turbo model are supplied with “T type” spare tires for temporary use.

CAUTION:

- Do not use a tire chain with the “T-type” tire. Because of the smaller tire size, a tire chain will not fit properly and will result in damage to the vehicle and the tire.
- Do not drive at a speed greater than 80 km/h (50 MPH).
- Drive as slowly as possible and avoid passing over bumps.

B: REPLACEMENT

Refer to “Steel Wheels” for removal and installation procedures of the “T Type.” <Ref. to WT-5, REMOVAL, Steel Wheel.>

CAUTION:

The “T-type” tire is only for temporary use. Replace with a conventional tire as soon as possible.

C: INSPECTION

- 1) Check the tire air pressure.

Specifications:

420 kPa (4.2 kg/cm², 60 psi)

- 2) Take stones, glass, nails, etc. out of the tread groove.
- 3) Check the tires for deformation, cracks, partial wear, or wear.

CAUTION:

Replace the tire with a new part if faulty.

General Diagnostic Table

WHEEL AND TIRE SYSTEM

7. General Diagnostic Table

A: INSPECTION

Symptoms	Possible cause	Corrective action
Vehicle sways	Improperly inflated tire.	Adjust the tire pressure. Refer to specifications for the tire air pressure. <Ref. to WT-2, SPECIFICATION, General Description.>
	Abnormal wear	Inspect the tire referring to "Abnormal tire wear" in this table, and perform the indicated procedures and replace the tire.
	Front wheel alignment	Check the front wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>
	Rear wheel alignment	Check the rear wheel alignment. <Ref. to RS-6, INSPECTION, Wheel Alignment.>
	Front strut	Check the front strut. <Ref. to FS-20, INSPECTION, Front Strut.>
	Rear strut	Check the rear strut. <Ref. to RS-12, INSPECTION, Rear Strut.>
	Front axle	Check the front axle. <Ref. to DS-20, INSPECTION, Front Axle.>
	Rear axle	Check the rear axle. <Ref. to DS-28, INSPECTION, Rear Axle.>
Abnormal vehicle pitching	Improperly inflated tire.	Adjust the tire pressure. Refer to specifications for the tire air pressure. <Ref. to WT-2, SPECIFICATION, General Description.>
	Abnormal wear	Inspect the tire referring to "Abnormal tire wear" in this table, and perform the indicated procedures and replace the tire.
	Front stabilizer	Inspect the front stabilizer. <Ref. to FS-21, INSPECTION, Front Stabilizer.>
	Front wheel alignment	Check the front wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>
	Rear wheel alignment	Check the rear wheel alignment. <Ref. to RS-6, INSPECTION, Wheel Alignment.>
Abnormal wheel vibration	Improperly inflated tire.	Adjust the tire pressure. Refer to specifications for the tire air pressure. <Ref. to WT-2, SPECIFICATION, General Description.>
	Abnormal wear	Inspect the tire referring to "Abnormal tire wear" in this table, and perform the indicated procedures and replace the tire.
	Wheel is out of balance.	Adjust wheel balance. <Ref. to WT-7, ADJUSTMENT, Wheel Balancing.>
	Front axle	Check the front axle. <Ref. to DS-20, INSPECTION, Front Axle.>
	Rear axle	Check the rear axle. <Ref. to DS-28, INSPECTION, Rear Axle.>

General Diagnostic Table

WHEEL AND TIRE SYSTEM

Symptoms	Possible cause	Corrective action
Uneven tire wear	Improperly inflated tire.	Adjust the tire pressure. Refer to specifications for the tire air pressure. <Ref. to WT-2, SPECIFICATION, General Description.>
	Wheel is out of balance.	Adjust wheel balance. <Ref. to WT-7, ADJUSTMENT, Wheel Balancing.>
	Front wheel alignment	Check the front wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>
	Rear wheel alignment	Check the rear wheel alignment. <Ref. to RS-6, INSPECTION, Wheel Alignment.>

General Diagnostic Table

WHEEL AND TIRE SYSTEM

General Description

DIFFERENTIALS

1. General Description

A: SPECIFICATION

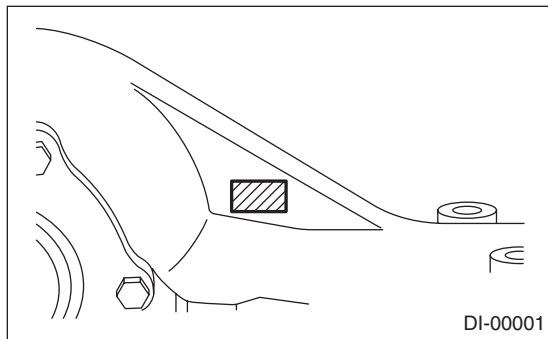
When replacing a rear differential assembly, select the correct assembly according to the following table.

NOTE:

Using a different rear differential assembly will cause the drive train and tires to drag or emit abnormal noise.

Model	Non-turbo, rear drum brake		Non-turbo, rear disc brake		Turbo	
	MT	AT	MT	AT	MT	AT
Rear differential type	T type (Model without LSD)		T type (Model with LSD)			
LSD type	—		Viscous coupling			
Identification	T2	TP	JP	CF	CF	JP
Type of gear	Hypoid gear					
Gear ratio (Number of gear teeth)	4.111 (37/9)	4.444 (40/9)	4.111 (37/9)	4.444 (40/9)	4.444 (40/9)	4.111 (37/9)
Oil capacity	0.8 ℓ (0.8 US qt, 0.7 Imp qt)					
Rear differential gear oil	GL-5					

• Identification

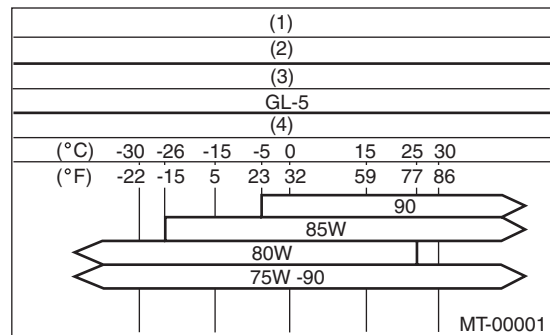


• Rear differential gear oil

Recommended oil

CAUTION:

Each oil manufacturer uses different base oil and additives. Thus, do not mix two or more brands.



- (1) Item
- (2) Differential gear oil
- (3) API classification
- (4) SAE viscosity No. and applicable temperature

1. SERVICE DATA

Drive pinion bearing preload (for new bearing)	Measure with spring measurement (Measured from the companion flange bolt) N (kgf, lbf)	17.7 — 38.8 (1.8 — 4.0, 4.0 — 8.7)
	Measure with torque wrench N·m (kgf·m, ft·lb)	0.67 — 1.47 (0.07 — 0.15, 0.49 — 1.08)
Side gear backlash	mm (in)	0.10 — 0.20 (0.004 — 0.008)
Side bearing standard width	mm (in)	20.00 (0.7874)
Hypoid driven gear to drive pinion backlash	mm (in)	0.10 — 0.20 (0.004 — 0.008)
Hypoid driven gear back surface runout	mm (in)	0.05 (0.0020) or less

General Description

DIFFERENTIALS

2. ADJUSTING PARTS

Drive pinion bearing preload (for new bearing)	Measure with spring measurement (Measured from the companion flange bolt) N (kgf, lbf)	17.7 — 38.8 (1.8 — 4.0, 3.8 — 8.7)
	Measure with torque wrench N·m (kgf-m, ft-lb)	0.67 — 1.47 (0.07 — 0.15, 0.49 — 1.08)
Preload adjusting collar	Part No.	Length mm (in)
	383695201	56.2 (2.213)
	383695202	56.4 (2.220)
	383695203	56.6 (2.228)
	383695204	56.8 (2.236)
	383695205	57.0 (2.244)
	383695206	57.2 (2.252)
Preload adjusting washer	Part No.	Thickness mm (in)
	383705200	2.59 (0.1020)
	383715200	2.57 (0.1012)
	383725200	2.55 (0.1004)
	383735200	2.53 (0.0996)
	383745200	2.51 (0.0988)
	383755200	2.49 (0.0980)
	383765200	2.47 (0.0972)
	383775200	2.45 (0.0965)
	383785200	2.43 (0.0957)
	383795200	2.41 (0.0949)
	383805200	2.39 (0.0941)
	383815200	2.37 (0.0933)
	383825200	2.35 (0.0925)
	383835200	2.33 (0.0917)
Pinion height adjusting washer	Part No.	Thickness mm (in)
	383495200	3.09 (0.1217)
	383505200	3.12 (0.1228)
	383515200	3.15 (0.1240)
	383525200	3.18 (0.1252)
	383535200	3.21 (0.1264)
	383545200	3.24 (0.1276)
	383555200	3.27 (0.1287)
	383565200	3.30 (0.1299)
	383575200	3.33 (0.1311)
	383585200	3.36 (0.1323)
	383595200	3.39 (0.1335)
	383605200	3.42 (0.1346)
	383615200	3.45 (0.1358)
	383625200	3.48 (0.1370)
	383635200	3.51 (0.1382)
	383645200	3.54 (0.1394)
383655200	3.57 (0.1406)	
383665200	3.60 (0.1417)	
383675200	3.63 (0.1429)	
383685200	3.66 (0.1441)	
Side gear backlash	mm (in)	0.1 — 0.2 (0.004 — 0.008)

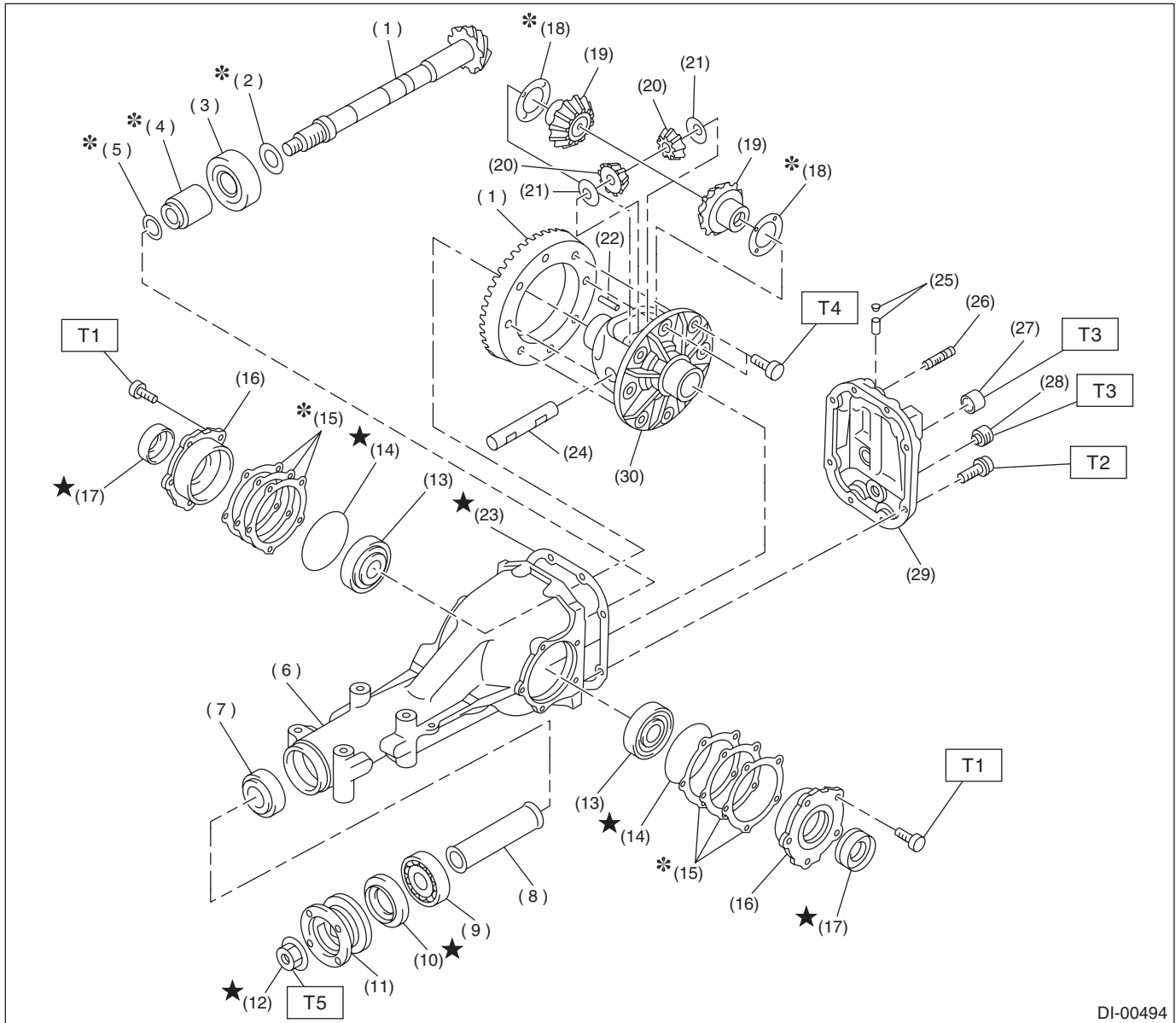
General Description

DIFFERENTIALS

Side gear thrust washer (Model without LSD)	Part No.	Thickness mm (in)
	383445201	0.75 — 0.80 (0.0295 — 0.0315)
	383445202	0.80 — 0.85 (0.0315 — 0.0335)
	383445203	0.85 — 0.90 (0.0335 — 0.0354)
Side bearing standard width	mm (in)	— 20.00 (0.7874)
Side bearing retainer shim	Part No.	Thickness mm (in)
	383475201	0.20 (0.0079)
	383475202	0.25 (0.0098)
	383475203	0.30 (0.0118)
	383475204	0.40 (0.0157)
Hypoid driven gear to drive pinion back-lash	Allowable limit mm (in)	0.10 — 0.20 (0.004 — 0.008)
Hypoid driven gear runout on its back surface		0.05 (0.0020)

B: COMPONENT

1. REAR DIFFERENTIAL WITHOUT LSD



DI-00494

- | | | |
|---|---------------------------------|------------------------|
| (1) Hypoid driven gear and drive pinion set | (13) Side bearing | (26) Stud bolt |
| (2) Pinion height adjusting washer | (14) O-ring | (27) Oil filler plug |
| (3) Rear bearing | (15) Side bearing retainer shim | (28) Oil drain plug |
| (4) Bearing preload adjusting collar | (16) Side bearing retainer | (29) Rear cover |
| (5) Bearing preload adjusting washer | (17) Side oil seal | (30) Differential case |
| (6) Differential carrier | (18) Side gear thrust washer | |
| (7) Front bearing | (19) Side gear | |
| (8) Collar | (20) Pinion mate gear | |
| (9) Pilot bearing | (21) Pinion mate gear washer | |
| (10) Front oil seal | (22) Pinion shaft lock pin | |
| (11) Companion flange | (23) Gasket | |
| (12) Self-locking nut | (24) Pinion mate shaft | |
| | (25) Air breather cap | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 10.5 (1.1, 7.7)

T2: 29.5 (3.0, 21.8)

T3: 49 (5.0, 36.2)

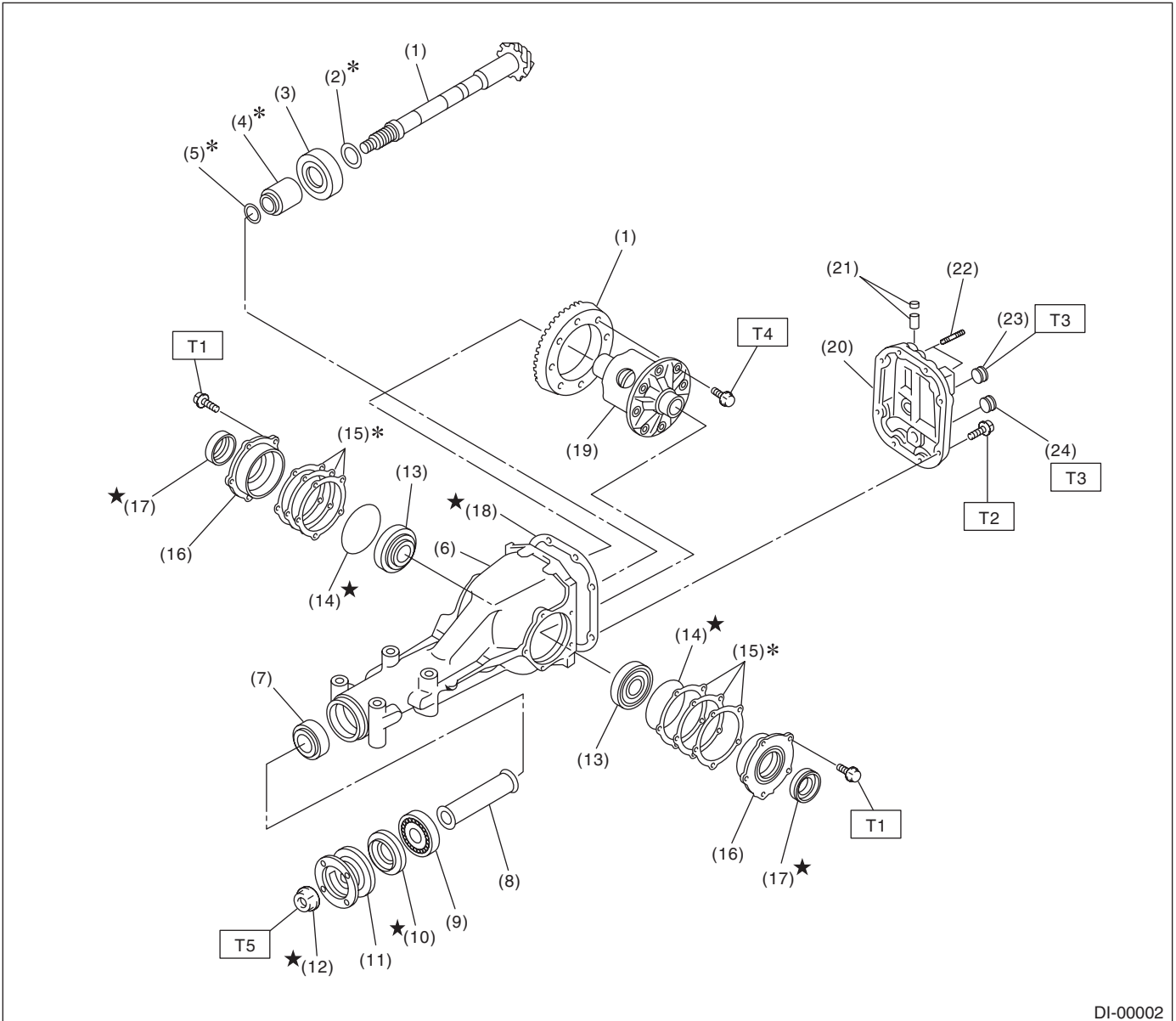
T4: 103 (10.5, 76)

T5: 181.5 (18.5, 134)

General Description

DIFFERENTIALS

2. REAR DIFFERENTIAL WITH LSD



DI-00002

- | | | |
|---|---|-----------------------|
| (1) Hypoid driven gear and drive pinion set | (11) Companion flange | (21) Air breather cap |
| (2) Pinion height adjusting washer | (12) Self-locking nut | (22) Stud bolt |
| (3) Rear bearing | (13) Side bearing | (23) Oil filler plug |
| (4) Bearing preload adjusting collar | (14) O-ring | (24) Oil drain plug |
| (5) Bearing preload adjusting washer | (15) Side bearing retainer shim | |
| (6) Differential carrier | (16) Side bearing retainer | |
| (7) Front bearing | (17) Side oil seal | |
| (8) Spacer | (18) Gasket | |
| (9) Pilot bearing | (19) Differential case
(Viscous coupling type) | |
| (10) Front oil seal | (20) Rear cover | |

Tightening torque: N-m (kgf-m, ft-lb)

T1: 10.5 (1.1, 7.7)

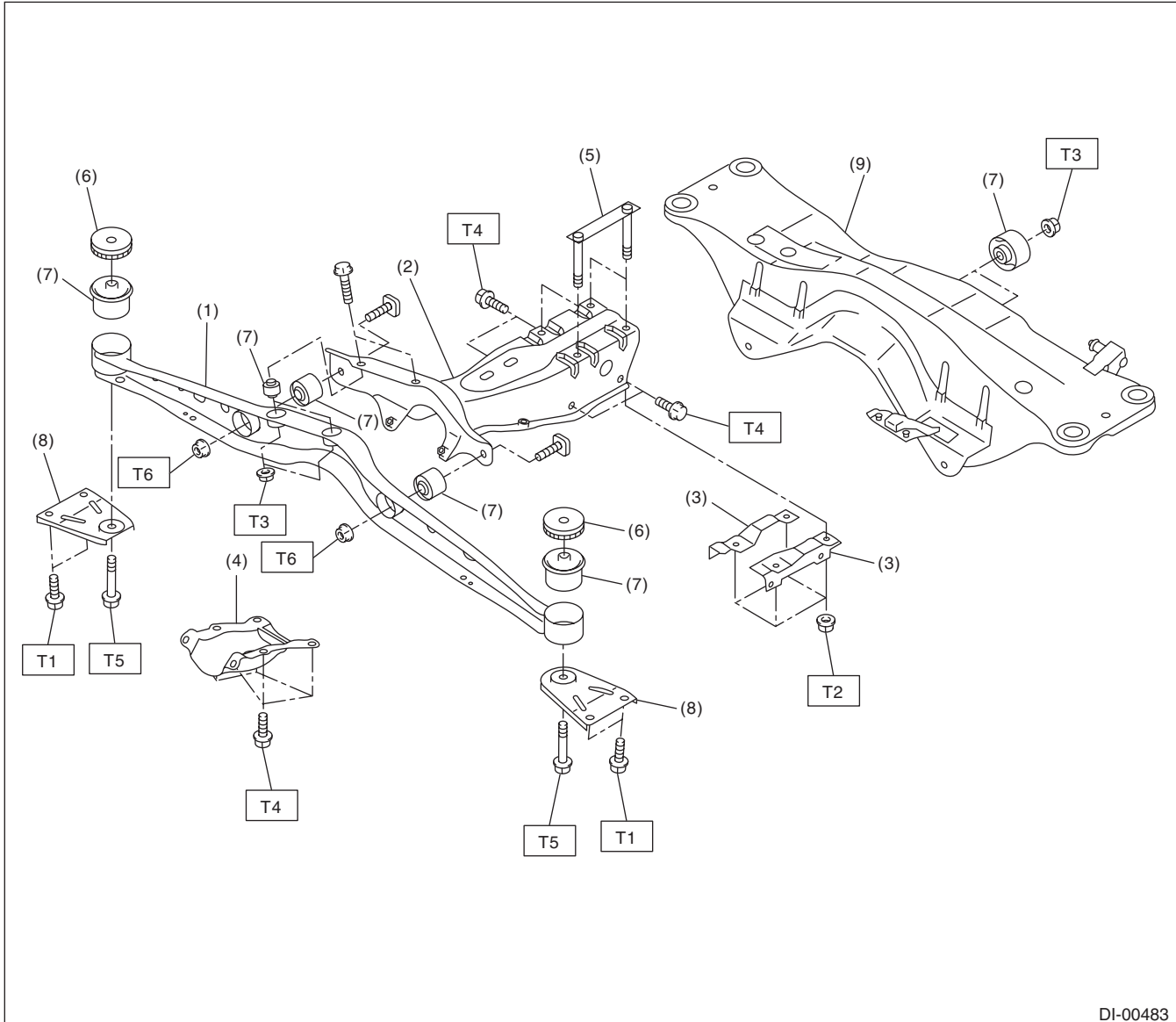
T2: 29.5 (3.0, 21.8)

T3: 49 (5.0, 36.2)

T4: 103 (10.5, 76)

T5: 181.5 (18.5, 134)

3. REAR DIFFERENTIAL MOUNTING SYSTEM



DI-00483

- | | |
|--------------------------------------|--------------------------------|
| (1) Front differential member | (8) Differential mount bracket |
| (2) Differential bracket | (9) Crossmember |
| (3) Differential mount lower bracket | |
| (4) Differential mount front cover | |
| (5) Plate | |
| (6) Stopper | |
| (7) Bushing | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 33 (3.4, 24.3)

T2: 50 (5.1, 36.9)

T3: 70 (7.1, 51.6)

T4: 90 (9.2, 66.4)

T5: 100 (10.2, 73.8)

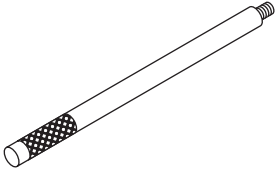
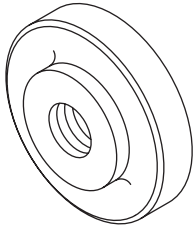
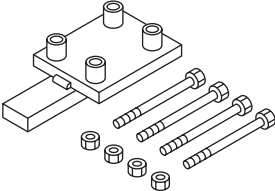
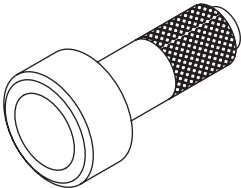
T6: 128 (13.8, 97.6)

C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Use SUBARU genuine gear oil, grease or the equivalent. Do not mix gear oil, grease, etc. with those of different grades or from other manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Apply gear oil onto sliding or revolving surfaces before installation.
- Before installing the O-ring or snap ring, apply a sufficient amount of gear oil to avoid damage and deformation.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Avoid damaging the mating surface of the case.

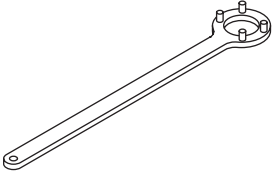
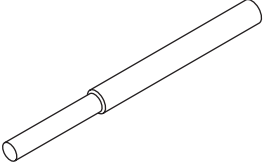
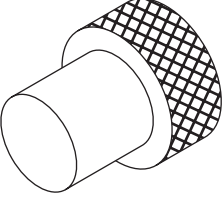
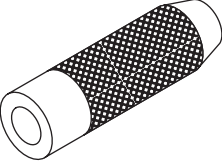
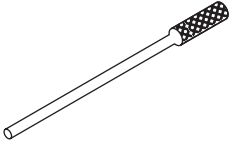
D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-398477701</p>	398477701	HANDLE	Used for installing the front and rear bearing cones.
 <p style="text-align: center;">ST-398477702</p>	398477702	DRIFT	Used for press-fitting the bearing cone of differential carrier (front).
 <p style="text-align: center;">ST-398217700</p>	398217700	ATTACHMENT SET	Stand for rear differential carrier disassembly and assembly.
 <p style="text-align: center;">ST-498447120</p>	498447120	INSTALLER	Used for installing the front oil seal.

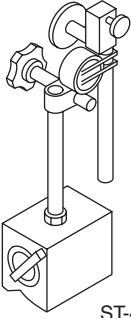
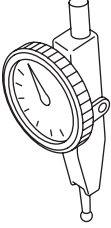
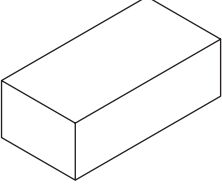
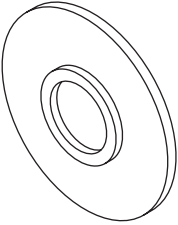
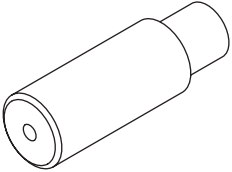
General Description

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-498427200</p>	498427200	FLANGE WRENCH	Used for preventing rotation of companion flange when loosening and tightening self-lock nut.
 <p style="text-align: center;">ST-398467700</p>	398467700	DRIFT	Used for removing pinion, pilot bearing and front bearing cone.
 <p style="text-align: center;">ST-399780104</p>	399780104	WEIGHT	Used for installing the front bearing cone and the pilot bearing companion flange.
 <p style="text-align: center;">ST-899580100</p>	899580100	INSTALLER	Used for press-fitting the front bearing cone and pilot bearing.
 <p style="text-align: center;">ST-899904100</p>	899904100	STRAIGHT PIN REMOVER	Used for driving out differential pinion shaft lock pin.

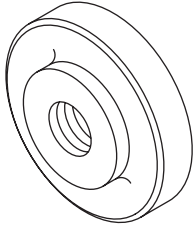
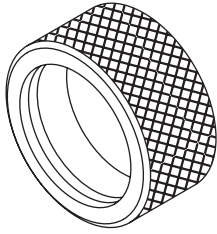
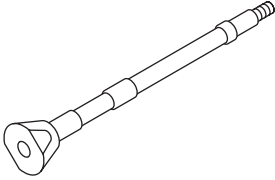
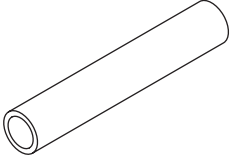
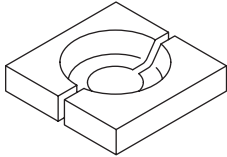
General Description

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-498247001</p>	498247001	MAGNET BASE	<ul style="list-style-type: none"> • Used for measuring backlash between side gear and pinion, and hypoid driven gear. • Used together with DIAL GAUGE (498247100).
 <p style="text-align: center;">ST-498247100</p>	498247100	DIAL GAUGE	<ul style="list-style-type: none"> • Used for measuring backlash between side gear and pinion, and hypoid driven gear. • Used together with MAGNET BASE (498247001).
 <p style="text-align: center;">ST-398507704</p>	398507704	BLOCK	Used for adjusting pinion height and preload.
 <p style="text-align: center;">ST-398177700</p>	398177700	INSTALLER	Used for installing the rear bearing cone.
 <p style="text-align: center;">ST-398457700</p>	398457700	ATTACHMENT	Used for removing the side bearing retainer.

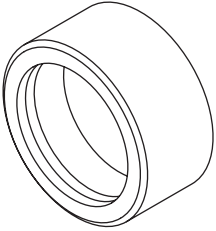
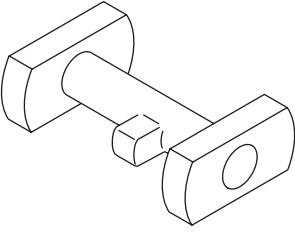
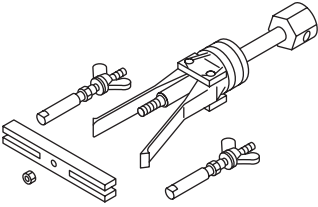
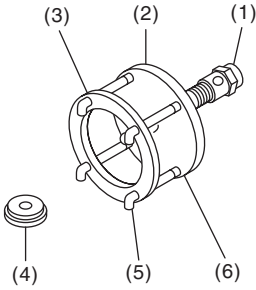
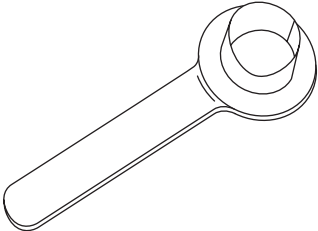
General Description

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-398477703</p>	398477703	DRIFT 2	Used for press-fitting bearing race (rear) of differential carrier.
 <p style="text-align: center;">ST-398437700</p>	398437700	DRIFT	Used for installing the side oil seal.
 <p style="text-align: center;">ST-398507702</p>	398507702	DUMMY SHAFT	Used for adjusting pinion height and preload.
 <p style="text-align: center;">ST-398507703</p>	398507703	DUMMY COLLAR	Used for adjusting pinion height and preload.
 <p style="text-align: center;">ST-398517700</p>	398517700	REPLACER	Used for removing rear bearing cone.

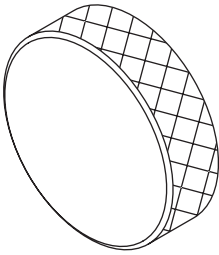
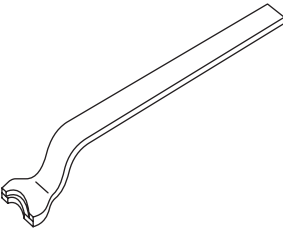
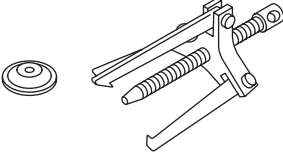
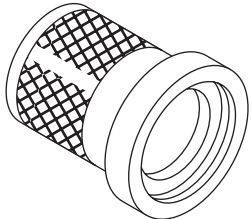
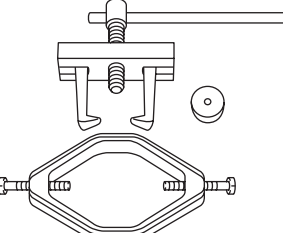
General Description

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-398487700</p>	398487700	DRIFT	Used for press-fitting side bearing cone.
 <p style="text-align: center;">ST-398507701</p>	398507701	DIFFERENTIAL CARRIER GAUGE	Used for adjusting pinion height.
 <p style="text-align: center;">ST-398527700</p>	398527700	PULLER ASSY	<ul style="list-style-type: none"> • Used for removing front oil seal. • Used for removing side bearing cup.
 <p style="text-align: center;">ST-399527700</p>	399527700	PULLER SET	Used for taking out the side bearing cone. (1) BOLT (899521412) (2) PULLER (399527702) (3) HOLDER (399527703) (4) ADAPTER (398497701) (5) BOLT (899520107) (6) NUT (021008000)
 <p style="text-align: center;">ST28099PA090</p>	28099PA090	OIL SEAL PROTECTOR	<ul style="list-style-type: none"> • Used for installing the rear drive shaft to the rear differential. • For oil seal protection

General Description

DIFFERENTIALS

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-398237700</p>	398237700	DRIFT	Used for installing side bearing.
 <p style="text-align: center;">ST28099PA100</p>	28099PA100	DRIVE SHAFT REMOVER	Used for removing the rear drive shaft from rear differential.
 <p style="text-align: center;">ST-399703600</p>	399703600	PULLER ASSY	Used for removing companion flange.
 <p style="text-align: center;">ST-899874100</p>	899874100	INSTALLER	Used for installing the companion flange.
 <p style="text-align: center;">ST18759AA000</p>	18759AA000	PULLER ASSY	Used for removing the differential side bearing cone.

2. GENERAL TOOL

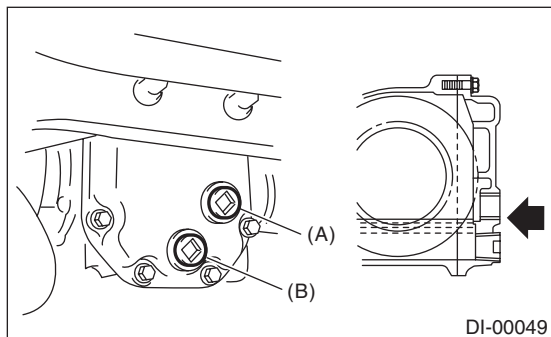
TOOL NAME	REMARKS
Transmission jack	Used for removing and installing the rear differential.
Puller	Used for removing the side bearing retainer.
Thickness gauge	Used for measuring clearance.
Tire lever	Used for removing the rear drive shaft.

2. Differential Gear Oil

A: INSPECTION

1) Remove the filler plug, and then check the gear oil. If it is contaminated or deteriorated, replace the gear oil. <Ref. to DI-16, REPLACEMENT, Differential Gear Oil.>

2) Check that the gear oil level is up to the bottom of filler plug or the oil temperature switch hole. If the level is low, check that there is no oil leakage and fill the oil up to the bottom of filler plug.



(A) Filler plug
(B) Drain plug

3) When checking is completed, tighten the filler plug.

NOTE:

Apply liquid gasket to the drain plug.

Liquid gasket:

THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:

49 N·m (5.0 kgf·m, 36.2 ft·lb)

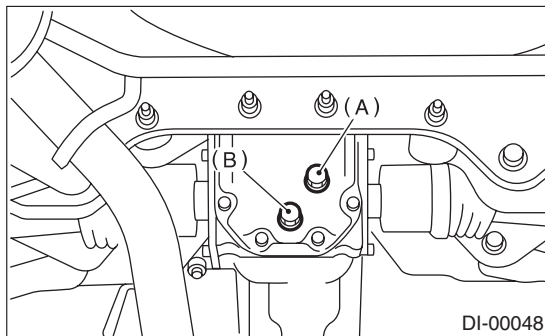
B: REPLACEMENT

1) Jack-up the vehicle and support it with rigid racks.

2) Remove the oil drain plug and filler plug, and drain the gear oil.

CAUTION:

Be careful not to get burned, because gear oil becomes extremely hot after running.



(A) Filler plug
(B) Drain plug

3) Tighten the oil drain plug.

NOTE:

Apply liquid gasket to the drain plug.

Liquid gasket:

THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:

49 N·m (5.0 kgf·m, 36.2 ft·lb)

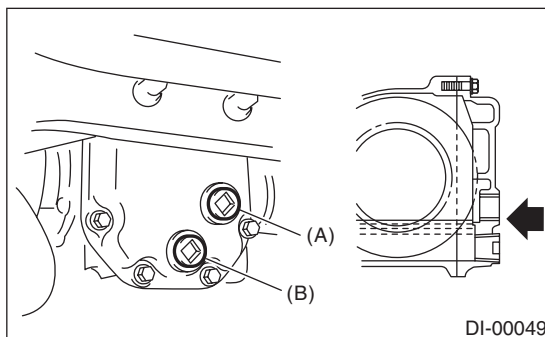
4) Fill the differential carrier with gear oil to the bottom of filler plug.

NOTE:

Carefully refill oil while watching the level. Excessive or insufficient oil must be avoided.

Oil capacity:

0.8 ℓ (0.8 US qt, 0.7 Imp qt)



(A) Filler plug
(B) Drain plug

5) Install the filler plug.

NOTE:

Apply liquid gasket to the filler plug.

Liquid gasket:

**THREE BOND 1105 (Part No. 004403010) or
equivalent**

Tightening torque:

49 N·m (5.0 kgf-m, 36.2 ft-lb)

3. Front Differential Assembly

A: NOTE

1. AT MODEL

For front differential of automatic transmission, refer to the "AT" section. <Ref. to 4AT-101, Front Differential Assembly.>

2. MT MODEL

For front differential of manual transmission, refer to "MT" section. <Ref. to 5MT-67, Front Differential Assembly.>

4. Rear Differential

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.
- 3) Shift the select lever or gear shift lever to neutral.
- 4) Release the parking brake.
- 5) Jack-up the vehicle and support it with rigid racks.
- 6) Remove the rear exhaust pipe and muffler.

Non-turbo model

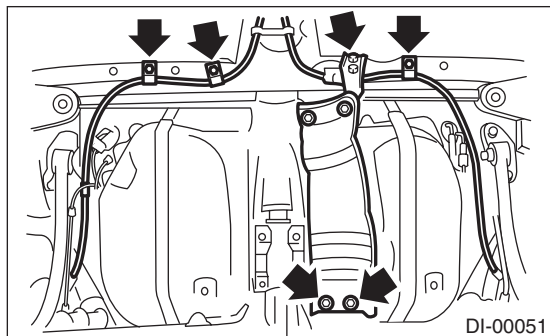
<Ref. to EX (H4SO)-8, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX (H4SO)-9, REMOVAL, Muffler.>

Turbo model

<Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-15, REMOVAL, Muffler.>

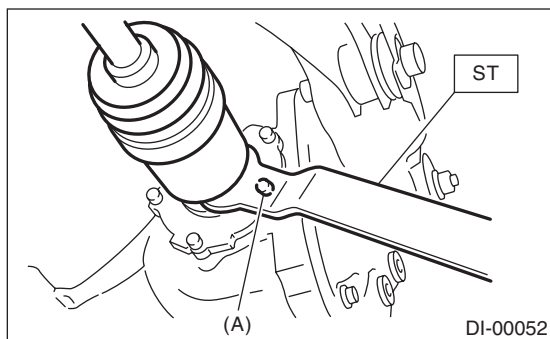
7) Remove the propeller shaft. <Ref. to DS-12, REMOVAL, Propeller Shaft.>

8) Remove the clamps and bracket of parking brake cable.



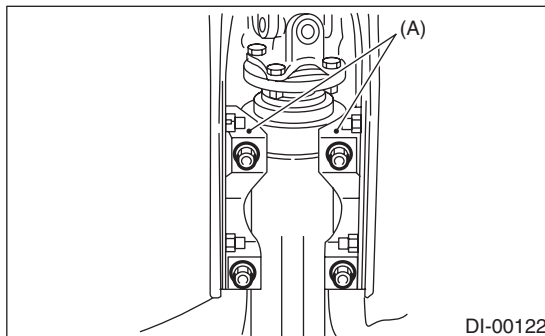
9) Remove the DOJ of rear drive shaft from rear differential using ST. <Ref. to DI-39, REPLACEMENT, Rear Differential Side Oil Seal.>

ST 28099PA100 DRIVE SHAFT REMOVER



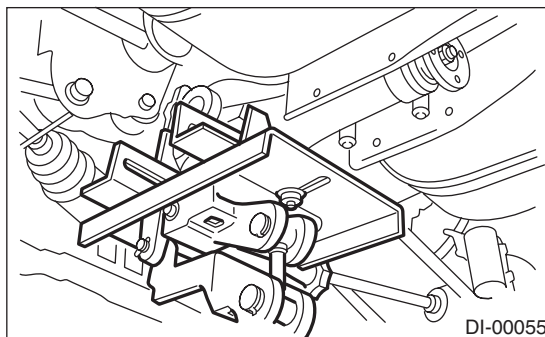
(A) Bolt

10) Remove the lower bracket.

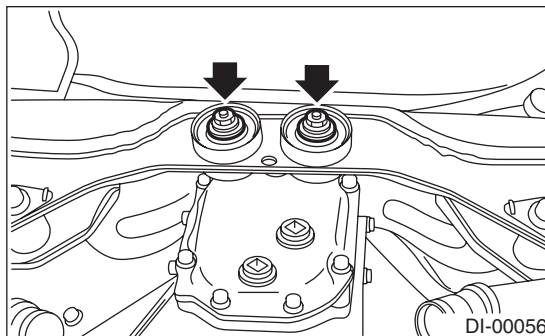


(A) Lower bracket

11) Support the rear differential with the transmission jack.



12) Remove the self-locking nuts and bolts.



Rear Differential

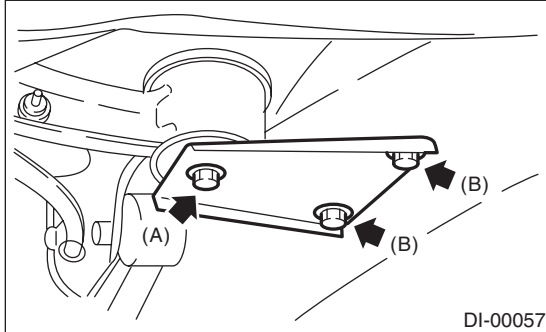
DIFFERENTIALS

13) Remove the bolts which secure the differential front member to the vehicle.

Loosen the bolt A first, then remove the bolt B.

NOTE:

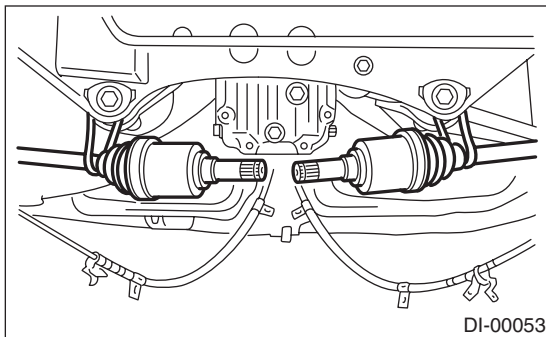
Instruct your co-worker to hold the differential front member so that it will not fall.



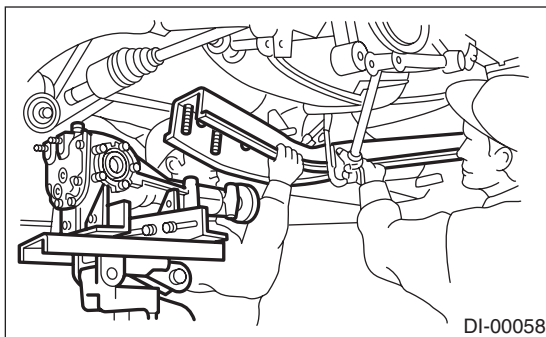
- (A) Bolt A
- (B) Bolt B

14) Remove the bolt A.

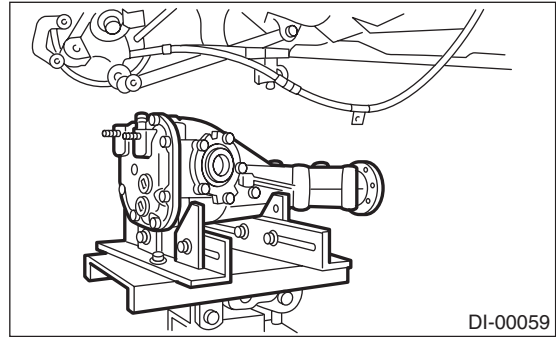
15) Suspend the rear drive shaft to the rear cross-member using wire.



16) While slowly lowering the transmission jack, move the rear differential forward, and remove the differential front member and the rear differential from vehicle.



17) Remove the rear differential from the differential front member.



B: INSTALLATION

Install in the reverse order of removal.

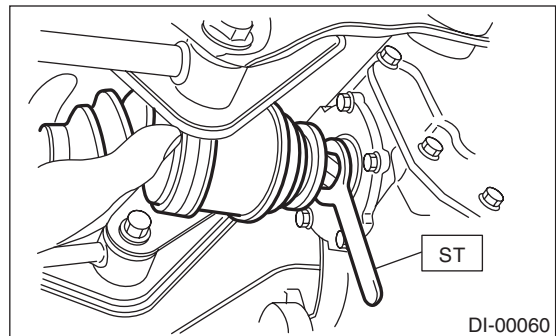
1) Position the differential front member with the vehicle by passing the member under the parking brake cable and securing it to rear differential.

NOTE:

When installing the rear differential front member, be careful of the order for installation of the upper and lower stoppers.

2) Install the DOJ of the drive shaft into the rear differential. <Ref. to DI-39, REPLACEMENT, Rear Differential Side Oil Seal.>

ST 28099PA090 SIDE OIL SEAL PROTECTOR



3) Installing procedure hereafter is in the reverse order of removal.

4) After installing, fill the differential carrier with gear oil up to the bottom of the filler plug hole. <Ref. to DI-16, Differential Gear Oil.>

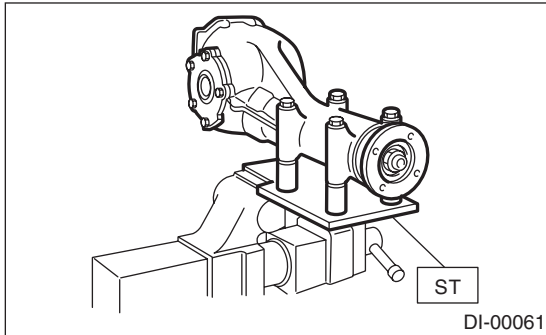
C: DISASSEMBLY

To detect the real cause of trouble, inspect the following items before disassembling.

- Tooth contact of hypoid driven gear and drive pinion, and backlash
- Hypoid driven gear runout on its back surface
- Total preload of drive pinion

1) Set the ST on vise and install the differential assembly to ST.

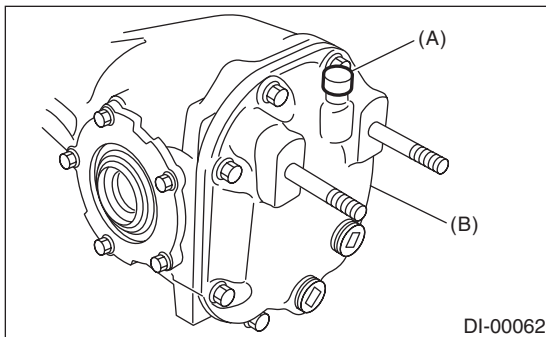
ST 398217700 ATTACHMENT



- 2) Drain the gear oil by removing the plug.
3) Remove the air breather cap.

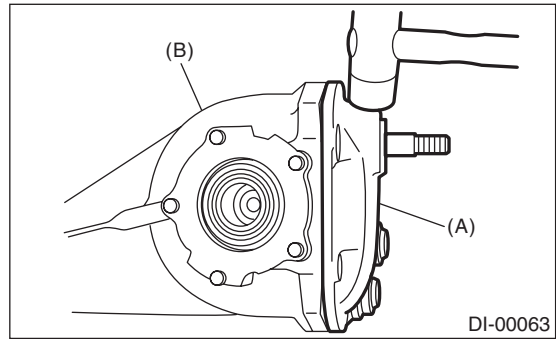
NOTE:

- Do not attempt to replace the air breather cap unless necessary.
- Replace the air breather cap with a new part when removing.



- (A) Air breather cap
(B) Rear cover

4) Remove the bolts, and then remove the rear cover.



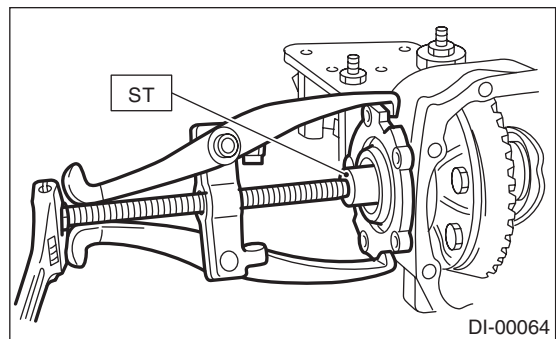
- (A) Rear cover
(B) Differential carrier

5) Keep the side bearing retainers RH and LH separately for easier reassembly. Remove the side bearing retainer attaching bolts, set the ST to differential case, and extract the side bearing retainers RH and LH with a puller.

NOTE:

Each shim, which is installed to adjusted the side bearing preload, should be kept together with its mating retainer.

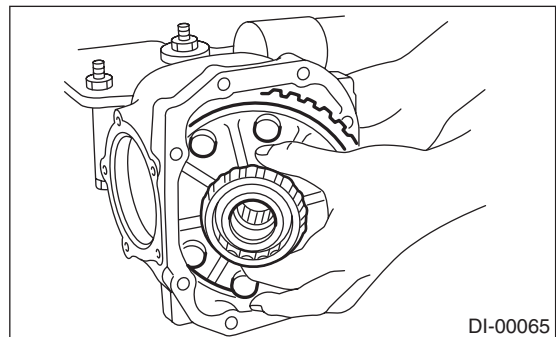
ST 398457700 ATTACHMENT



6) Pull out the differential case assembly from differential carrier.

NOTE:

Be careful not to hit the teeth against the case.



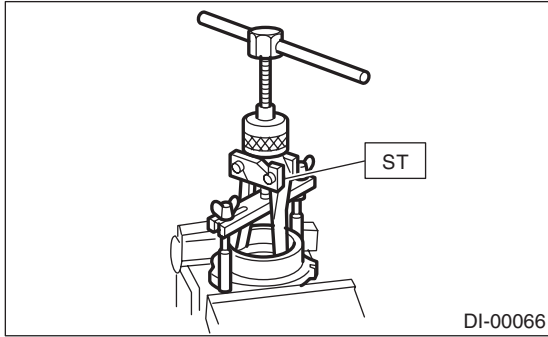
- 7) Remove the O-ring from side bearing retainer.
8) Remove the oil seal from the side bearing retainer. <Ref. to DI-39, REPLACEMENT, Rear Differential Side Oil Seal.>

Rear Differential

DIFFERENTIALS

9) Using the ST, remove the bearing cup from the side bearing retainer.

ST 398527700 PULLER ASSY

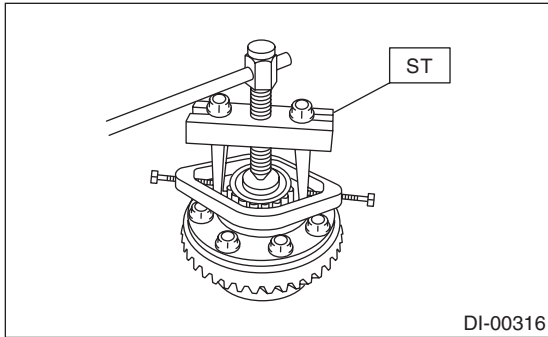


10) Remove the bearing cone with ST.

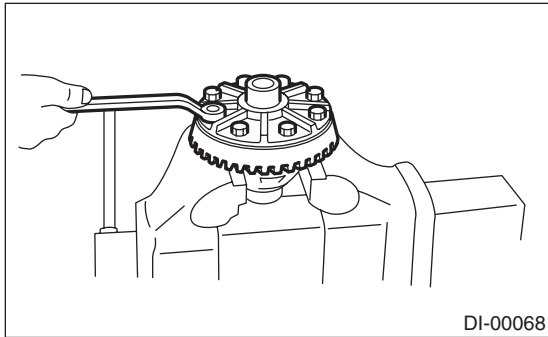
NOTE:

- Do not attempt to disassemble the parts unless necessary.
- Set the puller so that its claws catch the edge of the bearing cone.
- Never mix up the RH and LH bearing races and cones.

ST 18759AA000 PULLER ASSY



11) Remove the hypoid driven gear by loosening the hypoid driven gear bolts.

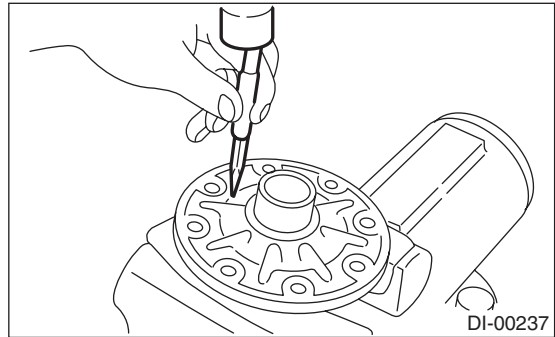


12) Drive out the pinion shaft lock pin from hypoid driven gear side (Model without LSD).

NOTE:

The lock pin is staked at the pin hole end on the differential carrier. Do not drive it out forcibly before removing the stake.

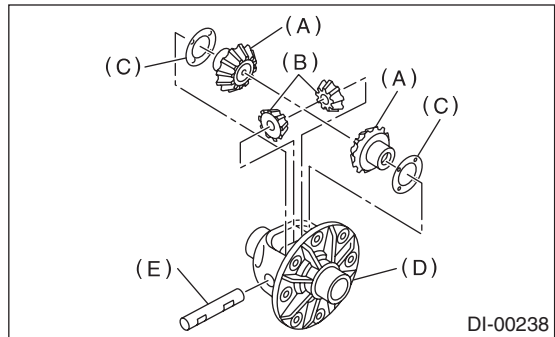
ST 899904100 STRAIGHT PIN REMOVER



13) Draw out the pinion mate shaft and remove pinion mate gears, side gears and thrust washers. (Model without LSD)

NOTE:

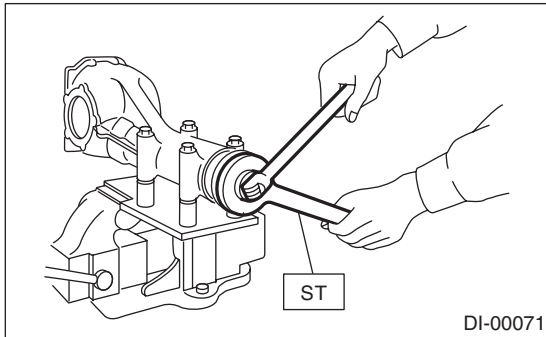
The gears should be marked or kept separated right and left, and front and rear as well as thrust washers.



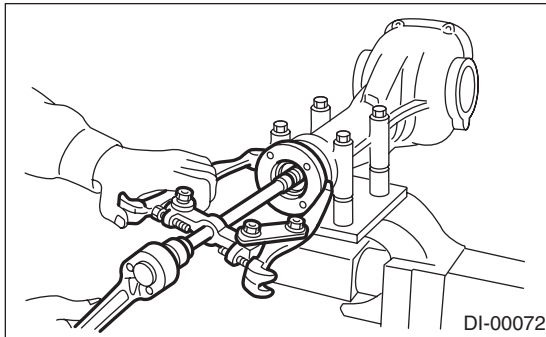
- (A) Side gear
- (B) Pinion mate gear
- (C) Thrust washer
- (D) Differential case
- (E) Pinion mate shaft

14) Remove the self-locking nut while holding the companion flange with ST.

ST 498427200 FLANGE WRENCH



15) Extract the companion flange with a puller.

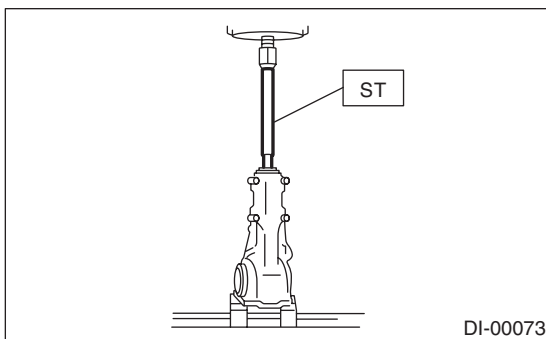


16) Press the end of drive pinion shaft and extract it together with rear bearing cone, pinion height adjusting washer and washer.

NOTE:

Hold the drive pinion so as not to drop it.

ST 398467700 DRIFT

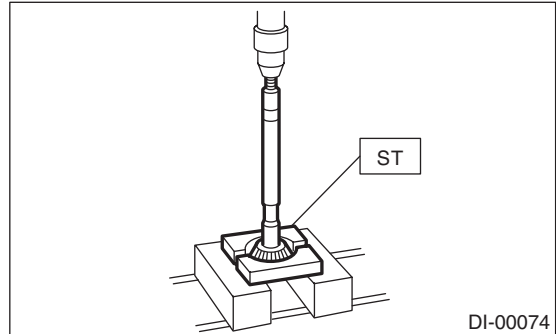


17) Remove the rear bearing cone from drive pinion by supporting the cone with ST.

NOTE:

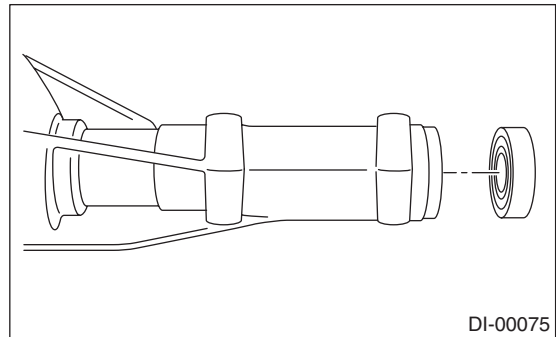
Place the replacer so that its center-recessed side faces the pinion gear.

ST 398517700 REPLACER



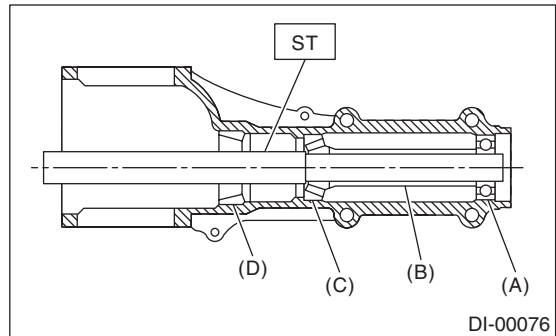
18) Remove the front oil seal from differential carrier using ST.

ST 398527700 PULLER ASSY



19) Remove the pilot bearing together with front bearing cone using ST.

ST 398467700 DRIFT

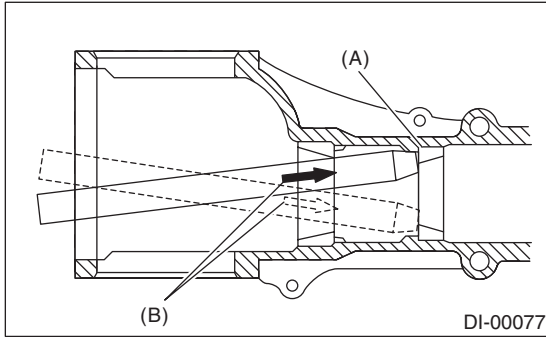


- (A) Pilot bearing
- (B) Collar
- (C) Front bearing
- (D) Rear bearing cup

Rear Differential

DIFFERENTIALS

20) When replacing the bearings, hit out the front bearing cup and rear bearing cup in this order from outside of the case using a brass bar.

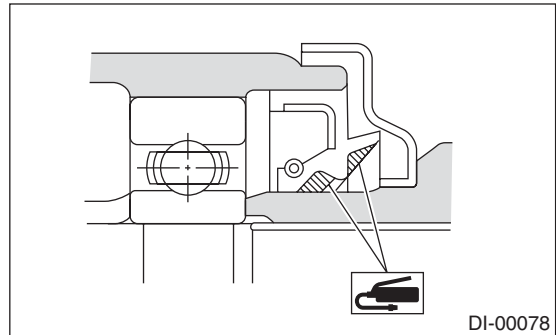


- (A) 2 cutout portions along diagonal lines
- (B) Tap alternately with brass bar.

D: ASSEMBLY

NOTE:

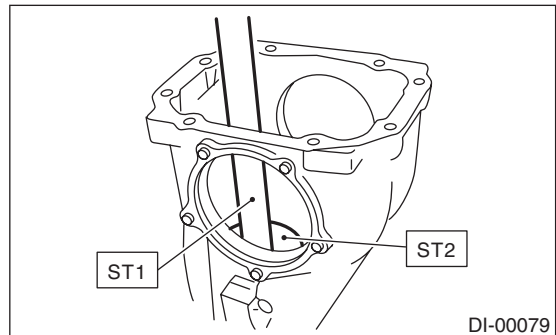
- Assemble in the reverse order of disassembly.
- Check and adjust each part during assembly.
- Keep the shims and washers in order, so that they are not improperly installed.
- Thoroughly clean the surfaces on which the shims, washers and bearings are to be installed.
- Apply gear oil when installing the bearings and thrust washers.
- Be careful not to mix up the RH and LH bearing races.
- Use a new O-ring and gasket.
- Replace the oil seal with a new part at every disassembly. Install the oil seal.
- Apply grease to the lips.
- Be careful not to mix up the differential oil seal RH and LH.



1) Adjusting preload for front and rear bearings
Adjust the bearing preload between front and rear bearings with collar and washer. Pinion height adjusting washer is not affected by this adjustment. The adjustment must not be carried out with oil seal inserted.

(1) Install the rear bearing race (rear) into differential carrier with ST1 and ST2.

ST1 398477701 HANDLE
ST2 398477703 DRIFT 2



(2) Install the rear bearing race (front) into differential carrier with ST1 and ST2.

ST1 398477701 HANDLE
ST2 398477702 DRIFT

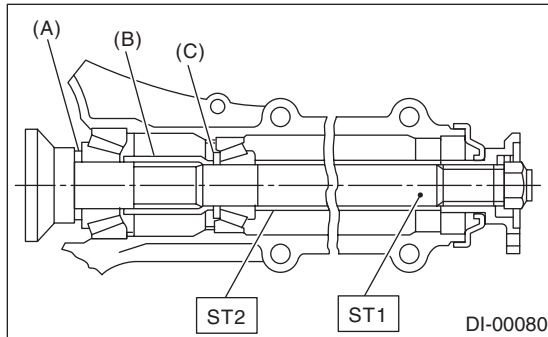
(3) Insert the ST1 into carrier with the pinion height adjusting washer and rear bearing cone fitted onto it.

NOTE:

- If tooth contact is normal in the inspection before disassembling, verify that the washer is not deformed, and then re-use the used washer.
- Use new rear bearing cone.

(4) Install the preload adjusting collar and washer, front bearing cone, ST2, companion flange, and washer and self-locking nut.

ST1 398507702 DUMMY SHAFT
ST2 398507703 DUMMY COLLAR



- (A) Pinion height adjusting washer
- (B) Preload adjusting collar
- (C) Preload adjusting washer

(5) Rotate the ST1 by hand to make it secured, and tighten the self-locking nut while measuring the preload with spring balance. Select the preload adjusting washer and collar so that the specified preload is obtained when nut is tightened to the specified torque.

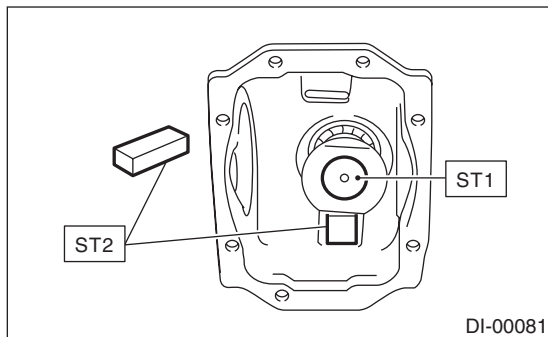
NOTE:

- Use a new self-locking nut.
- Be careful not to give excessive preload.
- When tightening the self-locking nut, lock ST1 with ST2 as shown in the figure.

ST1 398507704 BLOCK
ST2 398507702 DUMMY SHAFT

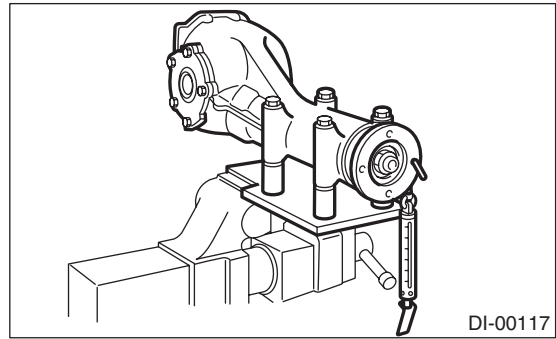
Tightening torque:

181.5 N·m (18.5 kgf·m, 134 ft·lb)



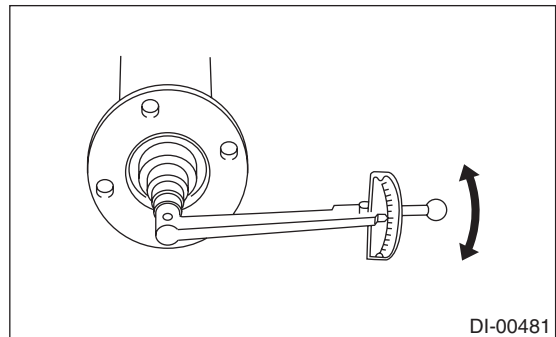
Initial load:

17.7 — 38.8 N (1.8 — 4.0 kgf, 4.0 — 8.7 lb)



Initial torque:

0.67 — 1.47 N·m (0.07 — 0.15 kgf·m, 0.49 — 1.08 ft·lb)



Preload adjusting washer	Part No.	Thickness mm (in)
	383705200	2.59 (0.1020)
	383715200	2.57 (0.1012)
	383725200	2.55 (0.1004)
	383735200	2.53 (0.0996)
	383745200	2.51 (0.0988)
	383755200	2.49 (0.0980)
	383765200	2.47 (0.0972)
	383775200	2.45 (0.0965)
	383785200	2.43 (0.0957)
	383795200	2.41 (0.0949)
	383805200	2.39 (0.0941)
	383815200	2.37 (0.0933)
	383825200	2.35 (0.0925)
383835200	2.33 (0.0917)	
383845200	2.31 (0.0909)	
Preload adjusting collar	Part No.	Length mm (in)
	383695201	56.2 (2.213)
	383695202	56.4 (2.220)
	383695203	56.6 (2.228)
	383695204	56.8 (2.236)
	383695205	57.0 (2.244)
	383695206	57.2 (2.252)

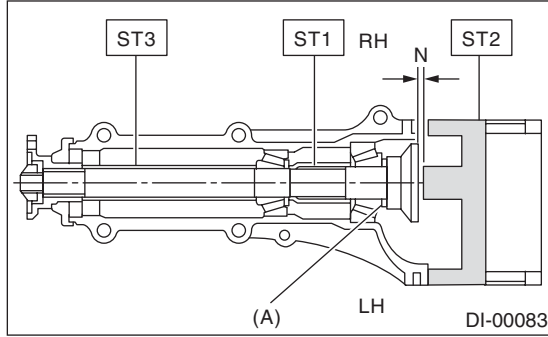
Rear Differential

DIFFERENTIALS

2) Adjusting drive pinion height:
Adjust the drive pinion height with washer installed between the rear bearing cone and the back of pinion gear.

(1) Attach ST2.

ST1 398507702 DUMMY SHAFT
ST2 398507701 DIFFERENTIAL CARRIER GAUGE
ST3 398507703 DUMMY COLLAR



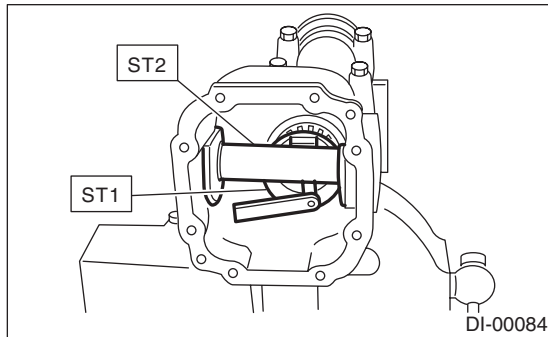
(A) Pinion height adjusting washer

(2) Measure the clearance N between the end of ST2 and the end surface of ST1 by using a thickness gauge.

NOTE:

Make sure there is no clearance between the case and ST2.

ST1 398507702 DUMMY SHAFT
ST2 398507701 DIFFERENTIAL CARRIER GAUGE



(3) Obtain the thickness of pinion height adjusting washer to be inserted from the following formula, and replace the temporarily installed washer with this one.

$$T = T_o + N - (H \times 0.01) - 0.20 \text{ mm (0.008 in)}$$

NOTE:

Use copies of this page.

T	Thickness of pinion height adjusting washer mm (in)
To	Thickness of washer temporarily inserted mm (in)
N	Clearance of thickness gauge mm (in)
H	Figure marked on drive pinion head
Memo:	

(Example of calculation)

$$T_o = 2.20 + 1.20 = 3.40 \text{ mm}$$

$$N = 0.23 \text{ mm}$$

$$H = +1$$

$$T = 3.40 + 0.23 - 0.01 - 0.20 = 3.42$$

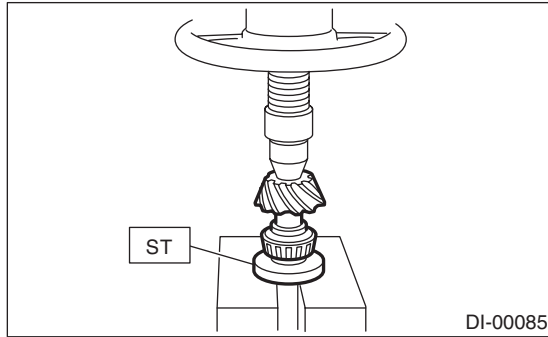
Result: Thickness = 3.42 mm

Therefore use the washer 383605200.

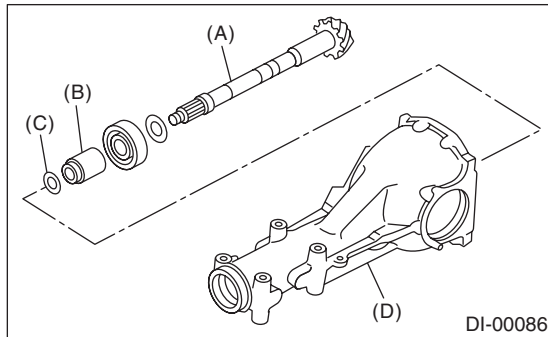
Pinion height adjusting washer	
Part No.	Thickness mm (in)
383495200	3.09 (0.1217)
383505200	3.12 (0.1228)
383515200	3.15 (0.1240)
383525200	3.18 (0.1252)
383535200	3.21 (0.1264)
383545200	3.24 (0.1276)
383555200	3.27 (0.1287)
383565200	3.30 (0.1299)
383575200	3.33 (0.1311)
383585200	3.36 (0.1323)
383595200	3.39 (0.1335)
383605200	3.42 (0.1346)
383615200	3.45 (0.1358)
383625200	3.48 (0.1370)
383635200	3.51 (0.1382)
383645200	3.54 (0.1394)
383655200	3.57 (0.1406)
383665200	3.60 (0.1417)
383675200	3.63 (0.1429)
383685200	3.66 (0.1441)

3) Install the selected pinion height adjusting washer on drive pinion, and press the rear bearing cone into position with ST.

ST 398177700 INSTALLER



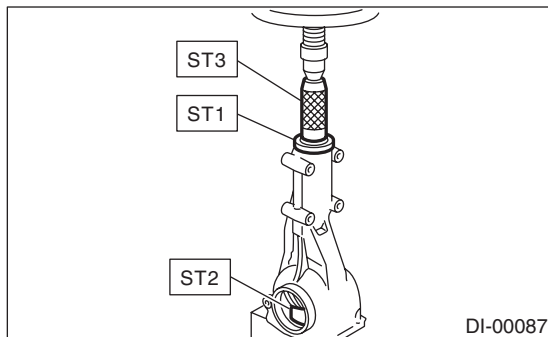
4) Insert the drive pinion into the differential carrier, and install the selected bearing preload adjusting collar and washer.



- (A) Drive pinion
- (B) Bearing preload adjusting collar
- (C) Bearing preload adjusting washer
- (D) Differential carrier

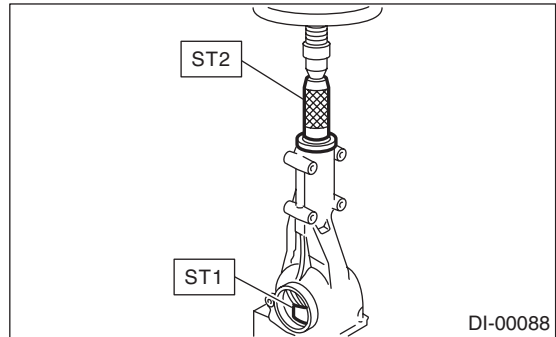
5) Press-fit the front bearing cone into case with ST1, ST2 and ST3.

ST1 398507703 DUMMY COLLAR
 ST2 399780104 WEIGHT
 ST3 899580100 INSTALLER



6) Insert the collar, then press-fit the pilot bearing with ST1 and ST2.

ST1 399780104 WEIGHT
 ST2 899580100 INSTALLER

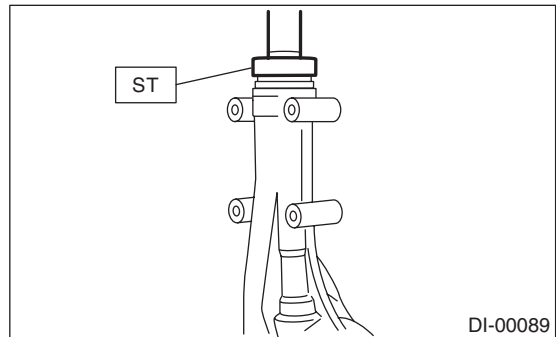


7) Fit a new oil seal with ST.

NOTE:

- Press-fit until the oil seal end comes 1 mm (0.04 in) inward from end of carrier.
- Apply grease to the oil seal lips.

ST 498447120 INSTALLER

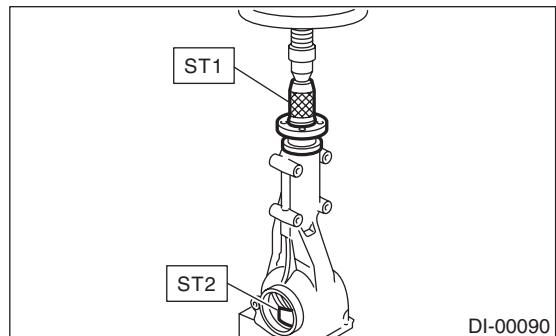


8) Press-fit the companion flange with ST1 and ST2.

NOTE:

Be careful not to damage the bearing.

ST1 899874100 INSTALLER
 ST2 399780104 WEIGHT



9) Apply Lock Tite on the drive pinion shaft thread and new self-locking nut seat.

Lock Tite:

THREE BOND 1324 (Part No. 004403042)

Rear Differential

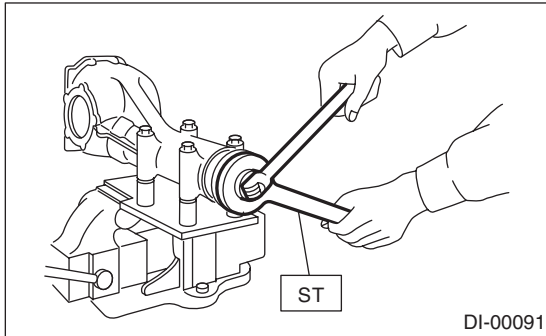
DIFFERENTIALS

10) Attach the self-locking nut. Then, tighten it with the ST.

ST 498427200 FLANGE WRENCH

Tightening torque:

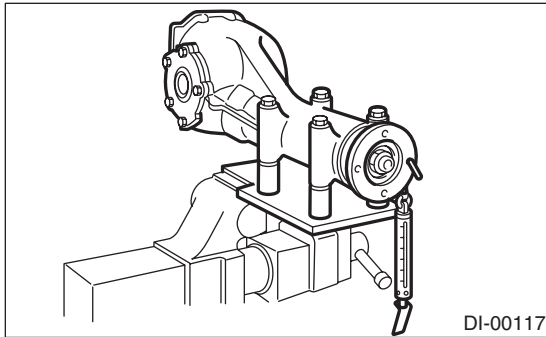
181.5 N·m (18.5 kgf·m, 134 ft·lb)



11) Measure the initial torque or the initial load.

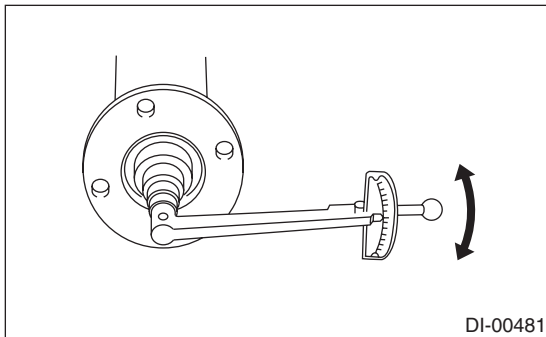
Initial load:

17.7 — 38.8 N (1.8 — 4.0 kgf, 4.0 — 8.7 lb)



Initial torque:

0.67 — 1.47 N·m (0.07 — 0.15 kgf·m, 0.49 — 1.08 ft·lb)

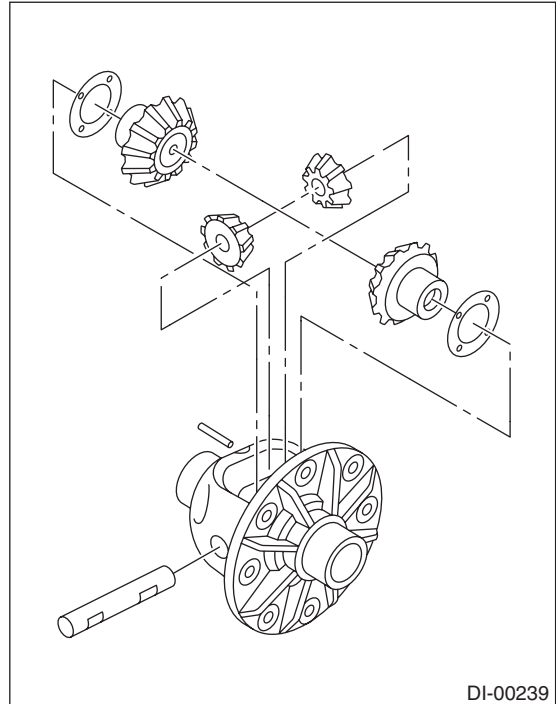


12) Assembling differential case

Install the side gears and pinion mate gears, with their thrust washers and pinion mate shaft, into the differential case. (Model without LSD)

NOTE:

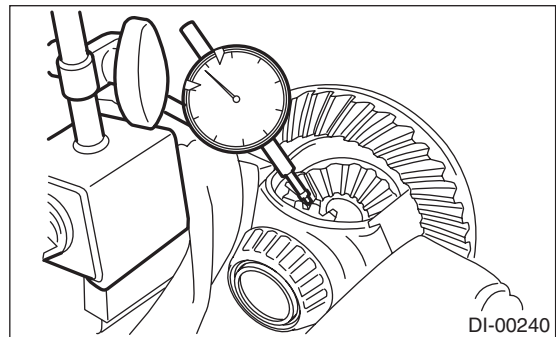
- Apply gear oil on both sides of the washer and on the side gear shaft before installing.
- Insert the pinion mate shaft into the differential case by aligning the lock pin holes.



(1) Measure the side gear backlash.

Side gear backlash:

0.10 — 0.20 mm (0.004 — 0.008 in)



(2) Adjust the side gear backlash as specified by selecting side gear thrust washer.

Side gear thrust washer	
Part No.	Thickness mm (in)
383445201	0.75 — 0.80 (0.0295 — 0.0315)
383445202	0.80 — 0.85 (0.0315 — 0.0335)
383445203	0.85 — 0.90 (0.0335 — 0.0354)

(3) Check the condition of rotation after applying oil to the gear tooth surfaces and thrust surfaces.

(4) After inserting the pinion shaft lock pin into differential case, stake the both sides of the hole to prevent pin from falling off.

13) Apply Loc Tite to bolt threads and install the hypoid driven gear to differential case.

Lock Tite:

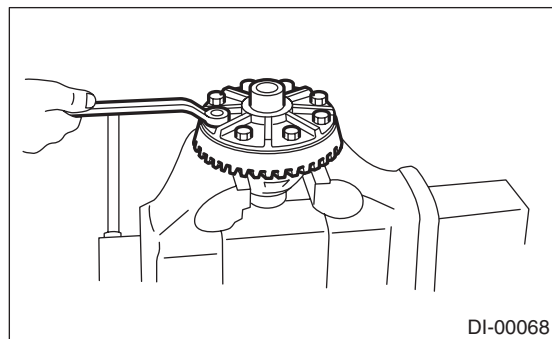
THREE BOND 1324 (Part No. 004403042) or equivalent

NOTE:

Tighten diagonally while tapping the bolt heads.

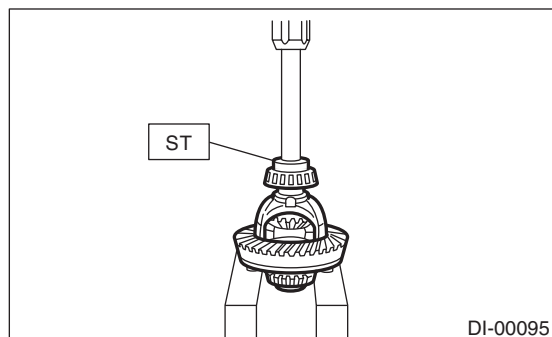
Tightening torque:

103 N·m (10.5 kgf-m, 76.0 ft-lb)



14) Press the side bearing into differential case using ST.

ST 398237700 DRIFT

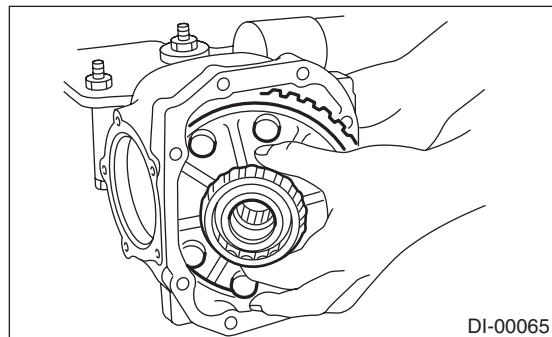


15) Press the side bearing cone into the side bearing retainer using the ST.

ST 398487700 DRIFT

16) Adjusting the side bearing retainer shims

- (1) The hypoid driven gear backlash and the side bearing preload can be adjusted by the side bearing retainer shim thickness.
- (2) Install the differential case assembly into differential carrier in the reverse order of disassembly.



(3) Install the side bearing retainer shims to retainers RH and LH from which they were installed.

NOTE:

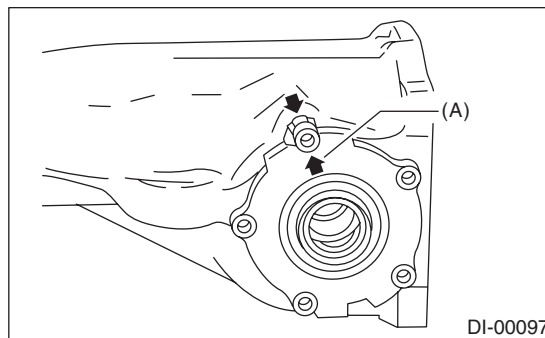
Replace the broken or corroded side retainer shim and O-ring with new parts of same thickness.

Side bearing retainer shim	
Part No.	Thickness mm (in)
383475201	0.20 (0.0079)
383475202	0.25 (0.0098)
383475203	0.30 (0.0118)
383475204	0.40 (0.0157)
383475205	0.50 (0.0197)

(4) Align the arrow mark on differential carrier with the mark on side retainer during installation.

NOTE:

- Replace the O-ring with a new part.
- Be careful that the bearing roller does not damage the side bearing cone.

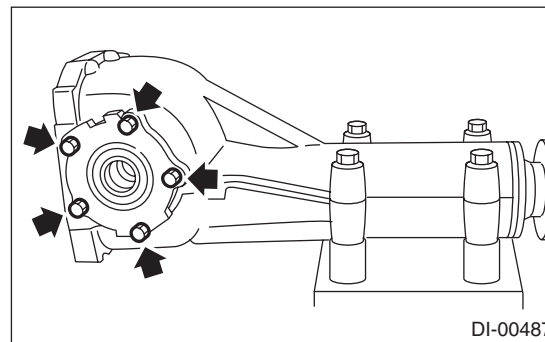


(A) Arrow mark

(5) Tighten the side bearing retainer bolts.

Tightening torque:

10.5 N·m (1.1 kgf-m, 7.7 ft-lb)



Rear Differential

DIFFERENTIALS

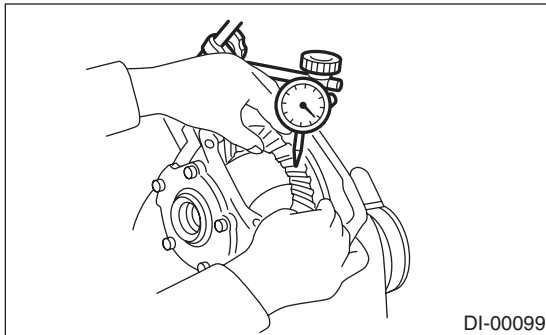
(6) Measure the backlash between hypoid driven gear and drive pinion. Set the magnet base on differential carrier. Align the contact point of dial gauge with the tooth surface of hypoid driven gear, and move the hypoid driven gear while securing the drive pinion. Read the value indicated on dial gauge. If the backlash is not within the range of specifications, adjust the side bearing retainer shim using the following procedures.

•**When backlash exceeds 0.2 mm (0.008 in):**
Reduce the hypoid driven gear back surface shim thickness and increase the hypoid driven gear tooth surface side shim thickness.

•**When backlash is less than 0.1 mm (0.004 in):**
Increase the hypoid driven gear back surface shim thickness and reduce the tooth surface side shim thickness.

Backlash:

0.10 — 0.20 mm (0.004 — 0.008 in)



(7) At the same time, measure the amount of the drive pinion preload. Compared with the resistance when differential case is not installed, if the total preload is not within specification, adjust the thickness of side bearing retainer shims, increasing/reducing both shims by an even amount at a time.

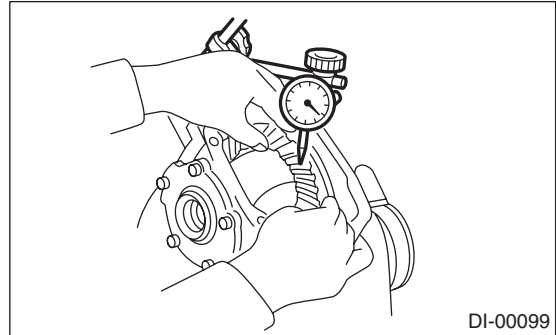
Total preload:

20.7 — 54.4 N (2.1 — 5.5 kgf, 4.7 — 12.2 lb)

17) Recheck the backlash between hypoid driven gear and pinion.

Backlash:

0.10 — 0.20 mm (0.004 — 0.008 in)

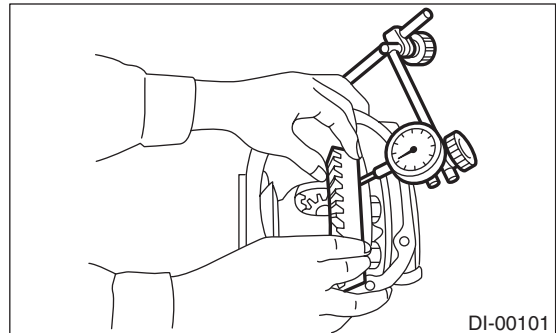


18) Check the hypoid driven gear runout on its back surface, and make sure that pinion and hypoid driven gear rotates smoothly.

If the hypoid driven gear runout on its rear face exceeds the limit, check for any foreign objects between hypoid driven gear and differential case, and for any deformation of the case or gear.

Hypoid driven gear runout on its back surface:

0.05 mm (0.0020 in) or less



19) Checking and adjusting the tooth contact of hypoid driven gear

(1) Apply an even coat of red lead on both sides of three or four teeth on the hypoid driven gear. Check the contact pattern after rotating the hypoid driven several revolutions back and forth until a definite contact pattern appears on the hypoid driven gear.

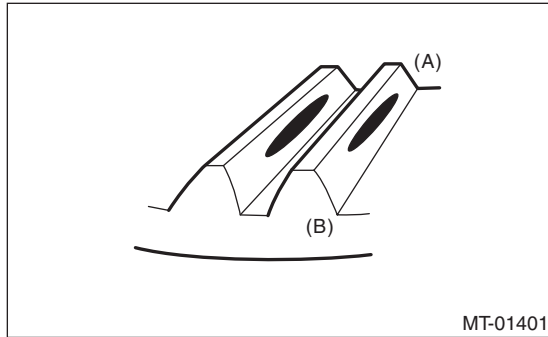
(2) When the contact pattern is not correct, re-adjust.

NOTE:

Be sure to wipe off the red lead completely after the adjustment is completed.

- Correct tooth contact

Check item: Tooth contact pattern is slightly shifted toward toe side under no-load rotation. (When driving, it moves towards the heel side.)

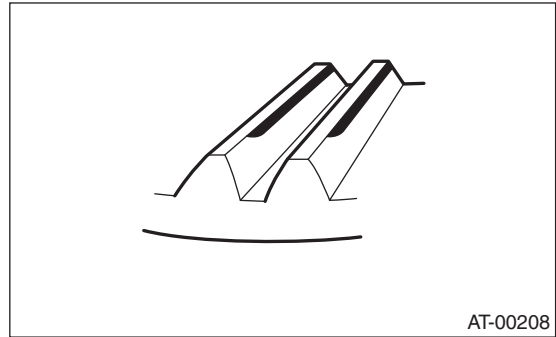


- (A) Toe side
- (B) Heel side

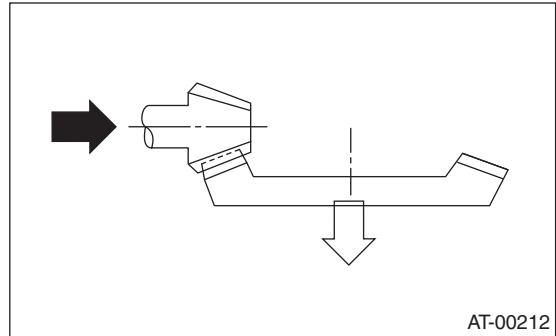
- Face contact

Check item: Backlash is too large.

Contact pattern



Corrective action: Increase the thickness of pinion height adjusting washer according to the procedure for bringing the drive pinion closer to the hypoid driven gear.



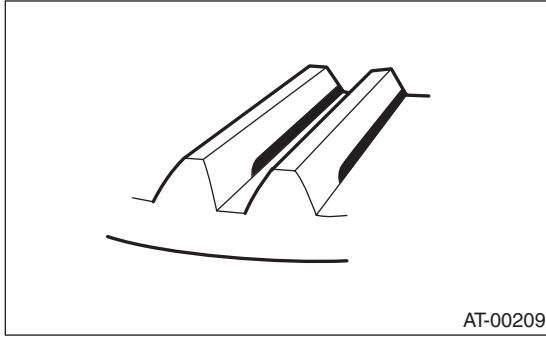
Rear Differential

DIFFERENTIALS

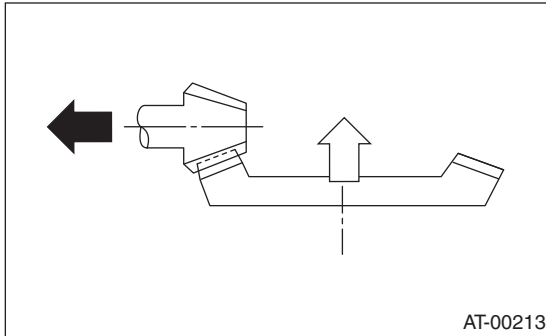
- Flank contact

Check item: Backlash is too small.

Contact pattern



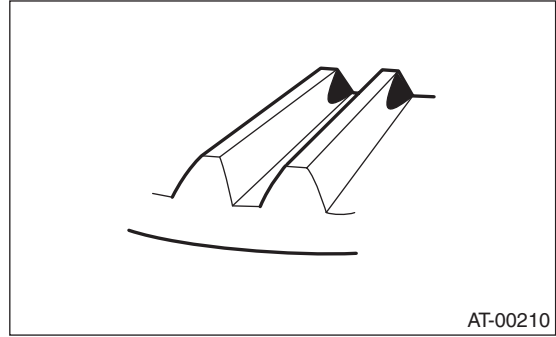
Corrective action: Reduce the thickness of pinion height adjusting washer according to the procedure for moving the drive pinion away from hypoid driven gear.



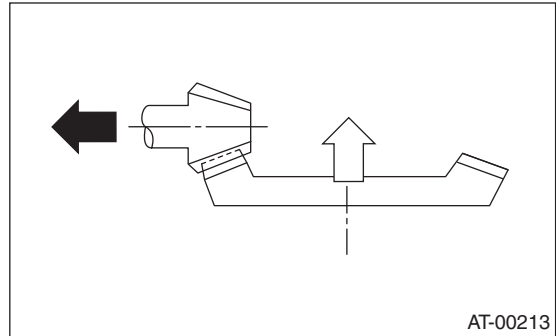
- Toe contact (inside contact)

Check item: Contact area is too small.

Contact pattern



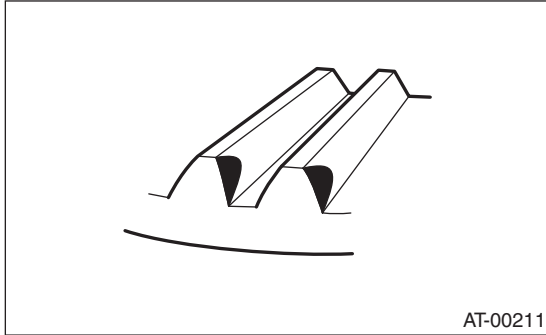
Corrective action: Reduce the thickness of pinion height adjusting washer according to the procedure for moving the drive pinion away from hypoid driven gear.



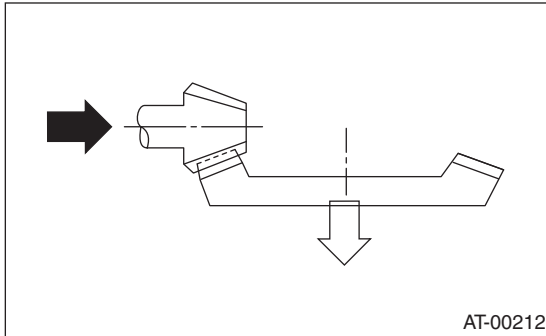
- Heel contact (outside end contact)

Check item: Contact area is too small.

Contact pattern



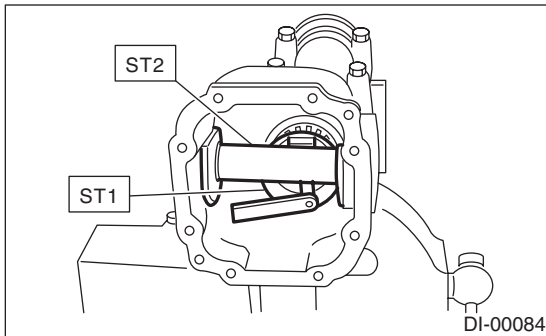
Corrective action: Increase the thickness of pinion height adjusting washer according to the procedure for bringing the drive pinion close to the hypoid driven gear.



20) If proper tooth contact is not obtained, once again adjust the drive pinion height by changing the RH and LH side bearing retainer shims and the hypoid gear backlash.

(1) Drive pinion height

- | | | |
|-----|-----------|----------------------------|
| ST1 | 398507702 | DUMMY SHAFT |
| ST2 | 398507701 | DIFFERENTIAL CARRIER GAUGE |



$$T = To + N - (H \times 0.01) - 0.20 \text{ (mm)}$$

Place:

T = Thickness of the pinion height adjusting washer (mm)

To = Thickness of the washer temporarily assembled (mm)

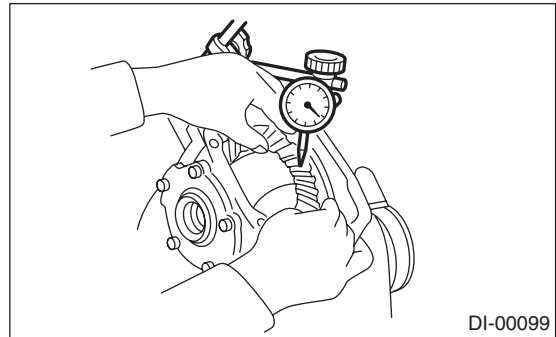
N = Clearance measured by thickness gauge (mm)

H = Figure marked on drive pinion head

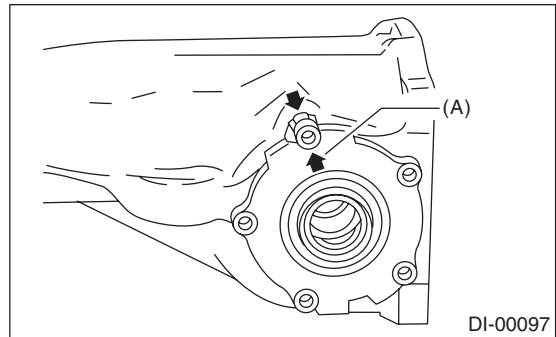
(2) Hypoid gear backlash

Backlash:

0.10 — 0.20 mm (0.004 — 0.008 in)



- 21) Remove the RH and LH side bearing retainer.
- 22) Install the O-rings and the side bearing retainer shims to both the left and right side bearing retainers.
- 23) Install the oil seals to the left and right side bearing retainers. <Ref. to DI-39, REPLACEMENT, Rear Differential Side Oil Seal.>
- 24) Align the arrow mark on differential carrier with the mark on side retainer during installation.



(A) Arrow mark

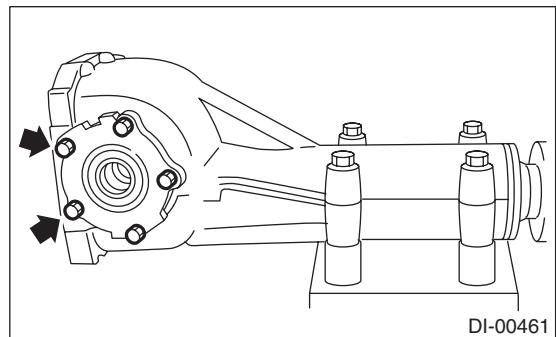
- 25) Apply liquid gasket to the bolts indicated by arrow marks, and install the side bearing retainer.

Liquid gasket:

THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:

10.5 N·m (1.1 kgf·m, 7.7 ft·lb)



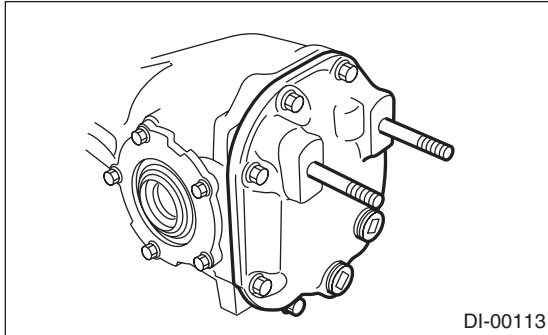
Rear Differential

DIFFERENTIALS

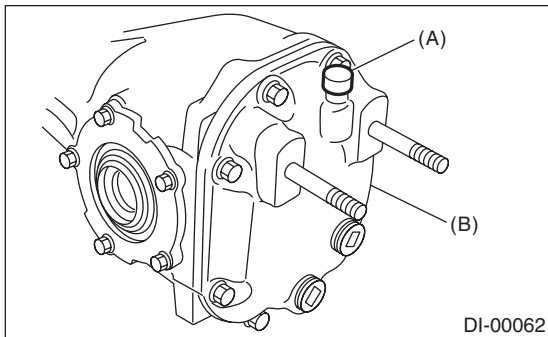
26) Install the new gasket and rear cover and tighten the bolts to specified torque.

Tightening torque:

29.5 N·m (3.0 kgf-m, 21.8 ft-lb)



27) Install the new air breather cap.



(A) Air breather cap

(B) Rear cover

28) Install the drain plug and filler plug.

Tightening torque:

49 N·m (5.0 kgf-m, 36.2 ft-lb)

E: INSPECTION

Wash all the disassembled parts clean, and examine them for wear, damage and other defects. Repair or replace the defective parts as necessary.

1) Hypoid driven gear and drive pinion

- If there is evidently an abnormal tooth contact, find out the cause and adjust until the teeth contact correctly. Replace the gear if there is an excessive worn or an incapable adjustment.

- If crack, cutout or seizure is found, replace the parts as a set. Slight damage of some teeth can be corrected by oil stone or the like.

2) Bearing

Replace if seizure, peeling, wear, rust, dragging during rotation, noise or other defect is evident.

3) Oil seal

Replace if deformed or damaged, and at every disassembling.

4) Differential carrier

Replace if the bearing bores are worn or damaged.

5) Differential case

Replace if its sliding surfaces are worn or cracked.

6) Companion flange

Replace if the oil seal lip contacting surface has flaws.

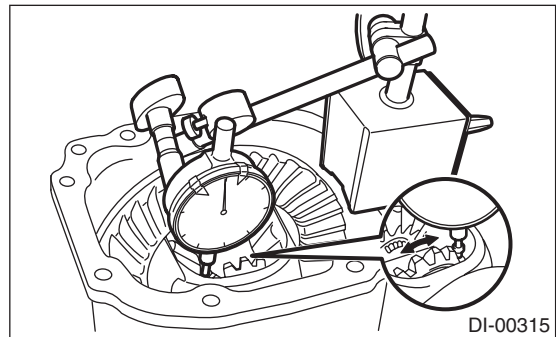
1. SIDE GEAR BACKLASH

Using a dial gauge, check the backlash of side gear. (Model without LSD)

Side gear backlash:

0.1 — 0.2 mm (0.004 — 0.008 in)

If the side gear backlash is not within the specification, select the side gear thrust washer and adjust the side gear backlash as specified.



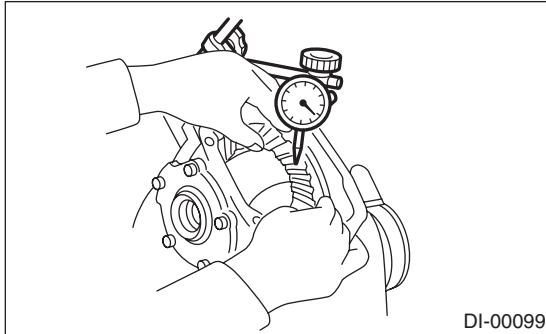
2. HYPOID DRIVEN GEAR BACKLASH

Using a dial gauge, check the backlash of hypoid driven gear.

Hypoid driven gear backlash:

0.1 — 0.2 mm (0.004 — 0.008 in)

If the hypoid driven gear backlash is not within the specification, adjust the side bearing preload or repair if necessary.



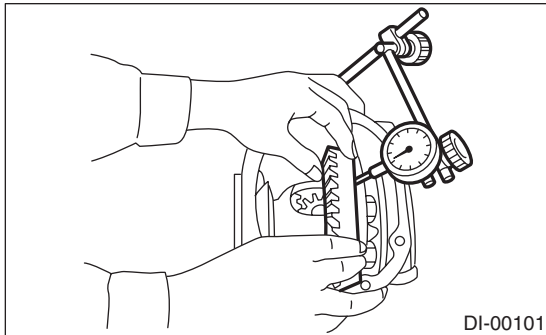
3. HYPOID DRIVEN GEAR RUNOUT ON ITS BACK SURFACE

Using a dial gauge, check the hypoid driven gear runout on its back surface.

Hypoid driven gear runout on its back surface:

0.05 mm (0.0020 in) or less

If the hypoid driven gear runout exceeds 0.05 mm (0.0020 in), replace the hypoid driven gear.



4. TOOTH CONTACT BETWEEN HYPOID DRIVEN GEAR AND DRIVE PINION

Inspect the tooth contact between hypoid driven gear and drive pinion. <Ref. to DI-24, ASSEMBLY, Rear Differential.>

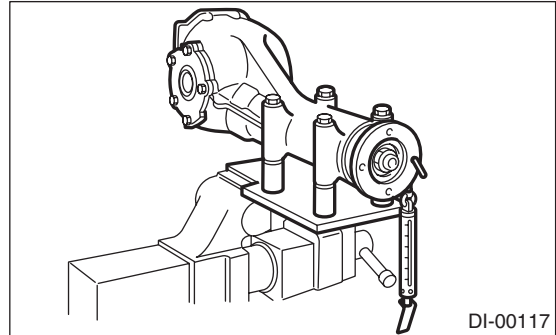
5. TOTAL PRELOAD

Using a spring balance, check the total preload.

Total preload:

20.7 — 54.4 N (2.1 — 5.5 kgf, 4.7 — 12.2 lb)

If the increase of the resistance is not within the specification, adjust the side bearing retainer shims.

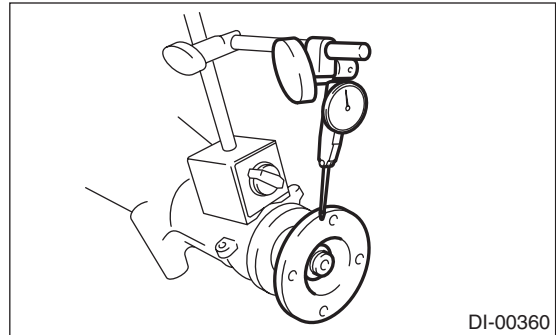


6. COMPANION FLANGE

- 1) If rust or dirt is attached to the companion flange, remove them.
- 2) Set a dial gauge at a companion flange surface (mating surface of propeller shaft and companion flange), and then measure the companion flange runout.

Limit of runout:

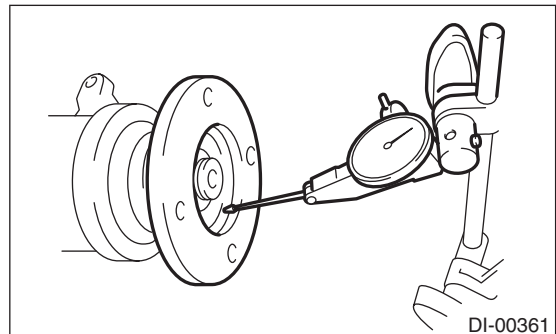
0.08 mm (0.0031 in)



- 3) Set the gauge inside of the companion flange, and measure the runout.

Limit of runout:

0.08 mm (0.0031 in)



Rear Differential

DIFFERENTIALS

4) If either runout exceeds the limit, move the phase of companion flange and drive pinion 90° each, and find the point where the runout is within the limit.

5) If the runout exceeds the limit after changing the phase, replace the companion flange and recheck the runout.

6) If the runout exceeds the limit after replacing the companion flange, the drive pinion may be assembled incorrectly or bearing is faulty.

F: ADJUSTMENT

1. SIDE GEAR BACKLASH

Adjust the side gear backlash.

<Ref. to DI-24, ASSEMBLY, Rear Differential.>

2. HYPOID DRIVEN GEAR BACKLASH

Adjust the hypoid driven gear backlash.

<Ref. to DI-24, ASSEMBLY, Rear Differential.>

3. TOOTH CONTACT BETWEEN HYPOID DRIVEN GEAR AND DRIVE PINION

Adjust the tooth contact between hypoid driven gear and drive pinion gear.

<Ref. to DI-24, ASSEMBLY, Rear Differential.>

4. TOTAL PRELOAD

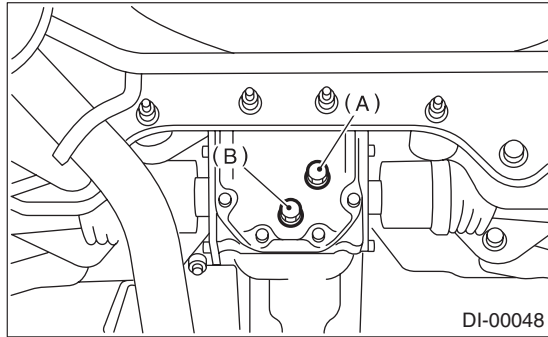
Adjust the side bearing shim.

<Ref. to DI-24, ASSEMBLY, Rear Differential.>

5. Rear Differential Front Oil Seal

A: REPLACEMENT

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.
- 3) Shift the select lever or gear shift lever to neutral.
- 4) Release the parking brake.
- 5) Remove the oil drain plug, and drain gear oil.



- (A) Filler plug
(B) Drain plug

- 6) Install the oil drain plug.

NOTE:

Apply liquid gasket to the drain plug.

Liquid gasket:

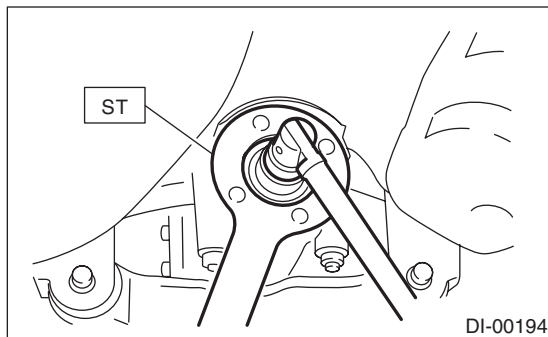
THREE BOND 1105 (Part No. 004403010) or equivalent

Tightening torque:

49 N·m (5.0 kgf·m, 36.2 ft·lb)

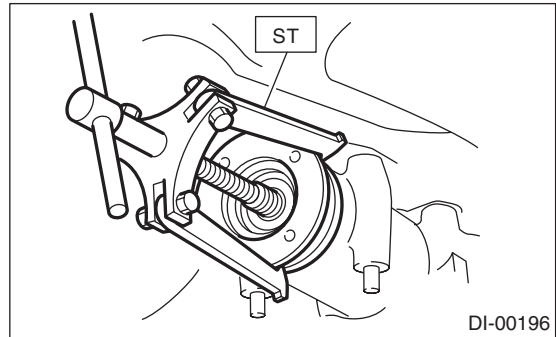
- 7) Jack-up the rear wheels and support with rigid racks.
- 8) Remove the rear exhaust pipe and muffler.
- 9) Remove the propeller shaft from the vehicle.
<Ref. to DS-12, REMOVAL, Propeller Shaft.>
- 10) Remove the self-locking nut while holding the companion flange with ST.

ST 498427200 FLANGE WRENCH



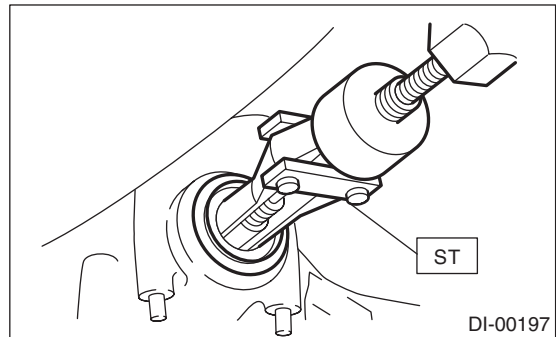
- 11) Extract the companion flange using ST.

ST 399703600 PULLER ASSY



- 12) Using the ST, remove the oil seal.

ST 398527700 PULLER ASSY

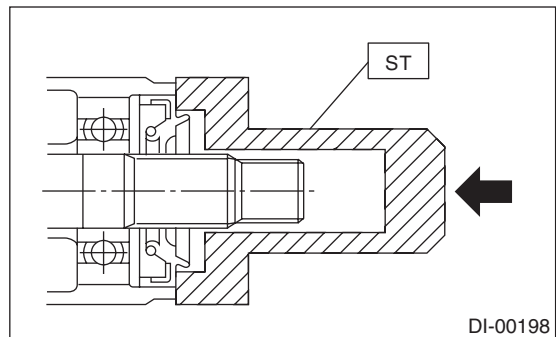


- 13) Install a new oil seal using ST.

NOTE:

Apply oil to the outer circumference of the oil seal.

ST 498447120 INSTALLER



- 14) Install the companion flange.

NOTE:

Use a plastic hammer to install companion flange.

- 15) Apply Lock Tite on the drive pinion shaft thread and new self-locking nut seat.

Lock Tite:

THREE BOND 1324 (Part No. 004403042) or equivalent

Rear Differential Front Oil Seal

DIFFERENTIALS

16) Tighten the self-locking nut to the specified torque so that the companion flange preload becomes the same value as that before replacing the oil seal.

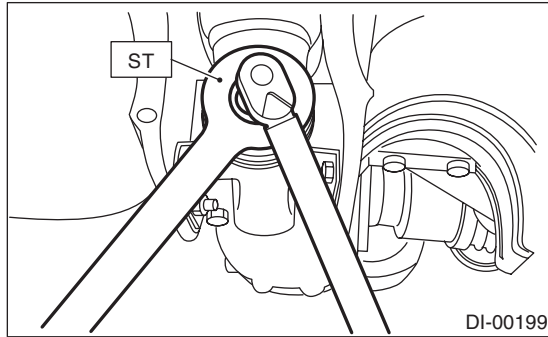
ST 498427200 FLANGE WRENCH

NOTE:

Use a new self-locking nut.

Tightening torque:

181.5 N·m (18.5 kgf-m, 134 ft-lb)



17) Hereafter, reassemble in the reverse order of disassembly.

6. Rear Differential Side Oil Seal

A: INSPECTION

Make sure that there is no oil leakage from side oil seal.

If there is oil leakage, replace the oil seal.

B: REPLACEMENT

- 1) Disconnect the ground cable from the battery.
- 2) Shift the select lever or gear shift lever to neutral.
- 3) Release the parking brake.
- 4) Jack-up the vehicle and support it with rigid racks.
- 5) Remove the rear exhaust pipe and muffler.

Non-turbo model

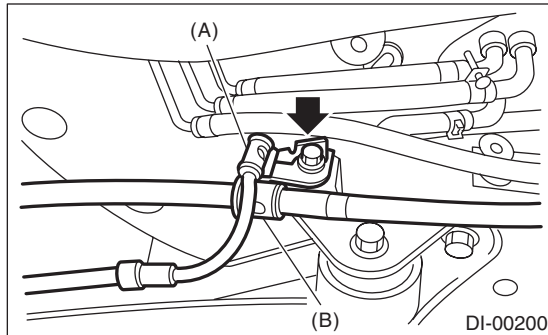
<Ref. to EX (H4SO)-8, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX (H4SO)-9, REMOVAL, Muffler.>

Turbo model

<Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-15, REMOVAL, Muffler.>

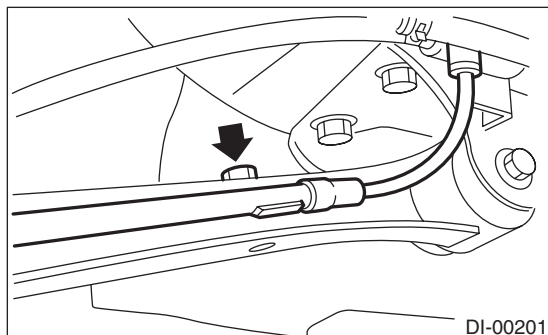
- 6) Remove the DOJ of rear drive shaft from rear differential.

- (1) Remove the ABS wheel speed sensor cable clamp and the parking brake cable clamp from bracket.

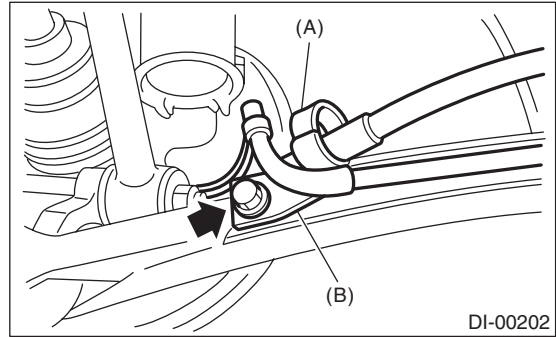


- (A) ABS wheel speed sensor cable clamp
- (B) Parking brake cable clamp

- (2) Remove the ABS wheel speed sensor cable clamp from the trailing link.

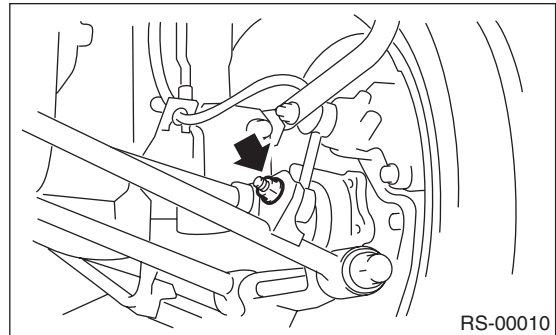


- (3) Remove the ABS wheel speed sensor cable clamp and the parking brake cable guide from the trailing link.

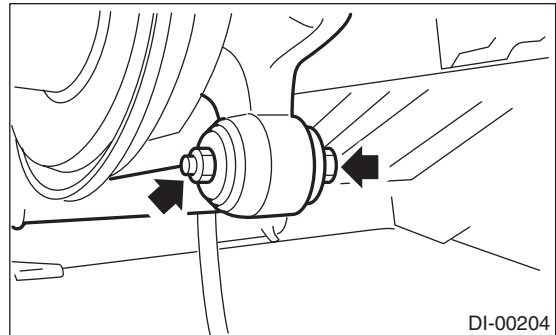


- (A) Parking brake cable guide
- (B) ABS wheel speed sensor cable clamp

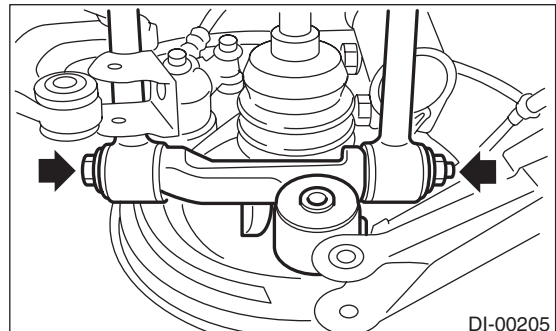
- (4) Remove the rear stabilizer link.



- (5) Remove the bolts which secure the trailing link to the housing.



- (6) Remove the bolts which secure the front and rear lateral links to the rear housing.



- (7) Remove the DOJ from the rear differential by using ST.

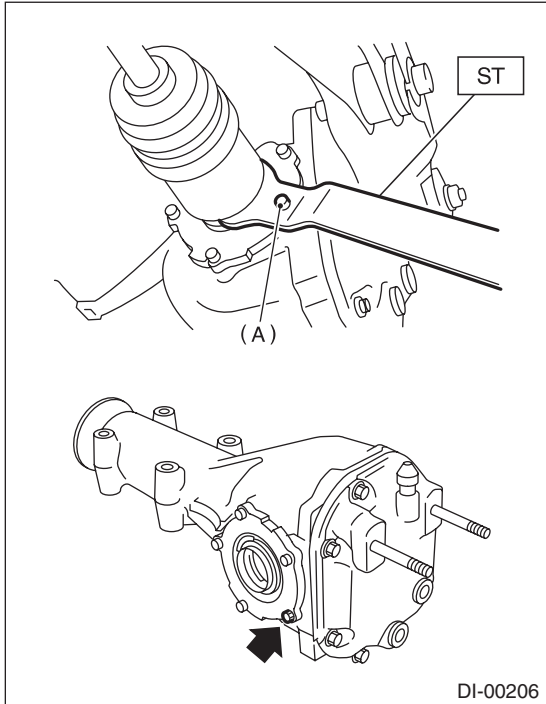
Rear Differential Side Oil Seal

DIFFERENTIALS

NOTE:

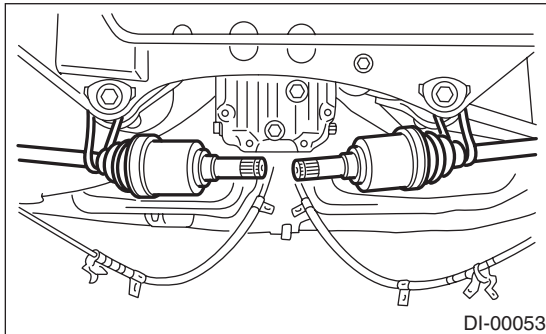
When removing the DOJ from the rear differential, fit the ST to the bolts (A) as shown in figure so as not to damage the side bearing retainer.

ST 28099PA100 DRIVE SHAFT REMOVER



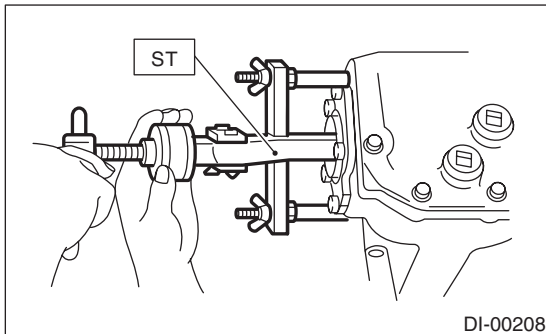
(A) Bolt

7) Suspend the rear drive shaft to the rear cross-member using wire.



8) Remove the oil seal using ST.

ST 398527700 PULLER ASSY

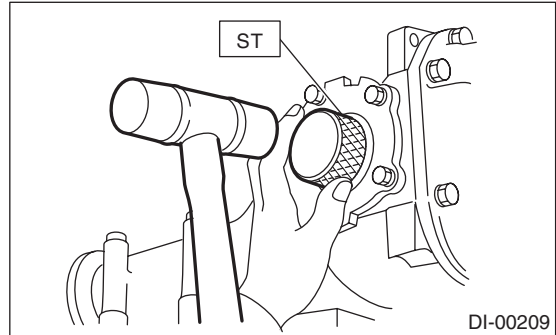


9) Install a new side oil seal using the ST.

NOTE:

Apply chassis grease to the oil seal lips.

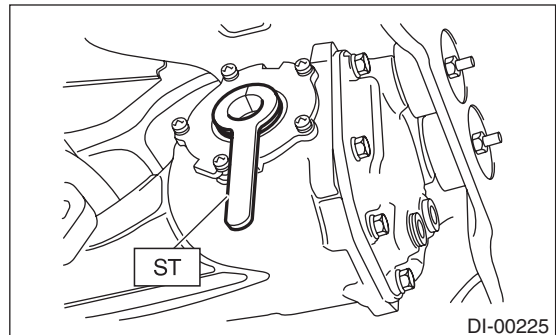
ST 398437700 DRIFT



10) Insert the DOJ into rear differential.

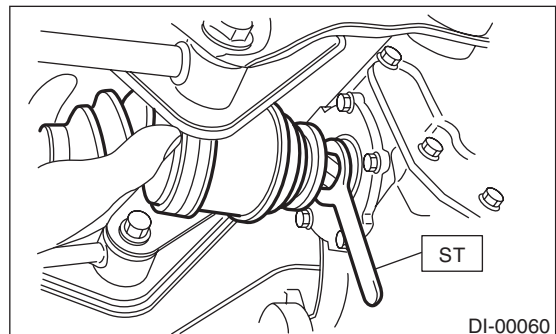
(1) Attach the ST to rear differential.

ST 28099PA090 SIDE OIL SEAL PROTECTOR



(2) Install the spline shaft until the spline portion is inside the side oil seal using ST.

ST 28099PA090 SIDE OIL SEAL PROTECTOR



(3) Remove the ST.

ST 28099PA090 SIDE OIL SEAL PROTECTOR

11) Hereafter, reassemble in the reverse order of disassembly.

7. Rear Differential Member

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.
- 3) Move the select lever or gear shift lever to "N".
- 4) Release the parking brake.
- 5) Jack-up the vehicle and support it with rigid racks.
- 6) Remove the rear exhaust pipe and muffler.

Non-turbo model

<Ref. to EX (H4SO)-8, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX (H4SO)-9, REMOVAL, Muffler.>

Turbo model

<Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-15, REMOVAL, Muffler.>

- 7) Remove the rear differential front member.

NOTE:

When removing the rear differential front member, work the removal procedure as rear differential.

<Ref. to DI-19, REMOVAL, Rear Differential.>

- 8) Remove the rear differential member.

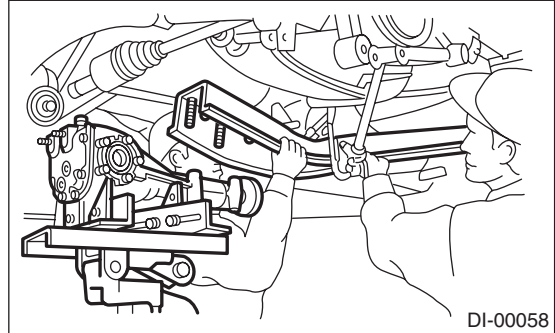
B: INSTALLATION

Install in the reverse order of removal.

- 1) Position the differential front member with the vehicle by passing the member under the parking brake cable and securing it to rear differential.

NOTE:

When installing the differential front member, be careful of the order for installation of the stoppers.

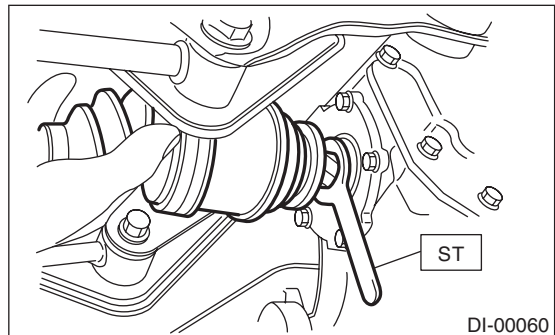


- 2) Insert the DOJ of the rear drive shaft into the rear differential.

NOTE:

Before inserting, replace the side oil seal with a new part.

ST 28099PA090 SIDE OIL SEAL PROTECTOR



- 3) Hereafter, install in the reverse order of removal.

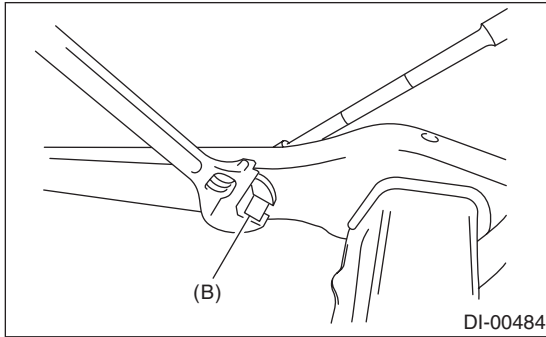
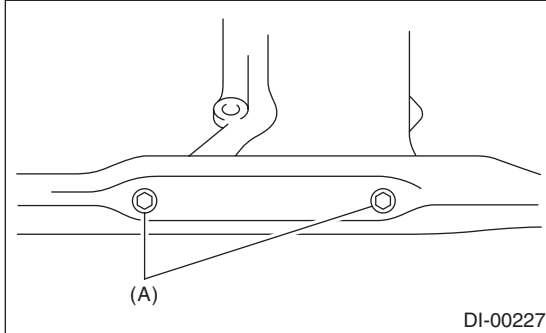
Rear Differential Member

DIFFERENTIALS

C: DISASSEMBLY

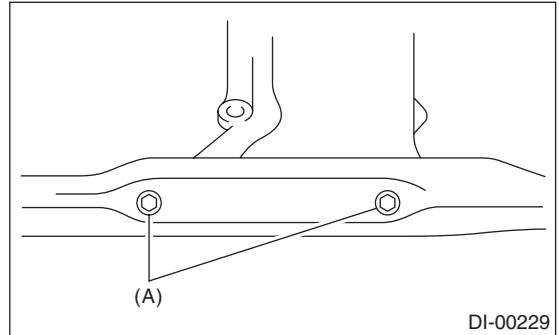
NOTE:

Clean the rear differential member before working.
1) Remove the bolts (A) and (B) which secure the differential front member and the differential mount bracket.



D: ASSEMBLY

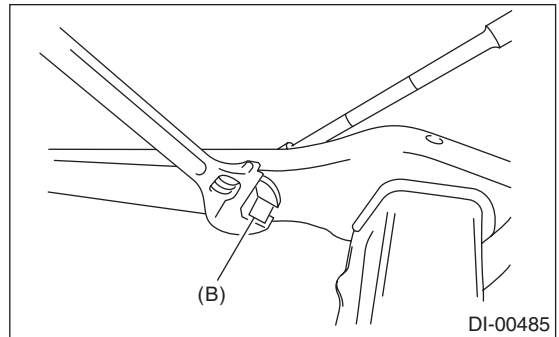
1) Temporarily tighten bolts (A) that secure the front differential assembly and differential mount.



2) Tighten the nut of mounting bolt (B).

Tightening torque:

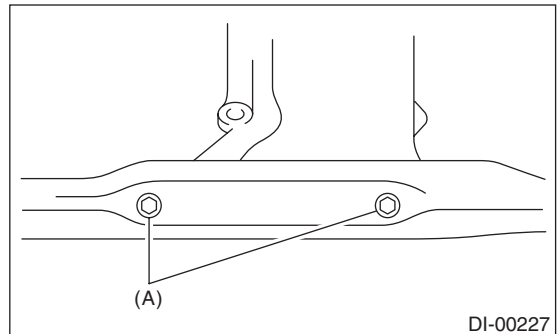
128 N·m (13.0 kgf-m, 94.4 ft-lb)



3) Tighten the nut of mounting bolt (A).

Tightening torque:

70 N·m (7.1 kgf-m, 51.6 ft-lb)



E: INSPECTION

1) Check the rear differential member for damage, bend or corrosion.

If damage, bend or corrosion is excessive, replace the rear differential member.

2) Check bushings of rear differential member for cracking, hardening or damage.

If cracking, hardening or damage is excessive, replace rear differential member.

8. General Diagnostic Table

A: INSPECTION

Symptom or trouble	Possible cause	Remedy
1. Oil leakage	(1) Worn, scratched, or incorrectly seated front or side oil seal. Cut-away, battered or excessively worn sliding surface of companion flange.	Correct or replace.
	(2) Clogged or damaged air breather.	Clean, repair or replace.
	(3) Loose bolts on the side retainer, or incorrectly fitted O-rings.	Tighten the bolts to specified torque. Replace the O-ring.
	(4) Loose rear cover attaching bolts or damaged gasket.	Tighten the bolts to specified torque. Replace gasket and apply liquid gasket.
	(5) Loose oil filler or drain plug.	Retighten and apply liquid gasket.
	(6) Wear, damage or incorrectly fitting for side retainer and oil seal.	Correct or replace.
2. Seizure NOTE: Incorrect or damaged parts should be replaced, and also other parts should be thoroughly checked for any defect and should be repaired or replaced as required.	(1) Improper backlash for hypoid gear.	Readjust or replace.
	(2) Excessive preload for side, rear or front bearing.	Readjust or replace.
	(3) Insufficient or improper oil used.	Replace the incorrect part and fill with specified oil to specified level.
3. Damage NOTE: Damaged parts should be replaced, and also other parts should be thoroughly checked for any defect and should be repaired or replaced as required.	(1) Improper backlash for hypoid gear.	Replace.
	(2) Insufficient or excessive preload for side, rear or front bearing.	Readjust or replace.
	(3) Excessive backlash for differential gear.	Replace gear or thrust washer.
	(4) Loose bolts and nuts such as hypoid driven gear bolt.	Retighten.
	(5) Damage due to overloading.	Replace.
4. Noises when starting or shifting gears NOTE: Noises may be caused by differential assembly, universal joint, wheel bearing, etc. Identify what is actually making noise before disassembling.	(1) Excessive backlash for hypoid gear.	Readjust.
	(2) Excessive backlash for differential gear.	Replace gear or thrust washer.
	(3) Insufficient preload for front or rear bearing.	Readjust.
	(4) Loose drive pinion nut.	Tighten to the specified torque.
	(5) Loose bolts and nuts such as side bearing retainer attaching bolt.	Tighten to the specified torque.
5. Noises when cornering	(1) Damaged differential gear.	Replace.
	(2) Excessive wear or damage of thrust washer.	Replace.
	(3) Broken pinion mate shaft.	Replace.
	(4) Seized or damaged side bearing.	Replace.

General Diagnostic Table

DIFFERENTIALS

Symptom or trouble	Possible cause	Remedy
6. Gear Noise NOTE: Since noises from engine, muffler, transmission, propeller shaft, wheel bearings, tires and body are sometimes mistaken for noises from differential assembly, be careful in checking them. Inspection methods to locate noises include coasting, accelerating, cruising, and jacking-up all four wheels. Perform these inspections according to the condition of trouble. When listening to noises, shift the gear into four wheel drive and fourth speed position, trying to pick up only differential noise.	(1) Improper tooth contact of hypoid gear.	Readjust or replace hypoid gear set.
	(2) Improper backlash for hypoid gear.	Readjust.
	(3) Scored or chipped teeth of hypoid gear.	Replace hypoid gear set.
	(4) Seized hypoid gear.	Replace hypoid gear set.
	(5) Improper preload for front or rear bearings.	Readjust.
	(6) Seized, cut-away or chipped front or rear bearing.	Replace.
	(7) Seized, cut-away or chipped side bearing.	Replace.
	(8) Differential gear is vibrating.	Replace.

1. General Description

A: NOTE

For a general description, refer to the “4AT” and the “5MT” sections.

AT model:

<Ref. to 4AT-2, General Description.>

MT model:

<Ref. to 5MT-2, General Description.>

2. Transfer Case and Extension Case Assembly

A: NOTE

For removal, installation and inspection, refer to the "5MT" section. <Ref. to 5MT-39, Transfer Case and Extension Case Assembly.>

3. Transfer Clutch

A: NOTE

For removal, installation and inspection, refer to the "4AT" section. <Ref. to 4AT-72, Transfer Clutch.>

4. Oil Seal

A: NOTE

For removal, installation and inspection, refer to the "4AT" or the "5MT" section.

AT model:

<Ref. to 4AT-45, Extension Case Oil Seal.>

MT model:

<Ref. to 5MT-33, Oil Seal.>

5. Transfer Drive Gear

A: NOTE

For removal, installation and inspection, refer to the "5MT" section. <Ref. to 5MT-43, Transfer Drive Gear.>

6. Transfer Driven Gear

A: NOTE

For removal, installation and inspection, refer to the "5MT" section. <Ref. to 5MT-45, Transfer Driven Gear.>

7. Reduction Drive Gear

A: NOTE

For removal, installation and inspection, refer to the "4AT" section. <Ref. to 4AT-82, Reduction Drive Gear.>

8. Reduction Driven Gear

A: NOTE

For removal, installation and inspection, refer to the "4AT" section. <Ref. to 4AT-80, Reduction Driven Gear.>

9. Center Differential

A: NOTE

For removal, installation and inspection, refer to the "5MT" section. <Ref. to 5MT-47, Center Differential.>

10. Transfer Clutch Pressure Test

A: NOTE

For inspection, refer to the "4AT" section.
<Ref. to 4AT-36, Transfer Clutch Pressure Test.>

Transfer Clutch Pressure Test

TRANSFER CASE

General Description

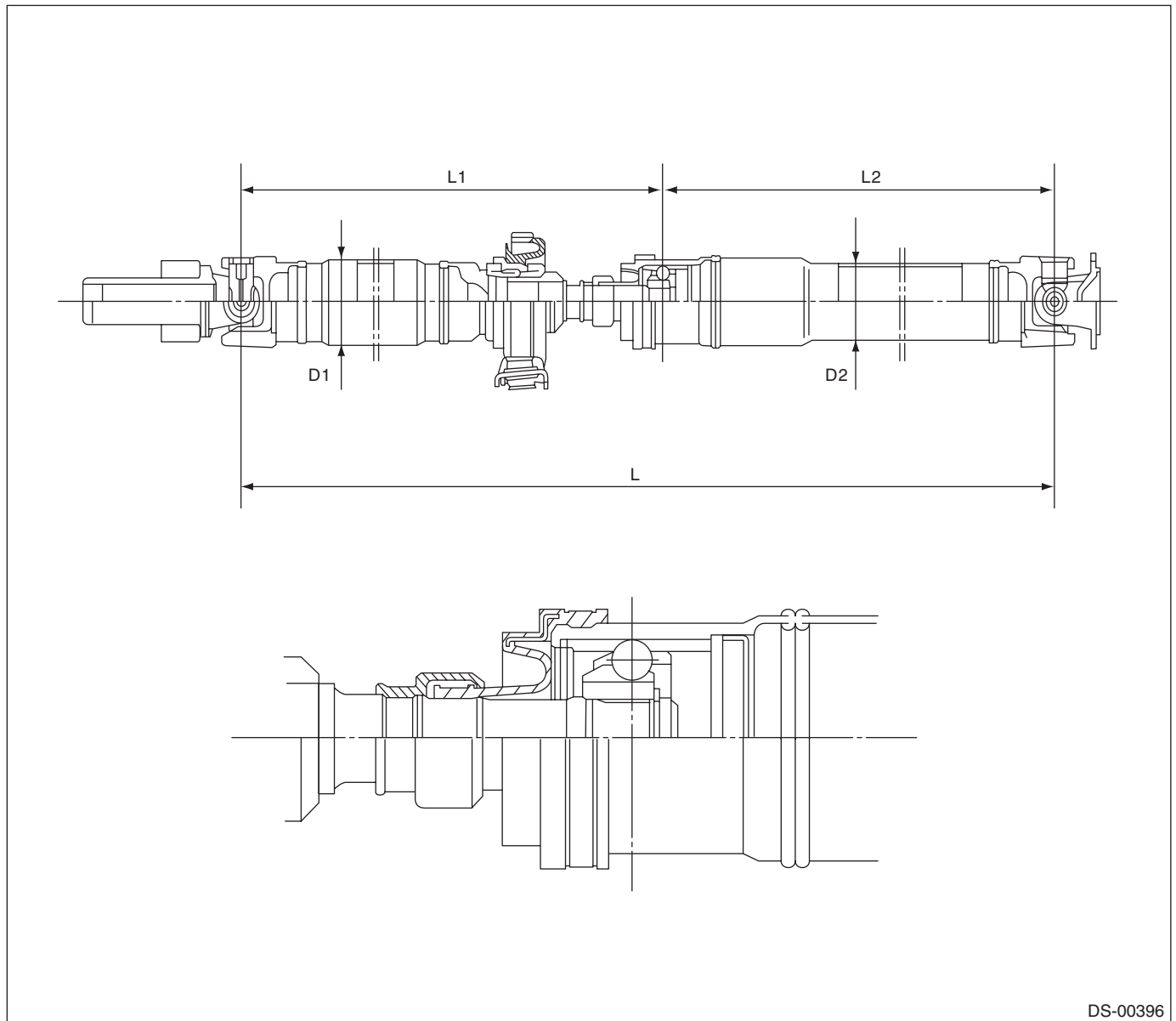
DRIVE SHAFT SYSTEM

1. General Description

A: SPECIFICATION

1. PROPELLER SHAFT

Model		AT	MT
Propeller shaft type		EDJ	
Propeller shaft length: L	mm (in)	1292 (50.87)	1352 (53.23)
Front propeller shaft joint-to-joint length: L ₁	mm (in)	608 (23.93)	668 (26.30)
Rear propeller shaft joint-to-joint length: L ₂	mm (in)	684 (26.93)	
Outer diameter of tube:	mm (in)	D ₁	63.5 (2.50)
		D ₂	57.5 (2.26)

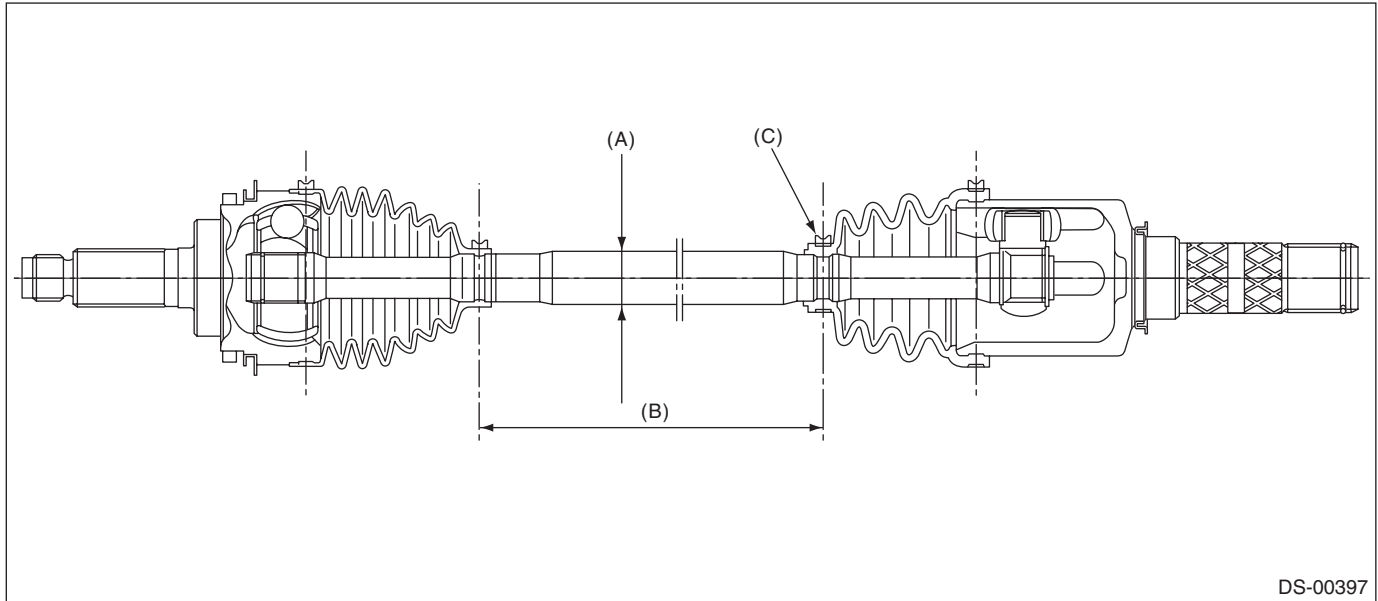


DS-00396

General Description

2. FRONT DRIVE SHAFT ASSEMBLY

Specification	Model	Boot band identification color	L1 mm (in)	ϕ D mm (in)
AC + AARi	Non-turbo, Turbo AT	Blue	319.8 (12.59)	24.9 (0.98)
	Turbo MT	—	320.2 (12.61)	24.9 (0.98)



DS-00397

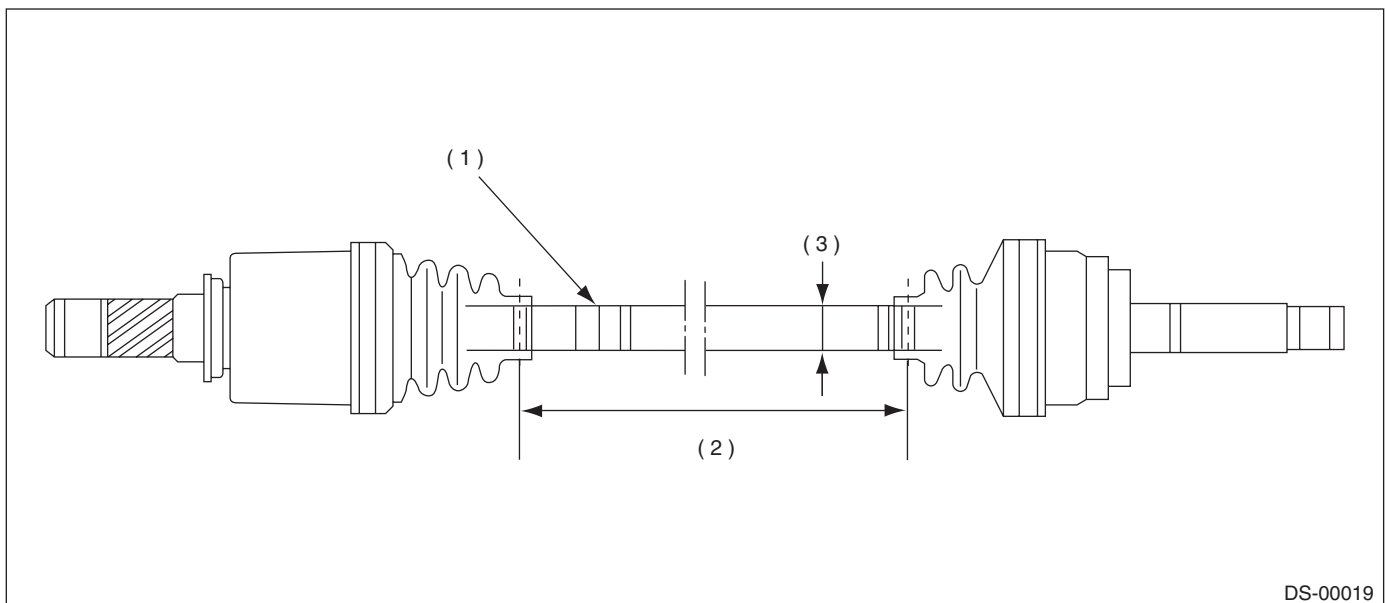
(A) ϕ D mm (in)

(B) L1 mm (in)

(C) Boot band

3. REAR DRIVE SHAFT ASSEMBLY

Specification	Model	No. of shaft identification groove	L1 mm (in)	ϕ D mm (in)
EBJ + DOJ RH	All models	2	367.4 (14.5)	24 (0.9)
EBJ + DOJ LH		1	357.4 (14.1)	24 (0.9)



DS-00019

(1) Identification groove

(2) L1 mm (in)

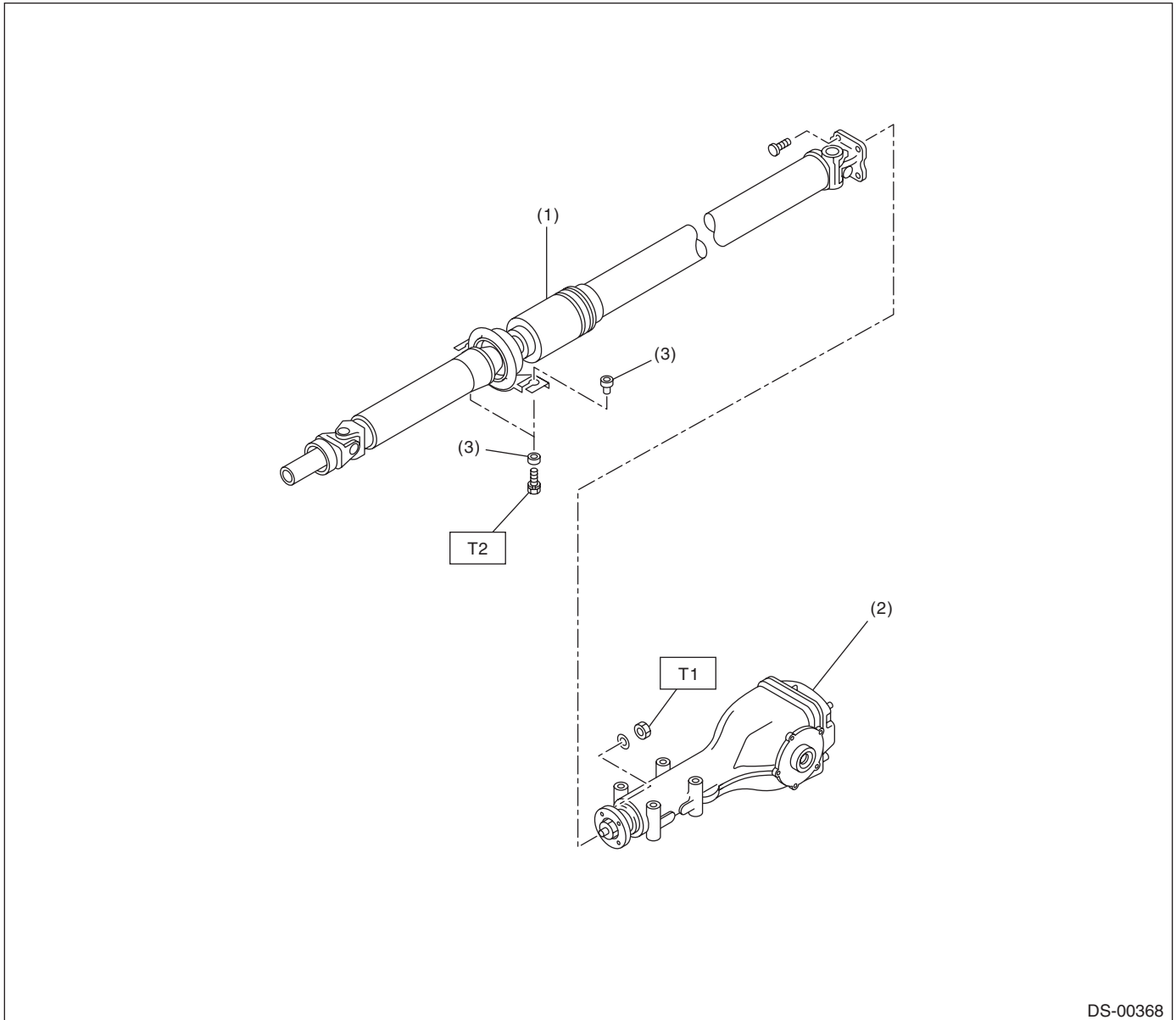
(3) ϕ D mm (in)

General Description

DRIVE SHAFT SYSTEM

B: COMPONENT

1. PROPELLER SHAFT



DS-00368

- (1) Propeller shaft
- (2) Rear differential

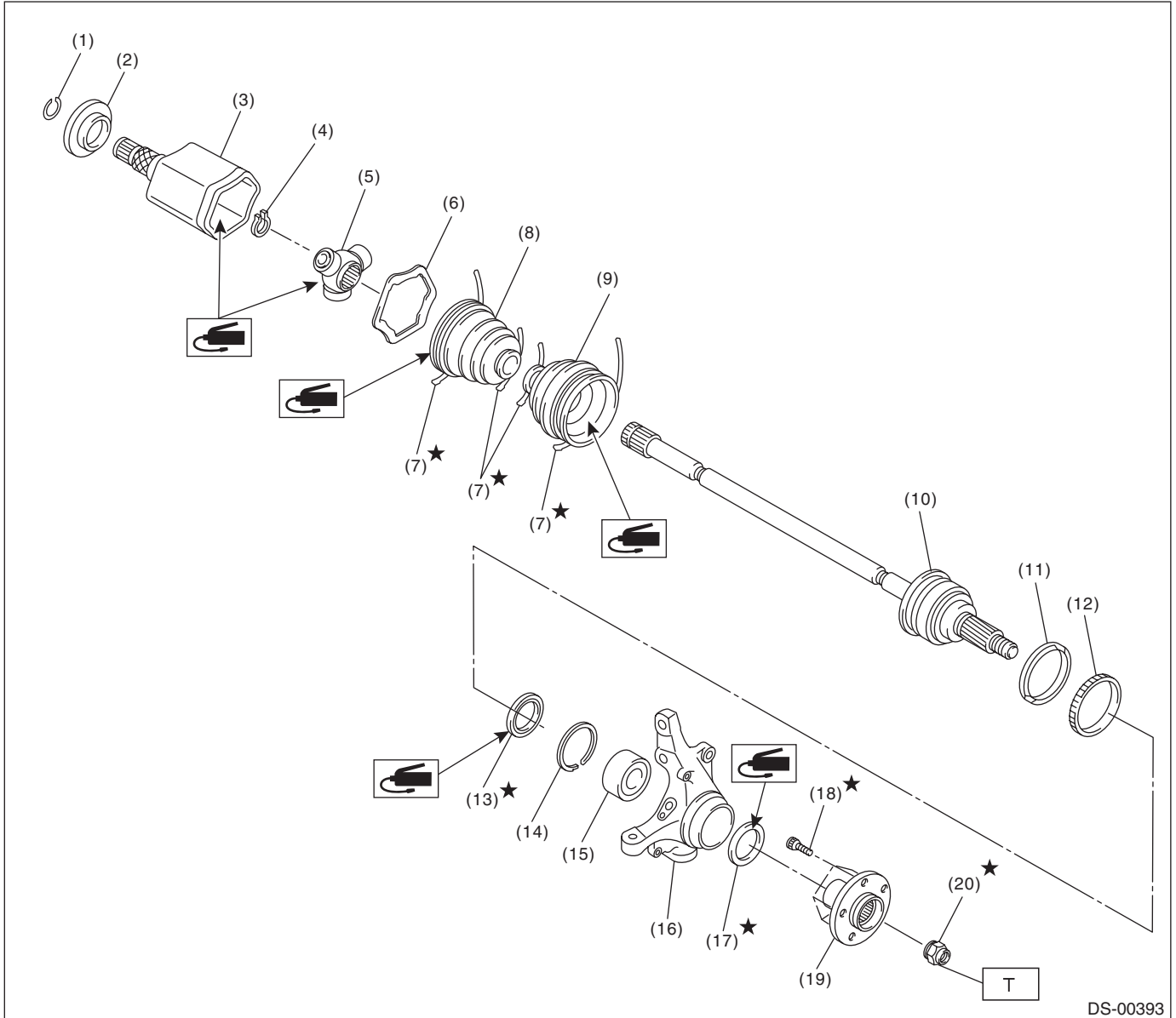
- (3) Bushing

Tightening torque: N·m (kgf·m, ft·lb)

T1: 31 (3.2, 23.1)

T2: 52 (5.3, 38.3)

2. FRONT AXLE



DS-00393

- | | | |
|------------------|---------------------|---------------------|
| (1) Circlip | (9) Boot (AC) | (17) Outer oil seal |
| (2) Baffle plate | (10) AC ASSY | (18) Hub bolt |
| (3) Outer race | (11) Baffle plate | (19) Hub |
| (4) Snap ring | (12) Tone wheel | (20) Axle nut |
| (5) Trunion | (13) Inner oil seal | |
| (6) Retainer | (14) Snap ring | |
| (7) Boot band | (15) Bearing | |
| (8) Boot (AARi) | (16) Housing | |

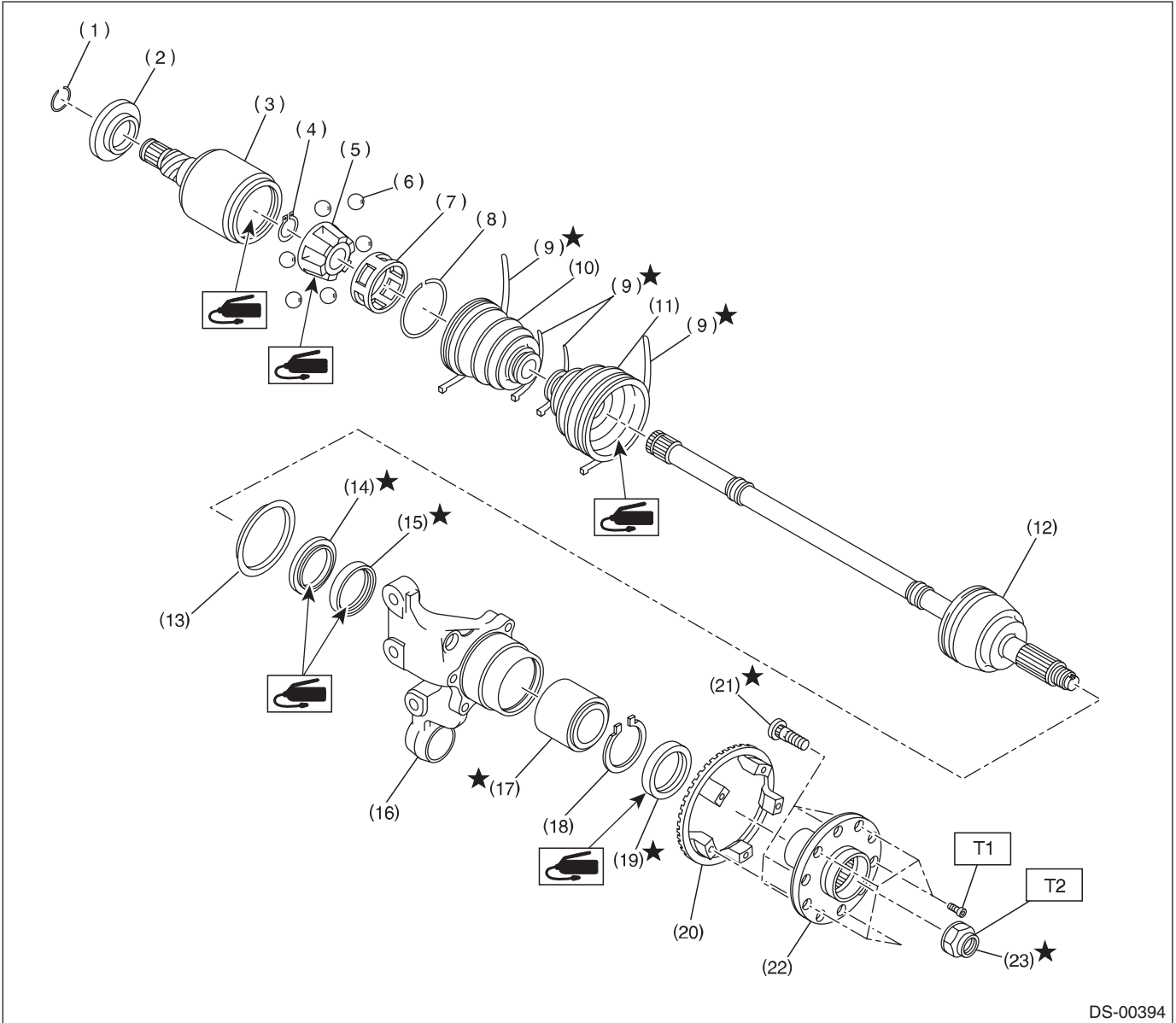
Tightening torque: N·m (kgf·m, ft·lb)

T: 220 (22.4, 162)

General Description

DRIVE SHAFT SYSTEM

3. REAR AXLE



DS-00394

- | | | |
|------------------------|-----------------------|---------------------|
| (1) Circlip | (10) DOJ (Boot) | (19) Outer oil seal |
| (2) Baffle plate (DOJ) | (11) Boot | (20) Tone wheel |
| (3) Outer race (DOJ) | (12) EBJ ASSY | (21) Hub bolt |
| (4) Snap ring | (13) Baffle plate | (22) Hub |
| (5) Inner race | (14) Inner oil seal 2 | (23) Axle nut |
| (6) Ball | (15) Inner oil seal 3 | |
| (7) Cage | (16) Housing | |
| (8) Circlip | (17) Bearing | |
| (9) Boot band | (18) Snap ring | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 13 (1.3, 9.4)

T2: 190 (19.4, 140)

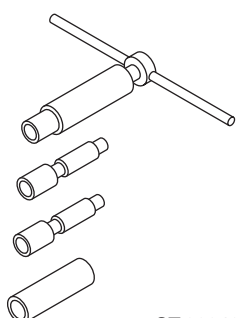
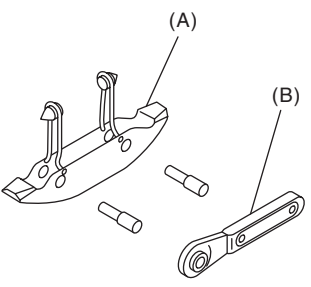
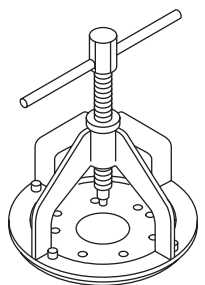
C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.

- Use SUBARU genuine grease etc. or equivalent. Do not mix grease etc. of different grades or manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Apply grease onto sliding or revolving surfaces before installation.
- Before installing snap rings, apply sufficient amount of grease to avoid damage and deformation.
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

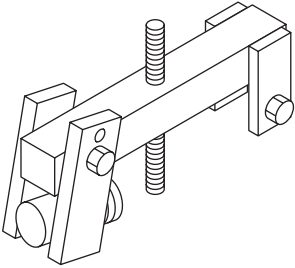
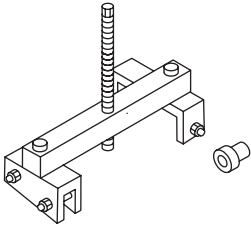
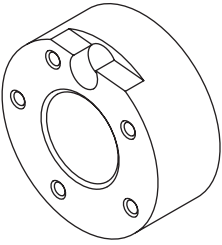
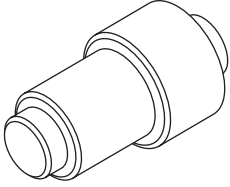
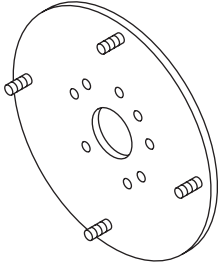
D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: right;">ST-922431000</p>	922431000	AXLE SHAFT INSTALLER	<ul style="list-style-type: none"> • Used for installing the axle shaft into housing. • Used together with ADAPTER (927390000).
 <p style="text-align: right;">ST-925091000</p>	925091000	BAND TIGHTENING TOOL	Used for tightening the boot band. (A) Jig for the band (B) Ratchet wrench
 <p style="text-align: right;">ST-926470000</p>	926470000	AXLE SHAFT PULLER	Used for removing the axle shaft.

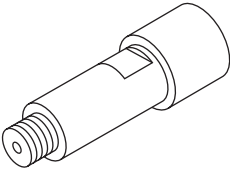
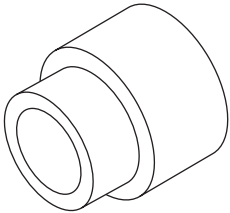
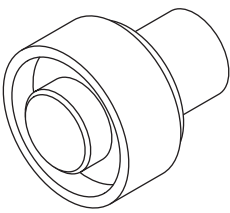
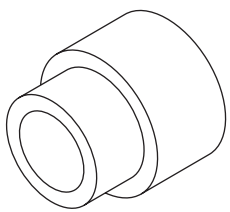
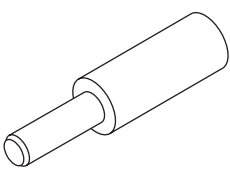
General Description

DRIVE SHAFT SYSTEM

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-927060000</p>	927060000	HUB REMOVER	<ul style="list-style-type: none"> • Used for removing front hub. • Used together with HUB STAND (927080000).
 <p style="text-align: center;">ST-927420000</p>	927420000	HUB REMOVER	<ul style="list-style-type: none"> • Used for removing rear hub. • Used together with HUB STAND (927080000).
 <p style="text-align: center;">ST-927080000</p>	927080000	HUB STAND	Used for disassembling and assembling hub bolt in hub.
 <p style="text-align: center;">ST-927100000</p>	927100000	BEARING PULLER	<ul style="list-style-type: none"> • Used for disassembling and assembling the front housing bearing. • Used together with HOUSING STAND (927400000).
 <p style="text-align: center;">ST-927140000</p>	927140000	AXLE SHAFT PULLER PLATE	Same as plate 2 included in AXLE SHAFT PULLER (926470000).

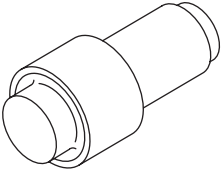
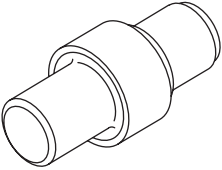
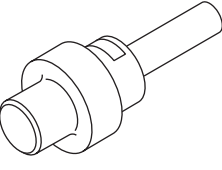
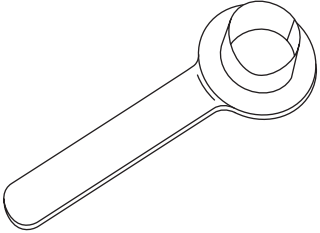
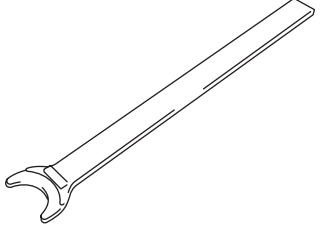
General Description

DRIVE SHAFT SYSTEM

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-927390000</p>	927390000	ADAPTER	Used as an adapter for AXLE SHAFT INSTALLER (922431000).
 <p style="text-align: center;">ST-927400000</p>	927400000	HOUSING STAND	<ul style="list-style-type: none"> • Used for disassembling and assembling the front housing bearing. • Used together with BEARING PULLER (927100000).
 <p style="text-align: center;">ST-927410000</p>	927410000	OIL SEAL INSTALLER	<ul style="list-style-type: none"> • Used for installing oil seal into front housing. • Used together with HOUSING STAND (927400000).
 <p style="text-align: center;">ST-927430000</p>	927430000	HOUSING STAND	<ul style="list-style-type: none"> • Used for disassembling and assembling rear housing bearing. • Used together with BEARING PULLER (927440000).
 <p style="text-align: center;">ST-927120000</p>	927120000	HUB INSTALLER	Used for installing hub.

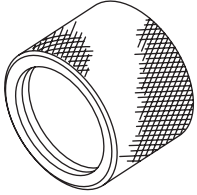
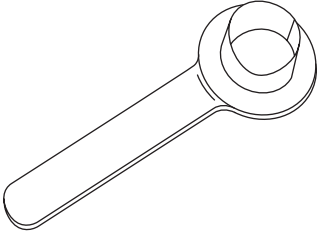
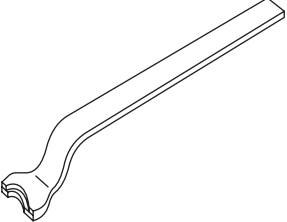
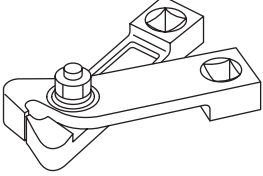
General Description

DRIVE SHAFT SYSTEM

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-927440000</p>	927440000	BEARING REMOVER	<ul style="list-style-type: none"> • Used for disassembling and assembling the rear wheel bearing. • Used together with HOUSING STAND (927430000).
 <p style="text-align: center;">ST-927460000</p>	927460000	OIL SEAL INSTALLER	<ul style="list-style-type: none"> • Used for installing the outer oil seal. • Used together with HOUSING STAND (927430000).
 <p style="text-align: center;">ST-927450000</p>	927450000	HUB INSTALLER	<ul style="list-style-type: none"> • Used for pressing in the hub bearing into the hub. • Used together with HUB STAND (927080000).
 <p style="text-align: center;">ST28399SA010</p>	28399SA010	OIL SEAL PROTECTOR	<ul style="list-style-type: none"> • Used for installing front drive shaft into front differential. • For protecting the oil seal.
 <p style="text-align: center;">ST28399SA000</p>	28399SA000	DRIVE SHAFT REMOVER	Used for removing the front drive shaft from the front differential.

General Description

DRIVE SHAFT SYSTEM

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST18675AA000	18675AA000	DIFFERENTIAL SIDE OIL SEAL INSTALLER	Used for installing the differential side retainer oil seal.
 ST28099PA090	28099PA090	OIL SEAL PROTECTOR	<ul style="list-style-type: none"> • Used for installing the rear drive shaft to the rear differential. • For protecting the oil seal.
 ST28099PA100	28099PA100	DRIVE SHAFT REMOVER	Used for removing the rear drive shaft from the rear differential.
 ST28099AC000	28099AC000	BOOT BAND PLIER	Used for tightening front AC boot band.

2. GENERAL TOOL

TOOL NAME	REMARKS
Puller	Used for removing the ball joint from knuckle arm.
Dial gauge	Used for inspecting the propeller shaft run-out.
Snap ring pliers	Used for installing and removing the snap ring.
Extension cap	When removing the propeller shaft, used to prevent gear oil or ATF fluid from leaking.

Propeller Shaft

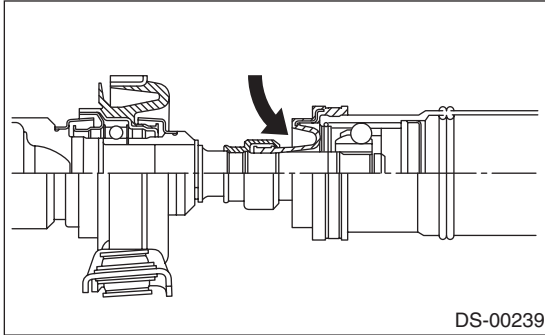
DRIVE SHAFT SYSTEM

2. Propeller Shaft

A: REMOVAL

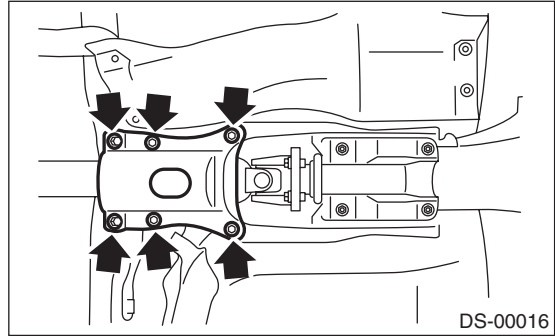
NOTE:

- Before removing propeller shaft, wrap metal parts with a cloth or rubber material.
- In case of a EDJ type, wrap the metal parts at the rubber boot of EDJ with a cloth or rubber material before removing propeller shaft, as shown in the figure. Rubber boot may be damaged due to interference with adjacent metal parts while bending the EDJ during removal.

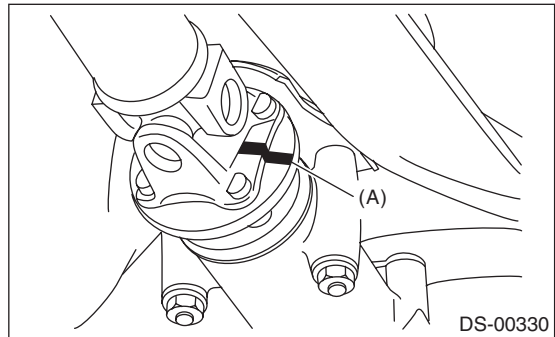


- 1) Disconnect the ground cable from the battery.
- 2) Move the select lever or the gear shift lever to "N".
- 3) Release the parking brake.
- 4) Jack-up the vehicle and support it with rigid racks.
- 5) Remove the center exhaust pipe.
Non-turbo model
<Ref. to EX (H4SO)-7, REMOVAL, Center Exhaust Pipe.>
Turbo model
<Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>
- 6) Remove the rear exhaust pipe and muffler.
Non-turbo model
<Ref. to EX (H4SO)-8, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX (H4SO)-9, REMOVAL, Muffler.>
Turbo model
<Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-15, REMOVAL, Muffler.>

- 7) Remove the differential mount front cover.

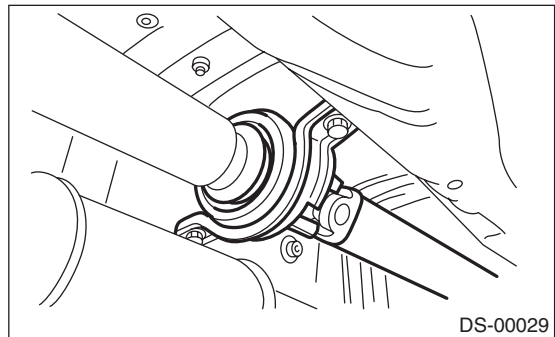


- 8) Apply alignment marks on appropriate parts before removal.



(A) Alignment mark

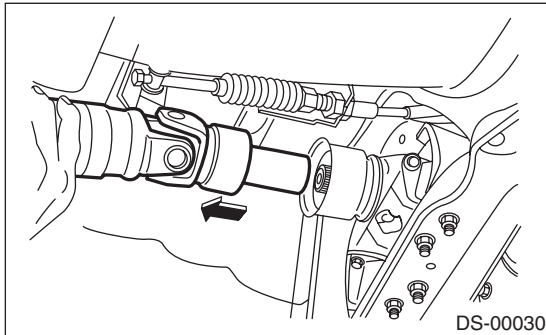
- 9) Remove the three bolts holding the propeller shaft to the rear differential.
- 10) Remove the remaining bolt.
- 11) Remove the two bolts which hold center bearing to the body.



12) Remove the propeller shaft from transmission.

CAUTION:

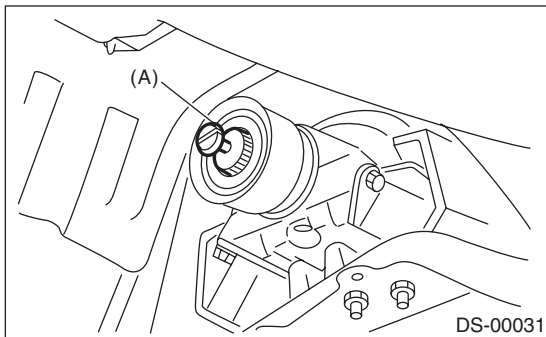
- Be careful not to damage the oil seals and contact surface of the sleeve yoke.
- Cover the center exhaust pipe with a cloth to keep off any ATF or oil spilled from transmission when removing the propeller shaft.



13) Install an extension cap to the transmission.

NOTE:

If an extension cap is not available, place a vinyl bag over the opening and tie with string to prevent gear oil or ATF from leaking.



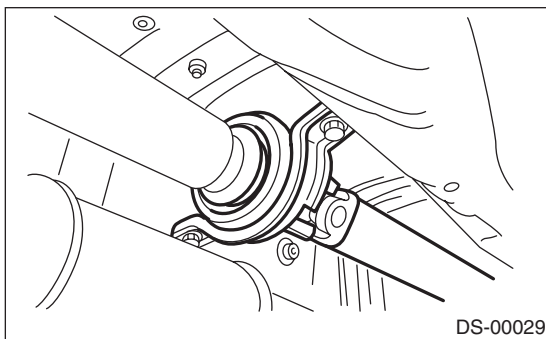
(A) Extension cap

B: INSTALLATION

1) Insert the sleeve yoke into the transmission and attach the center bearing to the body.

Tightening torque:

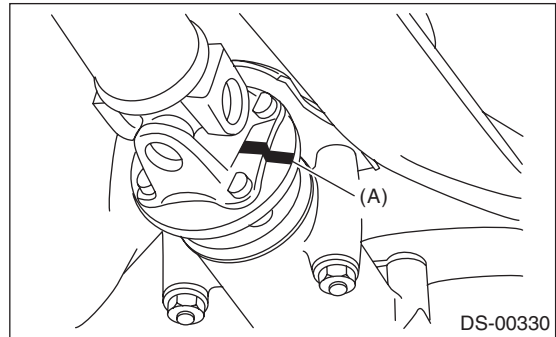
52 N·m (5.3 kgf·m, 38.3 ft·lb)



2) Align the alignment marks and connect the flange yoke and rear differential.

Tightening torque:

31 N·m (3.2 kgf·m, 23.1 ft·lb)



(A) Alignment mark

3) Using new bolts, install the differential mount front cover.

(1) Temporarily tighten the bolt A while pushing the cover towards the front of the vehicle.

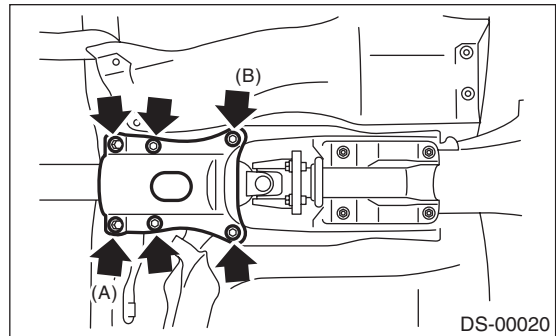
(2) Tighten the bolts B to the specified torque.

(3) Tighten the bolts A to the specified torque.

(4) Tighten the remaining bolts to the specified torque.

Tightening torque:

90 N·m (9.2 kgf·m, 66 ft·lb)



4) Install the center exhaust pipe.

Non-turbo model

<Ref. to EX (H4SO)-7, INSTALLATION, Center Exhaust Pipe.>

Turbo model

<Ref. to EX(H4DOTC)-9, INSTALLATION, Center Exhaust Pipe.>

5) Install the rear exhaust pipe and muffler.

Non-turbo model

<Ref. to EX (H4SO)-8, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX (H4SO)-9, INSTALLATION, Muffler.>

Turbo model

<Ref. to EX(H4DOTC)-14, INSTALLATION, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-15, INSTALLATION, Muffler.>

Propeller Shaft

DRIVE SHAFT SYSTEM

C: INSPECTION

NOTE:

Do not disassemble the propeller shaft. Check the following items and replace if necessary.

- 1) Dents or cracks on the tube surface
- 2) Deformation or uneven wear on the splines
- 3) Unsmooth joint operation or abnormal noise
- 4) Center bearing free play, noise or unsmooth operation.
- 5) Uneven wear or damaged oil seal
- 6) Damaged center bearing

Check the following points with the propeller shaft installed in the vehicle.

1. JOINTS AND CONNECTIONS

- 1) Remove the center exhaust pipe.

Non-turbo model

<Ref. to EX (H4SO)-7, REMOVAL, Center Exhaust Pipe.>

Turbo model

<Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>

- 2) Remove the heat shield cover. (If equipped)
- 3) Check for any looseness of the yoke flange mounting bolts which connect to the rear differential and center bearing bracket mounting bolts.

2. SPLINES AND BEARING LOCATIONS

- 1) Remove the center exhaust pipe.

Non-turbo model

<Ref. to EX (H4SO)-7, REMOVAL, Center Exhaust Pipe.>

Turbo model

<Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>

- 2) Remove the rear exhaust pipe and muffler.

Non-turbo model

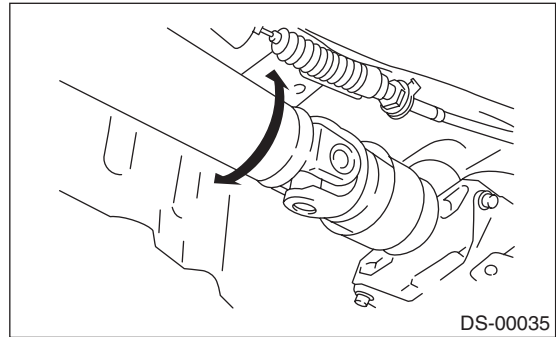
<Ref. to EX (H4SO)-8, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX (H4SO)-9, REMOVAL, Muffler.>

Turbo model

<Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-15, REMOVAL, Muffler.>

- 3) Remove the heat shield cover. (If equipped)

- 4) Turn the propeller shaft by hand to see if there is any excessive free play in the splines. Also move the yoke to see if there is any excessive free play at the spiders or bearings.



3. RUNOUT OF PROPELLER SHAFT

- 1) Remove the center exhaust pipe.

Non-turbo model

<Ref. to EX (H4SO)-7, REMOVAL, Center Exhaust Pipe.>

Turbo model

<Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>

- 2) Remove the rear exhaust pipe and muffler.

Non-turbo model

<Ref. to EX (H4SO)-8, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX (H4SO)-9, REMOVAL, Muffler.>

Turbo model

<Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-15, REMOVAL, Muffler.>

- 3) Remove the heat shield cover. (If equipped)

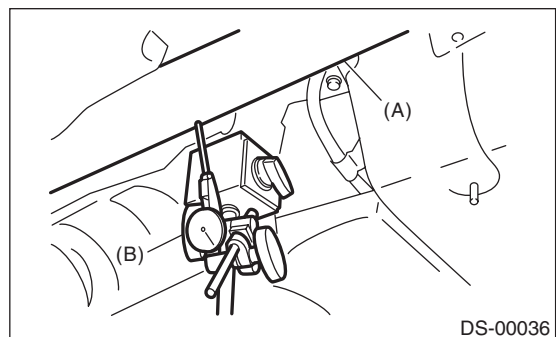
4) Set the dial gauge with its indicator stem at the center of the propeller shaft tube.

5) Turn the propeller shaft slowly by hands to check for runout of the propeller shaft.

Runout:

Limit:

0.6 mm (0.024 in)



(A) Propeller shaft

(B) Dial gauge

4. CENTER BEARING FREE PLAY

1) Remove the front and center exhaust pipes.

Non-turbo model

<Ref. to EX (H4SO)-4, REMOVAL, Front Exhaust Pipe.> <Ref. to EX (H4SO)-7, REMOVAL, Center Exhaust Pipe.>

Turbo model

<Ref. to EX(H4DOTC)-6, REMOVAL, Front Exhaust Pipe.> <Ref. to EX(H4DOTC)-8, REMOVAL, Center Exhaust Pipe.>

2) Remove the rear exhaust pipe and muffler.

Non-turbo model

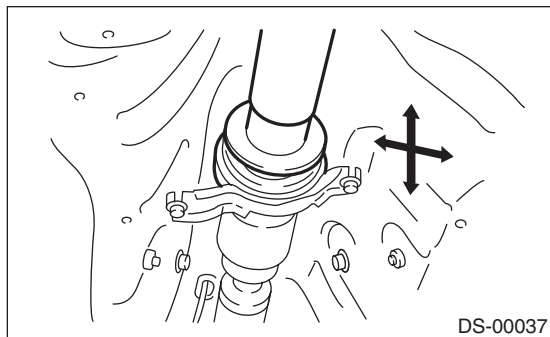
<Ref. to EX (H4SO)-8, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX (H4SO)-9, REMOVAL, Muffler.>

Turbo model

<Ref. to EX(H4DOTC)-13, REMOVAL, Rear Exhaust Pipe.> <Ref. to EX(H4DOTC)-15, REMOVAL, Muffler.>

3) Remove the heat shield cover. (If equipped)

4) Move the propeller shaft near the center bearing up, down, left, right by hand, to check for any abnormal free play of the bearings.



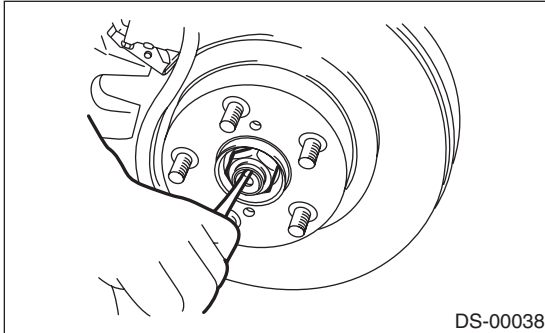
Front Axle

DRIVE SHAFT SYSTEM

3. Front Axle

A: REMOVAL

- 1) Lift-up the vehicle, and remove the front wheels.
- 2) Lift the crimped section of axle nut.

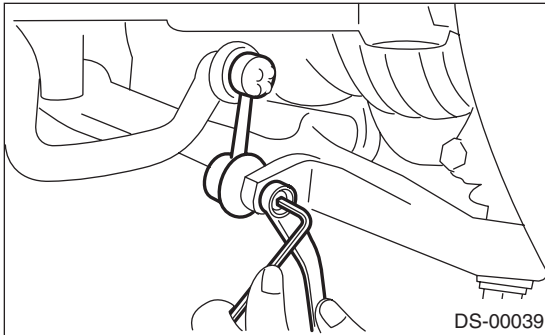


- 3) Remove the axle nut using a socket wrench while depressing the brake pedal.

CAUTION:

Remove the axle nut while there is no load being applied to the axle. Failure to do so may damage the wheel bearings.

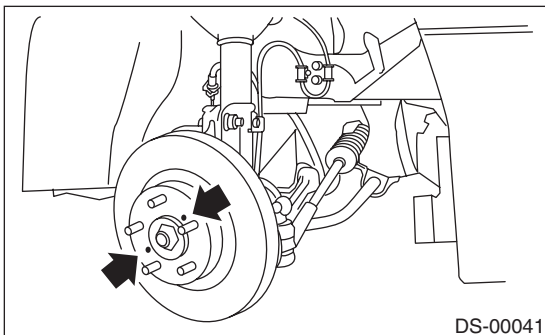
- 4) Remove the stabilizer link.



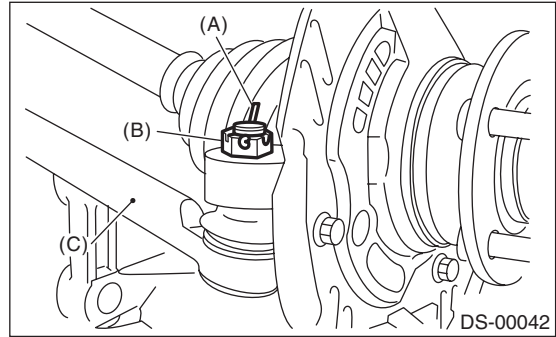
- 5) Remove the disc brake caliper from the housing, and suspend it from strut using a wire.
- 6) Remove the disc rotor from the hub.

NOTE:

If the disc rotor seizes up within hub, drive disc rotor out by installing an 8 mm bolt in screw hole on the rotor.

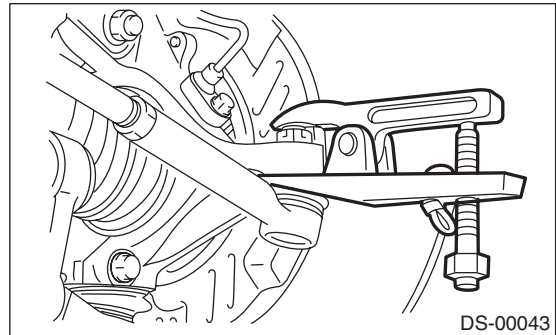


- 7) Remove the cotter pin and castle nut securing the tie-rod end to the housing knuckle arm.

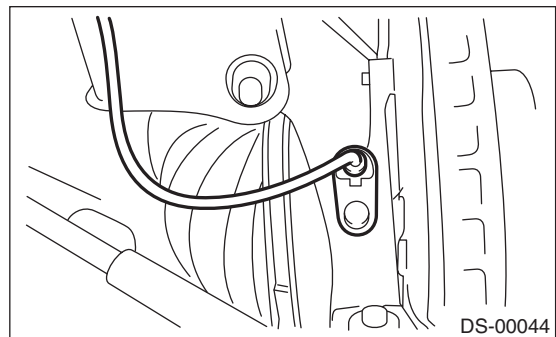


- (A) Cotter pin
- (B) Castle nut
- (C) Tie-rod

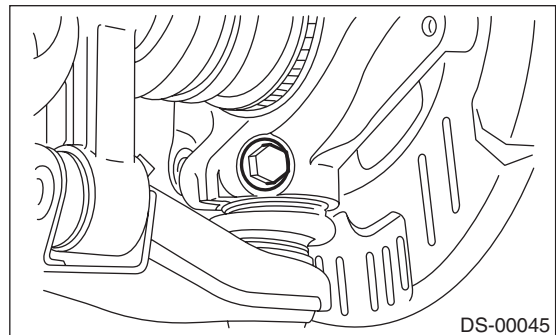
- 8) Using a puller, remove the tie-rod ball joint from knuckle arm.



- 9) Remove the ABS wheel speed sensor assembly and harness.



- 10) Remove the transverse link ball joint from the housing.



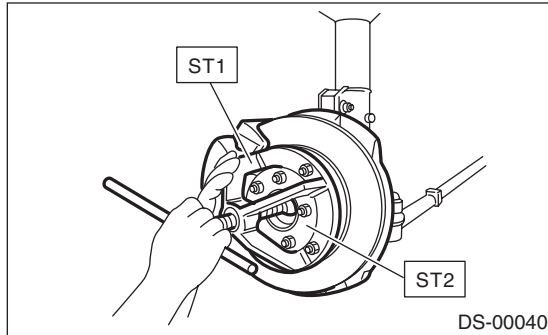
11) Remove the front drive shaft assembly from the hub. If it is hard to remove, use the STs.

ST1 926470000 AXLE SHAFT PULLER
 ST2 927140000 AXLE SHAFT PULLER
 PLATE

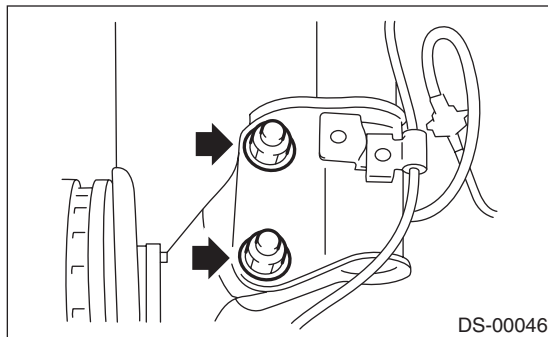
CAUTION:

Whenever the front drive shaft has been pulled out, always replace the differential side retainer oil seal on the transmission side with a new seal.

12) Hang the front drive shaft on the vehicle body using a wire.



13) After scribing an alignment mark on the camber adjusting bolt head, remove bolts connecting the housing and strut, and disconnect the housing from the strut.



B: INSTALLATION

- 1) Temporarily tighten the front axle to the front strut.
- 2) Insert the front drive shaft into the front axle.
- 3) Tighten the axle nut temporarily.
- 4) Install the transverse link ball joint to the housing.

Tightening torque:

50 N·m (5.1 kgf-m, 37 ft-lb)

5) Align the alignment mark on the camber adjusting bolt head, and tighten the housing and strut using a new self-locking nut.

Tightening torque:

175 N·m (17.8 kgf-m, 129 ft-lb)

6) Install the tie-rod end ball joint to the knuckle arm using the castle nut.

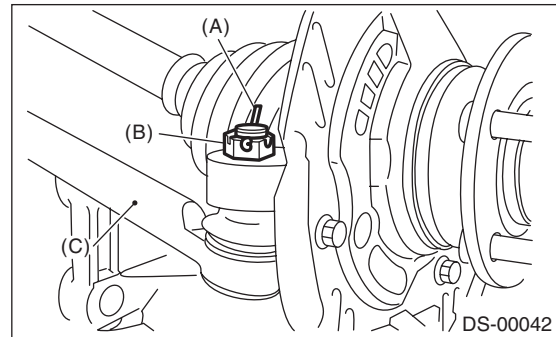
Tightening torque:

27 N·m (2.75 kgf-m, 19.9 ft-lb)

CAUTION:

When connecting the tie-rod, do not hit the cap at bottom of tie-rod end with a hammer.

7) Tighten the castle nut to specified torque and tighten further within 60° until the pin hole is aligned with the slot in nut. Bend the cotter pin to lock.



- (A) Cotter pin
- (B) Castle nut
- (C) Tie-rod

8) Install the disc rotor to hub.

9) Install the disc brake caliper on the housing.

Tightening torque:

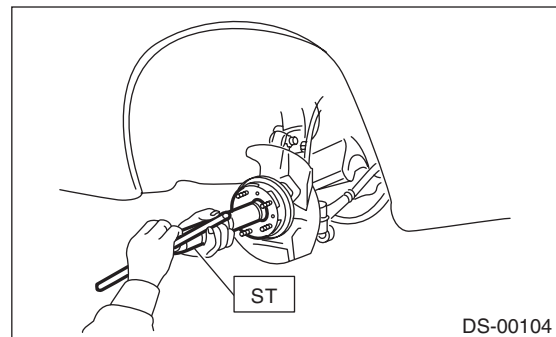
80 N·m (8.2 kgf-m, 59 ft-lb)

10) Connect the stabilizer link.

11) Using ST1 and ST2, pull the front drive shaft into the required position.

ST1 922431000 AXLE SHAFT INSTALLER

ST2 927390000 ADAPTER



12) While pressing the brake pedal, tighten a new axle nut to the specified torque.

Tightening torque:

220 N·m (22.4 kgf-m, 162 ft-lb)

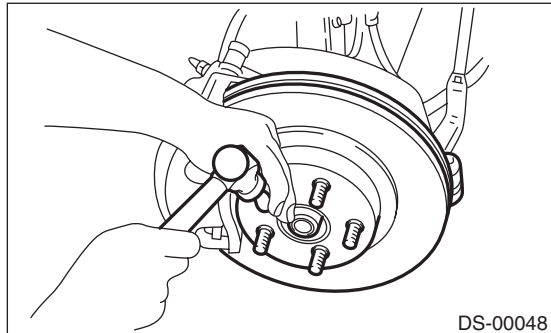
CAUTION:

Be sure to tighten the axle nut to specified torque. Do not overtighten it as this may damage the wheel bearing.

Front Axle

DRIVE SHAFT SYSTEM

13) After tightening the axle nut, lock it securely.



14) Install the ABS wheel speed sensor on the housing.

Tightening torque:

32 N·m (3.3 kgf·m, 24 ft·lb)

15) Install the wheel and tighten the wheel nuts to specified torque.

Tightening torque:

100 N·m (10.2 kgf·m, 73.8 ft·lb)

16) Inspect the wheel alignment and adjust if necessary.

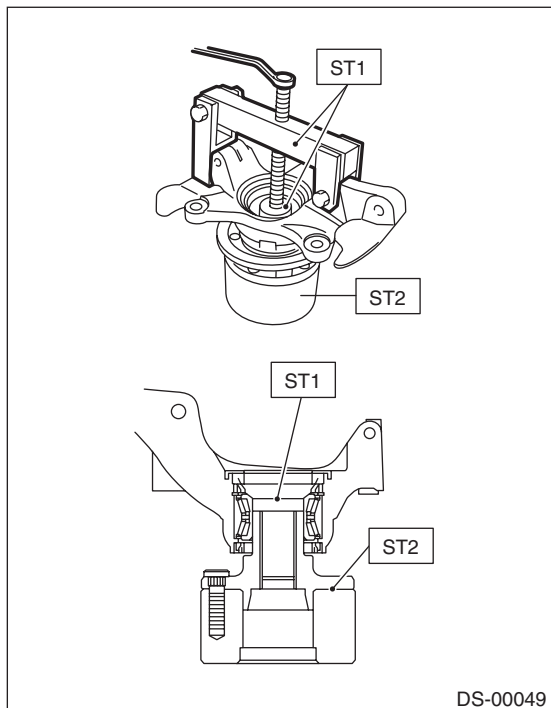
C: DISASSEMBLY

1) Using ST1, securely support the housing and hub.

2) Attach ST2 to housing and drive hub out.

ST1 927060000 HUB REMOVER

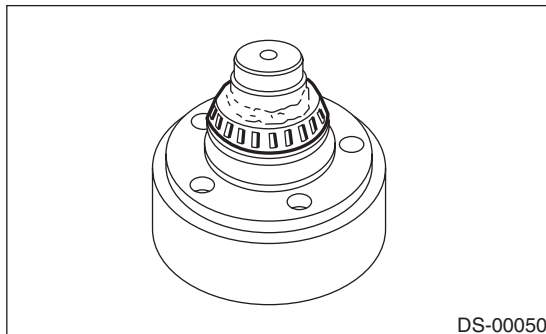
ST2 927080000 HUB STAND



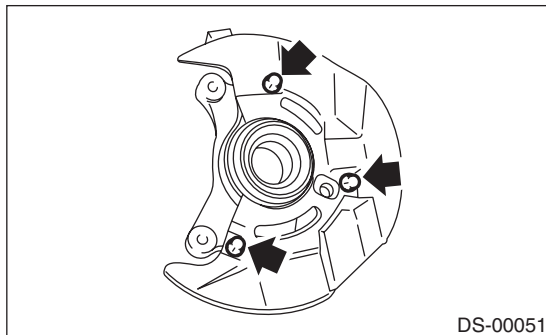
If inner bearing race remains in the hub, remove it with a suitable tool (commercially available tools).

CAUTION:

Be careful not to scratch the polished area of the hub.



3) Remove the disc cover from housing.

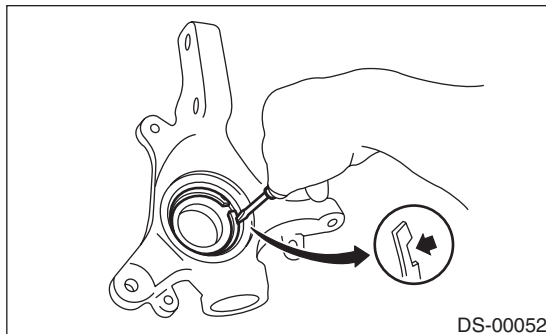


4) Remove the outer and inner oil seals using a flat tip screwdriver.

5) Remove the snap ring using a flat tip screwdriver.

CAUTION:

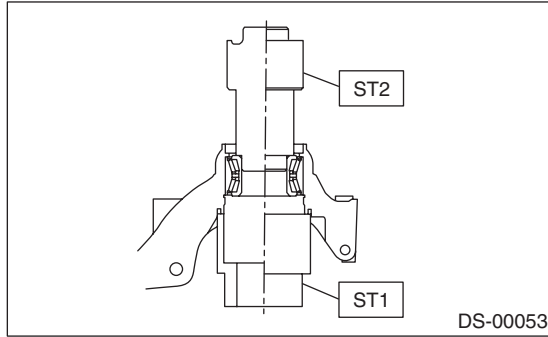
Be careful not to damage the housing during removal.



6) Using ST1, securely support the housing.

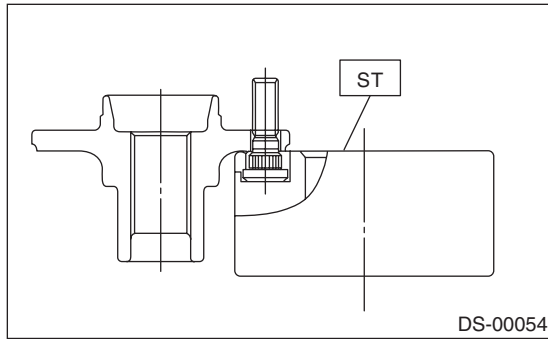
7) Using ST2, press the inner race, and push out the outer race of the bearing.

ST1 927400000 HOUSING STAND
ST2 927100000 BEARING PULLER



8) Using the ST and a hydraulic press, push out the hub bolts.

ST 927080000 HUB STAND



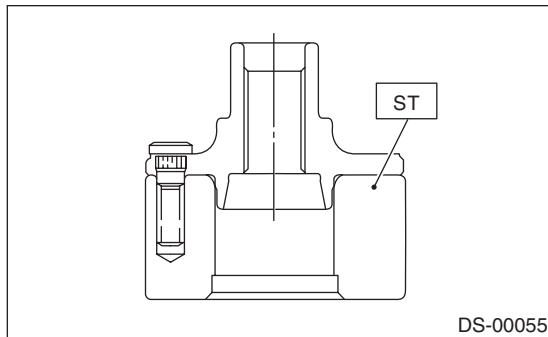
D: ASSEMBLY

NOTE:

When the hub is removed from housing, replace the bearing set and oil seal with new parts.

1) Attach the hub to the ST securely.

ST 927080000 HUB STAND



2) Using a press, press the new hub bolts until their seating surfaces contact the hub.

NOTE:

Use the 12 mm (0.47 in) dia. holes in the HUB STAND to prevent bolts from tilting.

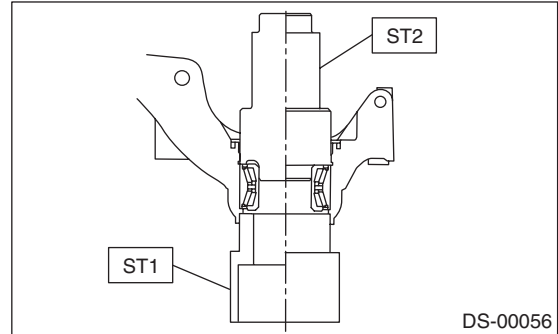
3) Clean the dust or foreign particles from inside the housing.

4) Using ST1 and ST2, press a new bearing into place.

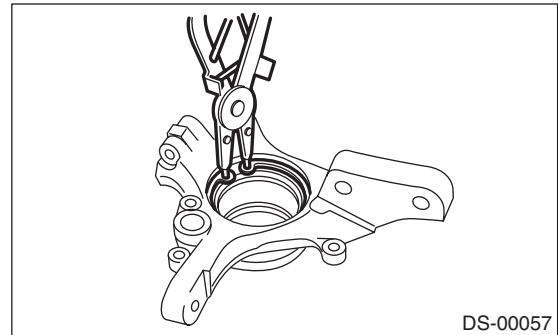
ST1 927400000 HOUSING STAND
ST2 927100000 BEARING PULLER

CAUTION:

- Always press the outer race when installing bearings.
- Be careful not to remove the plastic lock from the inner race when installing the bearings.

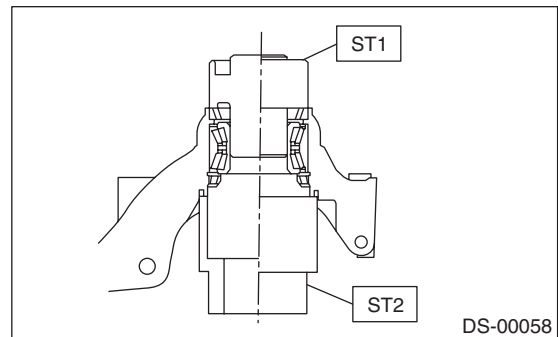


5) Using a pliers, securely install the snap ring.



6) Using the ST1 and ST2, press the outer oil seal until it contacts the bottom of housing.

ST1 927410000 OIL SEAL INSTALLER
ST2 927400000 HOUSING STAND

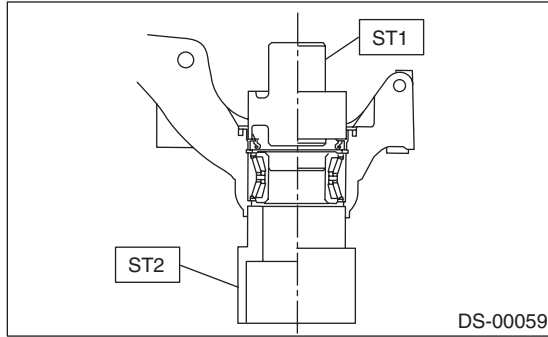


Front Axle

DRIVE SHAFT SYSTEM

7) Using the ST1 and ST2, press the inner oil seal until it contacts the circlip.

ST1 927410000 OIL SEAL INSTALLER
ST2 927400000 HOUSING STAND



8) Invert the ST and housing (up and down).

ST 927400000 HOUSING STAND

9) Apply sufficient grease to the oil seal lip.

Grease:

SHELL 6459N

NOTE:

If specified grease is not available, remove the bearing grease and apply Auto Rex A instead.

CAUTION:

Do not mix different types of grease.

10) Install the disc cover to housing with three bolts.

Tightening torque:

18 N·m (1.8 kgf·m, 13.0 ft·lb)

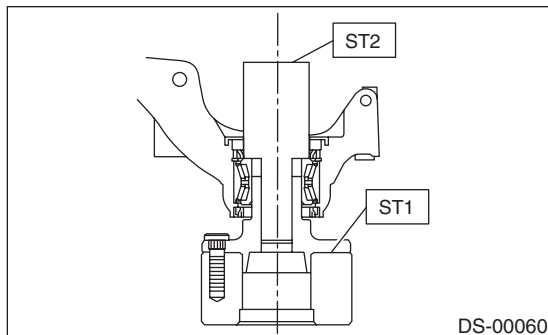
11) Attach the hub to ST1 securely.

12) Clean dust and foreign particles from the polished surface of hub.

13) Place ST2 against the bearing inner race to press the bearing into the hub.

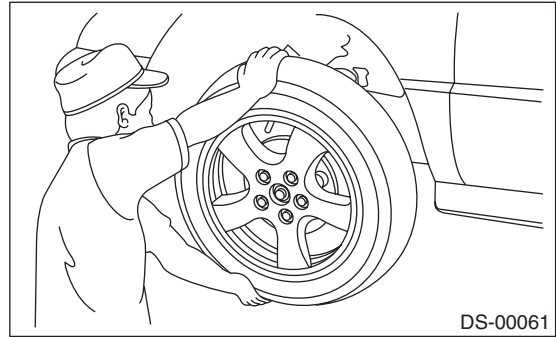
ST1 927080000 HUB STAND

ST2 927120000 HUB INSTALLER



E: INSPECTION

1) While moving the front tire up and down by hand, check that there is no looseness in the bearing, and check that the wheel rotates smoothly.

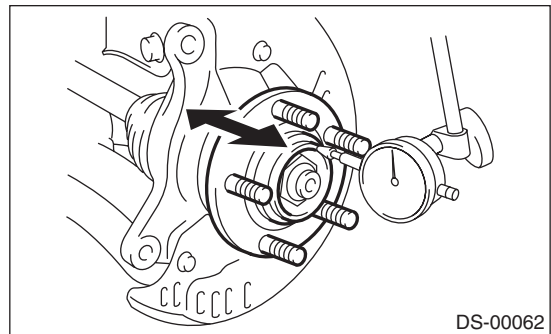


2) Inspect the play in the axial direction using a dial gauge. Replace the hub bearing if the play exceeds the limit value.

Limit:

Max:

0.05 mm (0.0020 in)



4. Rear Axle

A: REMOVAL

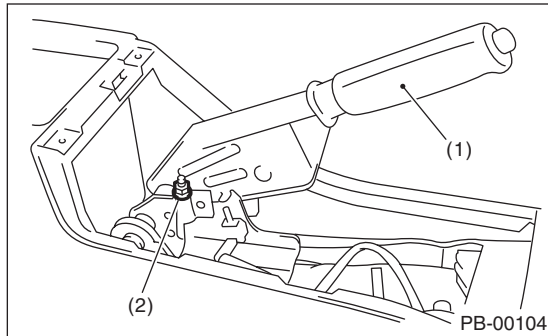
1. DISC BRAKE

- 1) Disconnect the ground cable from the battery.
- 2) Lift-up the vehicle, and then remove the rear wheels.
- 3) Lift the crimped section of axle nut.
- 4) While applying the parking brake, remove the axle nut using a socket wrench.

CAUTION:

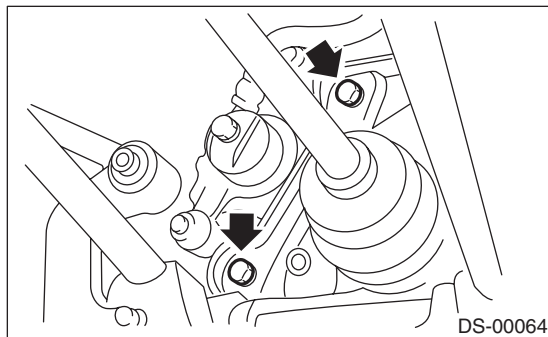
Remove the axle nut while there is no load being applied to the axle. Failure to do so may damage the wheel bearings.

- 5) Return the parking brake lever and loosen the self locking nut.



- (1) Parking brake lever
- (2) Self-locking nut

- 6) Remove the disc brake caliper from the back plate, and suspend it from strut using a piece of wire.

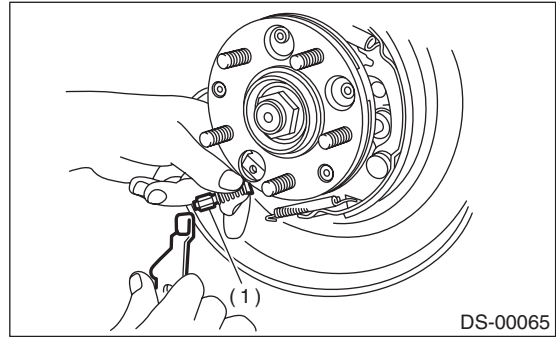


- 7) Remove the disc rotor from the hub.

NOTE:

If the disc rotor seizes up within hub, drive disc rotor out by installing an 8 mm bolt in screw hole on the rotor.

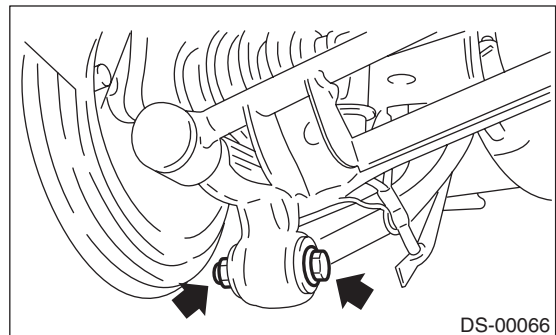
- 8) Disconnect the parking brake cable end from the parking lever.



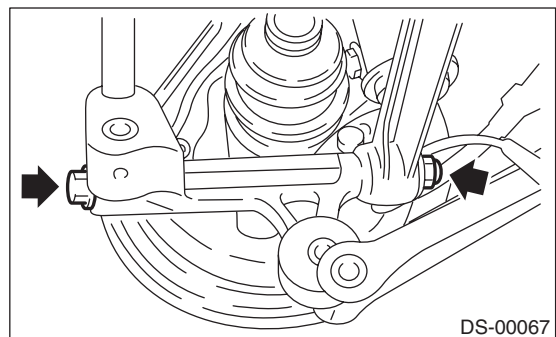
- (1) Cable end

- 9) Disconnect the rear stabilizer from the rear lateral link.

- 10) Remove the bolts which secure the trailing link assembly to the rear housing.



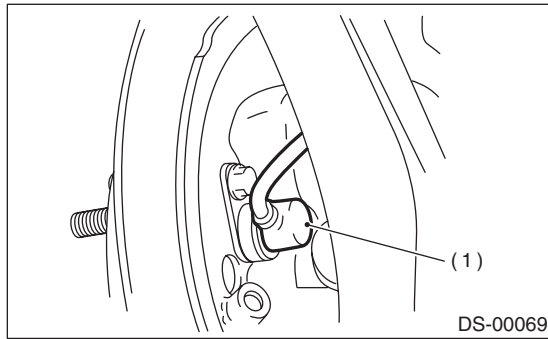
- 11) Remove the bolts which secure the lateral assembly to the rear housing.



Rear Axle

DRIVE SHAFT SYSTEM

12) Remove the rear ABS wheel speed sensor from the back plate.



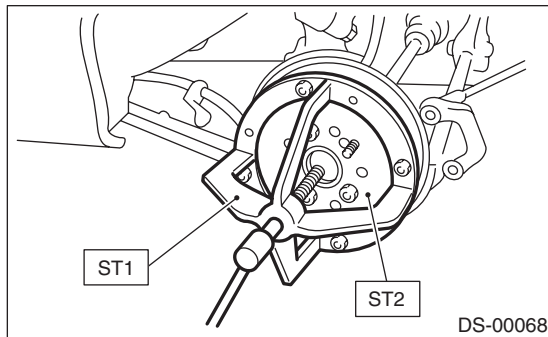
(1) ABS wheel speed sensor

13) Disengage the BJ assembly from the hub splines, and remove the rear drive shaft assembly. If it is hard to remove, use the STs.

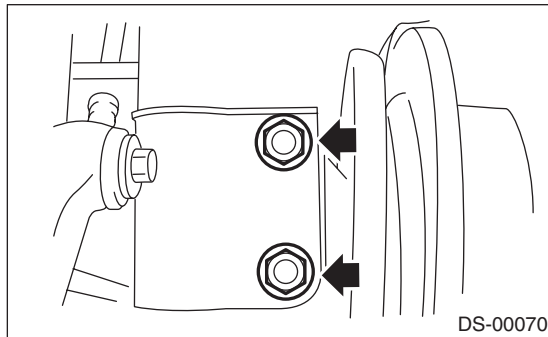
ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 AXLE SHAFT PULLER PLATE

CAUTION:

- Be careful not to damage the oil seal lip when removing the rear drive shaft.
- When rear drive shaft is to be replaced, also replace the inner oil seal with a new seal.



14) Remove the bolts which secure the rear housing to strut, and separate the two.



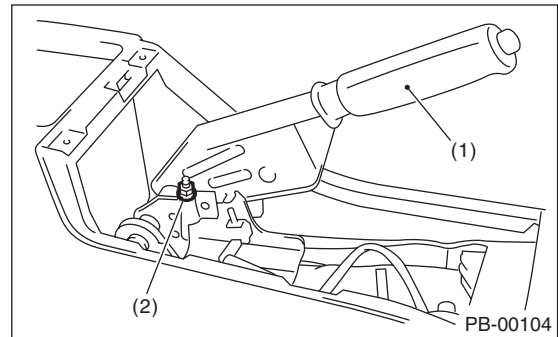
2. DRUM BRAKE

- 1) Disconnect the ground cable from the battery.
- 2) Lift-up the vehicle, and then remove the rear wheels.
- 3) Lift the crimped section of axle nut.
- 4) While applying the parking brake, remove the axle nut using a socket wrench.

CAUTION:

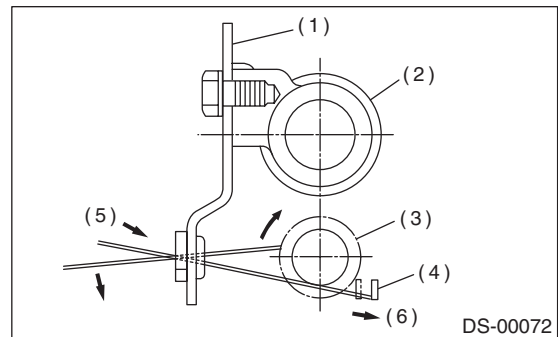
Remove the axle nut while there is no load being applied to the axle. Failure to do so may damage the wheel bearings.

- 5) Return the parking brake lever and loosen the self locking nut.



(1) Parking brake lever
(2) Self-locking nut

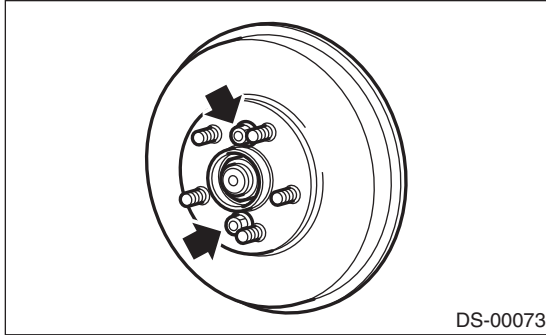
- 6) Remove the brake drum from hub.
- 7) If it is difficult to remove brake drum, remove the adjusting hole cover from the back plate, and then turn the adjusting screw using a slot-type screwdriver until the brake shoe separates from the drum.



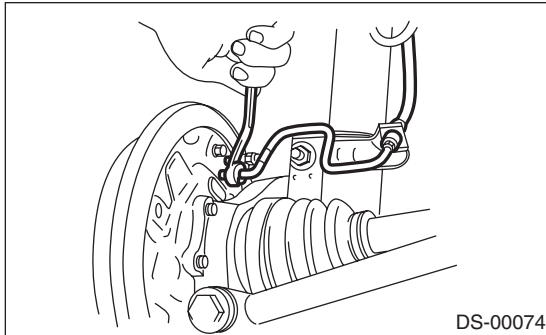
(1) Back plate
(2) Wheel cylinder
(3) Adjuster ASSY pole
(4) Adjusting lever
(5) Tightening direction
(6) Press

NOTE:

If the disc rotor seizes up within hub, drive disc rotor out by installing an 8 mm bolt in screw hole on the rotor.

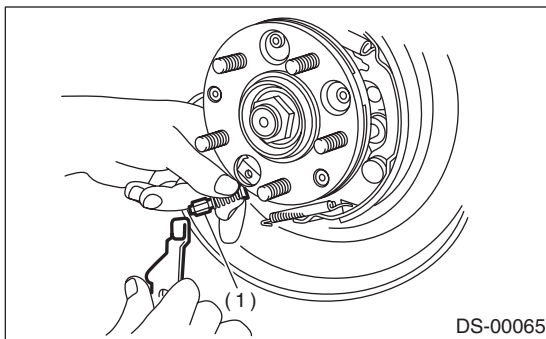


8) Using a flare-nut wrench, disconnect the brake pipe from the wheel cylinder. Place a cover on the brake pipe attachment hole of the wheel cylinder, to prevent entry of foreign particles.



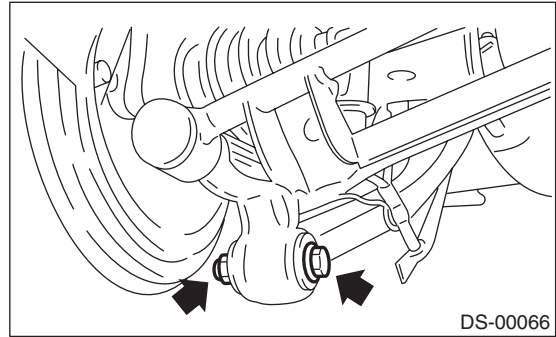
9) Cover the end of the brake pipe with a vinyl sheet or equivalent to prevent brake fluid from leaking out.

10) Disconnect the parking brake cable end from the parking brake lever.

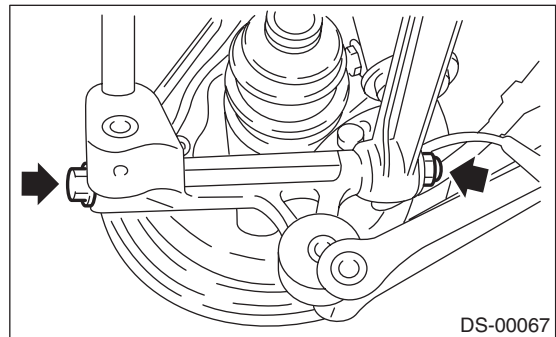


(1) Cable end

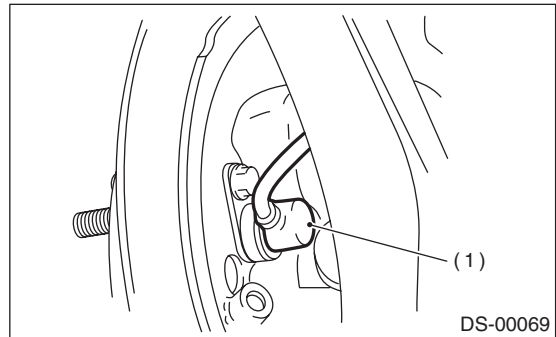
11) Disconnect the rear stabilizer from the rear lateral link. Remove the bolts which secure the trailing link assembly to the rear housing.



12) Remove the bolts which secure the lateral link assembly to the rear housing.



13) Remove the rear ABS wheel speed sensor from the back plate.



(1) ABS wheel speed sensor

Rear Axle

DRIVE SHAFT SYSTEM

14) Disengage the BJ assembly from the hub splines, and remove the rear drive shaft assembly.

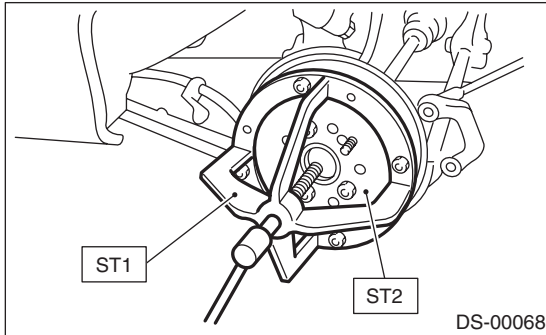
NOTE:

If it is hard to remove, use the STs.

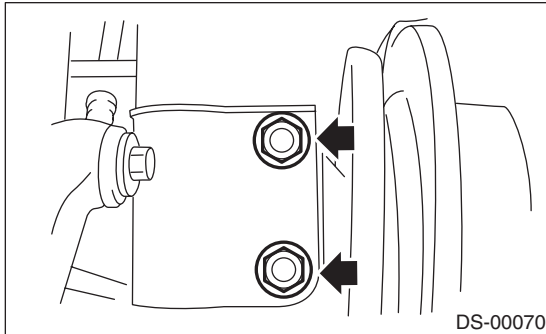
ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 AXLE SHAFT PULLER
PLATE

CAUTION:

- Be careful not to damage the oil seal lip when removing the rear drive shaft.
- When rear drive shaft is to be replaced, also replace the inner oil seal with a new seal.



15) Remove the bolts which secure the rear housing to strut, and separate the two.



B: INSTALLATION

1. DISC BRAKE

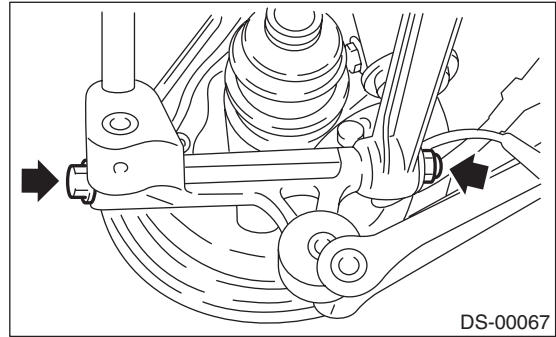
- 1) Temporarily tighten the rear axle to the strut.
- 2) Insert the rear drive shaft into the rear axle.

CAUTION:

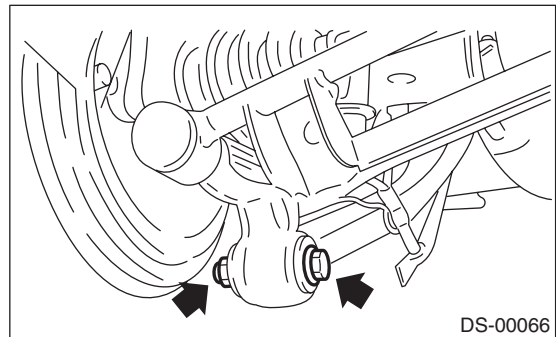
Be careful not to damage the inner oil seal lip.

- 3) Tighten the axle nut temporarily.

4) Using new self-locking nuts, temporarily attach the rear housing assembly and the rear lateral link assembly.



5) Using new self-locking nuts, temporarily attach the rear housing assembly and the trailing link assembly.



6) Using new self-locking nuts, secure the rear housing assembly and the strut assembly.

Tightening torque:

196 N·m (20 kgf·m, 145 ft·lb)

7) Using new self-locking nuts, install the rear stabilizer and rear lateral link.

Tightening torque:

44 N·m (4.5 kgf·m, 32.5 ft·lb)

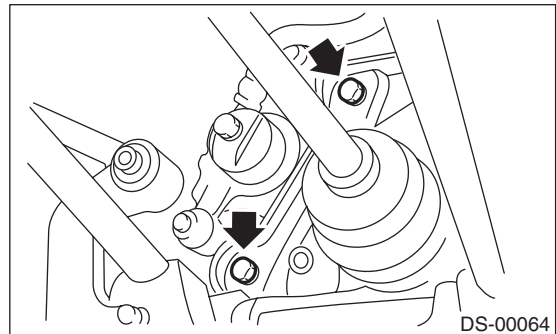
8) Connect the parking brake cable to the parking brake lever.

9) Install the disc rotor on the rear housing assembly.

10) Install the disc brake caliper on the back plate.

Tightening torque:

52 N·m (5.3 kgf·m, 38.3 ft·lb)



- 11) Adjust the parking brake lever stroke by turning the adjuster. <Ref. to PB-5, ADJUSTMENT, Parking Brake Lever.>
 12) While applying the parking brake, tighten a new axle nut using the socket wrench. After tightening, crimp the axle nut.

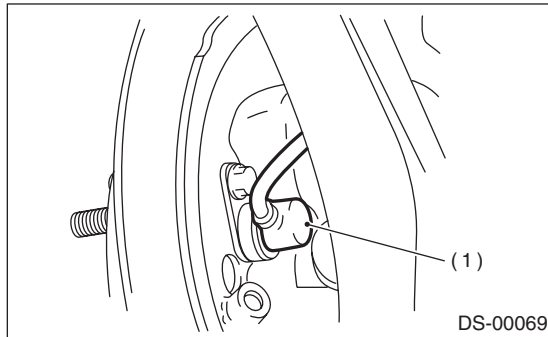
Tightening torque:

190 N·m (19.4 kgf·m, 140 ft·lb)

CAUTION:

Do not overtighten it as this may damage the wheel bearing.

- 13) Install the rear ABS wheel speed sensor.



(1) ABS wheel speed sensor

- 14) Install the wheel and tighten the wheel nuts to specified torque.

Tightening torque:

100 N·m (10.2 kgf·m, 73.8 ft·lb)

- 15) Make the tires completely touch the ground.

CAUTION:

Always tighten bushings with wheels in full contact with the ground and the vehicle at curb weight.

- 16) Tighten the rear housing assembly and lateral link assembly installation bolts.

Tightening torque:

140 N·m (14.3 kgf·m, 103 ft·lb)

- 17) Tighten the rear housing assembly and trailing link assembly installation bolts.

Tightening torque:

90 N·m (9.2 kgf·m, 66 ft·lb)

2. DRUM BRAKE

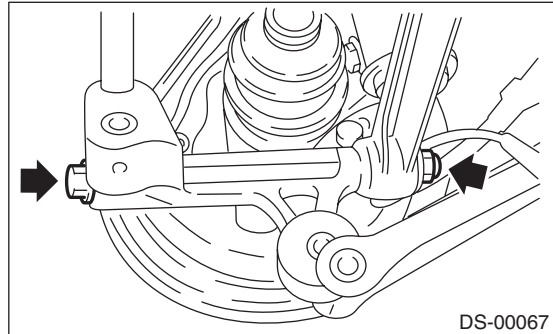
- 1) Temporarily tighten the rear axle to the strut.
 2) Insert the rear drive shaft into the rear axle.

CAUTION:

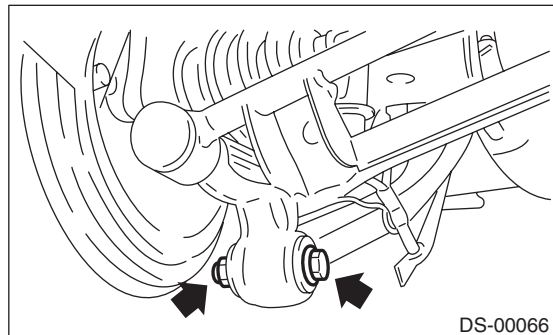
Be careful not to damage the inner oil seal lip.

- 3) Tighten the axle nut temporarily.

- 4) Using new self-locking nuts, temporarily attach the rear housing assembly and the rear lateral link assembly.



- 5) Using new self-locking nuts, temporarily attach the rear housing assembly and the trailing link assembly.



- 6) Using new self-locking nuts, secure the rear housing assembly and the strut assembly.

Tightening torque:

196 N·m (20 kgf·m, 145 ft·lb)

- 7) Using new self-locking nuts, install the rear stabilizer and rear lateral link.

Tightening torque:

44 N·m (4.5 kgf·m, 32.5 ft·lb)

- 8) Connect the parking brake cable to the parking brake lever.

- 9) Clean the brake pipe connection. Using a flare-nut wrench, connect the brake pipe to the wheel cylinder.

- 10) Connect the parking brake cable to the lever.

- 11) Install the brake drum on the rear housing assembly.

- 12) Bleed air from brake system. <Ref. to BR-41, REPLACEMENT, Brake Fluid.>

- 13) Adjust the parking brake lever stroke by turning the adjuster. <Ref. to PB-5, ADJUSTMENT, Parking Brake Lever.>

- 14) While applying the parking brake, remove the axle nut using a socket wrench. After tightening, crimp the axle nut.

Tightening torque:

190 N·m (19.4 kgf·m, 140 ft·lb)

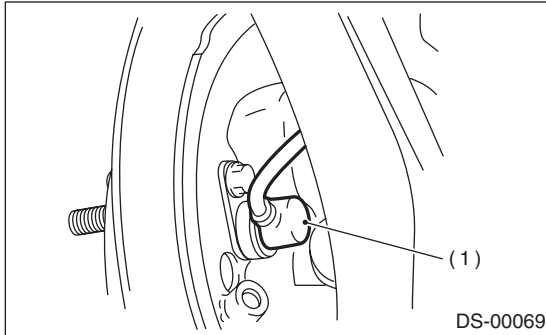
Rear Axle

DRIVE SHAFT SYSTEM

CAUTION:

Do not overtighten it as this may damage the wheel bearing.

15) Attach the rear ABS wheel speed sensor to the back plate.



(1) ABS wheel speed sensor

16) Install the wheel and tighten the wheel nuts to specified torque.

Tightening torque:

100 N·m (10.2 kgf·m, 73.8 ft·lb)

17) Make the tires completely touch the ground.

CAUTION:

Always tighten bushings with wheels in full contact with the ground and the vehicle at curb weight.

18) Tighten the rear housing assembly and lateral link assembly installation bolts.

Tightening torque:

140 N·m (14.3 kgf·m, 103 ft·lb)

19) Tighten the rear housing assembly and trailing link assembly installation bolts.

Tightening torque:

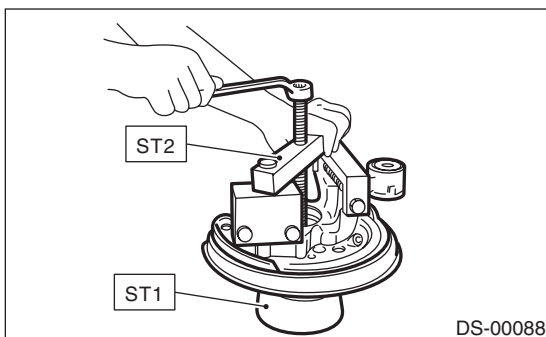
90 N·m (9.2 kgf·m, 66 ft·lb)

C: DISASSEMBLY

1) Using ST1 and ST2, remove the hub from the rear housing.

ST1 927080000 HUB STAND

ST2 927420000 HUB REMOVER



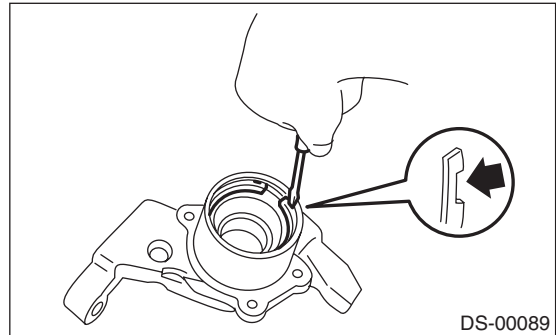
2) Remove the back plate from the rear housing.

3) Remove the outer and inner oil seals using a flat tip screwdriver.

4) Remove the snap ring using a flat tip screwdriver.

CAUTION:

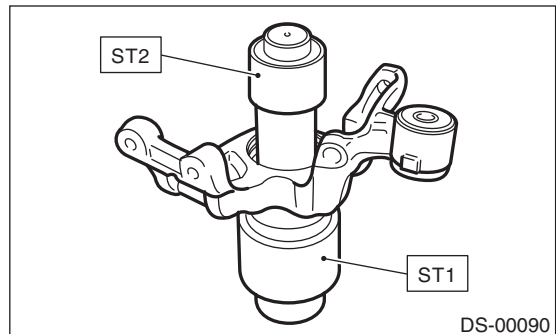
Be careful not to damage housing during removal.



5) Using ST1 and ST2, remove the bearing by pressing the inner race.

ST1 927430000 HOUSING STAND

ST2 927440000 BEARING REMOVER



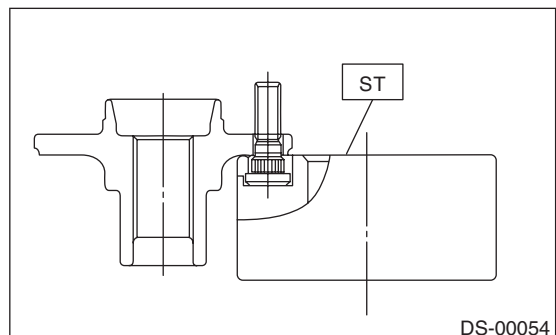
6) Remove the tone wheel bolts and remove the tone wheel from the hub.

7) Using ST, press the hub bolt out.

ST 927080000 HUB STAND

CAUTION:

Be careful not to hammer the hub bolts. This may deform the hub.



D: ASSEMBLY

NOTE:

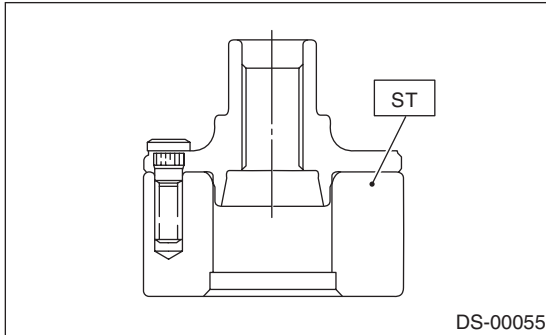
When the hub is removed from the housing, replace the bearing set and oil seal.

1) Using the ST, press the new hub bolt into place.

NOTE:

- Make sure the hub bolt contacts the hub.
- Use the 12 mm (0.47 in) hole in the ST to prevent the hub bolt from tilting during installation.

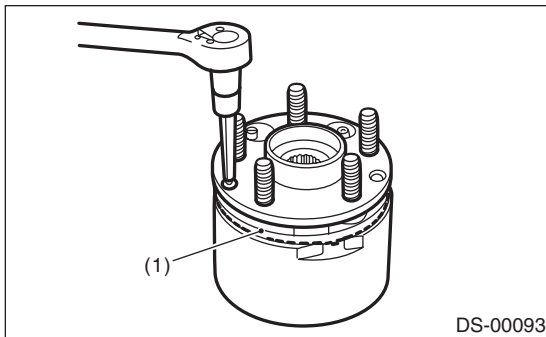
ST 927080000 HUB STAND



2) Remove the foreign particles (dust, rust, etc.) from the mating surfaces of hub tone wheel, and install the tone wheel to the hub.

NOTE:

- Make sure the tone wheel contacts the hub.
- Be careful not to damage the tone wheel teeth.



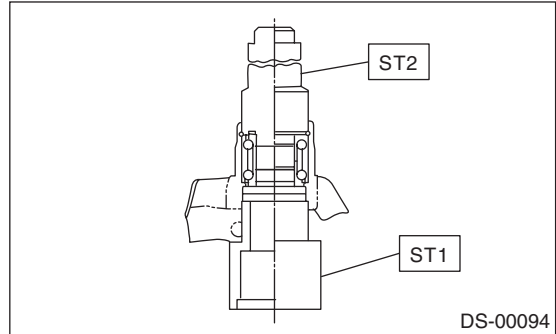
(1) Tone wheel

3) Clean the housing interior completely. Using ST1 and ST2, press the bearing into the housing.

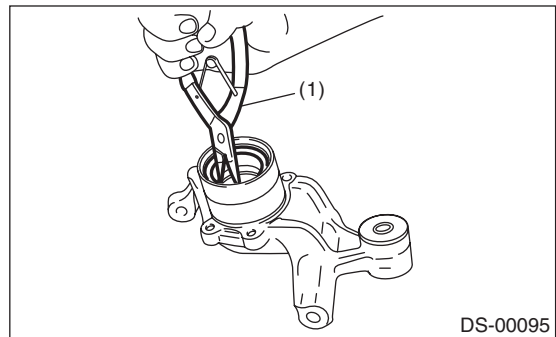
ST1 927430000 HOUSING STAND
ST2 927440000 BEARING REMOVER

CAUTION:

- Always press the outer race when installing bearings.
- Be careful not to remove the plastic lock from the inner race when installing the bearings.



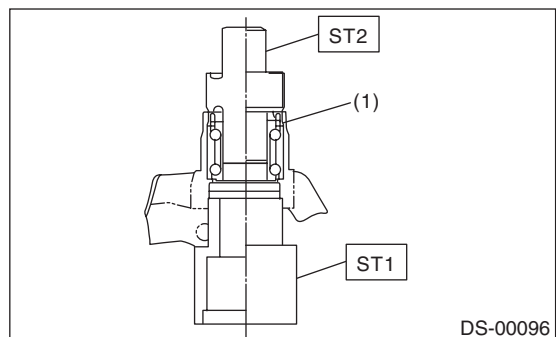
4) Using a pliers, securely install the snap ring.



(1) Pliers

5) Using the ST1 and ST2, press the outer oil seal until it comes in contact with snap ring.

ST1 927430000 HOUSING STAND
ST2 927460000 OIL SEAL INSTALLER

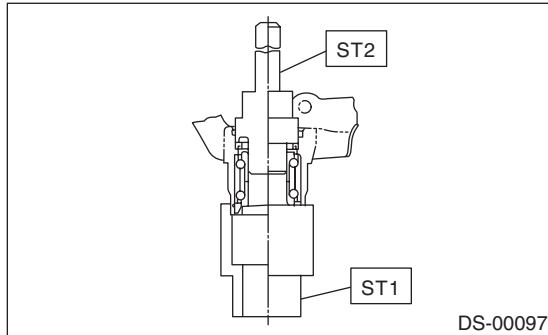


(1) Snap ring

Rear Axle

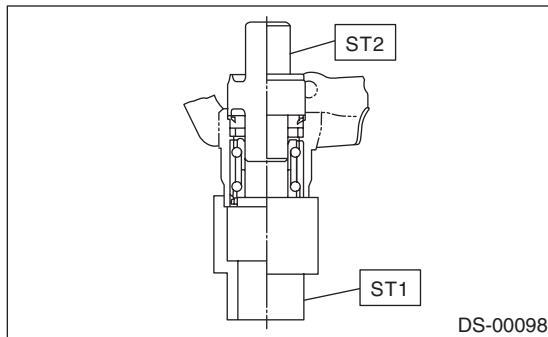
DRIVE SHAFT SYSTEM

- 6) Invert both ST1 and housing (up and down).
 - 7) Using ST2, press the inner oil seal into the housing until it touches the bottom.
- ST1 927430000 HOUSING STAND
ST2 927460000 OIL SEAL INSTALLER



- 8) Using ST1 and ST2, press the sub seal into place.

ST1 927430000 HOUSING STAND
ST2 927460000 OIL SEAL INSTALLER



- 9) Apply sufficient grease to the oil seal lip.

Grease:

SHELL 6459N

NOTE:

If specified grease is not available, remove the bearing grease and apply Auto Rex A instead.

CAUTION:

Do not mix different types of grease.

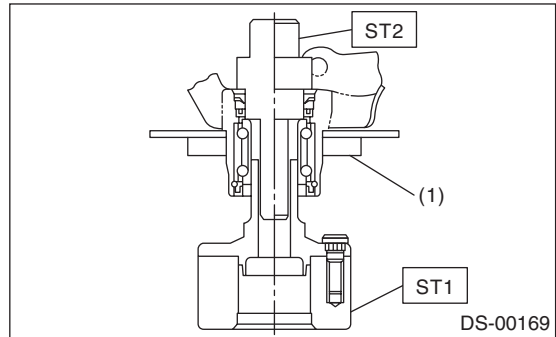
- 10) Install the back plate to the rear housing.

Tightening torque:

52 N·m (5.3 kgf-m, 38.3 ft-lb)

- 11) Using ST1 and ST2, press the bearing into the hub.

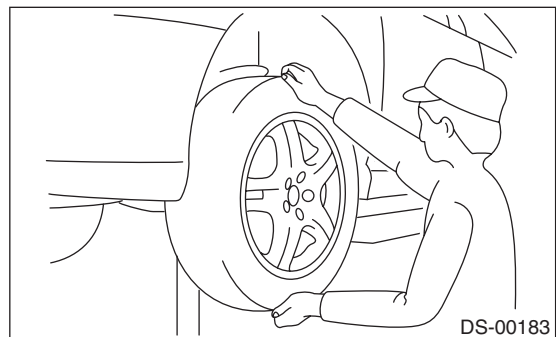
ST1 927080000 HUB STAND
ST2 927450000 HUB INSTALLER



(1) Back plate

E: INSPECTION

- 1) While moving the rear tire up and down by hand, check that there is no looseness of the bearing, and check that the wheel rotates smoothly.

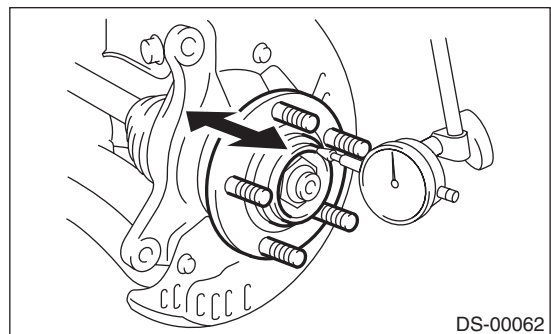


- 2) Inspect the play in the axial direction using a dial gauge. Replace the hub bearing if the play exceeds the limit value.

Limit:

Max:

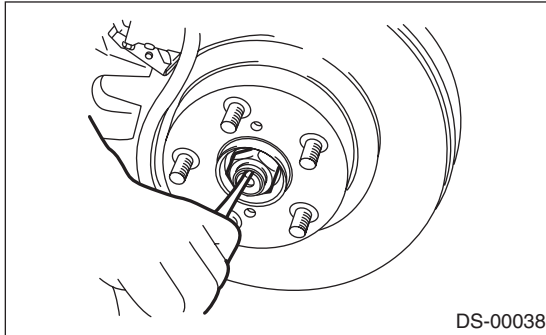
0.05 mm (0.0020 in)



5. Front Drive Shaft

A: REMOVAL

- 1) Lift-up the vehicle, and remove the front wheels.
- 2) Drain the transmission gear oil. (MT model)
- 3) Drain the differential gear oil. (AT model)
- 4) Lift the crimped section of axle nut.

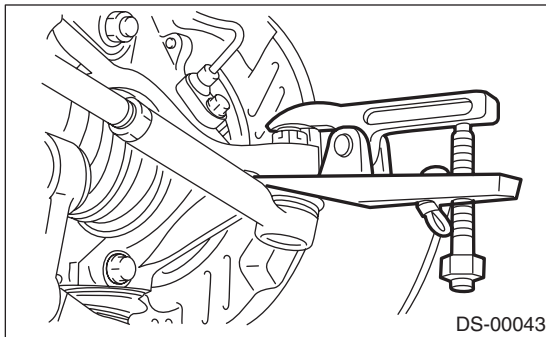


- 5) Depress the brake pedal and remove the axle nut using a socket wrench.

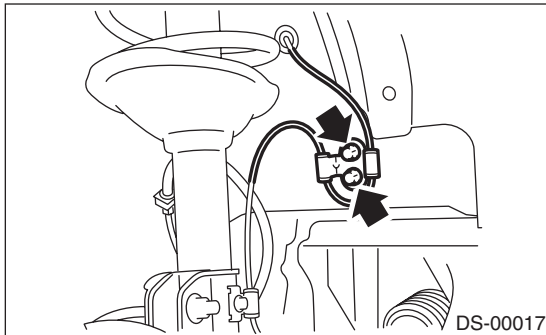
CAUTION:

Remove the axle nut while there is no load being applied to the axle. Failure to do so may damage the wheel bearings.

- 6) Remove the cotter pin and castle nut. Using a puller, remove the tie-rod end.

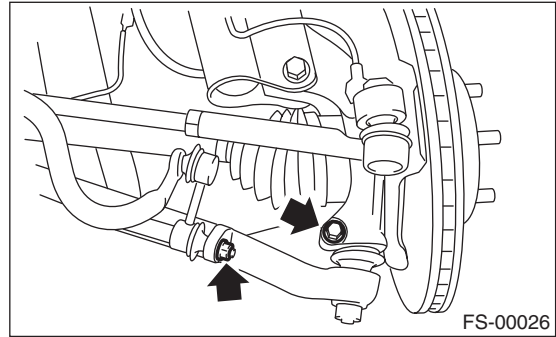


- 7) Remove the bracket of the ABS wheel speed sensor.



- 8) Remove the front stabilizer link from the transverse link.

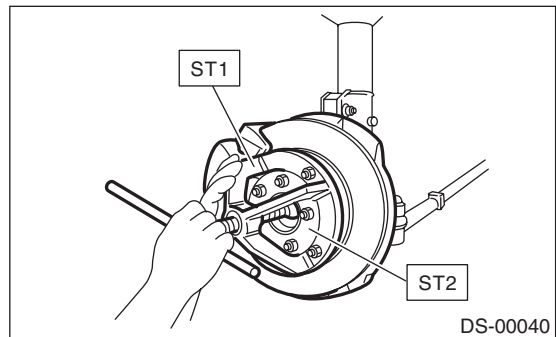
- 9) Remove the bolts which secure the ball joint. Remove the transverse link from the front housing.



- 10) Pull out the front drive shaft from the front axle. If it is hard to remove, use ST1 and ST2.
 ST1 926470000 AXLE SHAFT PULLER
 ST2 927140000 AXLE SHAFT PULLER PLATE

CAUTION:

- When removing the drive shaft, do not hammer the shaft.
- Do not damage the oil seal and tone wheel.
- When replacing the front drive shaft, also replace the inner oil seal.



Front Drive Shaft

DRIVE SHAFT SYSTEM

11) Using the ST, remove the front drive shaft from the transmission.

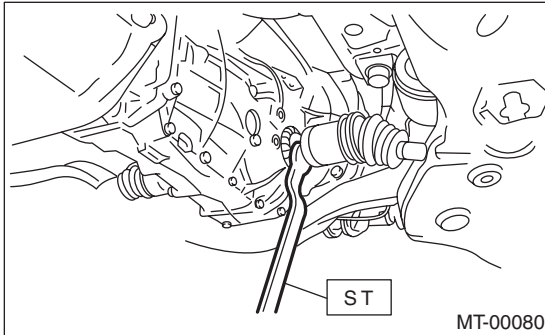
ST 28399SA000 DRIVE SHAFT REMOVER

NOTE:

- The direction of the ST differs by type of the transmission to be installed.
- For AT model, use ST with the "AT" stamped side facing the transmission side. For MT model, use the ST with the "MT" stamped side facing the transmission side.

CAUTION:

Be careful not to allow the ST to contact the holder area.



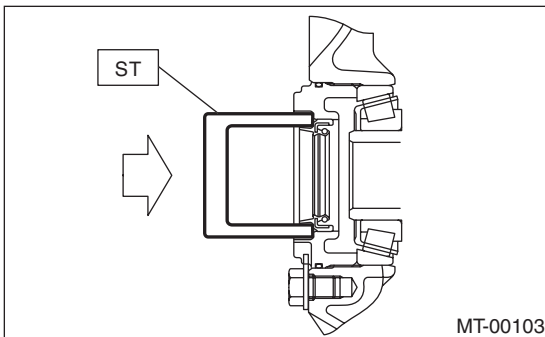
B: INSTALLATION

1) Using the ST, replace the differential side retainer oil seal with a new seal.

ST 18675AA000 DIFFERENTIAL SIDE OIL SEAL INSTALLER

CAUTION:

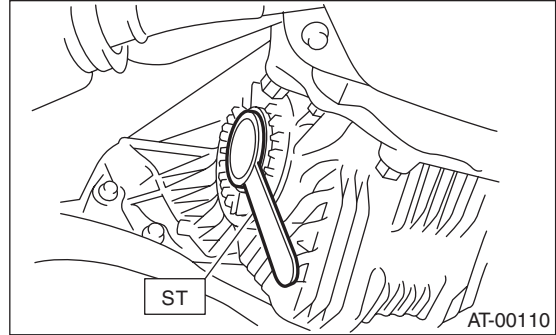
Always replace the differential side retainer oil seal with a new seal after removing the drive shaft.



- 2) Insert the front drive shaft into the front axle.
- 3) Tighten the axle nut temporarily.

4) Using the ST, install the front drive shaft to the transmission while protecting the differential side retainer oil seal.

ST 28399SA010 OIL SEAL PROTECTOR



5) Install the ball joint to the front axle.

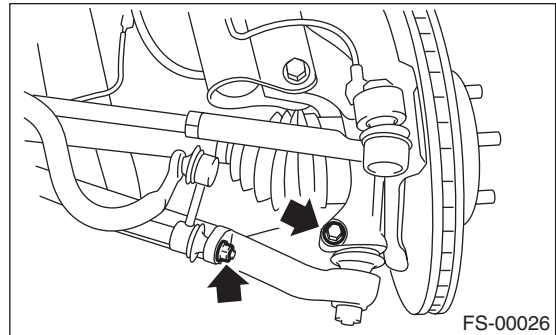
Tightening torque:

50 N·m (5.1 kgf-m, 37 ft-lb)

6) Install the stabilizer link.

Tightening torque:

45 N·m (4.6 kgf-m, 33 ft-lb)



7) Install the tie-rod end.

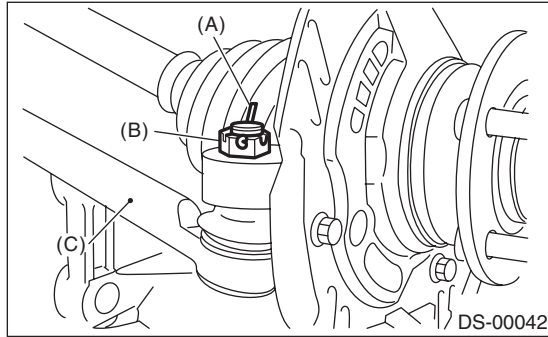
Tightening torque:

27 N·m (2.75 kgf-m, 19.9 ft-lb)

CAUTION:

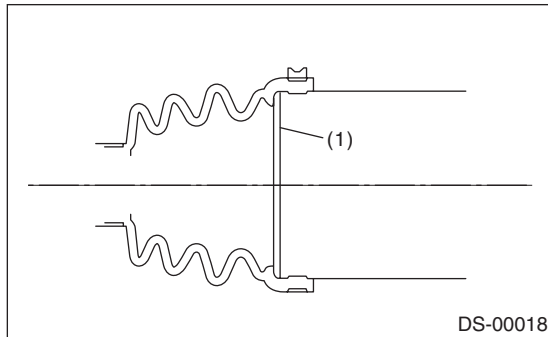
When connecting the tie-rod, do not hit the cap at bottom of tie-rod end with a hammer.

8) Tighten the castle nut to specified torque and tighten further within 60° until the pin hole is aligned with the slot in nut. Bend the cotter pin to lock.



- (A) Cotter pin
- (B) Castle nut
- (C) Tie-rod end

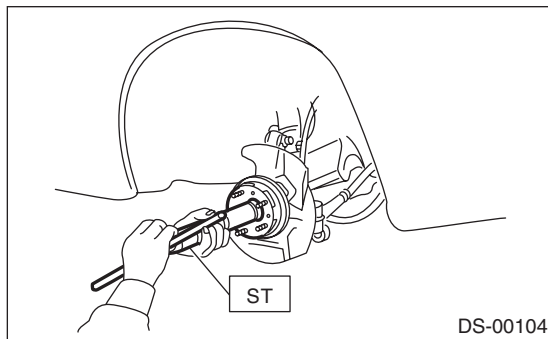
9) Check whether or not the AARi retainer has moved from its prescribed position.



- (1) Retainer

10) Using ST1 and ST2, pull the front drive shaft into the required position.

ST1 922431000 AXLE SHAFT INSTALLER
ST2 927390000 ADAPTER



11) While pressing the brake pedal, tighten a new axle nut to the specified torque.

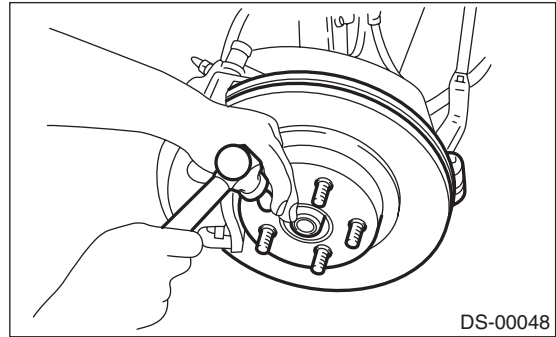
Tightening torque:

220 N·m (22.4 kgf-m, 162 ft-lb)

CAUTION:

Be sure to tighten the axle nut to specified torque. Do not overtighten it as this may damage the wheel bearing.

12) After tightening the axle nut, lock it securely.



13) Install the ABS wheel speed sensor bracket.

Tightening torque:

32 N·m (3.3 kgf-m, 24 ft-lb)

14) Add the transmission gear oil. (MT model)

15) Add the differential gear oil. (AT model)

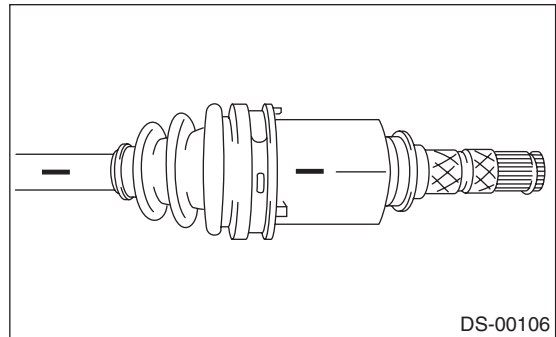
16) Install the wheel.

Tightening torque:

100 N·m (10.2 kgf-m, 73.8 ft-lb)

C: DISASSEMBLY

1) Place alignment marks on the shaft and outer race.



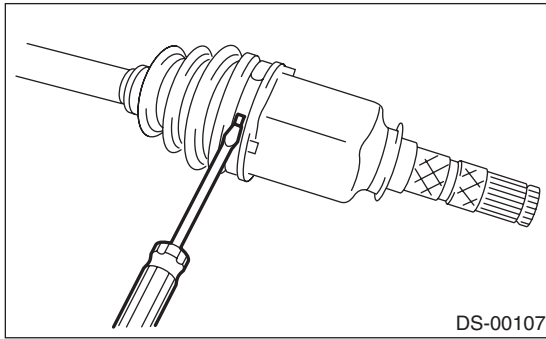
2) Remove the AARi boot band and boot.

Front Drive Shaft

DRIVE SHAFT SYSTEM

CAUTION:

Be careful not to damage the boot.

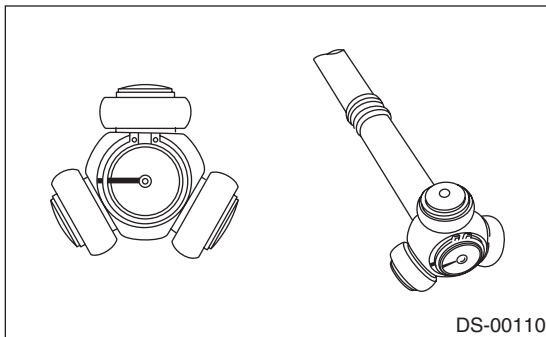


- 3) Remove the AARi outer race from the shaft assembly.
- 4) Wipe off grease.

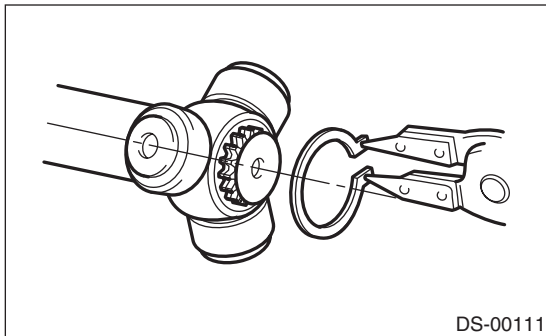
CAUTION:

This grease is a special type of grease. Do not mix it with other grease.

- 5) Place alignment marks on the trunnion and shaft.



- 6) Remove the snap ring and trunnion.



- 7) Remove the AARi boot.

CAUTION:

Be sure to wrap shaft splines with vinyl tape to protect the boot from scratches.

D: ASSEMBLY

NOTE:

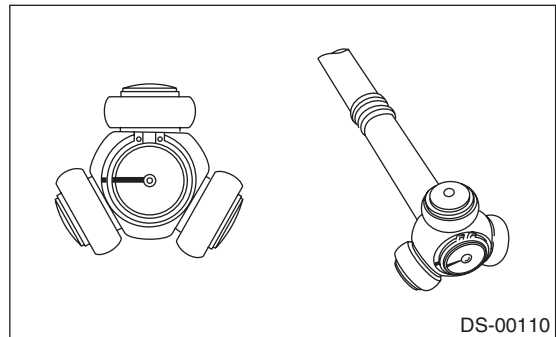
Use specified grease.

Grease:

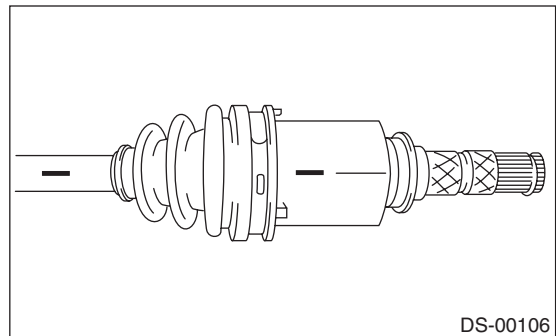
AARi side:

ONE LOUVER C (Part No. 28395SA000)

- 1) Pass the AARi boot and the retainer through the shaft and place at the center.
- 2) Align the alignment marks and install the trunnion on the shaft.



- 3) Fill 100 to 110 g (3.53 to 3.88 oz) of specified grease into the interior of AARi outer race.
- 4) Apply a thin coat of specified grease to the free ring and trunnion.
- 5) Align the alignment marks of the shaft and outer race, and install the outer race.

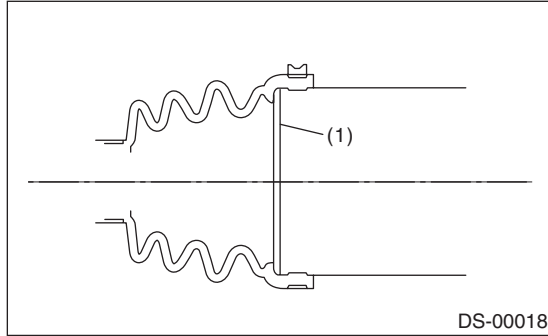


- 6) Apply an even coat of the specified grease 30 to 40 g (1.06 to 1.41 oz) to the entire inner surface of boot.
- 7) Install the AARi boot taking care not to twist it.

CAUTION:

- The inside of the larger end of the AARi boot and the boot groove is to be cleaned so as to be free of grease and other foreign substances.
- When installing the AARi boot, position the outer race of the AARi at the center of the stroke.

8) Check the position of the retainer.

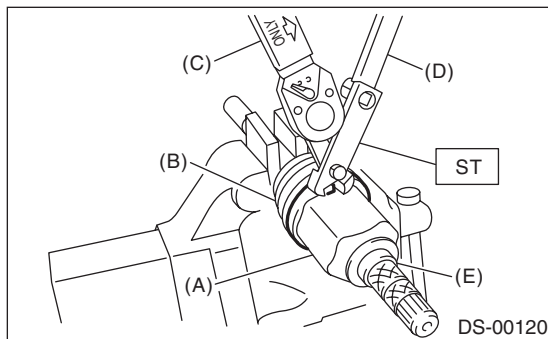


(1) Retainer

9) Install the new large boot band and small boot band at the required positions.

10) Tighten the boot bands using ST, torque wrench and socket flex handle.

ST 28099AC000 BOOT BAND PLIER



- (A) Large boot band
- (B) Boot
- (C) Torque wrench
- (D) Socket flex handle
- (E) AARi

Clearance at the crimped section of the boot band:

Large boot band

1 mm (0.04 in) or less

Small boot band

1 mm (0.04 in) or less

11) Extend and retract the AARi repeatedly to ensure an equal grease coating.

E: INSPECTION

Check the removed parts for damage, wear, corrosion etc. Repair or replace if defective.

1) AARi

Check for seizure, corrosion, damage and excessive play.

2) Shaft

Check for excessive bending, twisting, damage and wear.

3) AC

Check for seizure, corrosion, damage and excessive play.

4) Boot

Check for wear, warping, breakage and scratches.

5) Grease

Check for discoloration and fluidity.

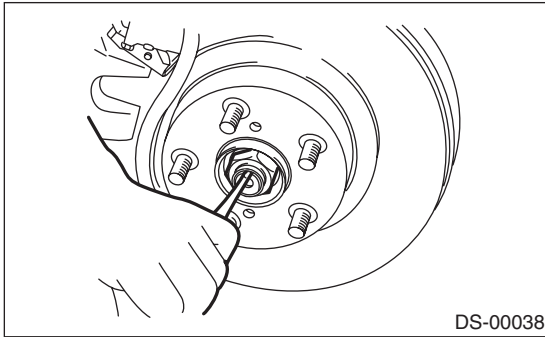
Rear Drive Shaft

DRIVE SHAFT SYSTEM

6. Rear Drive Shaft

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Lift-up the vehicle, and then remove the rear wheels.
- 3) Lift the crimped section of the axle nut.

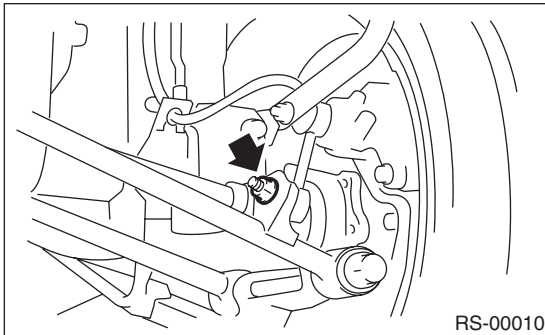


- 4) While applying the parking brake, remove the axle nut using a socket wrench.

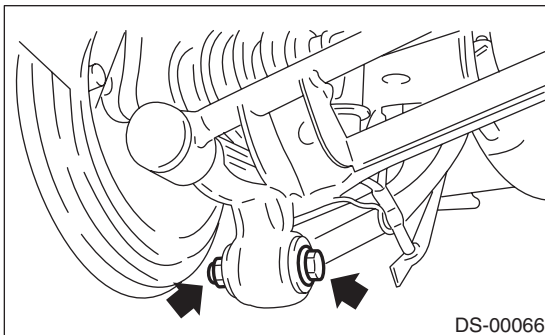
CAUTION:

Remove the axle nut while there is no load being applied to the axle. Failure to do so may damage the wheel bearings.

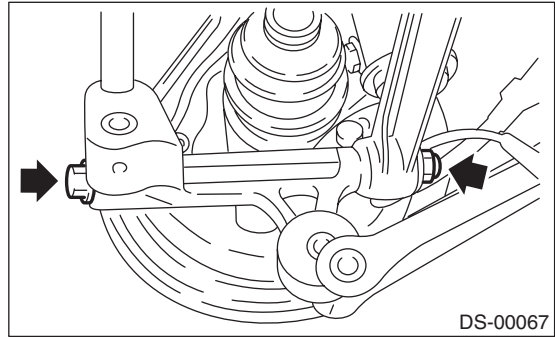
- 5) Remove the rear stabilizer link.



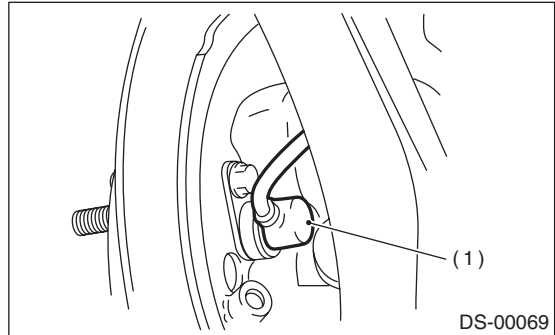
- 6) Remove the bolts which secure the trailing link to the housing.



- 7) Remove the bolts which secure the front and rear lateral link to the housing.



- 8) Remove the rear ABS wheel speed sensor from the back plate.



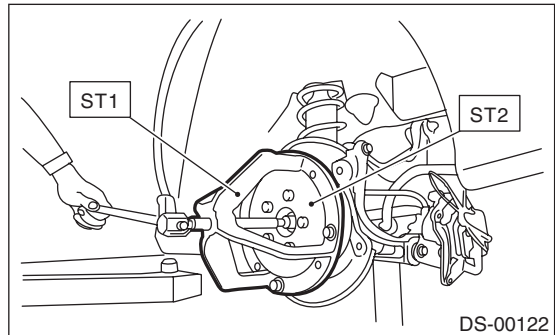
(1) ABS wheel speed sensor

- 9) Remove the rear drive shaft from the rear axle. If it is hard to remove, use ST1 and ST2 to remove the brake disc rotor.

ST1 926470000 AXLE SHAFT PULLER
ST2 927140000 AXLE SHAFT PULLER PLATE

CAUTION:

- Do not hammer the drive shaft when removing it.
- Do not damage the oil seal and tone wheel.

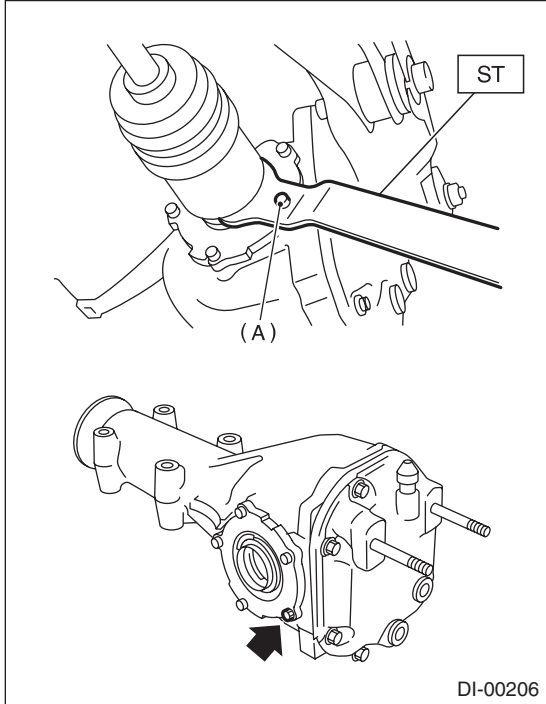


10) Remove the rear drive shaft from the rear differential by using the ST.

ST 28099PA100 DRIVE SHAFT REMOVER

CAUTION:

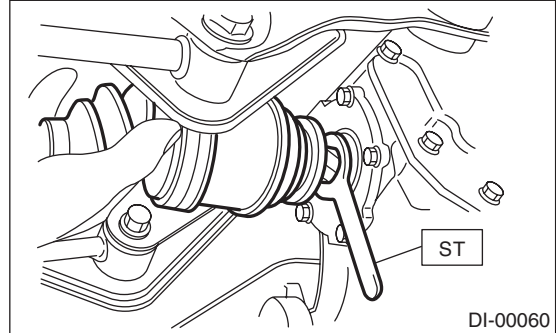
As shown in the figure, set the ST to the bolt (A) without damaging the side bearing retainer.



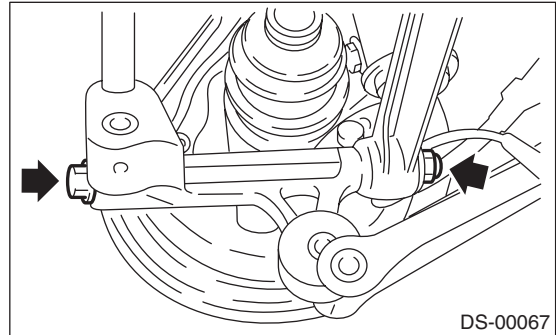
(A) Bolt

B: INSTALLATION

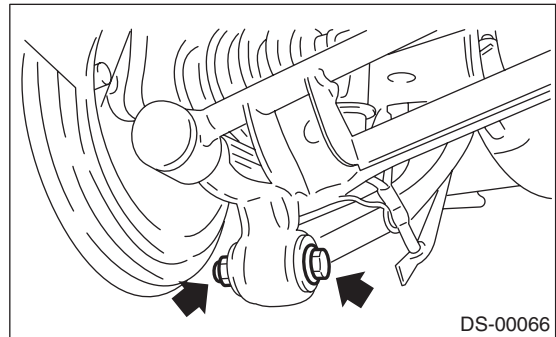
- 1) Insert the rear drive shaft into the rear axle.
 - 2) Tighten the axle nut temporarily.
 - 3) Using the ST, install the rear drive shaft to the rear differential while protecting the oil seal.
- ST 28099PA090 OIL SEAL PROTECTOR



- 4) Using new self-locking nuts, temporarily tighten the front and rear lateral links to the housing.



- 5) Using new self-locking nuts, temporarily attach the trailing link to the housing.



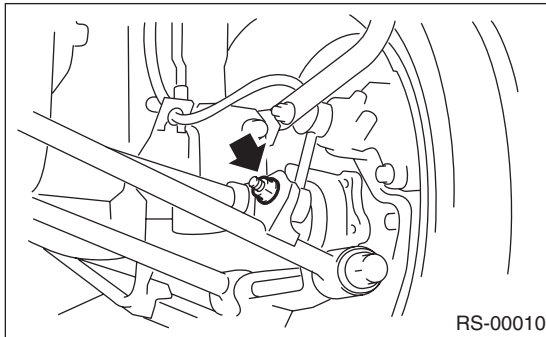
Rear Drive Shaft

DRIVE SHAFT SYSTEM

6) Install the stabilizer link.

Tightening torque:

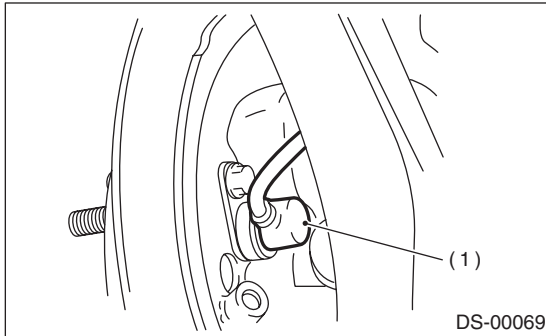
45 N·m (4.6 kgf·m, 33 ft·lb)



7) Install the ABS wheel speed sensor.

Tightening torque:

32 N·m (3.3 kgf·m, 24 ft·lb)

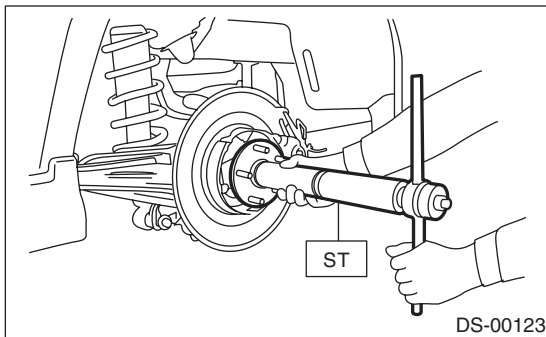


(1) ABS wheel speed sensor

8) Using ST1 and ST2, pull the rear drive shaft to the required location.

ST1 922431000 AXLE SHAFT INSTALLER

ST2 927390000 ADAPTER



9) While applying the parking brake pedal, tighten the new axle nut to the specified torque.

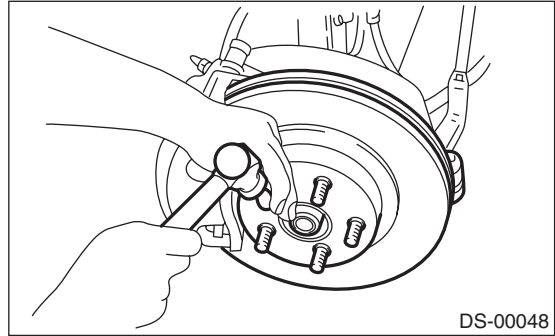
Tightening torque:

190 N·m (19.4 kgf·m, 140 ft·lb)

CAUTION:

Be sure to tighten the axle nut to specified torque. Do not overtighten it as this may damage the wheel bearing.

10) After tightening the axle nut, lock it securely.



11) Install the wheel.

Tightening torque:

100 N·m (10.2 kgf·m, 73.8 ft·lb)

12) Make the tires completely touch the ground.

CAUTION:

Always tighten bushings with wheels in full contact with the ground and the vehicle at curb weight.

13) Tighten the rear housing assembly and lateral link assembly installation bolts.

Tightening torque:

140 N·m (14.3 kgf·m, 103 ft·lb)

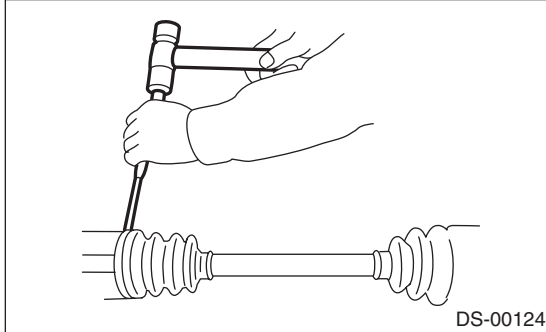
14) Tighten the rear housing assembly and trailing link assembly installation bolts.

Tightening torque:

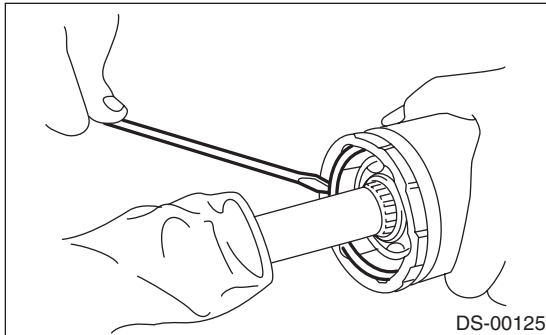
90 N·m (9.2 kgf·m, 66 ft·lb)

C: DISASSEMBLY

- 1) Straighten the bent claw at the larger end of the DOJ boot.
- 2) Loosen the band by means of a flat tip screwdriver or pliers, being careful not to damage the boot.



- 3) Remove the boot band on the small end of DOJ boot in the same manner.
- 4) Remove the larger end of DOJ boot from DOJ outer race.
- 5) Pry and remove the circlip at the neck of DOJ outer race with a screwdriver.

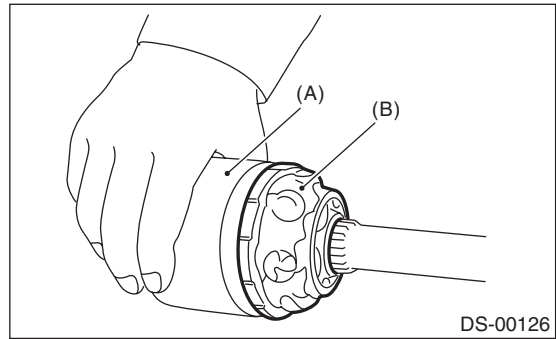


- 6) Take out the DOJ outer race from the shaft assembly.
- 7) Wipe off the grease and take out the ball bearings.

CAUTION:

- **The grease is a special grease (grease for constant velocity joints). Do not mix with other greases.**

- **Disassemble while being careful not to lose ball bearings (6 pcs).**



- (A) Outer race
- (B) Grease

- 8) To remove the cage from the inner race, turn the cage by a half pitch to the track groove of the inner race and move the cage.
- 9) Using pliers, remove the snap ring fixing the inner race to the shaft.
- 10) Take out the DOJ inner race.
- 11) Take off the DOJ cage from shaft and remove the DOJ boot.
- 12) Wrap vinyl tape around the spline part of shaft.
- 13) Remove the EBJ boot using the same procedures as for the DOJ boot.

NOTE:

The EBJ is a non-disassembly part, so the axle disassembly stops here.

Rear Drive Shaft

DRIVE SHAFT SYSTEM

D: ASSEMBLY

NOTE:

Use specified grease.

Grease:

EBJ side

NTG2218-M (Part No. 28395AG010)

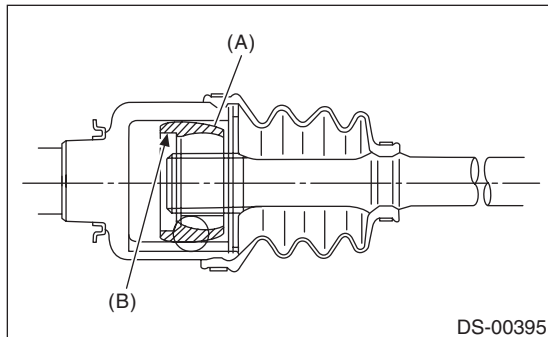
DOJ side:

NKG205 (Part No. 28495AG000)

- 1) Install the EBJ boot to the specified position, and fill it with 60 to 70 g (2.12 to 2.47 oz) of specified grease.
- 2) Place the DOJ boot at the center of shaft.
- 3) Wrap vinyl tape around the spline part of shaft.
- 4) Insert the DOJ cage onto shaft.

CAUTION:

The cage has a set orientation. Insert the cage with the cutout portion facing the shaft side.

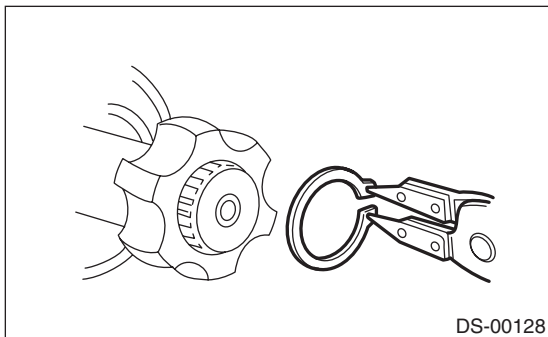


- (A) Cage
- (B) Cutout portion

- 5) Install the DOJ inner race on shaft and fix the snap ring in place with pliers.

CAUTION:

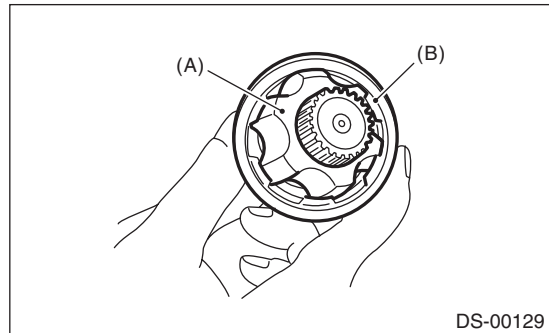
Confirm that the snap ring is completely fitted in the shaft groove.



- 6) Install the removed cage, to the inner race fixed onto the shaft.

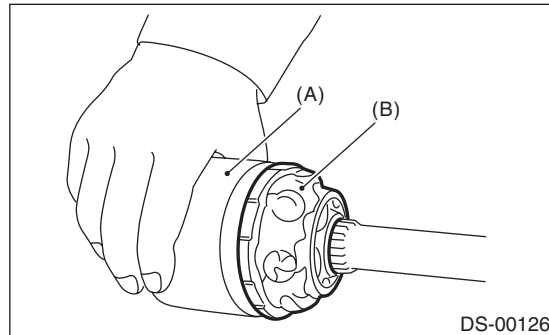
NOTE:

Fit the cage with the protruding section aligned with the track on the inner race, and turn by a half pitch.



- (A) Inner race
- (B) Cage

- 7) Fill 80 to 90 g (2.82 to 3.17 oz) of specified grease into the inner side of the DOJ outer race.
- 8) Apply a thin coat of specified grease to the cage pocket and six ball bearings.
- 9) Insert the six ball bearings into the cage pocket.
- 10) Align the outer race track and ball positions, and place the shaft, inner race, cage and ball bearings in the original positions, then fix outer race in place.

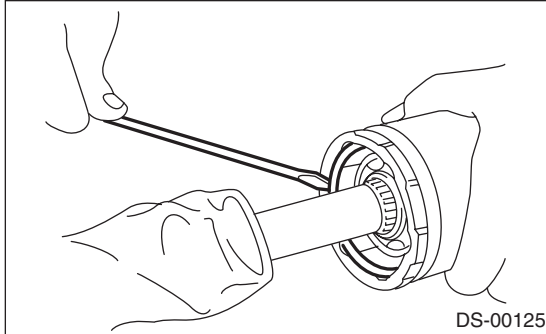


- (A) Outer race
- (B) Grease

11) Install the circlip in the groove on the DOJ outer race.

CAUTION:

- Make sure that the balls, cage and inner race are firmly fitted in the outer race of the DOJ.
- Take care not to place the matching position of the circlip in the ball groove of outer race.
- Pull the shaft lightly to make sure that the circlip is completely fitted in the groove.



12) Apply an even coat of the specified grease [20 to 30 g (0.71 to 1.06 oz)] to the entire inner surface of boot. Also apply grease to the shaft.

13) Install the DOJ boot taking care not to twist it.

NOTE:

- The inside of the larger end of DOJ boot and the boot groove is to be cleaned so as to be free from grease and other foreign substances.
- When installing the DOJ boot, position the outer race of DOJ at center of the stroke.

14) Put a new band through the clip and wind twice in the band groove of the boot.

15) Pinch the end of band with pliers. Hold the clip and tighten securely.

CAUTION:

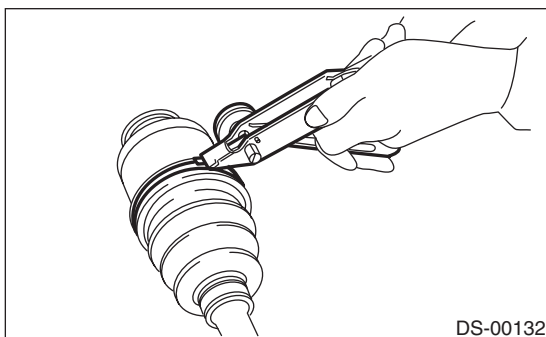
When tightening the boot, exercise care so that the air within the boot is appropriate.

16) Tighten the band using the ST.

ST 925091000 BAND TIGHTENING TOOL

CAUTION:

Tighten the band until it cannot be moved by hand.

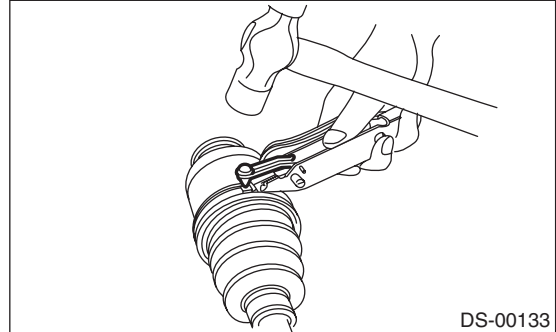


17) Tap the clip with the punch provided at the end of the ST.

ST 925091000 BAND TIGHTENING TOOL

CAUTION:

Tap to an extent that the boot underneath is not damaged.



18) Cut off the band with an allowance of about 10 mm (0.39 in) left from the clip and bend this allowance over the clip.

CAUTION:

Make sure that the end of the band is in close contact with clip.

19) Install EBJ boot in the same manner.

20) Extend and retract the DOJ repeatedly to provide an equal coating of grease.

E: INSPECTION

Check the removed parts for damage, wear, corrosion etc. Repair or replace if defective.

1) DOJ (Double Offset Joint)

Check for seizure, corrosion, damage, wear and excessive play.

2) Shaft

Check for excessive bending, twisting, damage and wear.

3) EBJ

Check for seizure, corrosion, damage and excessive play.

4) Boot

Check for wear, warping, breakage and scratches.

5) Grease

Check for discoloration and fluidity.

General Diagnostic Table

DRIVE SHAFT SYSTEM

7. General Diagnostic Table

A: INSPECTION

NOTE:

Vibration while cruising may be caused by an unbalanced tire, improper tire inflation pressure, improper wheel alignment, etc.

Symptom	Possible cause	Corrective action
Noise or vibration from propeller shaft	Center bearing	Check the center bearing. <Ref. to DS-15, CENTER BEARING FREE PLAY, INSPECTION, Propeller Shaft.>
	Runout of propeller shaft	Check for deflection of the propeller shaft. <Ref. to DS-14, RUNOUT OF PROPELLER SHAFT, INSPECTION, Propeller Shaft.>
	Loose or gap at connections	Check the joints and connectors. <Ref. to DS-14, JOINTS AND CONNECTIONS, INSPECTION, Propeller Shaft.> Check the spline and bearing. <Ref. to DS-14, SPLINES AND BEARING LOCATIONS, INSPECTION, Propeller Shaft.>
Abnormal wheel vibration	Wheel is out of balance.	Check the wheel balance. <Ref. to WT-7, ADJUSTMENT, Wheel Balancing.>
	Wheel alignment	Check the wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>
	Front strut	Check the front strut. <Ref. to FS-20, INSPECTION, Front Strut.>
	Rear strut	Check the rear strut. <Ref. to RS-12, INSPECTION, Rear Strut.>
	Front drive shaft	Check the front drive shaft. <Ref. to DS-33, INSPECTION, Front Drive Shaft.>
	Rear drive shaft	Check the rear drive shaft. <Ref. to DS-39, INSPECTION, Rear Drive Shaft.>
	Front axle	Check the wheel alignment. <Ref. to DS-20, INSPECTION, Front Axle.>
	Rear axle	Check the rear axle. <Ref. to DS-28, INSPECTION, Rear Axle.>
Noise from the underbody	Wheel is out of balance.	Check the wheel balance. <Ref. to WT-7, ADJUSTMENT, Wheel Balancing.>
	Wheel alignment	Check the wheel alignment. <Ref. to FS-6, INSPECTION, Wheel Alignment.>
	Front strut	Check the front strut. <Ref. to FS-20, INSPECTION, Front Strut.>
	Rear strut	Check the rear strut. <Ref. to RS-12, INSPECTION, Rear Strut.>

General Description

ABS

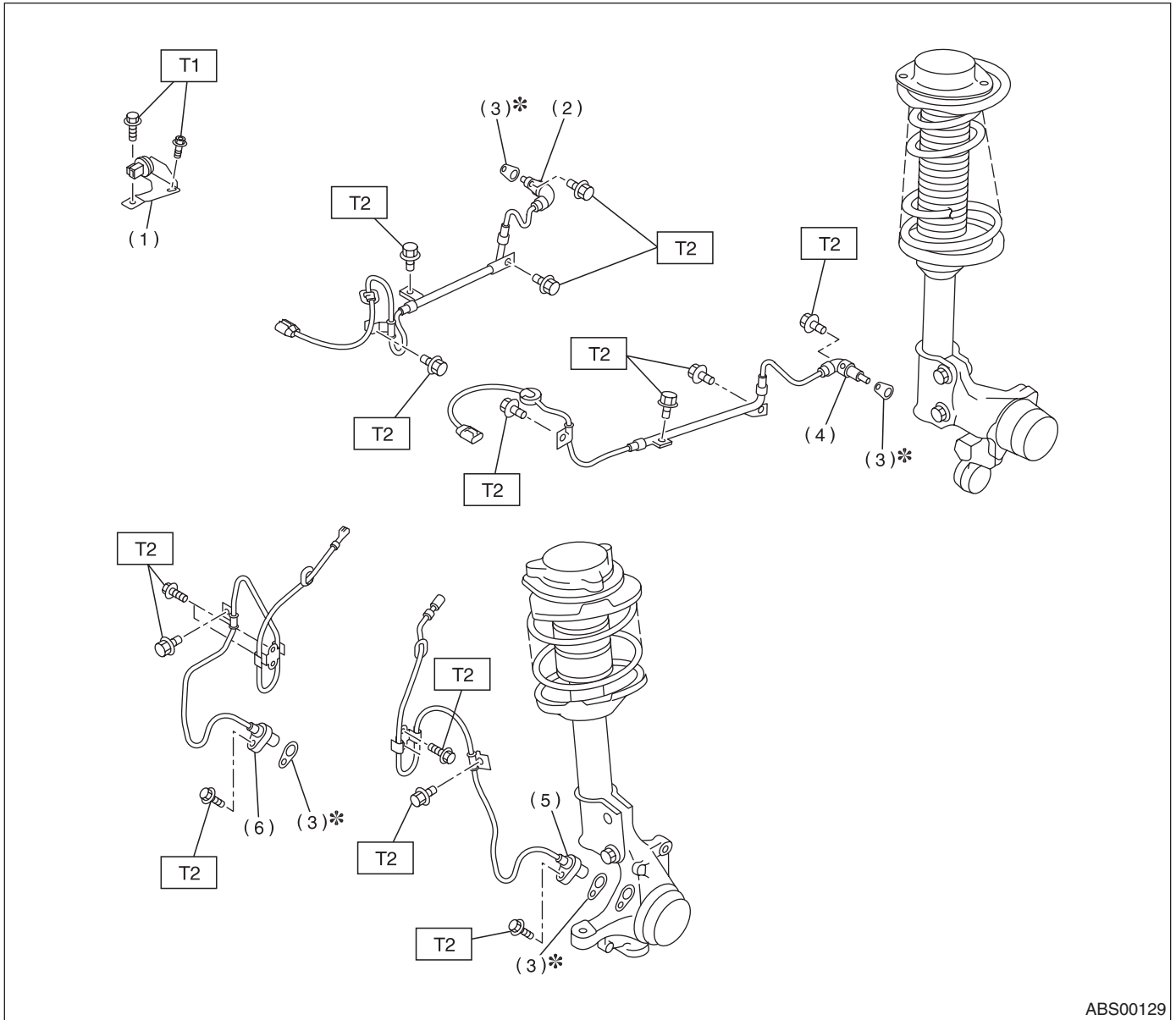
1. General Description

A: SPECIFICATION

Item			Specification	
ABS wheel speed sensor	ABS wheel speed sensor gap	Front	0.3 — 0.8 mm (0.012 — 0.031 in)	
		Rear	0.7 — 1.2 mm (0.028 — 0.047 in)	
	ABS wheel speed sensor resistance	Front	1.25±0.25 kΩ	
		Rear	1.15±0.115 kΩ	
	Identifications of harness (Colors)	Front	RH	Red
			LH	Blue
Rear		RH	White	
		LH	Yellow	
G sensor	G sensor voltage		2.3±0.2 V	
ABSCM & H/U identification		AT	L6	
		MT	L7	

B: COMPONENT

1. SENSOR



ABS00129

- | | |
|------------------------------------|-------------------------------------|
| (1) G sensor | (4) Rear ABS wheel speed sensor LH |
| (2) Rear ABS wheel speed sensor RH | (5) Front ABS wheel speed sensor LH |
| (3) Adjusting spacer | (6) Front ABS wheel speed sensor RH |

Tightening torque: N·m (kgf·m, ft·lb)

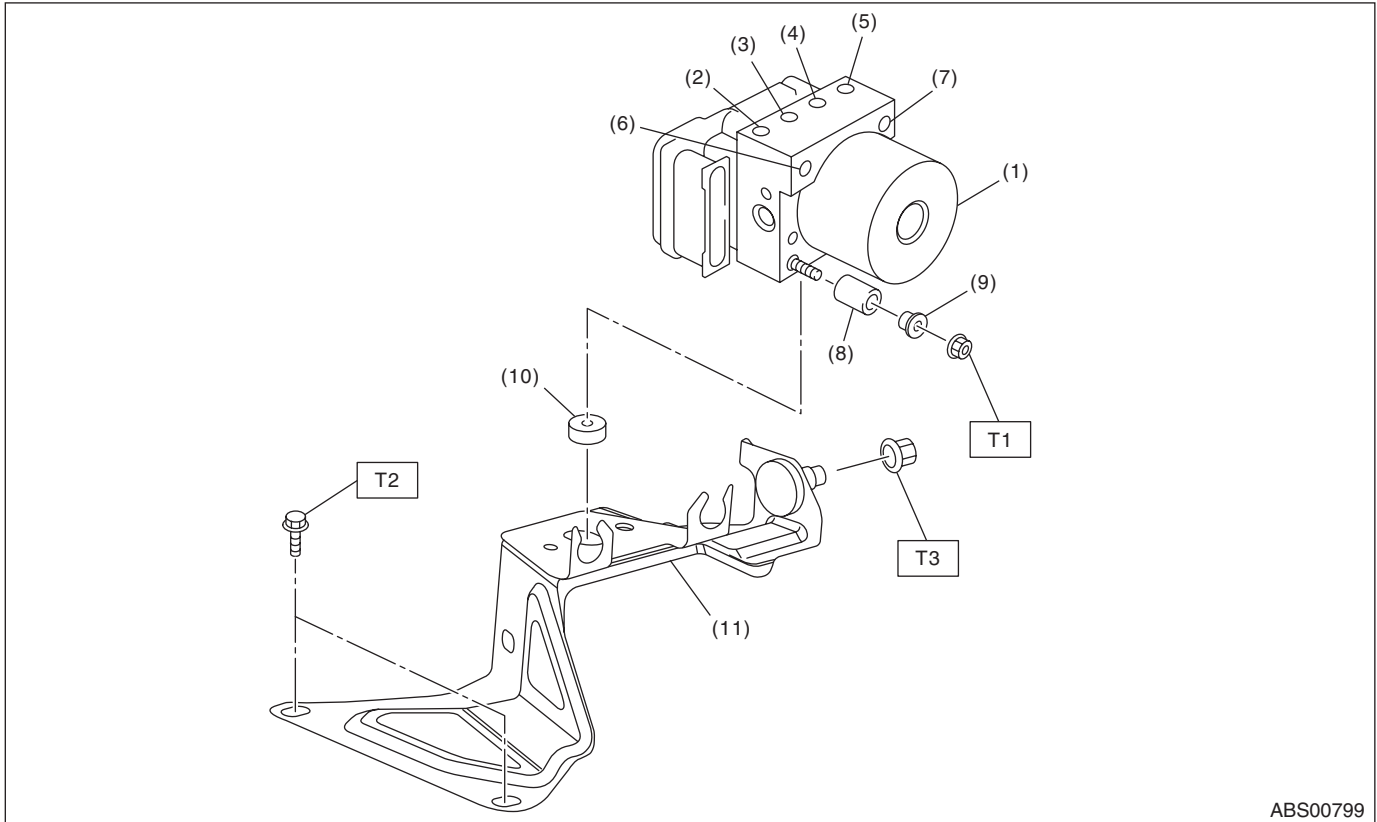
T1: 18 (1.8, 13.0)

T2: 33 (3.4, 24.6)

General Description

ABS

2. ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)



ABS00799

- | | |
|---|---------------------|
| (1) ABS control module and hydraulic control unit (ABSCM&H/U) | (6) Primary inlet |
| (2) Front outlet RH | (7) Secondary inlet |
| (3) Rear outlet LH | (8) Damper |
| (4) Rear outlet RH | (9) Spacer |
| (5) Front outlet LH | (10) Damper |
| | (11) Bracket |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 7.5 (0.76, 5.5)

T2: 33 (3.4, 24.6)

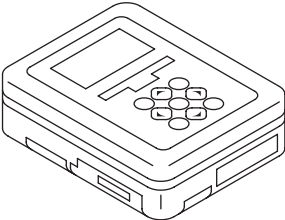
T3: 38 (3.8, 27.5)

C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from the battery.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.

D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B020XU0	1B020XU0	SUBARU SELECT MONITOR KIT	Used for troubleshooting the electrical system. English: 22771AA030 (Without printer)

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.
Pressure gauge	Used for measuring oil pressure.
Oscilloscope	Used for measuring the sensor.
TORX® BIT E5	Used for replacing ABSCM.

ABS Control Module and Hydraulic Control Unit (ABSCM&H/U)

ABS

2. ABS Control Module and Hydraulic Control Unit (ABSCM&H/U)

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the air cleaner case to make it easier to remove the ABSCM&H/U. <Ref. to IN(H4DOTC)-8, REMOVAL, Air Cleaner Case.>
- 3) Use an air gun to blow off any water around the ABSCM&H/U.

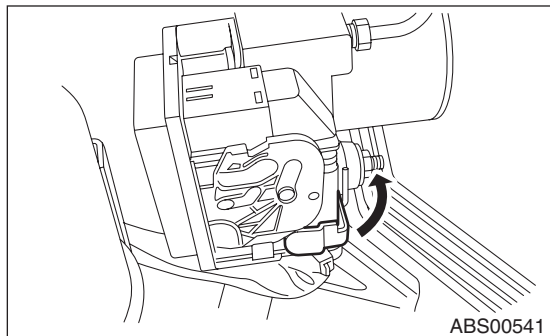
NOTE:

A contact fault may occur if the terminal is wet.

- 4) Lift the lock lever and disconnect the ABSCM&H/U connector.

CAUTION:

Do not pull on the harness when disconnecting the connector.



- 5) Remove the harness clip.
- 6) Disconnect the brake pipes from the ABSCM&H/U.
- 7) Wrap the brake pipe with a vinyl bag so as not to spill the brake fluid on the vehicle body.

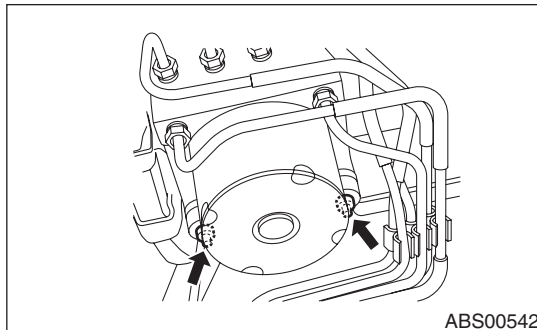
CAUTION:

If brake fluid is spilled on the vehicle body, wash it off immediately with water and wipe clean.

- 8) Remove the nuts and remove the ABSCM&H/U.

CAUTION:

- Do not drop or bump the ABSCM&H/U.
- Do not turn the ABSCM&H/U upside down or place it sideways for storage.
- Be careful not to let foreign matter enter into ABSCM&H/U.
- Be careful that no water enters the connectors.



- 9) Remove the ABSCM&H/U bracket.

B: INSTALLATION

1) Install the ABSCM&H/U bracket.

Tightening torque:

33 N·m (3.4 kgf-m, 24.6 ft-lb)

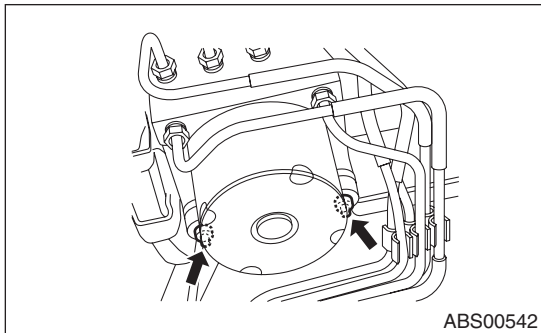
2) Install the ABSCM&H/U by aligning the damper groove of the ABSCM&H/U to the bracket side claw.

NOTE:

Check the identification marks of the ABSCM&H/U.

Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)



3) Connect the brake pipes to their correct positions on the ABSCM&H/U.

Tightening torque:

15 N·m (1.5 kgf-m, 10.8 ft-lb)

4) Using cable clip, secure the ABSCM&H/U harness to the bracket.

5) Connect the connector to the ABSCU&H/U.

NOTE:

- Be sure to remove all foreign matter from inside the connector before connecting.
- Make sure that the ABSCM&H/U connector is securely locked.

6) Connect the grounding wire of the ABSCM&H/U and apply rust-prevention wax.

7) Install the air cleaner case. <Ref. to IN(H4DOTC)-8, INSTALLATION, Air Cleaner Case.>

8) Bleed air from the brake system.

C: REPLACEMENT

CAUTION:

- Because the seal of the ABSCM cannot be replaced, do not pull or peel it by lifting it up.
- Because the screw of the H/U will become slightly worn in every replacement procedure, 5 times is the maximum number of times for replacement. If a problem is found such as not being able to torque the screw to specifications even before 5 replacement operations are performed, replace the H/U body.
- When installing the ABSCM, always use new screws.
- When the sealing surface of the ABSCM or H/U is dirty or damaged and it cannot be removed or repaired, replace with a new part.

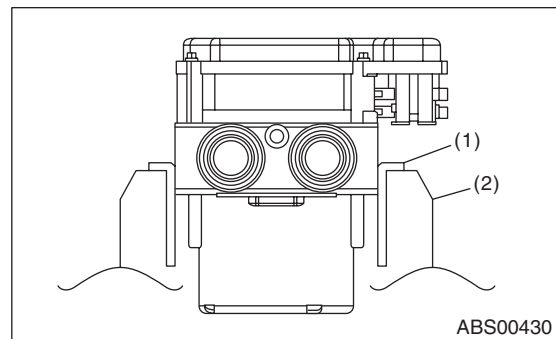
1) Remove the ABSCM&H/U. <Ref. to ABS-6, REMOVAL, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

2) To prevent entry of foreign objects and brake fluid leakage, plug the oil pressure port of the ABSCM&H/U using a screw plug, etc.

3) Set the pump motor section of the removed ABSCM&H/U face down on a vise.

NOTE:

Before securing a part on a vise, set cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.



(1) Aluminum plate, etc.

(2) Vise

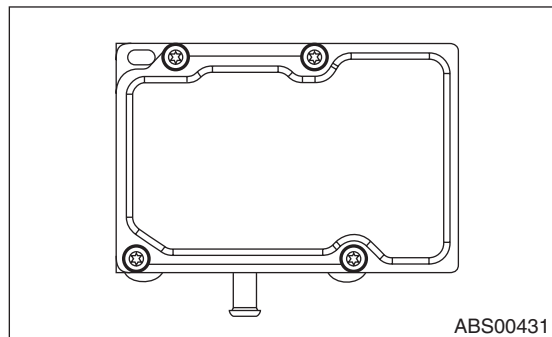
ABS Control Module and Hydraulic Control Unit (ABSCM&H/U)

ABS

4) Using TORX® BIT E5, remove the four screws of ABSCM.

NOTE:

These screws cannot be reused.



5) Slowly pull out the ABSCM upward from the H/U.

NOTE:

To prevent damaging the coil section, remove the ABSCM straight up from H/U without twisting.

6) Make sure there is no dirt or damage on the sealing surface of the H/U.

CAUTION:

- Do not clean the ABSCM & H/U by applying compressed air.
- Even if damage is found on the H/U seal, do not attempt repair by filing or with a metal scraper. To remove the seal residue, always use a plastic scraper. Do not use chemical such as paint thinner, etc., to clean.

7) Position the coil of the new ABSCM to align with the H/U valve.

8) To prevent deformation of the ABSCM housing cover, hold the corner of ABSCM and install it to the H/U without tilting.

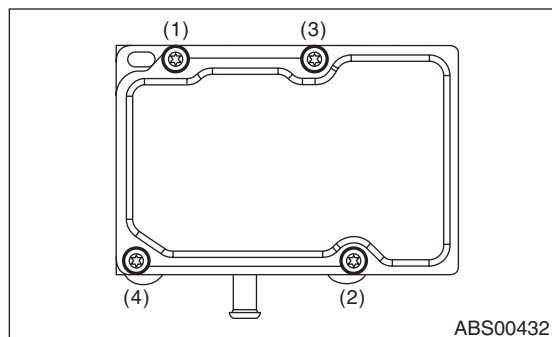
9) Using a TORX® BIT E5, attach/tighten new screws in the order of (1) through (4).

CAUTION:

Always use new screws.

Tightening torque:

1.5 N·m (0.15 kgf·m, 1.1 ft·lb)



10) Check that there is no foreign matter in mating surface between the ABSCM & H/U.

11) Using a TORX® BIT E5, tighten the screws in the order of (1) through (4) again.

Tightening torque:

3 N·m (0.3 kgf·m, 2.2 ft·lb)

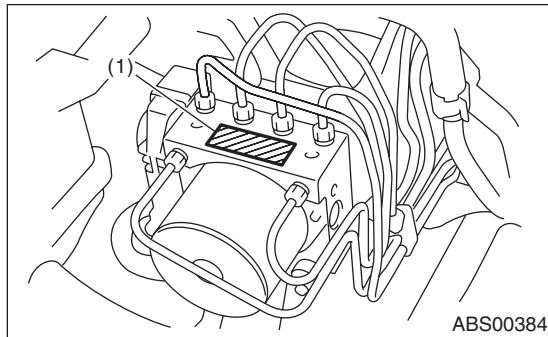
12) Check that there is no gap in the mating surface between ABSCM and H/U.

13) Install the ABSCM&H/U to the vehicle. <Ref. to ABS-7, INSTALLATION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

D: INSPECTION

- 1) Check the connection and seating of the connector.
- 2) Check the mark used for ABSCM&H/U identification.

Identification mark	Model
L6	AT
L7	MT



(1) Identification mark

1. CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE

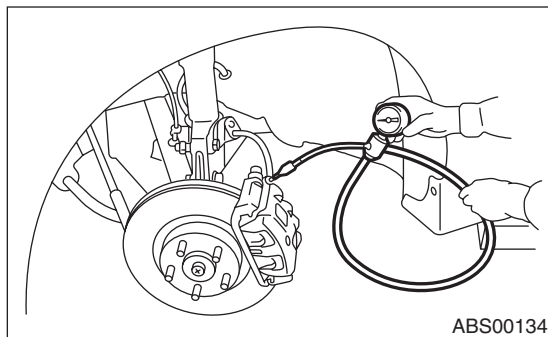
- 1) Lift up the vehicle, and remove the wheels.
- 2) Remove the air bleeder screws from FL and FR caliper bodies.
- 3) Connect two pressure gauges to FL and FR caliper bodies.

CAUTION:

- Use a pressure gauge used exclusively for brake fluid measurement.
- Do not use a pressure gauge used previously for measurement of transmission oil pressure, as the piston seal may expand and deform.

NOTE:

Wrap sealing tape around the pressure gauge.



- 4) Bleed air from the pressure gauge.
- 5) Perform ABS sequence control. <Ref. to ABS-11, ABS Sequence Control.>

- 6) When the hydraulic unit begins to work, first the FL side performs decompression, hold and compression, and then the FR side performs decompression, hold and compression.
- 7) Read the values indicated on the pressure gauge and check if the fluctuation of the values between decompression and compression meets the standard values. Also check whether any irregular tightness of the brake pedal can be felt.

	Front wheel	Rear wheel
Initial value	3,500 kPa (35 kgf/cm ² , 498 psi)	3,500 kPa (35 kgf/cm ² , 498 psi)
When depressurized	500 kPa (5 kgf/cm ² , 71 psi) or less	500 kPa (5 kgf/cm ² , 71 psi) or less
When pressurized	3,500 kPa (35 kgf/cm ² , 498 psi) or more	3,500 kPa (35 kgf/cm ² , 498 psi) or more

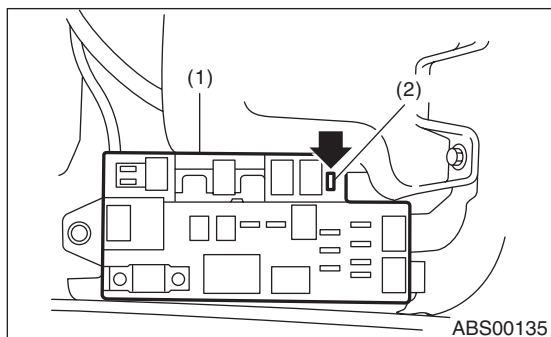
- 8) Disconnect the pressure gauges from FL and FR caliper bodies.
- 9) Remove the air bleeder screws from RL and RR caliper bodies.
- 10) Install the air bleeder screws of FL and FR caliper bodies.
- 11) Connect two pressure gauges to RL and RR caliper bodies.
- 12) Bleed the air of the FL and FR caliper bodies.
- 13) Perform ABS sequence control. <Ref. to ABS-11, ABS Sequence Control.>
- 14) When the hydraulic unit begins to work, first the RR side performs decompression, hold and compression, and then the RL side performs decompression, hold and compression.
- 15) Read the values indicated on the pressure gauges and check if it is within specification.
- 16) After checking, remove the pressure gauges from the caliper bodies.
- 17) Install the air bleeder screws of RL and RR caliper bodies.
- 18) Bleed air from the brake system.

ABS Control Module and Hydraulic Control Unit (ABSCM&H/U)

ABS

2. CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH THE BRAKE TESTER

1) In the case of AWD AT models, install a spare fuse to the FWD connector in the main fuse box to simulate FWD vehicles.



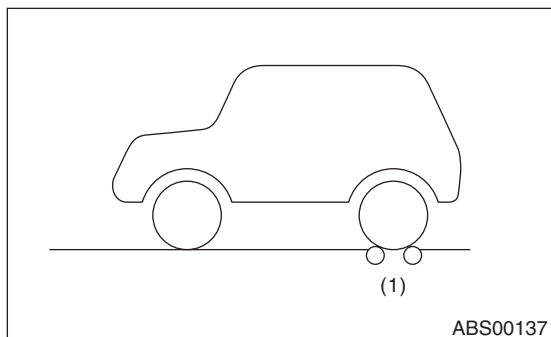
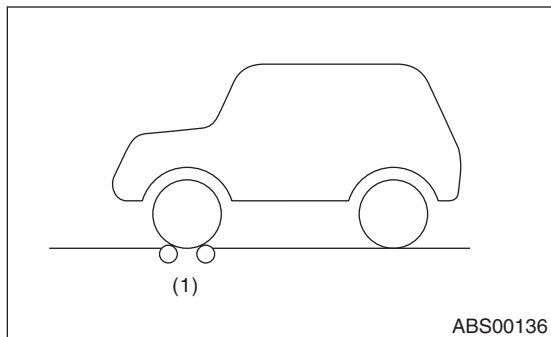
- (1) Main fuse box
- (2) FWD connector

NOTE:

Since a viscous coupling is used in the center differential on MT models, AWD circuit cut-off cannot be performed.

2) Prepare for the ABS sequence control operation. <Ref. to ABS-11, ABS Sequence Control.>

3) Set the front wheels or rear wheels on the brake tester and set the select lever position to the "N" range.



- (1) Brake tester

4) Operate the brake tester.

5) Perform ABS sequence control. <Ref. to ABS-11, ABS Sequence Control.>

6) When the hydraulic unit begins to work, check the following work sequence.

(1) The FL side performs decompression, hold and compression in sequence, and subsequently the FR side repeats the cycle.

(2) The RR side performs decompression, hold and compression in sequence, and the RL side repeats the same cycle next.

7) Read values indicated on the brake tester and check if the fluctuation of the values between decompression and compression meets the standard values.

	Front wheel	Rear wheel
Initial value	1,000 N (100 kgf, 221 lb)	1,000 N (100 kgf, 221 lb)
When depressurized	500 N (50 kgf, 110 lb) or less	500 N (50 kgf, 110 lb) or less
When pressurized	1,000 N (100 kgf, 221 lb) or more	1,000 N (100 kgf, 221 lb) or more

8) After checking, press the brake pedal and check whether any irregular tightness of the brake pedal can be felt.

3. ABS Sequence Control

A: OPERATION

- 1) While the ABS sequence control is being performed, the operation of the hydraulic unit can be checked using the brake tester or pressure gauge after the hydraulic unit solenoid valve operation.
- 2) ABS sequence control can be started by diagnosis connector or Subaru Select Monitor.

1. ABS SEQUENCE CONTROL WITH SUBARU SELECT MONITOR

NOTE:

If a problem occurs, sequence control will not operate. In this case, diagnose the failure. <Ref. to ABS(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>

- 1) Connect the Subaru Select Monitor to data link connector under the driver's side instrument panel lower cover.
- 2) Turn the ignition switch to ON.
- 3) Run the Subaru Select Monitor.
- 4) Set the Subaru Select Monitor to "BRAKE CONTROL" mode.
- 5) When the "Function check sequence" is selected, the "ABS sequence control" will start.
- 6) Execute the following operations when the message "Press the brake pedal so that the brake pedal force is between 100 and 150 kgf" is displayed.
 - (1) When using a brake tester, press the brake pedal pad with a force of 981 N (100 kgf, 221 lb).
 - (2) When using a pressure gauge, press the brake pedal so that the pressure gauge indicates 3,432 kPa (35 kg/cm², 498 psi).

CAUTION:

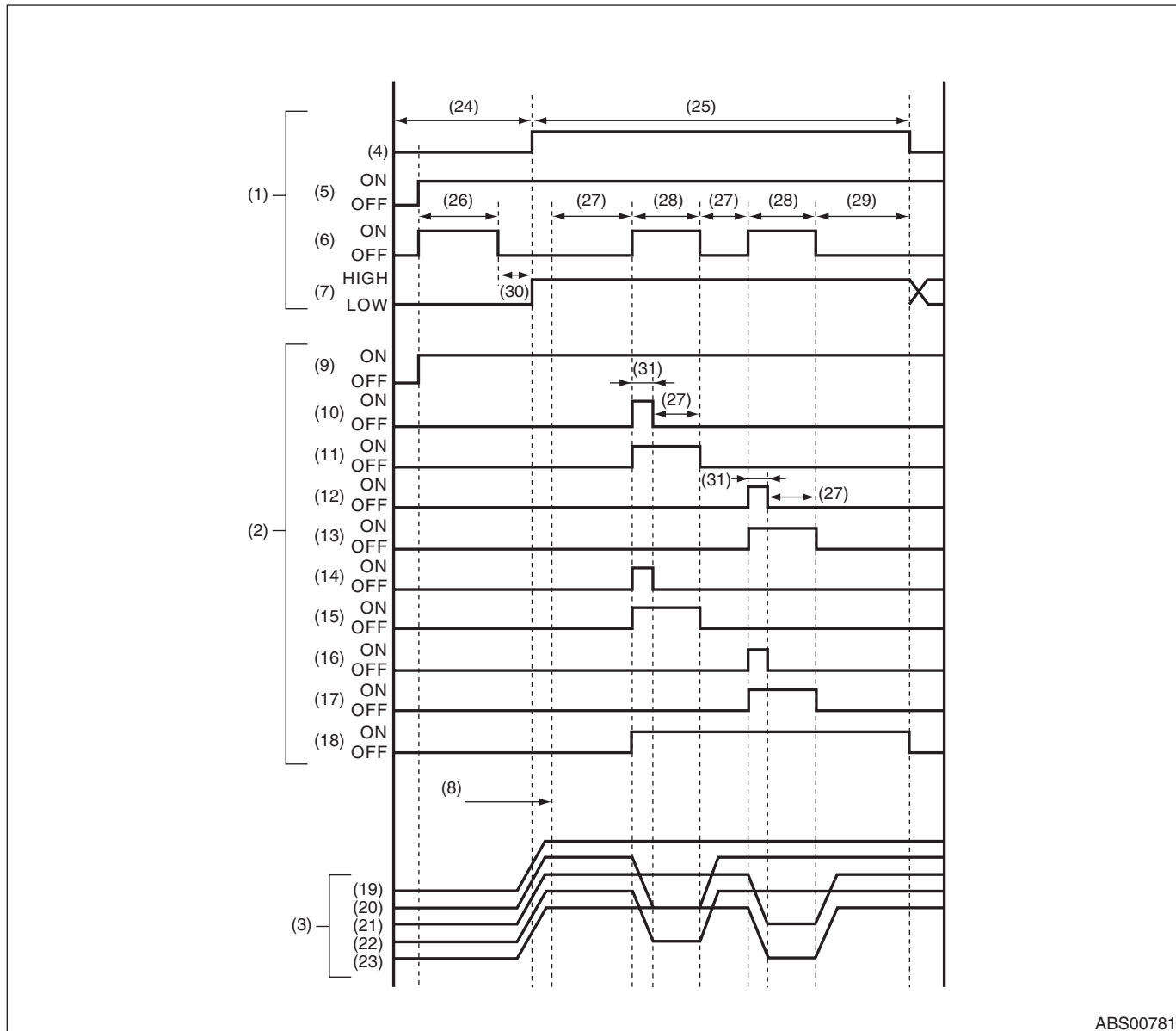
On models with the hill holder feature, do not step on the clutch pedal.

- 7) "OK" will be displayed. Select the [OK].
- 8) The brake system being operated is displayed on the Subaru Select Monitor.

ABS Sequence Control

ABS

2. CONDITIONS FOR ABS SEQUENCE CONTROL



ABS00781

- | | | |
|--|---------------------------------|---------------------------------|
| (1) Operation guide line of the sequence control | (10) FL decompression valve | (21) FR wheel cylinder pressure |
| (2) Operation pattern of sequence control | (11) FL compression valve | (22) RR wheel cylinder pressure |
| (3) Operating pressure of sequence control | (12) FR decompression valve | (23) RL wheel cylinder pressure |
| (4) All wheel speed | (13) FR compression valve | (24) 4 km/h (2 MPH) or less |
| (5) Ignition key | (14) RR decompression valve | (25) 10 km/h (6 MPH) or less |
| (6) ABS warning light | (15) RR compression valve | (26) Approx. 2 sec. |
| (7) Stop light switch | (16) RL decompression valve | (27) 1.0 second |
| (8) A point | (17) RL compression valve | (28) 1.4 seconds |
| (9) Valve relay | (18) Pump motor | (29) 0.6 seconds |
| | (19) Master cylinder pressure | (30) Within 0.5 second |
| | (20) FL wheel cylinder pressure | (31) 0.4 seconds |

NOTE:

- The control operation starts from point A.
- HIGH indicates high voltage.

- LOW indicates low voltage.

B: SPECIFICATION

1. ABS SEQUENCE CONTROL COMPLETE CONDITION

When the following conditions develop, the ABS sequence control stops and ABS operation is returned to the normal control mode.

- 1) When the speed of at least one wheel reaches 10 km/h (6 MPH).
- 2) When the brake pedal is released during sequence control and the stop light switch becomes OFF.
- 3) After completion of the sequence control.
- 4) When a malfunction is detected.

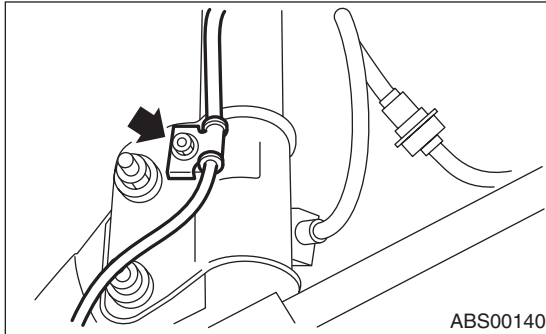
Front ABS Wheel Speed Sensor

ABS

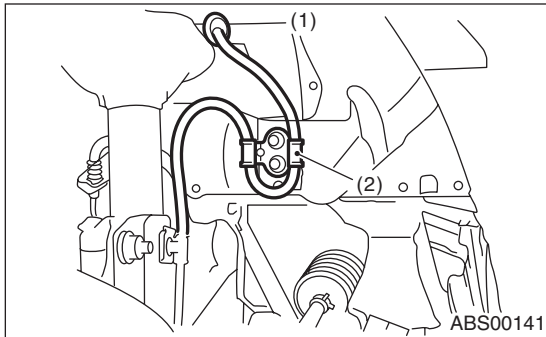
4. Front ABS Wheel Speed Sensor

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Disconnect the ABS wheel speed sensor connector located next to the front strut mounting house in the engine compartment.
- 3) Remove the bolts which secure the sensor harness to the strut.



- 4) Remove the bolts which secure the sensor harness to the body.

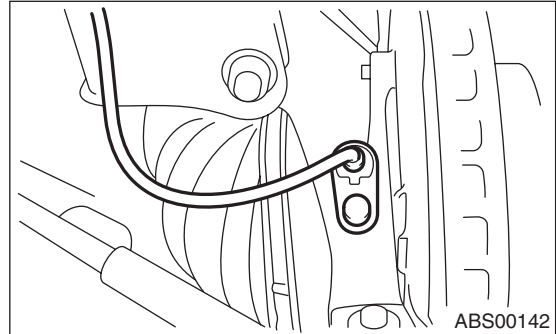


- (1) To the front ABS wheel speed sensor connector
- (2) Bracket

- 5) Remove the bolts which secure front ABS wheel speed sensor to the housing, and remove the front ABS wheel speed sensor.

CAUTION:

- Be careful not to damage the pole piece and the face of the teeth located at tip of the sensor during removal.
- Do not pull on the sensor harness during removal.

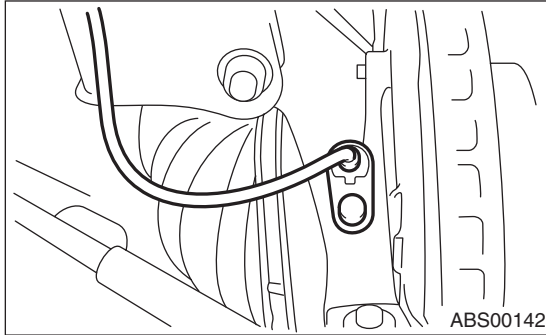


B: INSTALLATION

1) Temporarily install the front ABS wheel speed sensor on the housing.

CAUTION:

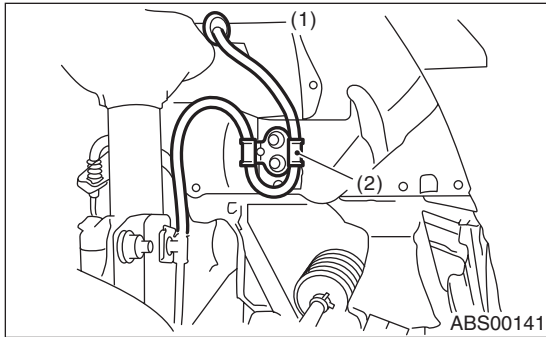
Be careful not to hit the ABS wheel speed sensor pole piece and tone wheel against adjacent metal parts during installation.



2) Install the front ABS wheel speed sensor on the strut and the wheel apron bracket.

Tightening torque:

33 N·m (3.4 kgf·m, 24.6 ft·lb)



- (1) To the front ABS wheel speed sensor connector
- (2) Bracket

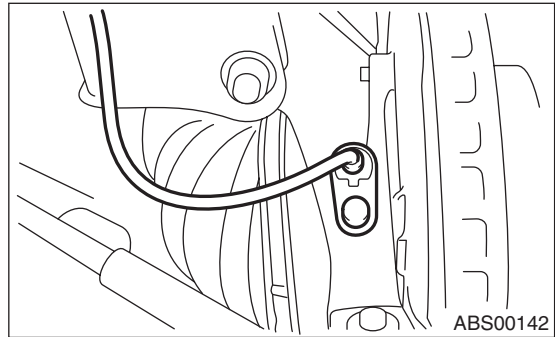
3) Check the clearance of the sensor. <Ref. to ABS-16, SENSOR GAP, INSPECTION, Front ABS Wheel Speed Sensor.>

If clearance is outside of the standard value, readjust by using the spacer (Part No. 26755AA000).

ABS wheel speed sensor gap standard value:
0.3 — 0.8 mm (0.012 — 0.031 in)

Tightening torque:

33 N·m (3.4 kgf·m, 24.6 ft·lb)



NOTE:

Check the identification (mark) on the harness to make sure there is no warpage. (RH: Red, LH: Blue)

4) After confirmation of the ABS wheel speed sensor clearance, connect the connector to the ABS wheel speed sensor.

5) Connect the ground cable to the battery.

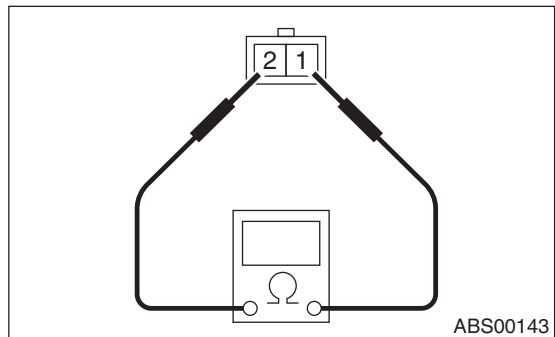
C: INSPECTION

1. ABS WHEEL SPEED SENSOR

1) Check the pole piece of the ABS wheel speed sensor for foreign particles or damage. If necessary, clean the pole piece or replace the ABS wheel speed sensor.

2) Measure the ABS wheel speed sensor resistance.

If resistance is outside the standard value, replace with a new ABS wheel speed sensor.



Terminal No.	Specification
1 and 2	1.25±0.25 kΩ

Front ABS Wheel Speed Sensor

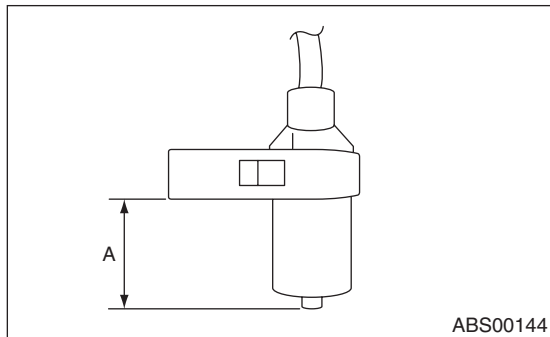
ABS

NOTE:

Check the ABS wheel speed sensor cable for discontinuity. If necessary, replace with a new part.

2. SENSOR GAP

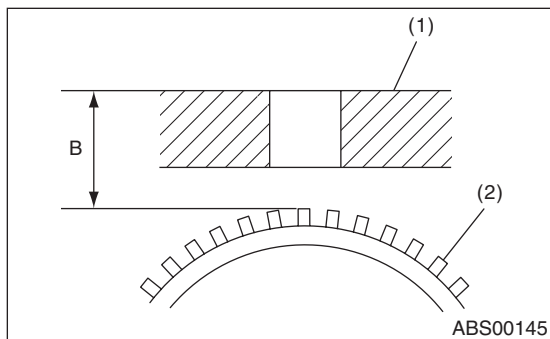
1) Measure the distance "A" between the ABS wheel speed sensor surface and sensor pole face.



2) Measure the distance "B" between the surface where the front axle housing meets the ABS wheel speed sensor, and the tone wheel.

NOTE:

Measure so that the gauge touches the apex of the tone wheel teeth.



- (1) Axle housing
- (2) Tone wheel

3) Find the gap between the ABS wheel speed sensor pole face and the surface of the tone wheel teeth by entering and calculating the measured values in the formula below.

$$\text{ABS wheel speed sensor gap} = B - A$$

ABS wheel speed sensor gap standard value:
0.3 — 0.8 mm (0.012 — 0.031 in)

NOTE:

If clearance is outside of the standard value, readjust by using the spacer (Part No. 26755AA000).

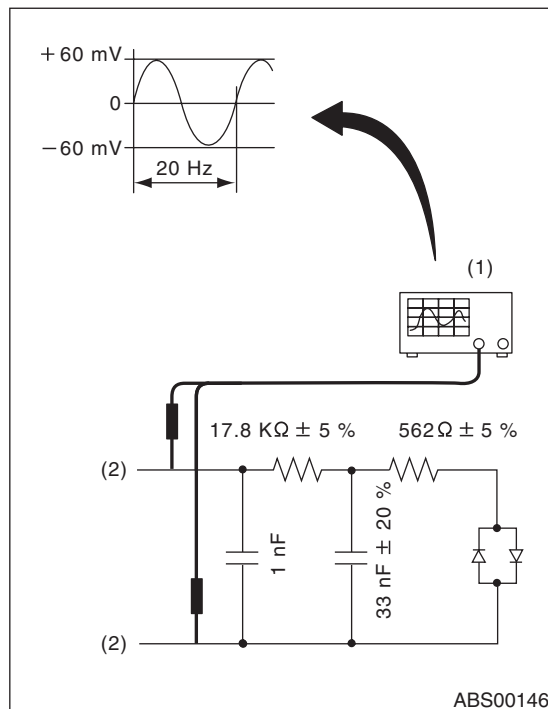
3. OUTPUT VOLTAGE

Output voltage can be checked by the following method. Install a resistor and condenser, then rotate the wheel about 2.75 km/h (2 MPH) or equivalent.

Standard value of output voltage:
0.12 — 1 V (at 20 Hz)

NOTE:

Regarding terminal numbers, refer to 1. ABS WHEEL SPEED SENSOR. <Ref. to ABS-15, ABS WHEEL SPEED SENSOR, INSPECTION, Front ABS Wheel Speed Sensor.>



- (1) Oscilloscope
- (2) Terminals

D: ADJUSTMENT

Adjust the gap using spacers (Part No. 26755AA000).

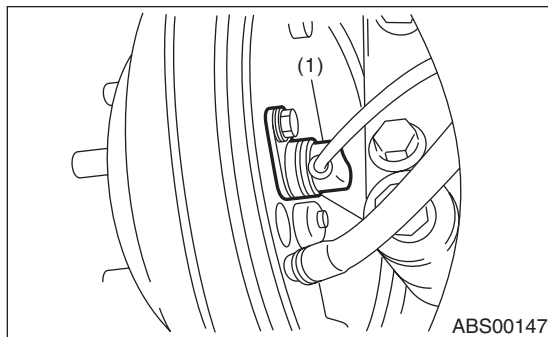
5. Rear ABS Wheel Speed Sensor

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Lift-up the vehicle.
- 3) Remove the rear seat and disconnect the rear ABS wheel speed sensor connector.
- 4) Remove the rear sensor harness bracket from the rear trailing link and bracket.
- 5) Remove the rear ABS wheel speed sensor from the back plate.

CAUTION:

- Be careful not to damage the pole piece and the face of the teeth located at tip of the sensor during removal.
- Do not pull on the sensor harness during removal.



(1) Rear ABS wheel speed sensor

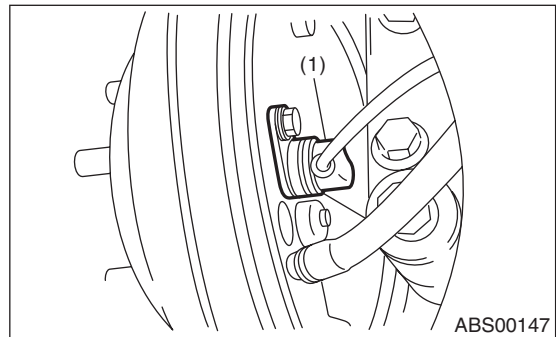
- 6) Remove the rear tone wheel when removing the hub from the housing and hub assembly. <Ref. to DS-21, REMOVAL, Rear Axle.>

B: INSTALLATION

- 1) Attach the hub to the rear tone wheel and attach the rear housing. <Ref. to DS-27, ASSEMBLY, Rear Axle.>
- 2) Temporarily attach the rear ABS wheel speed sensor to the back plate.

CAUTION:

Be careful not to hit the ABS wheel speed sensor pole piece and tone wheel against adjacent metal parts during installation.

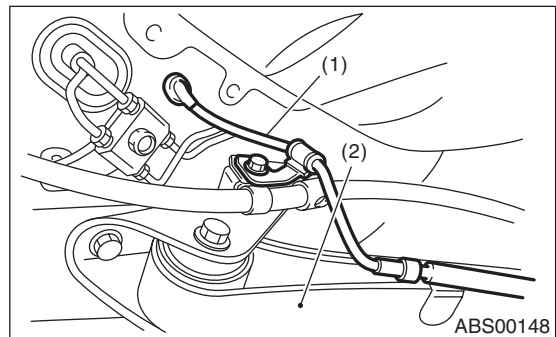


(1) Rear ABS wheel speed sensor

- 3) Install the rear drive shaft to the rear housing and rear differential spindle. <Ref. to DS-24, INSTALLATION, Rear Axle.>
- 4) Install the rear sensor harness on the rear trailing link.

Tightening torque:

33 N·m (3.4 kgf-m, 24.6 ft-lb)



(1) Rear sensor harness
(2) Trailing link

Rear ABS Wheel Speed Sensor

ABS

5) Check the clearance of the sensor. <Ref. to ABS-18, SENSOR GAP, INSPECTION, Rear ABS Wheel Speed Sensor.> When the clearance is within standard values, tighten the ABS wheel speed sensor to the back plate at the specified torque.

If clearance is outside of the standard value, readjust by using the spacer (Part No. 26755AA000).

ABS wheel speed sensor gap standard value:
0.7 — 1.2 mm (0.028 — 0.047 in)

Tightening torque:
33 N·m (3.4 kgf·m, 24.6 ft·lb)

NOTE:

Check the identification (mark) on the harness to make sure there is no warpage. (RH: White, LH: Yellow)

6) After confirmation of the ABS wheel speed sensor clearance, connect the connector to the ABS wheel speed sensor.

7) Connect the ground cable to the battery.

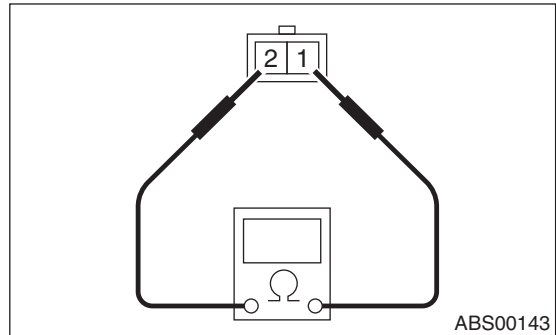
C: INSPECTION

1. ABS WHEEL SPEED SENSOR

1) Check the pole piece of the ABS wheel speed sensor for foreign particles or damage. If necessary, clean the pole piece or replace the ABS wheel speed sensor.

2) Measure the ABS wheel speed sensor resistance.

If resistance is outside the standard value, replace with a new ABS wheel speed sensor.



Terminal No.	Specification
1 and 2	1.15±0.115 kΩ

NOTE:

Check the ABS wheel speed sensor cable for discontinuity. If necessary, replace with a new part.

2. SENSOR GAP

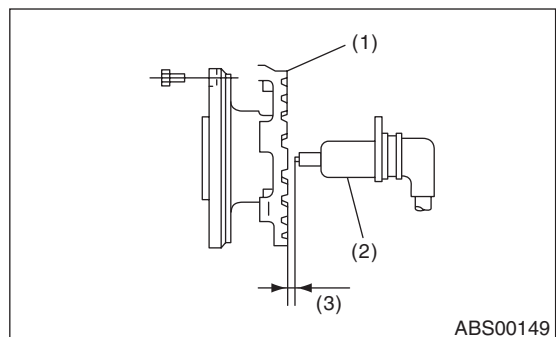
Check the gap between the tone wheel and the ABS wheel speed sensor around the entire circumference.

NOTE:

If clearance is narrow, adjust by using the spacer (Part No. 26755AA000).

If clearance is wide, check the output voltage and replace the ABS wheel speed sensor or tone wheel if the output voltage is outside the specification.

ABS wheel speed sensor gap standard value:
0.7 — 1.2 mm (0.028 — 0.047 in)



- (1) Tone wheel
- (2) ABS wheel speed sensor
- (3) Sensor gap

3. OUTPUT VOLTAGE

Output voltage can be checked by the following method. Install a resistor and condenser, then rotate the wheel about 2.75 km/h (2 MPH) or equivalent.

Standard value of output voltage:

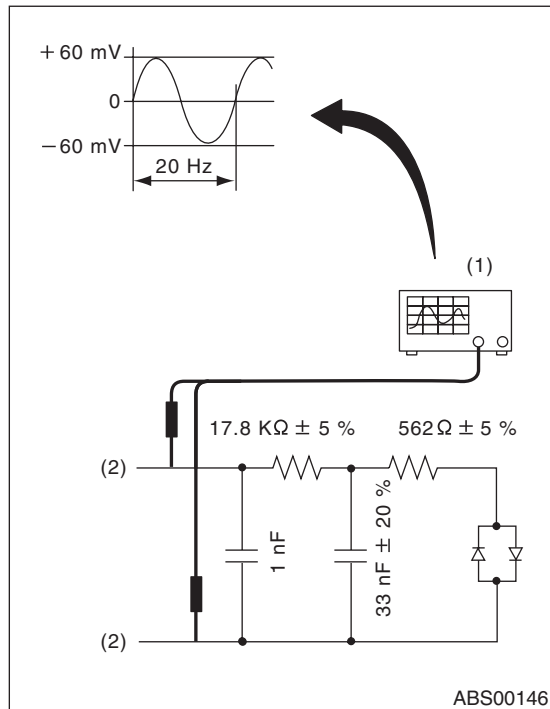
0.12 — 1 V at (20 Hz)

NOTE:

Regarding terminal numbers, refer to 1. ABS WHEEL SPEED SENSOR. <Ref. to ABS-18, ABS WHEEL SPEED SENSOR, INSPECTION, Rear ABS Wheel Speed Sensor.>

D: ADJUSTMENT

Adjust the gap using spacers (Part No. 26755AA000).



- (1) Oscilloscope
- (2) Terminals

6. Front Tone Wheel

A: REMOVAL

The front tone wheel is integrated with the front drive shaft. Refer to the section on Front Drive Shaft.

<Ref. to DS-29, REMOVAL, Front Drive Shaft.>

B: INSTALLATION

The front tone wheel is integrated with the front drive shaft. Refer to the section on Front Drive Shaft

<Ref. to DS-30, INSTALLATION, Front Drive Shaft.>

C: INSPECTION

Visually check the tone wheel's teeth (44 pieces) for cracks or dents. If necessary, replace with a new tone wheel.

NOTE:

Replace the AC assembly with a new part if there is any defect found on the tone wheel, since it is unitized with the AC assembly of the drive shaft.

7. Rear Tone Wheel

A: REMOVAL

The rear tone wheel is attached to the rear hub. Refer to Rear Axle.

<Ref. to DS-21, REMOVAL, Rear Axle.>

B: INSTALLATION

The rear tone wheel is attached to the rear hub. Refer to Rear Axle.

<Ref. to DS-24, INSTALLATION, Rear Axle.>

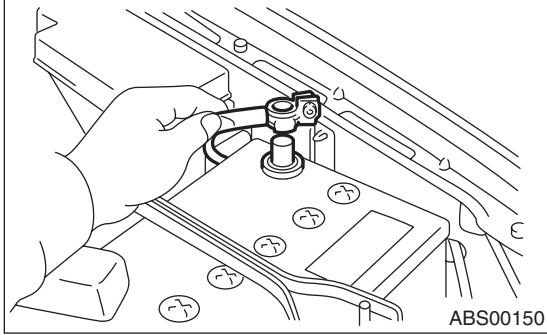
C: INSPECTION

Visually check the tone wheel's teeth (44 pieces) for cracks or dents. If necessary, replace with a new tone wheel.

8. G Sensor

A: REMOVAL

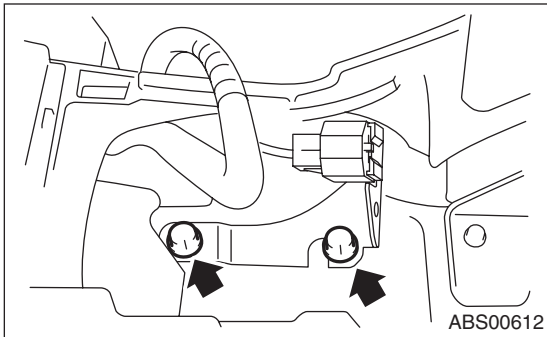
- 1) Disconnect the ground cable from the battery.



- 2) Remove the console cover.
<Ref. to EI-38, REMOVAL, Console Box.>
- 3) Disconnect the connector from the G sensor.
- 4) Remove the G sensor from the body.

CAUTION:

- Do not drop or bump the G sensor.
- The G sensor integrated with the bracket. Do not disassemble.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

CAUTION:

Do not drop or bump the G sensor.

C: INSPECTION

	Step	Check	Yes	No
1	CHECK SUBARU SELECT MONITOR.	Is a Subaru Select Monitor available?	Go to step 5.	Go to step 2.
2	CHECK G SENSOR. 1) Turn the ignition switch to OFF. 2) Remove the G sensor from vehicle. 3) Connect the connector to the G sensor. 4) Turn the ignition switch to ON. 5) Measure the voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage 2.3 ± 0.2 V when G sensor is in a horizontal position?	Go to step 3.	Replace the G sensor.
3	CHECK G SENSOR. Measure the voltage between G sensor connector terminals. Connector & terminal (B292) No. 2 (+) — No. 3 (-):	Is the voltage between 3.9 ± 0.2 V when G sensor is inclined forward 90° ?	Go to step 4.	Replace the G sensor.
4	CHECK G SENSOR. Measure the voltage between G sensor connector terminals. Connector & terminal: (B292) No. 2 (+) — No. 3 (-)	Is the voltage 0.7 ± 0.2 V when the G sensor is inclined backward 90° ?	G sensor is normal.	Replace the G sensor.
5	CHECK G SENSOR. 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to the data link connector. 3) Set the Subaru Select Monitor to the "BRAKE CONTROL" mode. 4) Set the display in the {Current Data Display & Save} mode. 5) Read the G sensor output voltage.	Is the indicated reading on the monitor display 0 ± 0.1 m/s ² ?	Go to step 6.	Replace the G sensor.
6	CHECK G SENSOR. 1) Remove the console box. 2) Remove the G sensor from vehicle. (Do not disconnect the connector.) 3) Read the Subaru Select Monitor display.	Is the numerical value 9.8 ± 0.1 m/s ² when G sensor is inclined forward 90° ?	Go to step 7.	Replace the G sensor.
7	CHECK G SENSOR. Read the Subaru Select Monitor display.	Is the numerical value -9.8 ± 0.1 m/s ² when G sensor is inclined back 90° ?	G sensor is normal.	Replace the G sensor.

Basic Diagnostic Procedure

ABS (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

CAUTION:

Remove foreign matter (dust, water, oil etc.) from the ABSCM&H/U connector during removal and installation.

NOTE:

- To check harness for broken wires or short circuits, shake the suspected trouble spot or connector.
- Refer to "Check List for Interview". <Ref. to ABS(diag)-4, Check List for Interview.>

	Step	Check	Yes	No
1	<p>CHECK PRE-INSPECTION.</p> <p>1) Ask the customer when and how the trouble occurred using the interview check list. <Ref. to ABS(diag)-4, Check List for Interview.></p> <p>2) Before performing diagnostics, check the components which might affect ABS problems. <Ref. to ABS(diag)-8, INSPECTION, General Description.></p>	Are components which might affect the ABS problem operating correctly?	Go to step 2.	Repair or replace each component.
2	<p>CHECK INDICATION OF DTC ON SCREEN.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Connect the Subaru Select Monitor to the data link connector.</p> <p>3) Turn the ignition switch to ON and run the Subaru Select Monitor.</p> <p>NOTE: If the communication function of the Subaru Select Monitor cannot be executed normally, check the communication circuit. <Ref. to ABS(diag)-19, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.></p> <p>4) Read the DTC. <Ref. to ABS(diag)-24, OPERATION, Read Diagnostic Trouble Code (DTC).></p> <p>5) Record all DTCs and freeze frame data.</p>	Is DTC displayed?	Go to step 4.	Go to step 3.
3	<p>PERFORM GENERAL DIAGNOSTICS.</p> <p>1) Perform the inspection using "General Diagnostic Table". <Ref. to ABS(diag)-69, General Diagnostic Table.></p> <p>2) Perform the Clear Memory Mode. <Ref. to ABS(diag)-18, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.></p> <p>3) Perform the Inspection Mode. <Ref. to ABS(diag)-25, Inspection Mode.></p> <p>4) Read the DTC. <Ref. to ABS(diag)-16, READ DIAGNOSTIC TROUBLE CODE, OPERATION, Subaru Select Monitor.></p> <p>Check that there is no DTC displayed.</p>	Does the ABS warning light go off after turning the ignition switch ON?	Finish the diagnosis.	Check using "ABS Diagnostic Procedure". <Ref. to ABS(diag)-22, WITHOUT DTC, INSPECTION, Subaru Select Monitor.>

Basic Diagnostic Procedure

ABS (DIAGNOSTICS)

	Step	Check	Yes	No
4	PERFORM DIAGNOSIS. 1) Refer to "List of Diagnostic Trouble Code (DTC)." <Ref. to ABS(diag)-35, LIST, List of Diagnostic Trouble Code (DTC).> 2) Correct the cause of trouble. 3) Perform the Clear Memory Mode. <Ref. to ABS(diag)-18, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.> 4) Perform the Inspection Mode. <Ref. to ABS(diag)-25, Inspection Mode.> 5) Read the DTC. <Ref. to ABS(diag)-16, READ DIAGNOSTIC TROUBLE CODE, OPERATION, Subaru Select Monitor.>	Is DTC displayed?	Repeat step 1 to 4 until DTC does not appear.	Finish the diagnosis.

Check List for Interview

ABS (DIAGNOSTICS)

2. Check List for Interview

A: CHECK

Check the following items regarding condition of the vehicle.

1. STATE OF ABS WARNING LIGHT

ABS warning light comes on.	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Only once <input type="checkbox"/> Does not come on • When and for how long does it come on?																																										
Ignition key position	<input type="checkbox"/> LOCK <input type="checkbox"/> ACC <input type="checkbox"/> ON (Before starting engine) <input type="checkbox"/> START <input type="checkbox"/> ON (After starting engine, while engine is running) <input type="checkbox"/> ON (After starting engine, engine is stopped)																																										
Timing	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;"><input type="checkbox"/> Immediately after turning the ignition to ON</td> <td colspan="2"></td> </tr> <tr> <td style="padding: 2px;"><input type="checkbox"/> Immediately after turning the ignition to START</td> <td colspan="2"></td> </tr> <tr> <td style="padding: 2px;"><input type="checkbox"/> When accelerating</td> <td style="text-align: center; width: 100px;">—</td> <td style="text-align: right; width: 100px;">km/h</td> </tr> <tr> <td></td> <td style="text-align: center;">—</td> <td style="text-align: right;">MPH</td> </tr> <tr> <td style="padding: 2px;"><input type="checkbox"/> While driving at a constant speed</td> <td style="text-align: center;">km/h</td> <td style="text-align: right;">MPH</td> </tr> <tr> <td style="padding: 2px;"><input type="checkbox"/> When decelerating</td> <td style="text-align: center;">—</td> <td style="text-align: right;">km/h</td> </tr> <tr> <td></td> <td style="text-align: center;">—</td> <td style="text-align: right;">MPH</td> </tr> <tr> <td style="padding: 2px;"><input type="checkbox"/> When turning to the right</td> <td style="padding: 2px;">Steering angle:</td> <td style="text-align: right;">deg</td> </tr> <tr> <td></td> <td style="padding: 2px;">Steering time:</td> <td style="text-align: right;">Sec.</td> </tr> <tr> <td style="padding: 2px;"><input type="checkbox"/> When turning to the left</td> <td style="padding: 2px;">Steering angle:</td> <td style="text-align: right;">deg</td> </tr> <tr> <td></td> <td style="padding: 2px;">Steering time:</td> <td style="text-align: right;">Sec.</td> </tr> <tr> <td style="padding: 2px;"><input type="checkbox"/> When other electrical parts are operating</td> <td colspan="2"></td> </tr> <tr> <td></td> <td colspan="2">• Parts name:</td> </tr> <tr> <td></td> <td colspan="2">• Operating condition:</td> </tr> </table>	<input type="checkbox"/> Immediately after turning the ignition to ON			<input type="checkbox"/> Immediately after turning the ignition to START			<input type="checkbox"/> When accelerating	—	km/h		—	MPH	<input type="checkbox"/> While driving at a constant speed	km/h	MPH	<input type="checkbox"/> When decelerating	—	km/h		—	MPH	<input type="checkbox"/> When turning to the right	Steering angle:	deg		Steering time:	Sec.	<input type="checkbox"/> When turning to the left	Steering angle:	deg		Steering time:	Sec.	<input type="checkbox"/> When other electrical parts are operating				• Parts name:			• Operating condition:	
<input type="checkbox"/> Immediately after turning the ignition to ON																																											
<input type="checkbox"/> Immediately after turning the ignition to START																																											
<input type="checkbox"/> When accelerating	—	km/h																																									
	—	MPH																																									
<input type="checkbox"/> While driving at a constant speed	km/h	MPH																																									
<input type="checkbox"/> When decelerating	—	km/h																																									
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<input type="checkbox"/> When turning to the right	Steering angle:	deg																																									
	Steering time:	Sec.																																									
<input type="checkbox"/> When turning to the left	Steering angle:	deg																																									
	Steering time:	Sec.																																									
<input type="checkbox"/> When other electrical parts are operating																																											
	• Parts name:																																										
	• Operating condition:																																										

Check List for Interview

ABS (DIAGNOSTICS)

2. STATE OF BRAKE WARNING LIGHT

Brake warning light comes on.	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Only once <input type="checkbox"/> Does not come on <input type="checkbox"/> When pulling the parking brake lever. <input type="checkbox"/> When releasing the parking brake lever. • When and for how long does it come on?		
Ignition key position	<input type="checkbox"/> LOCK <input type="checkbox"/> ACC <input type="checkbox"/> ON (Before starting engine) <input type="checkbox"/> START <input type="checkbox"/> ON (After starting engine, while engine is running) <input type="checkbox"/> ON (After starting engine, engine is stopped)		
Timing	<input type="checkbox"/> Immediately after turning the ignition to ON <input type="checkbox"/> Immediately after turning the ignition to START		
	<input type="checkbox"/> When accelerating	—	km/h
		—	MPH
	<input type="checkbox"/> While driving at a constant speed	km/h	MPH
	<input type="checkbox"/> When decelerating	—	km/h
		—	MPH
	<input type="checkbox"/> When turning to the right	Steering angle:	deg
		Steering time:	Sec.
	<input type="checkbox"/> When turning to the left	Steering angle:	deg
		Steering time:	Sec.
	<input type="checkbox"/> When other electrical parts are operating		
	• Parts name:		
	• Operating condition:		

Check List for Interview

ABS (DIAGNOSTICS)

3. SYMPTOMS

ABS operating condition	<input type="checkbox"/> Does not operate.	
	<input type="checkbox"/> Operates only when applying the brakes suddenly.	Vehicle speed: km/h
	MPH	
	• Procedures for stepping on the brake pedal:	
	a) Operating time:	Sec.
	b) Operating noise: <input type="checkbox"/> Occurs. / <input type="checkbox"/> Does not occur.	
• What kind of noise?		<input type="checkbox"/> Knocking <input type="checkbox"/> Gong gong <input type="checkbox"/> Thump <input type="checkbox"/> Buzz <input type="checkbox"/> Gong gong buzz <input type="checkbox"/> Others :
c) Reaction force of brake pedal		<input type="checkbox"/> Sticks <input type="checkbox"/> Weak pedal resistance <input type="checkbox"/> Strong pedal resistance <input type="checkbox"/> Others :
Condition of vehicle	a) Directional stability cannot be obtained or the steering does not respond when applying brakes: <input type="checkbox"/> Yes / <input type="checkbox"/> No	
	• When:	<input type="checkbox"/> When turning to the right <input type="checkbox"/> When turning to the left <input type="checkbox"/> When spinning out <input type="checkbox"/> Others :
	b) Directional stability cannot be obtained or the steering does not respond when accelerating: <input type="checkbox"/> Yes / <input type="checkbox"/> No	
	• When:	<input type="checkbox"/> When turning to the right <input type="checkbox"/> When turning to the left <input type="checkbox"/> When spinning out <input type="checkbox"/> Others :
	c) Poor brake performance: <input type="checkbox"/> Yes / <input type="checkbox"/> No	
	• What kind:	<input type="checkbox"/> Braking distance is long. <input type="checkbox"/> Brakes lock or drag. <input type="checkbox"/> Pedal stroke is long. <input type="checkbox"/> Pedal sticks. <input type="checkbox"/> Others :
	d) Poor acceleration: <input type="checkbox"/> Yes / <input type="checkbox"/> No	
	• What kind:	<input type="checkbox"/> Fails to accelerate. <input type="checkbox"/> Engine stalls. <input type="checkbox"/> Others :
	e) Occurrence of vibration: <input type="checkbox"/> Yes / <input type="checkbox"/> No	
	• Where • What kind:	
	f) Occurrence of noise: <input type="checkbox"/> Yes / <input type="checkbox"/> No	
• Where • What kind:		
g) Other troubles occurred: <input type="checkbox"/> Yes / <input type="checkbox"/> No		
• What kind:		

Check List for Interview

ABS (DIAGNOSTICS)

4. CONDITIONS UNDER WHICH TROUBLE OCCURS

Environment	a) Weather	<input type="checkbox"/> Fine <input type="checkbox"/> Cloudy <input type="checkbox"/> Rainy <input type="checkbox"/> Snowy <input type="checkbox"/> Others :	
	b) Ambient temperature	°C (°F)	
	c) Road	<input type="checkbox"/> Inner city <input type="checkbox"/> Suburbs <input type="checkbox"/> Highway <input type="checkbox"/> Local street <input type="checkbox"/> Uphill <input type="checkbox"/> Downhill <input type="checkbox"/> Paved road <input type="checkbox"/> Gravel road <input type="checkbox"/> Muddy road <input type="checkbox"/> Sandy place <input type="checkbox"/> Others :	
	d) Road surface	<input type="checkbox"/> Dry <input type="checkbox"/> Wet <input type="checkbox"/> Covered with fresh snow <input type="checkbox"/> Covered with hardened snow <input type="checkbox"/> Frozen slope <input type="checkbox"/> Others :	
Condition	a) Brakes	Deceleration: G	
		<input type="checkbox"/> Intermittent / <input type="checkbox"/> Temporary	
	b) Accelerator	Acceleration: G	
		<input type="checkbox"/> Intermittent / <input type="checkbox"/> Temporary	
	c) Vehicle speed	km/h	MPH
		<input type="checkbox"/> Advancing <input type="checkbox"/> When accelerating <input type="checkbox"/> When decelerating <input type="checkbox"/> At low speed <input type="checkbox"/> When turning <input type="checkbox"/> Others :	
	d) Tire inflation pressure	Front RH tire:	kPa
		Front LH tire:	kPa
		Rear RH tire:	kPa
		Rear LH tire:	kPa
	e) Degree of wear	Front RH tire:	
		Front LH tire:	
		Rear RH tire:	
		Rear LH tire:	
f) Genuine parts are used.:	<input type="checkbox"/> Yes / <input type="checkbox"/> No		
g) Tire chain is attached.:	<input type="checkbox"/> Yes / <input type="checkbox"/> No		
h) T-type tire is used.:	<input type="checkbox"/> Yes / <input type="checkbox"/> No		
i) Condition of suspension alignment:			
j) Loaded state:			
k) Repair parts are used.:	<input type="checkbox"/> Yes / <input type="checkbox"/> No		
• Contents:			
l) Others:			

General Description

ABS (DIAGNOSTICS)

3. General Description

A: CAUTION

1. SUPPLEMENTAL RESTRAINT SYSTEM “AIRBAG”

Airbag system wiring harness is routed near the ABS wheel speed sensor and ABSCM&H/U.

CAUTION:

- All airbag system wiring harness and connectors are colored yellow. Do not use the electrical test equipment on these circuits.
- Be careful not to damage the airbag system wiring harness when servicing the ABS wheel speed sensor and ABSCM&H/U.

B: INSPECTION

Before performing diagnosis, check the following item which might affect ABS problems.

1. BATTERY

Measure the battery voltage and check electrolyte.

Standard voltage:

12 V or more

Specific gravity:

1.260 or more

2. GROUND

Check the tightness of ABS ground (B302) bolt.

3. BRAKE FLUID

- 1) Check the brake fluid level.
- 2) Check the brake fluid for leaks.

4. HYDRAULIC UNIT

Check the hydraulic unit.

- When using the brake tester <Ref. to ABS-10, CHECKING THE HYDRAULIC UNIT ABS OPERATION WITH THE BRAKE TESTER, INSPECTION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
- When not using the brake tester <Ref. to ABS-9, CHECKING THE HYDRAULIC UNIT ABS OPERATION BY PRESSURE GAUGE, INSPECTION, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

5. BRAKE DRAG

Check for brake drag.

6. BRAKE PAD AND ROTOR

Check the brake pad and rotor.

- Front <Ref. to BR-16, INSPECTION, Front Brake Pad.> <Ref. to BR-17, INSPECTION, Front Disc Rotor.>

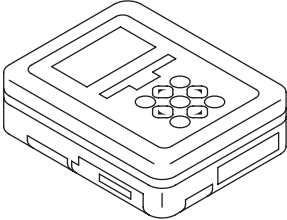
- Rear <Ref. to BR-21, INSPECTION, Rear Brake Pad.> <Ref. to BR-23, INSPECTION, Rear Disc Rotor.>

7. TIRE

Check the tire specifications, tire wear and air pressure. <Ref. to WT-2, SPECIFICATION, General Description.>

C: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	Description	REMARKS
 <p style="text-align: center;">ST1B020XU0</p>	1B020XU0	SUBARU SELECT MONITOR KIT	Used for diagnosing the electrical system.

2. GENERAL TOOL

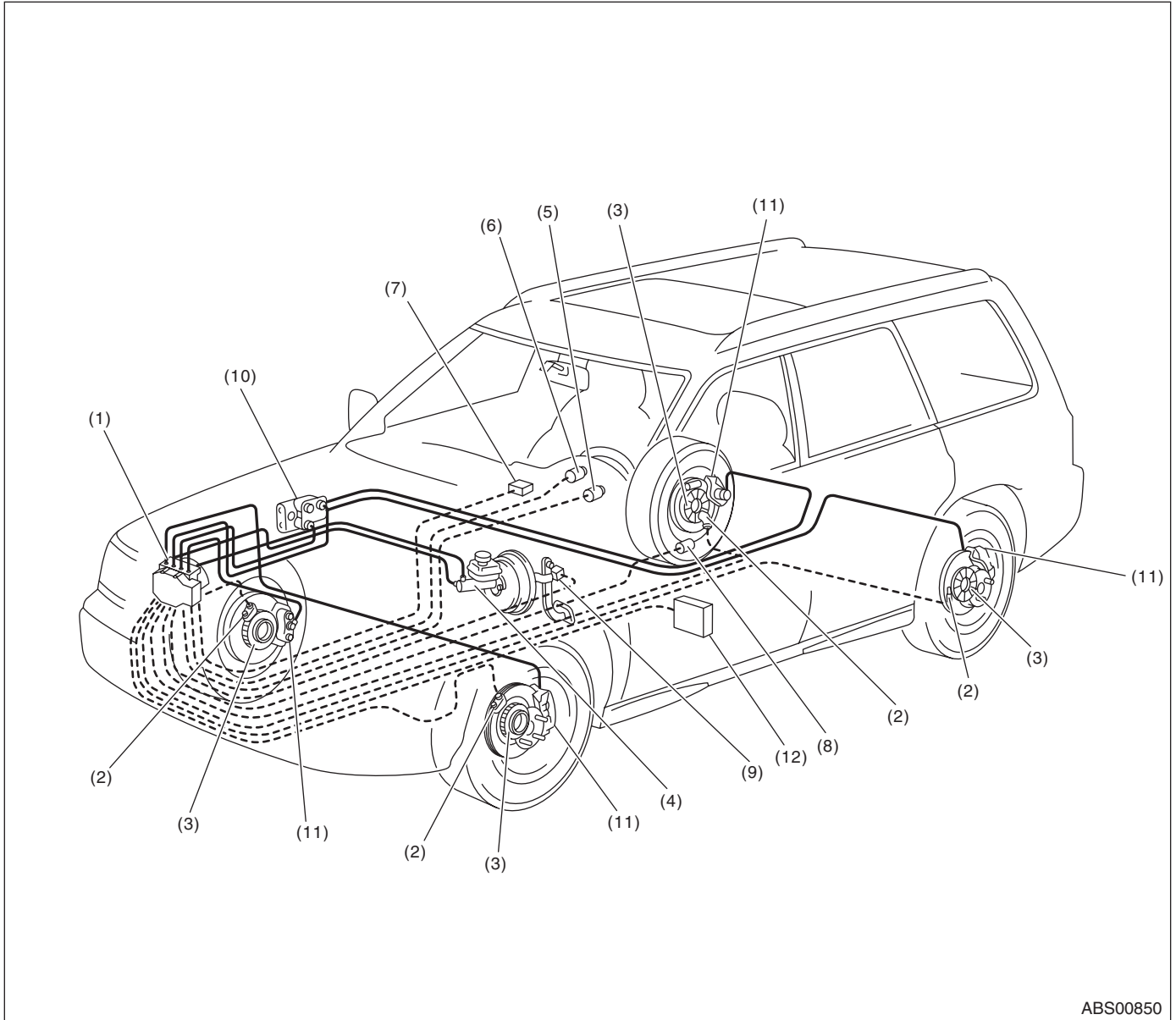
TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.
Oscilloscope	Used for measuring the sensor.

Electrical Component Location

ABS (DIAGNOSTICS)

4. Electrical Component Location

A: LOCATION

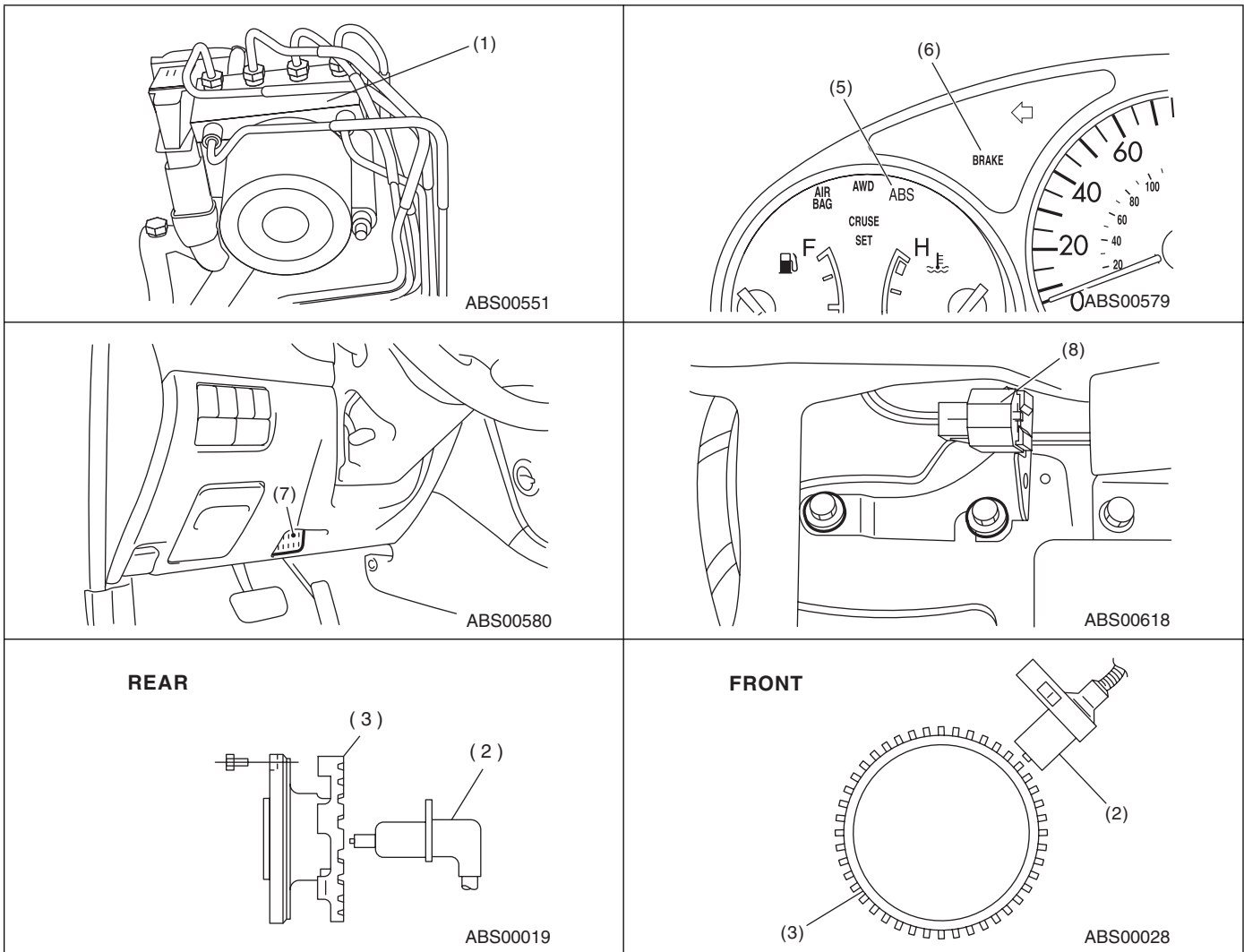


ABS00850

- | | | |
|---|---|--|
| (1) ABS control module and hydraulic control unit (ABSCM&H/U) | (6) Brake warning light (EBD warning light) | (10) Proportioning valve (Model without EBD) |
| (2) ABS wheel speed sensor | (7) Data link connector | (11) Caliper body |
| (3) Tone wheel | (8) G sensor | (12) Transmission control module (for AT model only) |
| (4) Master cylinder | (9) Stop light switch | |
| (5) ABS warning light | | |

Electrical Component Location

ABS (DIAGNOSTICS)

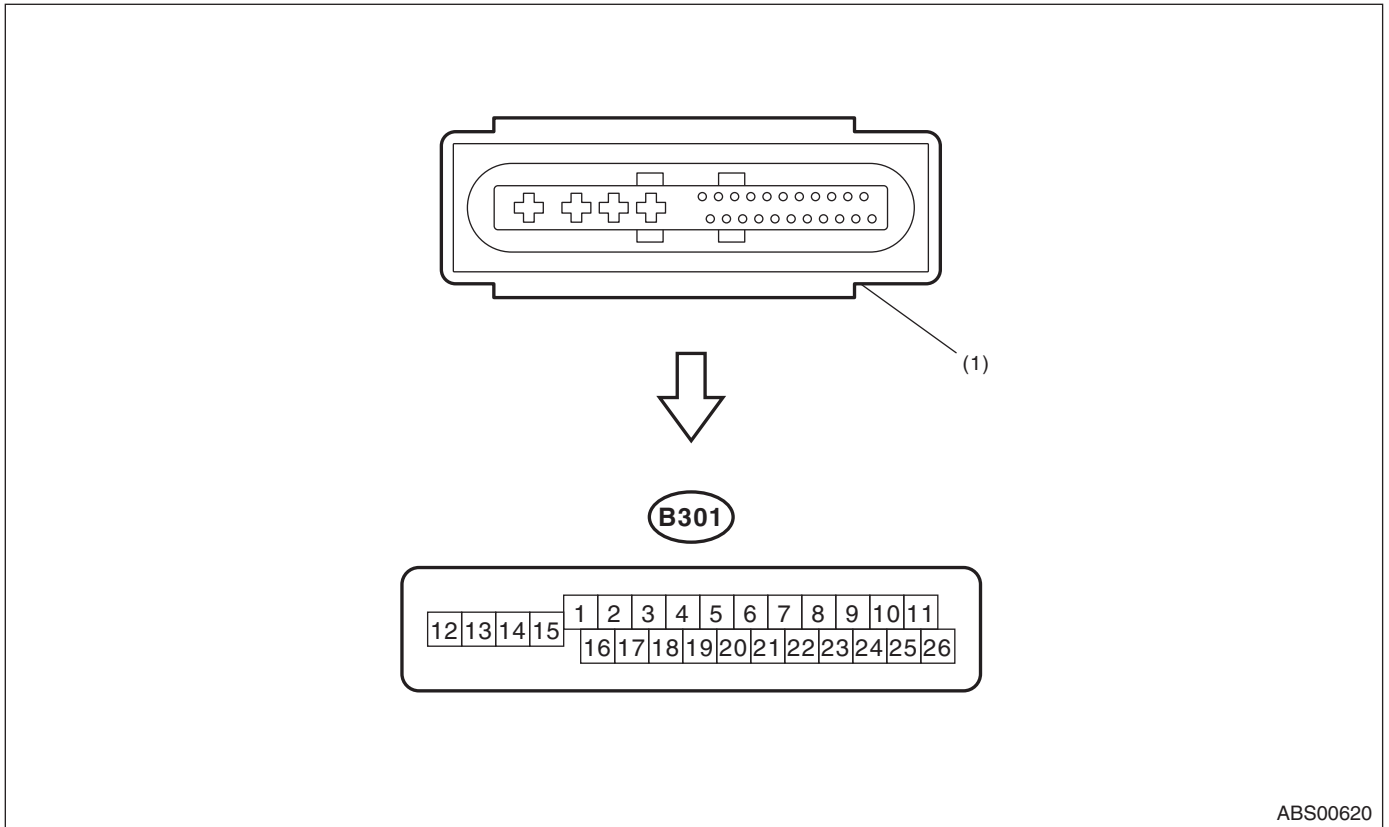


Control Module I/O Signal

ABS (DIAGNOSTICS)

5. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



ABS00620

- (1) ABS control module and hydraulic control unit (ABSCM&H/U) connector

NOTE:

- Terminal numbers in ABSCM&H/U connector are shown in the figure.
- ABS warning light illuminates when the connector is removed from ABSCM&H/U.

Control Module I/O Signal

ABS (DIAGNOSTICS)

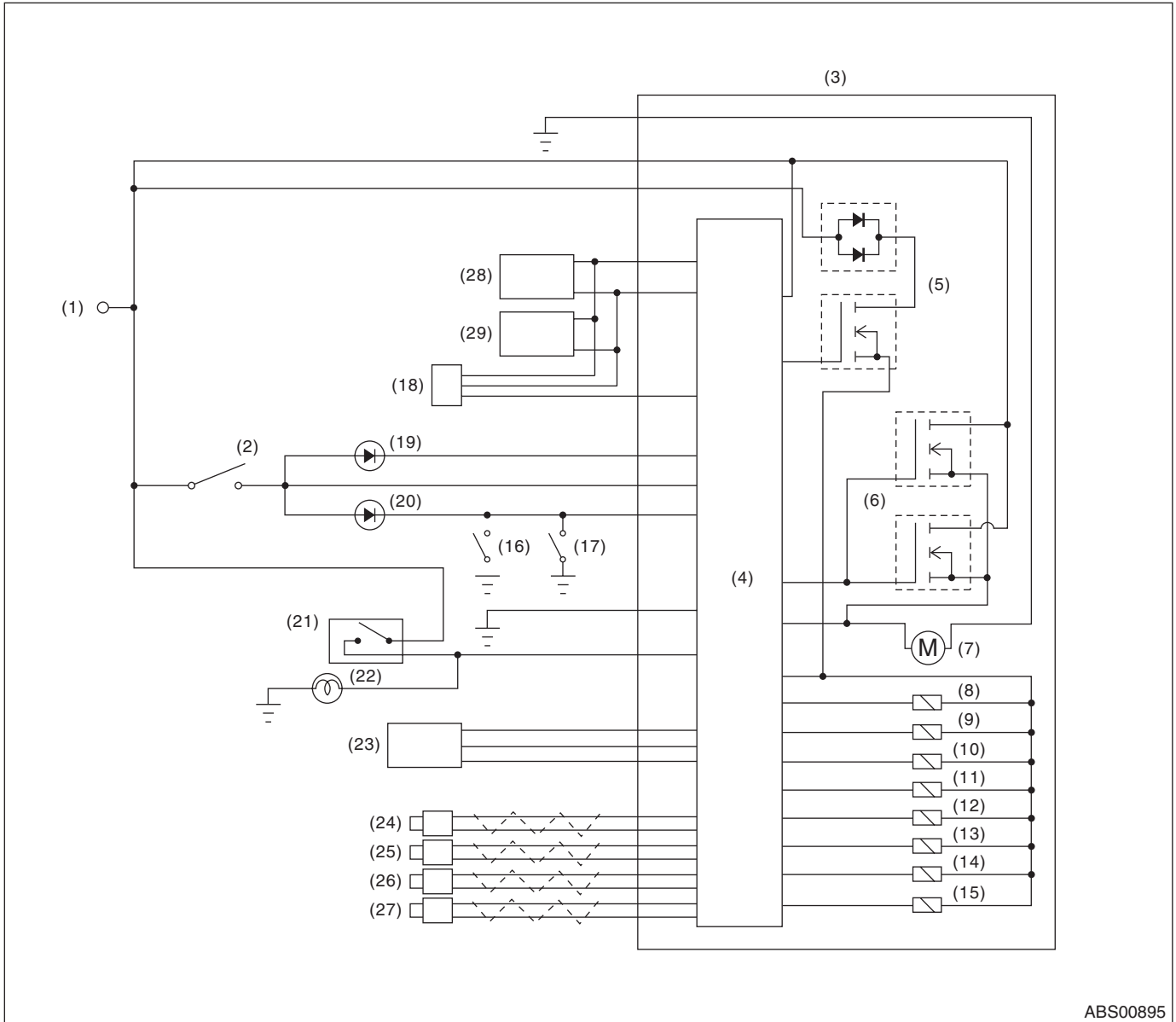
Description		Terminal No. (+) — (-)	Input/Output signal
ABS wheel speed sensor (Wheel speed sensor)	Front LH wheel	1 — 16	0.12 — 1 V (at 20 Hz)
	Front RH wheel	6 — 5	
	Rear LH wheel	3 — 2	
	Rear RH wheel	19 — 4	
CAN communication circuit (+) (for AT models only)		26	2.5 — 1.5 V pulse signal
CAN communication circuit (-) (for AT models only)		11	3.5 — 2.5 V pulse signal
Valve relay power supply *1		14 — 15	10 — 15 V
Motor relay power supply *1		13 — 15	10 — 15 V
G Sensor	Power supply	24 — 10	4.75 — 5.25 V
	Ground	10	—
	Output	21 — 10	2.1 — 2.5 V when the vehicle is on level surface
Stop light switch *1		20 — 15	Less than 1.5 V when the stop light is OFF; otherwise, 10 — 15 V when the stop light is ON.
ABS warning light		22 — 15	After turning the ignition switch ON, 10 — 15 V during 1.5 seconds and less than 1.5 V after 1.5 seconds passed.
Brake warning light (EBD warning light)		8 — 15	After turning the ignition switch ON, 10 — 15 V during 1.5 seconds and less than 1.5 V after 1.5 seconds passed.
Subaru Select Monitor		7 — 15	Less than 1.5 V when no data is received. 0 ↔ 12 V pulse (in communication)
Power supply *1		18 — 15	10 — 15 V when the ignition switch is ON.
Grounding line		15	—

*1: Measure the I/O signal voltage after removing the connector from the ABSCM&H/U terminal.

Control Module I/O Signal

ABS (DIAGNOSTICS)

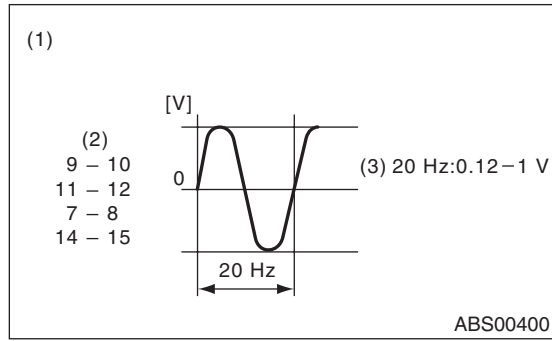
B: WIRING DIAGRAM



ABS00895

- | | | |
|---|-------------------------------------|--|
| (1) Battery | (11) Front outlet solenoid valve RH | (21) Stop light switch |
| (2) Ignition switch | (12) Rear inlet solenoid valve LH | (22) Stop light |
| (3) ABS control module and hydraulic control unit (ABSCM&H/U) | (13) Rear outlet solenoid valve LH | (23) G Sensor |
| (4) ABS control module | (14) Rear inlet solenoid valve RH | (24) Front ABS wheel speed sensor LH |
| (5) Valve relay | (15) Rear outlet solenoid valve RH | (25) Front ABS wheel speed sensor RH |
| (6) Motor relay | (16) Parking brake switch | (26) Rear ABS wheel speed sensor LH |
| (7) Motor | (17) Brake fluid level switch | (27) Rear ABS wheel speed sensor RH |
| (8) Front inlet solenoid valve LH | (18) Data link connector | (28) Transmission control module (AT models) |
| (9) Front outlet solenoid valve LH | (19) ABS warning light | (29) Engine control module |
| (10) Front inlet solenoid valve RH | (20) Brake warning light | |

C: WAVEFORM



- (1) ABS wheel speed sensor
- (2) Terminal No.
- (3) Standard output voltage

6. Subaru Select Monitor

A: OPERATION

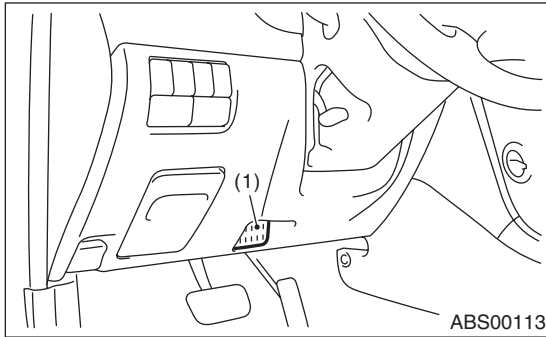
1. READ DIAGNOSTIC TROUBLE CODE

1) Prepare the Subaru Select Monitor kit. <Ref. to ABS(diag)-9, SPECIAL TOOL, PREPARATION TOOL, General Description.>

2) Connect the diagnosis cable to Subaru Select Monitor.

3) Connect the Subaru Select Monitor to the data link connector.

(1) Data link connector is located in the lower portion of instrument panel (on the driver's side).



(1) Data link connector

(2) Connect the diagnosis cable to data link connector.

CAUTION:

Do not connect the scan tools other than the Subaru Select Monitor.

4) Turn the ignition switch to ON (engine OFF) and run the Subaru Select Monitor.

5) On the «Main Menu» display screen, select {Each System Check}.

6) On the «System Selection Menu» display screen, select {Brake Control}.

7) Select the [OK] after the {ABS} is displayed.

8) On the «ABS Diagnosis» screen, select {DTC Display}.

NOTE:

- For details concerning operation procedure, refer to the "SUBARU SELECT MONITOR OPERATION MANUAL".

- For details concerning DTCs, refer to List of Diagnostic Trouble Code (DTC). <Ref. to ABS(diag)-35, List of Diagnostic Trouble Code (DTC).>

- Up to 3 DTCs are displayed in the order of detection.

- If a particular DTC is not stored in memory properly at the occurrence of problem (due to a drop in ABSCM&H/U power supply etc.), the DTC suffixed with a question mark "?" is displayed on Subaru Select Monitor display screen. This shows it may be an unreliable reading.

9) If communication is not possible between the ABS and the Subaru Select Monitor, check the communication circuit. <Ref. to ABS(diag)-19, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.>

10) When DTC is not displayed, check the meter circuit and the CAN communication circuit. <Ref. to ABS(diag)-22, WITHOUT DTC, INSPECTION, Subaru Select Monitor.>

Display	Contents to be monitored
Current	The current DTC is displayed on Subaru Select Monitor display screen.
Previous	The latest DTC from the history of previous problems is displayed on Subaru Select Monitor display screen.
Second previous	The second latest DTC from the history of previous problems is displayed on the Subaru Select Monitor display screen.
Third previous	The third latest DTC from the history of previous problems is displayed on Subaru Select Monitor display screen.

2. READ CURRENT DATA

- 1) On the «Main Menu» display screen, select {Each System Check}.
 - 2) On the «System Selection Menu» display screen, select the {Brake Control}.
 - 3) Select the [OK] after {ABS} is displayed.
 - 4) On the «Brake Control Diagnosis» display screen, select the {Current Data Display/Save}.
 - 5) On the «Display Menu» screen, select the data display method.
 - 6) Using the scroll key, scroll the display screen up or down until necessary data is shown.
- A list of the support data is shown in the following table.

Display	Contents to be monitored	Unit of measure
FR Wheel Speed	Wheel speed detected by front ABS wheel speed sensor RH is displayed.	km/h or MPH
FL Wheel Speed	Wheel speed detected by front ABS wheel speed sensor LH is displayed.	km/h or MPH
RR Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor RH is displayed.	km/h or MPH
RL Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor LH is displayed.	km/h or MPH
BLS Signal	Brake ON/OFF is displayed.	ON or OFF
G Sensor	Vehicle acceleration detected by analog G sensor is displayed.	m/s (m/s ²)
Valve Relay Signal	Valve relay operation signal is displayed.	ON or OFF
ABS Warning Light	ON operation of the ABS warning light is displayed.	ON or OFF
EBD Warning Light	ON operation of the EBD warning light is displayed.	ON or OFF
Motor Relay Monitor	Motor relay monitor voltage is displayed.	V
IG power supply voltage	Voltage supplied to ABSCM&H/U is displayed.	V
ABS Control Flag	ABS control condition is displayed.	ON or OFF
ABS OK B Signal	ABS system normal/abnormal is displayed.	OK or NG

NOTE:

For details concerning operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

Subaru Select Monitor

ABS (DIAGNOSTICS)

3. CLEAR MEMORY MODE

- 1) On the «Main Menu» display screen, select the {2. Each System Check}.
- 2) On the «System Selection Menu» display screen, select the {Brake Control}.
- 3) Select the [OK] after {ABS} is displayed.
- 4) On the «Brake Control Diagnosis» display screen, select {Clear Memory}.

Display	Contents to be monitored
Clear memory?	DTC deleting function

5) When “Done” and “Turn ignition switch OFF” is shown on the display screen, turn the ignition switch OFF and close the Subaru Select Monitor.

NOTE:

For details concerning operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

4. ABS SEQUENCE CONTROL

Display	Contents to be monitored	Index No.
ABS sequence control	Operate the valve and pump motor continuously to perform the ABS sequence control.	<Ref. to ABS-11, ABS Sequence Control.>

5. FREEZE FRAME DATA

NOTE:

- Data stored at the time of trouble occurrence is shown on the display.
- Each time a trouble occurs, the latest information is stored in the freeze frame data in memory.
- Up to 3 freeze frame data will be stored.
- If freeze frame data is not stored in memory properly (due to a drop in ABS control module power supply etc.), a DTC suffixed with a question mark “?” is displayed on Subaru Select Monitor display screen. This shows it may be an unreliable reading.

Display	Contents to be monitored
FR Wheel Speed	Wheel speed detected by front ABS wheel speed sensor RH is displayed in km/h or MPH.
FL Wheel Speed	Wheel speed detected by front ABS wheel speed sensor LH is displayed in km/h or MPH.
RR Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor RH is displayed in km/h or MPH.
RL Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor LH is displayed in km/h or MPH.
IG power supply voltage	Voltage supplied (V) to ABSCM&H/U is displayed.
G Sensor	Vehicle acceleration detected by analog G sensor is displayed.
Motor Relay Monitor	Motor relay condition is displayed.
BLS Signal	Brake ON/OFF is displayed.
Vehicle speed	Vehicle speed calculated by ABS control module is displayed.
ABS Control Flag	ABS control condition is displayed.
Power Supply Failure	Whether abnormal voltage occurred or not is displayed during malfunction.

B: INSPECTION

1. COMMUNICATION FOR INITIALIZING IMPOSSIBLE

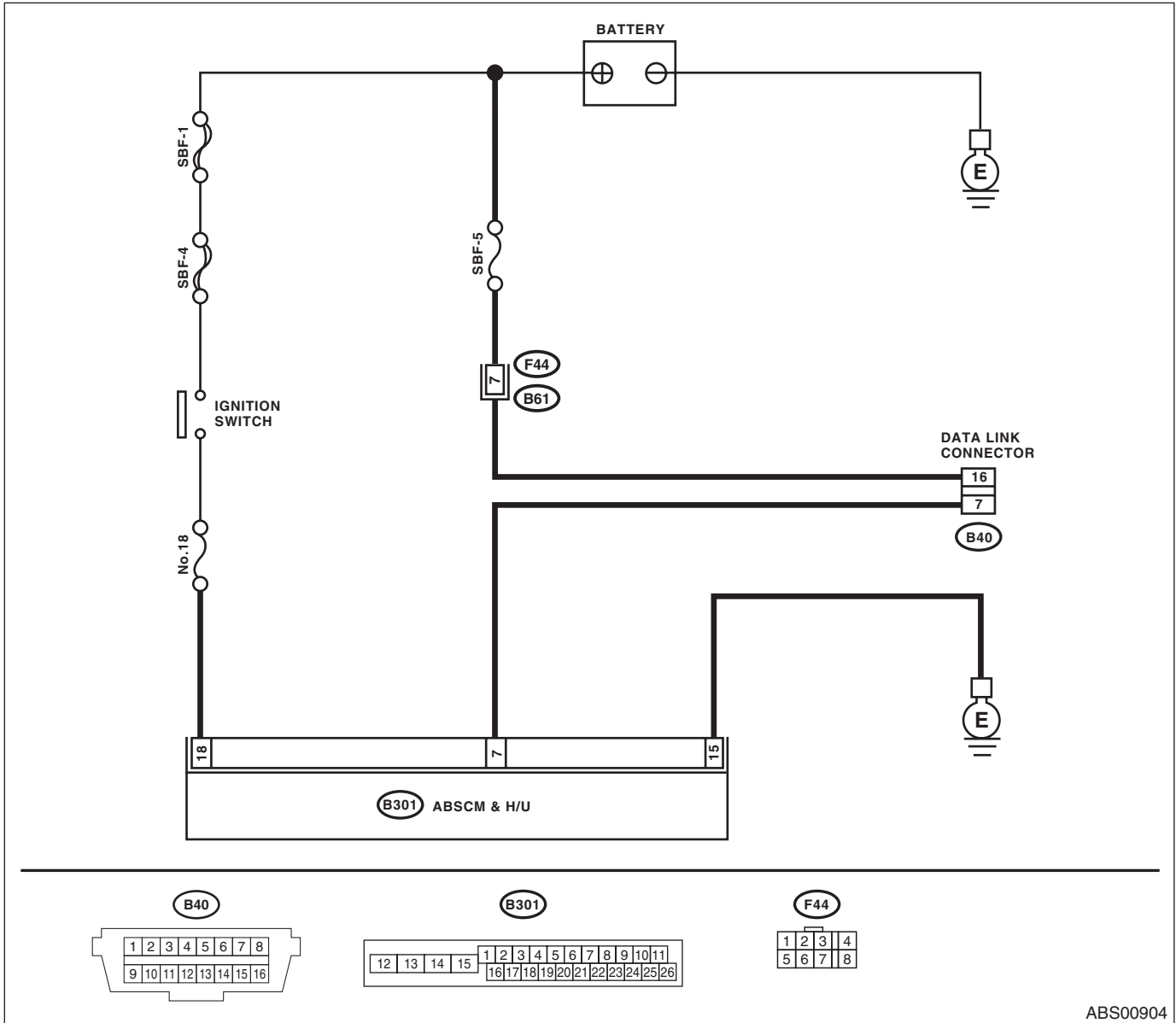
DETECTING CONDITION:

Defective harness connector

TROUBLE SYMPTOM:

Communication is impossible between ABS and Subaru Select Monitor.

WIRING DIAGRAM:



ABS00904

Subaru Select Monitor

ABS (DIAGNOSTICS)

Step	Check	Yes	No	
1	CHECK IGNITION SWITCH.	Is the ignition switch ON?	Go to step 2.	Turn the ignition switch to ON, and select ABS mode using Subaru Select Monitor.
2	CHECK BATTERY. 1) Turn the ignition switch to OFF. 2) Measure the battery voltage.	Is the voltage 11 V or more?	Go to step 3.	Charge or replace the battery.
3	CHECK BATTERY TERMINAL.	Is there poor contact at the battery terminal?	Repair or tighten the battery terminal.	Go to step 4.
4	CHECK SUBARU SELECT MONITOR COMMUNICATION. 1) Turn the ignition switch to ON. 2) Using the Subaru Select Monitor, check whether communication to other systems can be executed normally.	Are the system name and model year displayed on Subaru Select Monitor?	Go to step 8.	Go to step 5.
5	CHECK SUBARU SELECT MONITOR COMMUNICATION. 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U connectors. 3) Turn the ignition switch to ON. 4) Check whether communication to other systems can be executed normally.	Are the system name and model year displayed on Subaru Select Monitor?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 6.
6	CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U, ECM and TCM. 3) Measure the resistance between data link connector and chassis ground. Connector & terminal (B40) No. 7 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 7.	Repair the harness and connector between each control module and data link connector.
7	CHECK OUTPUT SIGNAL FOR ABSCM&H/U. 1) Turn the ignition switch to ON. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B40) No. 7 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 8.	Repair the harness and connector between each control module and data link connector.
8	CHECK HARNESS CONNECTOR BETWEEN ABSCM&H/U AND DATA LINK CONNECTOR. Measure the resistance between ABSCM&H/U connector and data link connector. Connector & terminal (B301) No. 7 — (B40) No. 7:	Is the resistance less than 0.5 Ω ?	Go to step 9.	Repair harness and connector between ABSCM&H/U and data link connector.
9	CHECK INSTALLATION OF ABSCM&H/U CONNECTOR. Turn the ignition switch to OFF.	Is the ABSCM&H/U connector inserted into ABSCM&H/U until the clamp locks onto it?	Go to step 10.	Insert ABSCM&H/U connector into ABSCM&H/U.
10	CHECK POWER SUPPLY CIRCUIT. 1) Turn the ignition switch to ON. (Engine OFF) 2) Measure the ignition power supply voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 18 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 11.	Repair open circuit of harness between ABSCM&H/U and battery.

Subaru Select Monitor

ABS (DIAGNOSTICS)

Step	Check	Yes	No
11 CHECK HARNESS CONNECTOR BETWEEN ABSCM&H/U AND CHASSIS GROUND. 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U connectors. 3) Measure the resistance of the harness between ABSCM&H/U and chassis ground. <i>Connector & terminal (B301) No. 15 — Chassis ground:</i>	Is the resistance less than 0.5 Ω ?	Go to step 12.	Repair the open circuit of the harness between ABSCM&H/U and inhibitor side connector, and poor contact of coupling connector.
12 CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact in control module power supply, ground circuit and data link connector?	Repair the connector.	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

Subaru Select Monitor

ABS (DIAGNOSTICS)

2. WITHOUT DTC

DETECTING CONDITION:

- Defective combination meter
- Open circuit of harness

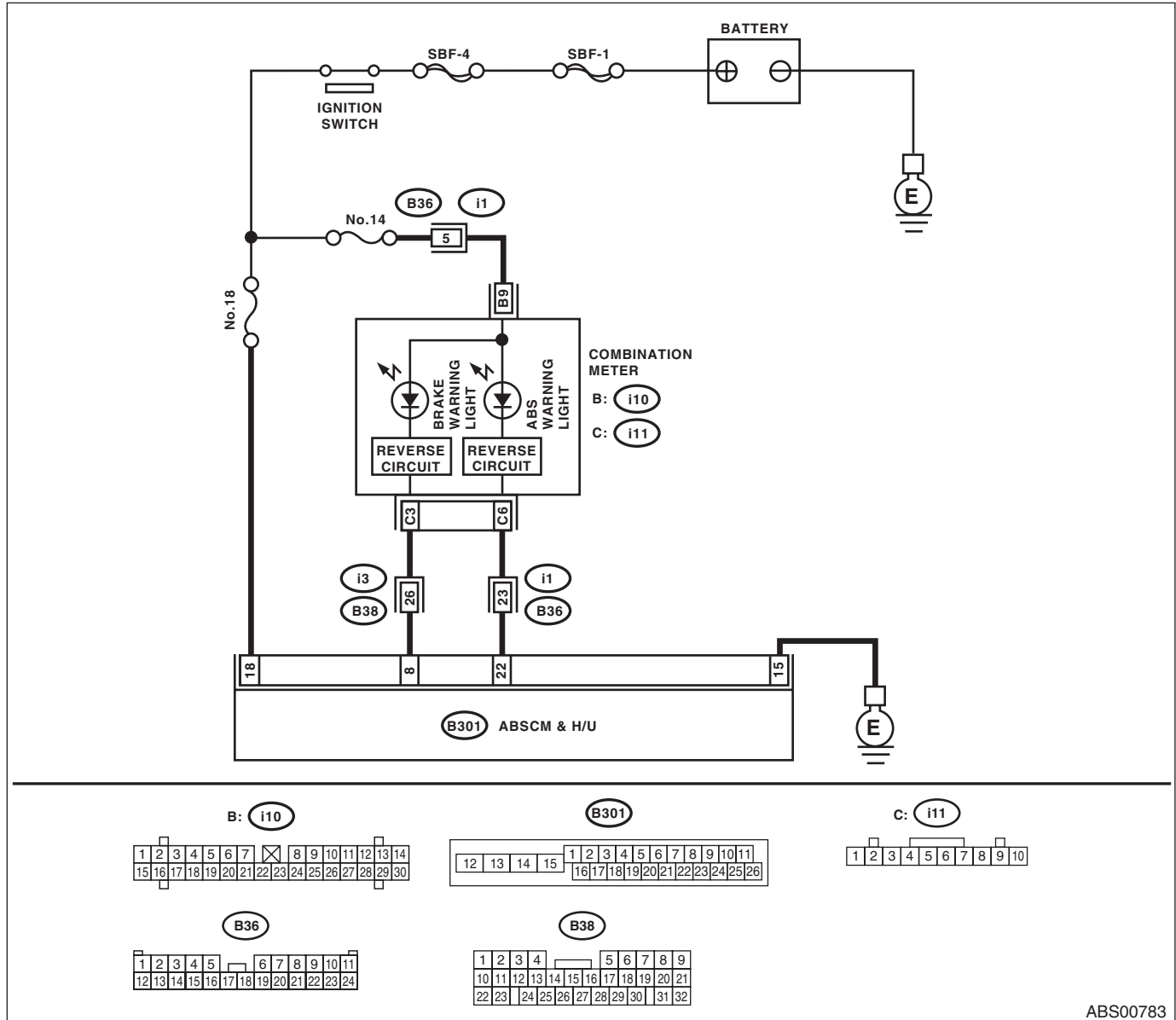
TROUBLE SYMPTOM:

- ABS warning light does not go off.
- "NO TROUBLE CODE" will be displayed on the Subaru Select Monitor.

NOTE:

When the ABS warning light is OFF and "NO TROUBLE CODE" is displayed on Subaru Select Monitor, the system is in normal condition.

WIRING DIAGRAM:



Subaru Select Monitor

ABS (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK SUBARU SELECT MONITOR DATA. 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the condition of "ABS warning light."	Is "ON" indicated?	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 2.
2	CHECK WIRING HARNESS. Measure the resistance between ABSCM connector and combination meter connector. <i>Connector & terminal (i11) No. 6 — (B301) No. 22:</i>	Is the resistance less than 0.5 Ω?	Go to step 3.	Repair harness and connector between ABSCM&H/U and combination meter.
3	CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact in ABSCM connector and combination meter connector?	Repair the connector.	Check the combination meter.

Read Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

For details about reading of DTCs, refer to “Subaru Select Monitor”. <Ref. to ABS(diag)-16, Subaru Select Monitor.>

8. Inspection Mode

A: PROCEDURE

Reproduce the malfunction occurrence condition as much as possible.

Drive the vehicle at a speed more than 40 km/h (25 MPH) for at least one minute.

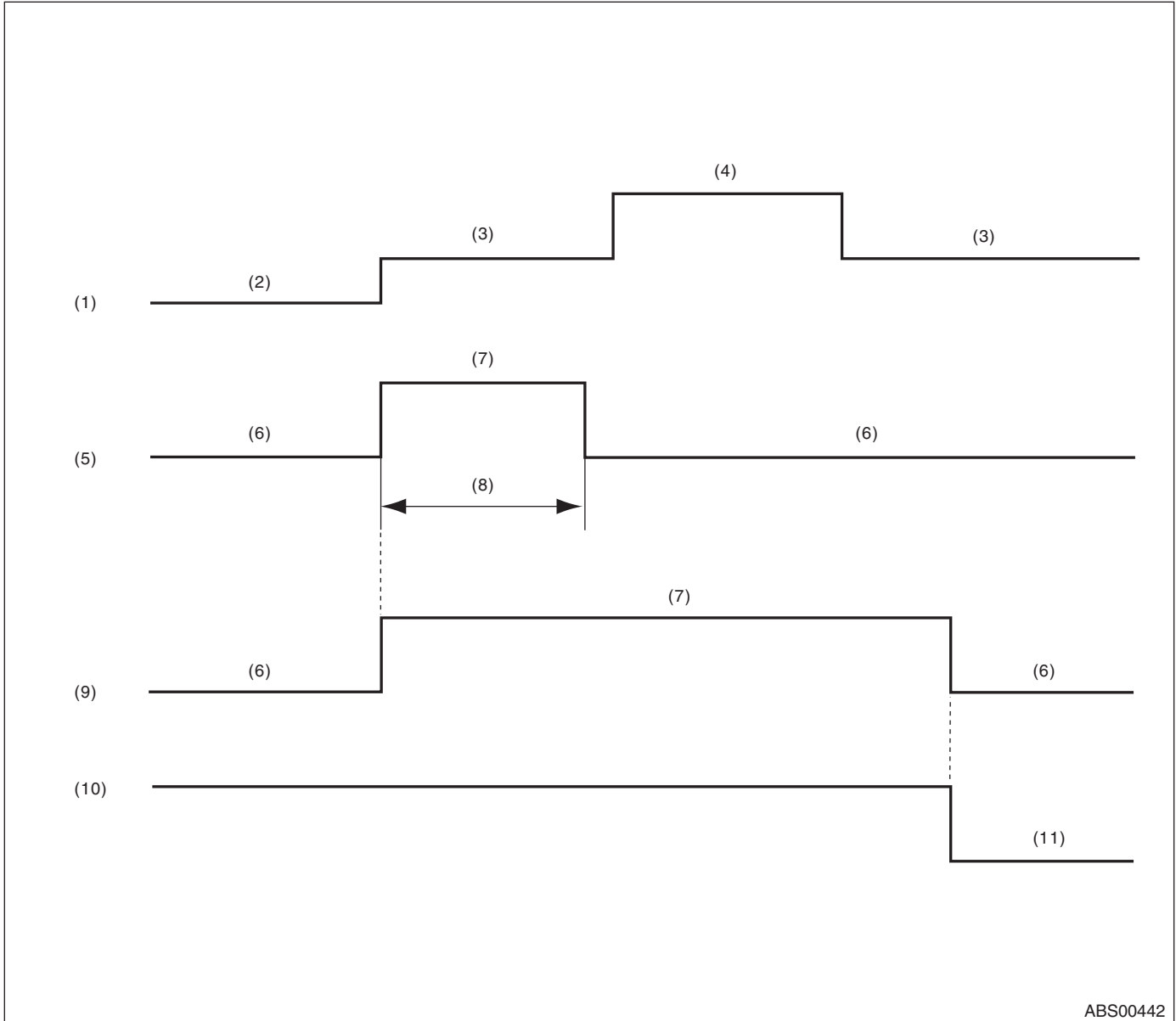
9. Clear Memory Mode

A: OPERATION

For details concerning DTC clear operation, refer to "Subaru Select Monitor". <Ref. to ABS(diag)-16, Subaru Select Monitor.>

10. ABS Warning Light / Brake Warning Light Illumination Pattern

A: INSPECTION



ABS00442

- | | | |
|--|---|---|
| <p>(1) Ignition switch</p> <p>(2) OFF</p> <p>(3) ON</p> <p>(4) Start</p> | <p>(5) ABS warning light</p> <p>(6) Light OFF</p> <p>(7) Light ON</p> <p>(8) Approx. 2 sec.</p> | <p>(9) Brake warning light (EBD warning light)</p> <p>(10) Parking brake</p> <p>(11) Released</p> |
|--|---|---|

ABS Warning Light / Brake Warning Light Illumination Pattern

ABS (DIAGNOSTICS)

- 1) When the ABS warning light and brake warning light do not illuminate in accordance with this illumination pattern, it can be thought that there is an electrical problem.
- 2) When the ABS warning light remains constantly OFF, check the combination meter circuit. <Ref. to ABS(diag)-29, ABS WARNING LIGHT DOES NOT COME ON, ABS Warning Light / Brake Warning Light Illumination Pattern.>
- 3) When the ABS warning light does not go off, check the combination meter circuit. <Ref. to ABS(diag)-31, ABS WARNING LIGHT DOES NOT GO OFF, ABS Warning Light / Brake Warning Light Illumination Pattern.>
- 4) When the brake warning light does not go off, check the brake warning circuit and the combination meter circuit. <Ref. to ABS(diag)-33, BRAKE WARNING LIGHT DOES NOT GO OFF, ABS Warning Light / Brake Warning Light Illumination Pattern.>

NOTE:

Even though the ABS warning light does not go off after approximately 2 seconds from ABS warning light illumination, the ABS function operates normally when the warning light goes off while driving at approximately 12 km/h (7 MPH). However, the ABS system does not work while the ABS warning light is illuminated.

ABS Warning Light / Brake Warning Light Illumination Pattern

ABS (DIAGNOSTICS)

B: ABS WARNING LIGHT DOES NOT COME ON

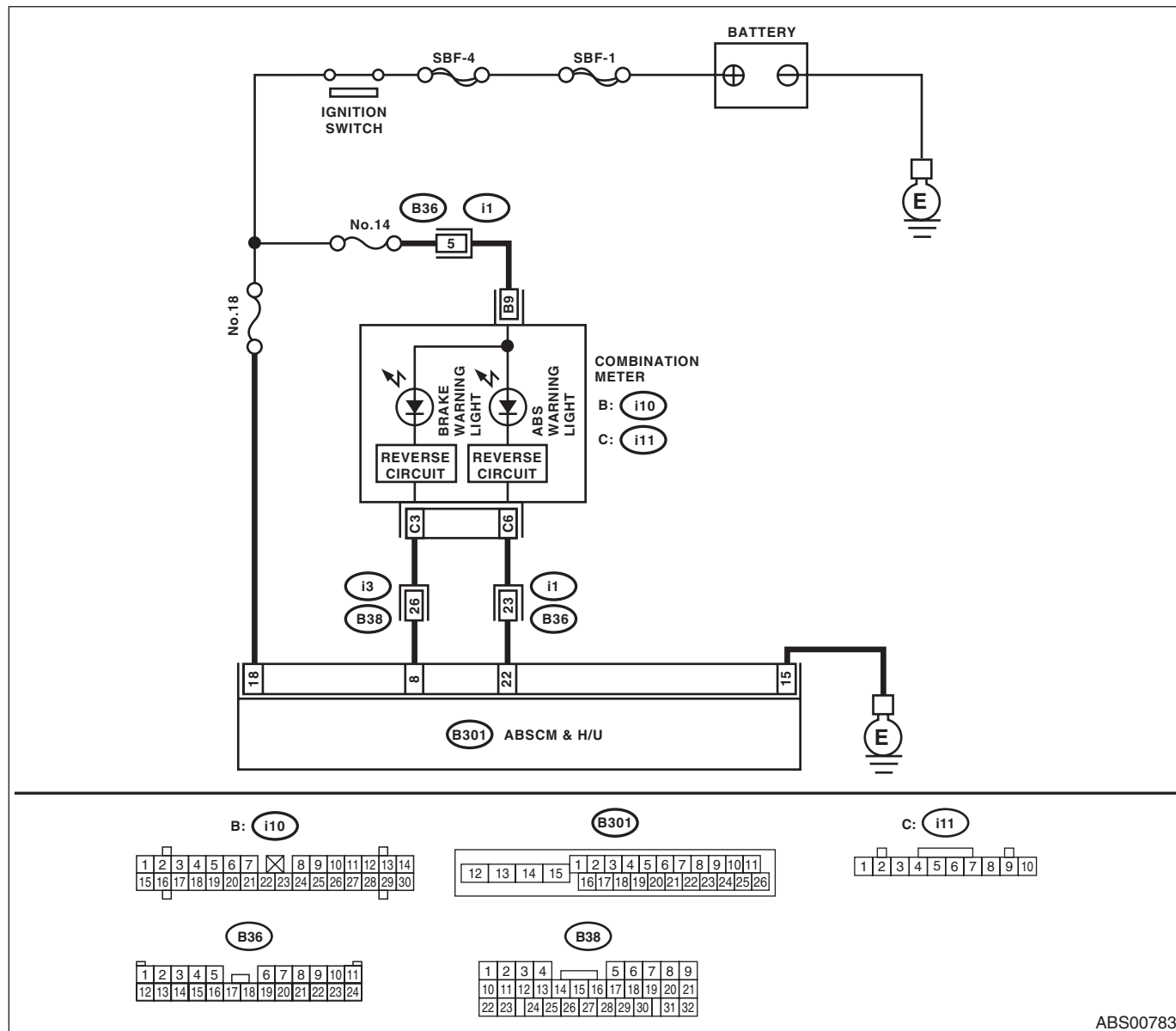
DETECTING CONDITION:

- Defective combination meter
- Defective harness

TROUBLE SYMPTOM:

When the ignition switch is turned ON (engine OFF), ABS warning light does not come on.

WIRING DIAGRAM:



ABS00783

ABS Warning Light / Brake Warning Light Illumination Pattern

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK ILLUMINATION OF OTHER LIGHTS. Turn the ignition switch to ON. (Engine OFF)	Do other warning lights illuminate?	Go to step 2.	Check the combination meter.
2 READ DTC. Read the DTC. <Ref. to ABS(diag)-24, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step 3.
3 CHECK GROUND SHORT OF HARNESS. 1) Turn the ignition OFF. 2) Disconnect the connector (B301) from the ABSCM&H/U. 3) Disconnect the connector (i11) from combination meter. 4) Measure the resistance between ABSCM connector and chassis ground. Connector & terminal (B301) No. 22 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 4.	Repair harness and connector between ABSCM&H/U and combination meter.
4 CHECK ABSCM. 1) Connect the connector (B301) to the ABSCM&H/U. 2) Turn the ignition ON. 3) Immediately after turning ignition switch ON (within approximately 2 seconds), measure the resistance of harness between the combination meter connector and chassis ground. Connector & terminal (i11) No. 6 — Chassis ground:	Is the resistance 1 MΩ or more?	Check the combination meter.	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

ABS Warning Light / Brake Warning Light Illumination Pattern

ABS (DIAGNOSTICS)

C: ABS WARNING LIGHT DOES NOT GO OFF

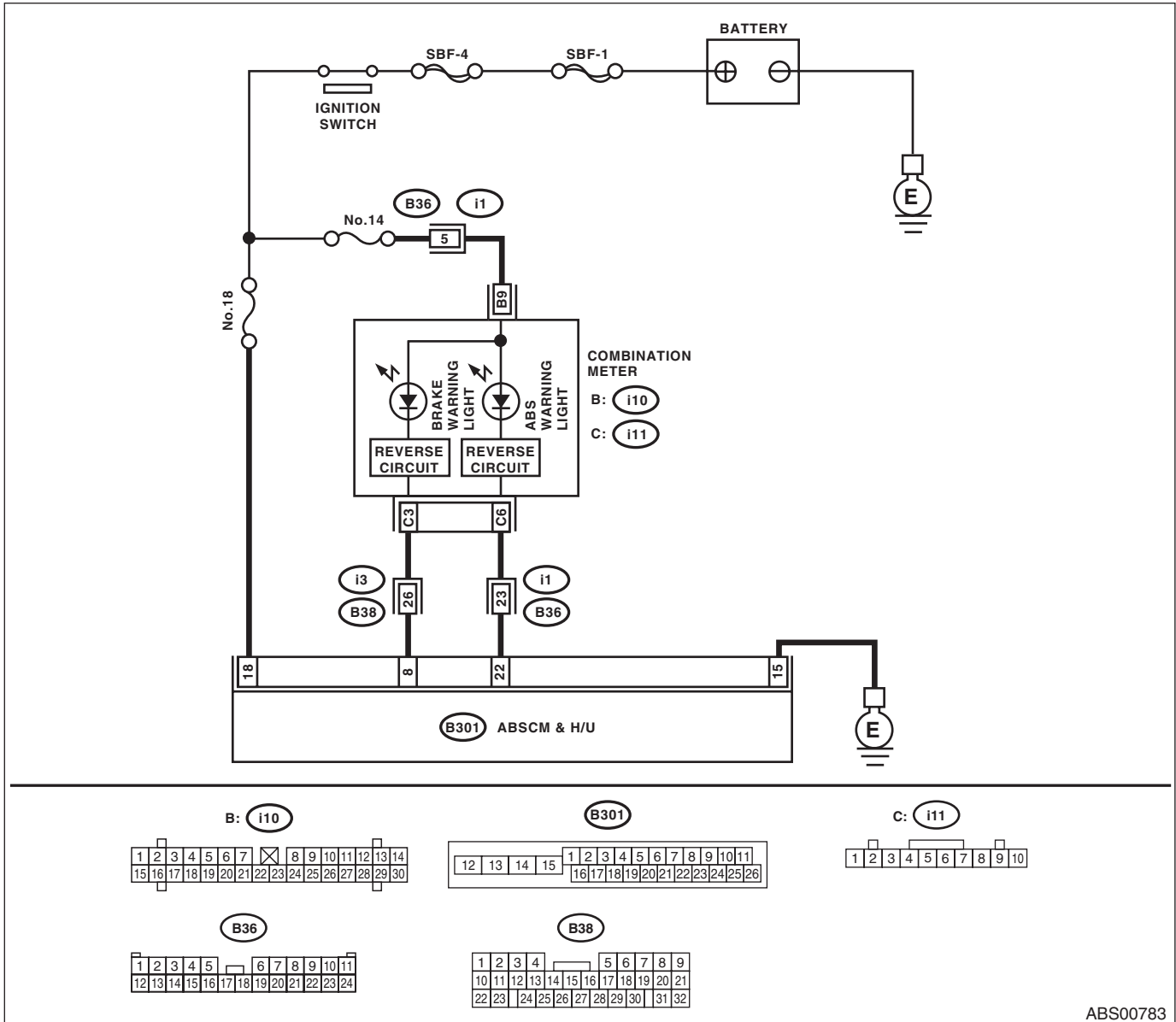
DETECTING CONDITION:

- Defective combination meter
- Open circuit of harness

TROUBLE SYMPTOM:

When starting the engine, the ABS warning light is kept on.

WIRING DIAGRAM:



ABS00783

ABS Warning Light / Brake Warning Light Illumination Pattern

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 READ DTC. Read the DTC. <Ref. to ABS(diag)-24, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step 2.
2 CHECK WIRING HARNESS. 1) Turn the ignition OFF. 2) Disconnect the connector (B301) from the ABSCM&H/U. 3) Disconnect the connector (i11) from combination meter. 4) Measure the resistance between ABSCM connector and combination meter connector. <i>Connector & terminal</i> <i>(B301) No. 22 — (i11) No. 6:</i>	Is the resistance less than 0.5 Ω ?	Go to step 3.	Repair the harness connector between ABSCM&H/U and combination meter.
3 CHECK POOR CONTACT OF CONNECTOR. Check for poor contact in all connectors.	Is there poor contact?	Repair the connector.	Go to step 4.
4 CHECK ABSCM. 1) Connect the connector (B301) to the ABSCM&H/U. 2) Turn the ignition switch to ON. 3) Measure the resistance between combination meter connector and chassis ground. <i>Connector & terminal</i> <i>(i11) No. 6 — Chassis ground:</i>	Is the resistance less than 0.5 Ω ?	Check the combination meter.	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

ABS Warning Light / Brake Warning Light Illumination Pattern

ABS (DIAGNOSTICS)

D: BRAKE WARNING LIGHT DOES NOT GO OFF

DETECTING CONDITION:

- Brake warning light circuit is shorted.
- Defective sensor/connector

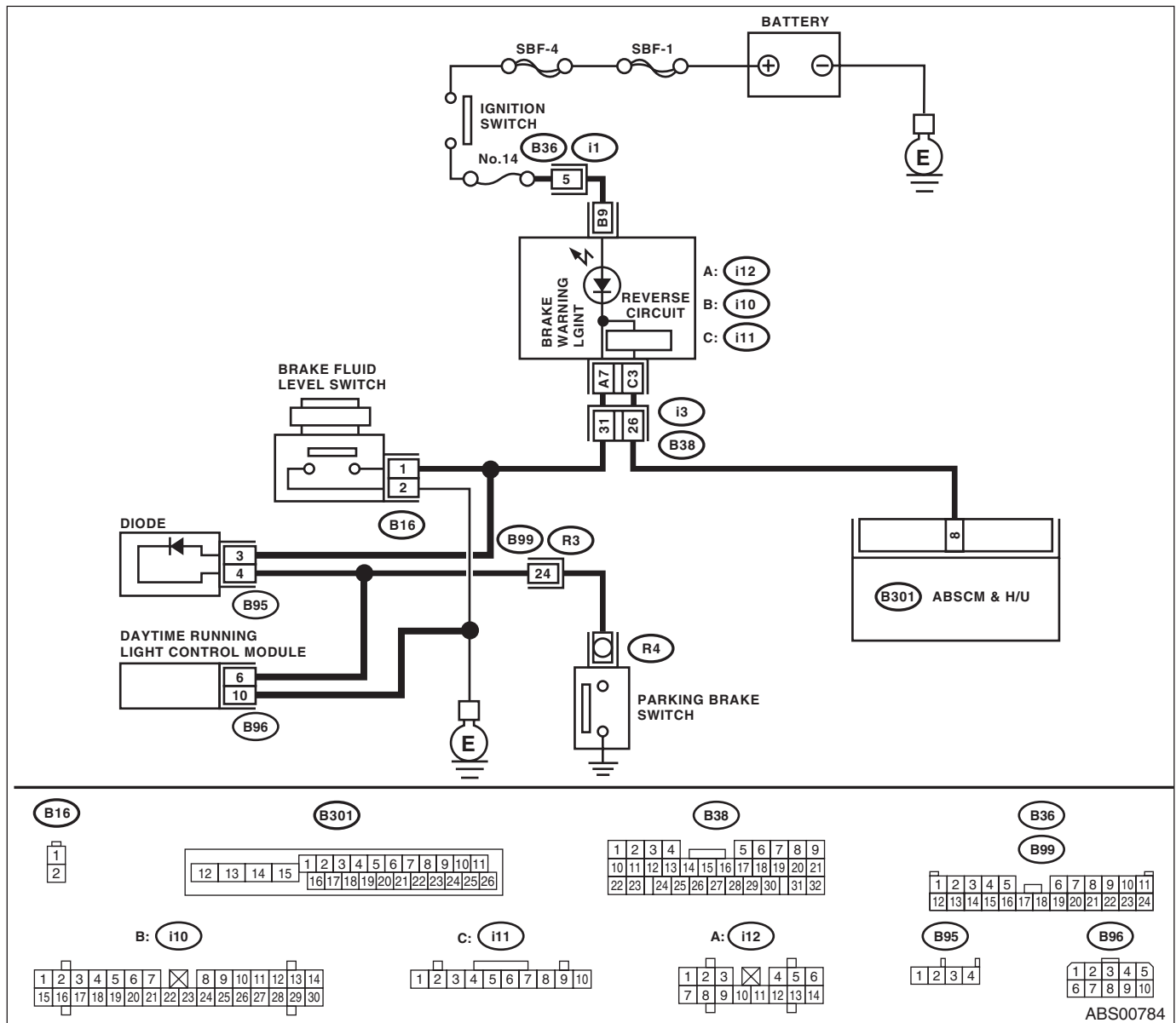
TROUBLE SYMPTOM:

After starting the engine, the brake warning light remains lit though the parking lever is released.

NOTE:

If the ABS warning light is lit, perform the diagnosis of "ABS WARNING LIGHT DOES NOT GO OFF", then the diagnosis of "BRAKE WARNING LIGHT DOES NOT GO OFF" after repairing it. <Ref. to ABS(diag)-31, ABS WARNING LIGHT DOES NOT GO OFF, ABS Warning Light / Brake Warning Light Illumination Pattern.>

WIRING DIAGRAM:



ABS Warning Light / Brake Warning Light Illumination Pattern

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INSTALLATION OF ABSCM&H/U CONNECTOR. 1) Turn the ignition switch to OFF. 2) Check that the ABSCM&H/U connector is inserted to ABSCM&H/U until the clamp locks onto it.	Is the connector firmly inserted?	Go to step 2.	Insert the ABSCM&H/U connector until the clamp locks completely.
2 READ DTC. Read the DTC. <Ref. to ABS(diag)-24, Read Diagnostic Trouble Code (DTC).>	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step 3.
3 CHECK BRAKE FLUID AMOUNT. Check the amount of brake fluid in the reservoir tank of the master cylinder.	Is the amount of brake fluid between the lines of "MAX" and "MIN"?	Go to step 4.	Replenish brake fluid to the specified value.
4 CHECK BRAKE FLUID LEVEL SWITCH. 1) Disconnect the level switch connector (B16) from master cylinder. 2) Measure the resistance of master cylinder terminals. Terminals No. 1 — No. 2:	Is the resistance 1 MΩ or more?	Go to step 5.	Replace the master cylinder.
5 CHECK PARKING BRAKE SWITCH. 1) Disconnect the connector (R4) from parking brake switch. 2) Release the parking brake. 3) Measure the resistance between parking brake switch terminal and chassis ground.	Is the resistance 1 MΩ or more?	Go to step 6.	Replace the parking brake switch.
6 CHECK GROUND SHORT OF HARNESS. 1) Disconnect the connector (i11) from combination meter. 2) Measure the resistance between combination meter connector and chassis ground. Connector & terminal (i11) No. 3 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 7.	Repair the harness connector between combination meter and parking brake switch.
7 CHECK HARNESS. 1) Disconnect the connector (B301) from the ABSCM&H/U. 2) Disconnect the connector (i11) from combination meter. 3) Measure the resistance between the ABSCM&H/U connector and combination meter connector. Connector & terminal (B301) No. 8 — (i11) No. 3:	Is the resistance less than 0.5 Ω?	Go to step 8.	Repair the harness between the ABSCM&H/U and the combination meter.
8 CHECK POOR CONTACT OF CONNECTOR. Check for poor contact in all connectors.	Is there poor contact?	Repair the connector.	Go to step 9.
9 CHECK ABSCM. 1) Connect the connector to ABSCM&H/U. 2) Turn the ignition switch to ON. 3) Measure the resistance between combination meter connector and chassis ground. Connector & terminal (i11) No. 3 — Chassis ground:	Is the resistance less than 0.5 Ω?	Check the combination meter.	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

11. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Content of diagnosis		Display	Reference target
21	ABS wheel speed sensor malfunction (Broken wire, short)	Front ABS wheel speed sensor RH	Front Right ABS Sensor Circuit Open or Shorted Battery	<Ref. to ABS(diag)-38, DTC 21 ABS WHEEL SPEED SENSOR MALFUNCTION FR SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
22	ABS wheel speed sensor malfunction (ABS wheel speed sensor abnormal signal)	Abnormal signal of front ABS wheel speed sensor RH	Front Right ABS Sensor Signal	<Ref. to ABS(diag)-43, DTC 22 FRONT ABS WHEEL SPEED SENSOR RH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
23	ABS wheel speed sensor malfunction (Broken wire, short)	Front ABS wheel speed sensor LH	Front Left ABS Sensor Circuit Open or Shorted Battery	<Ref. to ABS(diag)-38, DTC 23 ABS WHEEL SPEED SENSOR MALFUNCTION FL SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
24	ABS wheel speed sensor malfunction (ABS wheel speed sensor abnormal signal)	Abnormal signal of front ABS wheel speed sensor LH	Front Left ABS Sensor Signal	<Ref. to ABS(diag)-43, DTC 24 FRONT ABS WHEEL SPEED SENSOR LH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
25	ABS wheel speed sensor malfunction (Broken wire, short)	Rear ABS wheel speed sensor RH	Rear Right ABS Sensor Circuit Open or Shorted Battery	<Ref. to ABS(diag)-38, DTC 25 ABS WHEEL SPEED SENSOR MALFUNCTION RR SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
26	ABS wheel speed sensor malfunction (ABS wheel speed sensor abnormal signal)	Abnormal signal of rear ABS wheel speed sensor RH	Rear Right ABS Sensor Signal	<Ref. to ABS(diag)-43, DTC 26 REAR ABS WHEEL SPEED SENSOR RH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
27	ABS wheel speed sensor malfunction (Broken wire, short)	Rear ABS wheel speed sensor LH	Rear Left ABS Sensor Circuit Open or Shorted Battery	<Ref. to ABS(diag)-39, DTC 27 ABS WHEEL SPEED SENSOR MALFUNCTION RL SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
28	ABS wheel speed sensor malfunction (ABS wheel speed sensor abnormal signal)	Abnormal signal of rear ABS wheel speed sensor LH	Rear Left ABS Sensor Signal	<Ref. to ABS(diag)-44, DTC 28 REAR ABS WHEEL SPEED SENSOR LH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
29		Abnormal ABS wheel speed sensor on any one of four sensors	Any One of Four ABS Sensors Signal	<Ref. to ABS(diag)-48, DTC 29 ABS WHEEL SPEED SENSOR SIGNAL MALFUNCTION IN ONE OF FOUR WHEELS, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
31	Inlet valve malfunction in hydraulic unit	Front inlet valve RH	FR Hold Valve malfunction	<Ref. to ABS(diag)-51, DTC 31 FRONT INLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

DTC	Content of diagnosis		Display	Reference target
32	Outlet valve malfunction in hydraulic unit	Front outlet valve RH	FR Pressure Reducing Valve malfunction	<Ref. to ABS(diag)-51, DTC 32 FRONT OUTLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
33	Inlet valve malfunction in hydraulic unit	Front inlet valve LH	FL Hold Valve malfunction	<Ref. to ABS(diag)-51, DTC 33 FRONT INLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
34	Outlet valve malfunction in hydraulic unit	Front outlet valve LH	FL Pressure Reducing Valve malfunction	<Ref. to ABS(diag)-51, DTC 34 FRONT OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
35	Inlet valve malfunction in hydraulic unit	Rear inlet valve RH	RR Hold Valve malfunction	<Ref. to ABS(diag)-51, DTC 35 REAR INLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
36	Outlet valve malfunction in hydraulic unit	Rear outlet valve RH	RR Pressure Reducing Valve malfunction	<Ref. to ABS(diag)-51, DTC 36 REAR OUTLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
37	Inlet valve malfunction in hydraulic unit	Rear inlet valve LH	RL Hold Valve malfunction	<Ref. to ABS(diag)-51, DTC 37 REAR INLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
38	Outlet valve malfunction in hydraulic unit	Rear outlet valve LH	RL Pressure Reducing Valve malfunction	<Ref. to ABS(diag)-52, DTC 38 REAR OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
41	ABS control module malfunction		ECM	<Ref. to ABS(diag)-54, DTC 41 ABS CONTROL MODULE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
42	Power voltage malfunction		Power Supply Voltage Failure	<Ref. to ABS(diag)-56, DTC 42 POWER VOLTAGE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
47	Defective CAN communication line		CAN communication link	<Ref. to ABS(diag)-58, DTC 47 IMPROPER CAN COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
51	Defective valve relay		Valve Relay	<Ref. to ABS(diag)-60, DTC 51 VALVE RELAY MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

DTC	Content of diagnosis	Display	Reference target
52	Motor/motor relay on failure	Motor and Motor Relay	<Ref. to ABS(diag)-62, DTC 52 MOTOR/MOTOR RELAY MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
54	Stop light switch circuit malfunction	Brake Light Switch	<Ref. to ABS(diag)-64, DTC 54 FAULTY STOP LIGHT SWITCH, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
56	Faulty G sensor output voltage or output signal error	G Sensor Failure	<Ref. to ABS(diag)-66, DTC 56 G SENSOR OUTPUT VOLTAGE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

12. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC 21 ABS WHEEL SPEED SENSOR MALFUNCTION FR SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH)

NOTE:

Refer to DTC 27 for diagnostic procedure. <Ref. to ABS(diag)-39, DTC 27 ABS WHEEL SPEED SENSOR MALFUNCTION RL SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

B: DTC 23 ABS WHEEL SPEED SENSOR MALFUNCTION FL SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH)

NOTE:

Refer to DTC 27 for diagnostic procedure. <Ref. to ABS(diag)-39, DTC 27 ABS WHEEL SPEED SENSOR MALFUNCTION RL SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

C: DTC 25 ABS WHEEL SPEED SENSOR MALFUNCTION RR SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH)

NOTE:

Refer to DTC 27 for diagnostic procedure. <Ref. to ABS(diag)-39, DTC 27 ABS WHEEL SPEED SENSOR MALFUNCTION RL SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

D: DTC 27 ABS WHEEL SPEED SENSOR MALFUNCTION RL SENSOR (BROKEN WIRE, INPUT VOLTAGE TOO HIGH)

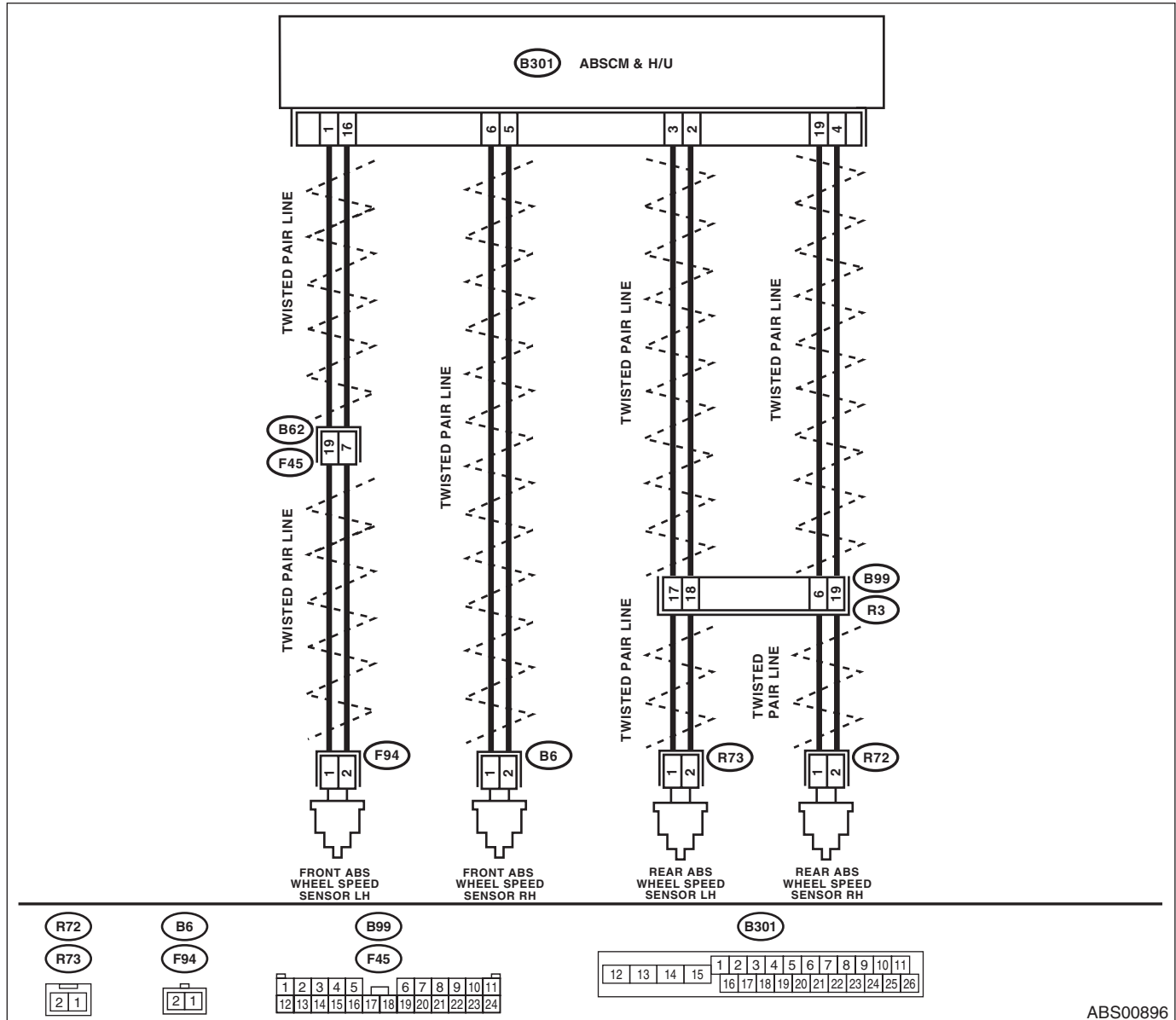
DTC DETECTING CONDITION:

- Defective ABS wheel speed sensor (broken wire, input voltage too high)
- Defective harness connector

TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:



ABS00896

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT OF ABS WHEEL SPEED SENSOR USING SUBARU SELECT MONITOR. 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the ABS wheel speed sensor output corresponding to the faulty system in Subaru Select Monitor display mode.	Does the speed indicated on the display change in response to the speedometer reading during acceleration or deceleration when the steering wheel is in the straight-ahead position?	Go to step 2.	Go to step 8.
2 CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.	Is the ABS wheel speed sensor installation bolt tightened to 33 N·m (3.3 kgf·m, 24 ft·lb)?	Go to step 3.	Tighten the ABS wheel speed sensor installation bolts.
3 CHECK ABS WHEEL SPEED SENSOR GAP. Measure the gap between the ABS wheel speed sensor protrusion and tone wheel.	Is the gap within the following? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in); Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step 4.	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace the worn sensor or worn tone wheel.
4 CHECK TONE WHEEL RUNOUT. Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step 5.	Replace the tone wheel. Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>
5 CHECK POOR CONTACT OF CONNECTOR. Turn the ignition switch to OFF.	Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?	Repair the connector.	Go to step 6.
6 CHECK ABSCM&H/U. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC still output?	Replace the ABSCM only. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 7.
7 CHECK OTHER DTC DETECTION.	Is there any other DTC detected?	Perform the diagnosis according to DTC.	Temporary poor contact occurs. NOTE: Check the harness and connector between ABSCM&H/U and ABS wheel speed sensor.
8 CHECK ABS WHEEL SPEED SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ABS wheel speed sensor. 3) Measure the resistance of ABS wheel speed sensor terminals while shaking the harness lightly. Terminals Front RH No. 1 — No. 2: Front LH No. 1 — No. 2: Rear RH No. 1 — No. 2: Rear LH No. 1 — No. 2:	Is the resistance within the following? Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step 9.	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-14, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-17, Rear ABS Wheel Speed Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

Step	Check	Yes	No
<p>9 CHECK BATTERY SHORT OF ABS WHEEL SPEED SENSOR. 1) Disconnect the ABSCM&H/U connectors. 2) Measure the voltage between ABS wheel speed sensor and chassis ground. Terminals <i>Front RH No. 1 (+) — Chassis ground (-):</i> <i>Front LH No. 1 (+) — Chassis ground (-):</i> <i>Rear RH No. 1 (+) — Chassis ground (-):</i> <i>Rear LH No. 1 (+) — Chassis ground (-):</i></p>	Is the voltage less than 1 V?	Go to step 10.	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-14, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-17, Rear ABS Wheel Speed Sensor.>
<p>10 CHECK BATTERY SHORT OF ABS WHEEL SPEED SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between ABS wheel speed sensor and chassis ground. Terminals <i>Front RH No. 1 (+) — Chassis ground (-):</i> <i>Front LH No. 1 (+) — Chassis ground (-):</i> <i>Rear RH No. 1 (+) — Chassis ground (-):</i> <i>Rear LH No. 1 (+) — Chassis ground (-):</i></p>	Is the voltage less than 1 V?	Go to step 11.	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-14, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-17, Rear ABS Wheel Speed Sensor.>
<p>11 CHECK HARNESS CONNECTOR BETWEEN ABSCM&H/U AND ABS WHEEL SPEED SENSOR. 1) Turn the ignition switch to OFF. 2) Connect the connector to the ABS wheel speed sensor. 3) Measure the resistance between ABSCU&H/U connector terminals. Connector & terminal <i>DTC 21; (B301) No. 6 — No. 5:</i> <i>DTC 23; (B301) No. 1 — No. 16:</i> <i>DTC 25; (B301) No. 19 — No. 4:</i> <i>DTC 27; (B301) No. 3 — No. 2:</i></p>	Is the resistance within the following? Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Go to step 12.	Repair the harness connector between ABSCM&H/U and ABS wheel speed sensor.
<p>12 CHECK BATTERY SHORT OF HARNESS. Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal <i>DTC 21; (B301) No. 6 (+) — Chassis ground (-):</i> <i>DTC 23; (B301) No. 1 (+) — Chassis ground (-):</i> <i>DTC 25; (B301) No. 19 (+) — Chassis ground (-):</i> <i>DTC 27; (B301) No. 3 (+) — Chassis ground (-):</i></p>	Is the voltage less than 1 V?	Go to step 13.	Repair the harness between ABSCM&H/U and ABS wheel speed sensor.
<p>13 CHECK BATTERY SHORT OF HARNESS. 1) Turn the ignition switch to ON. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal <i>DTC 21; (B301) No. 6 (+) — Chassis ground (-):</i> <i>DTC 23; (B301) No. 1 (+) — Chassis ground (-):</i> <i>DTC 25; (B301) No. 19 (+) — Chassis ground (-):</i> <i>DTC 27; (B301) No. 3 (+) — Chassis ground (-):</i></p>	Is the voltage less than 1 V?	Go to step 14.	Repair the harness between ABSCM&H/U and ABS wheel speed sensor.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

Step	Check	Yes	No
14	CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.	Go to step 15.	Tighten the ABS wheel speed sensor installation bolts.
15	CHECK ABS WHEEL SPEED SENSOR GAP. Measure the gap between the ABS wheel speed sensor protrusion and tone wheel.	Go to step 16.	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace the worn sensor or worn tone wheel.
16	CHECK TONE WHEEL RUNOUT. Measure the tone wheel runout.	Go to step 17.	Replace the tone wheel. Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>
17	CHECK GROUND SHORT OF ABS WHEEL SPEED SENSOR. 1) Turn the ignition switch to ON. 2) Measure the resistance between ABS wheel speed sensor and chassis ground. Terminals Front RH No. 1 — Chassis ground: Front LH No. 1 — Chassis ground: Rear RH No. 1 — Chassis ground: Rear LH No. 1 — Chassis ground:	Go to step 18.	Replace the ABSCM&H/U and ABS wheel speed sensor. Front: <Ref. to ABS-14, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-17, Rear ABS Wheel Speed Sensor.> and <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
18	CHECK GROUND SHORT OF HARNESS. 1) Turn the ignition switch to OFF. 2) Connect the connector to the ABS wheel speed sensor. 3) Measure the resistance between ABSCM&H/U connectors and chassis ground. Connector & terminal DTC 21; (B301) No. 6 — Chassis ground: DTC 23; (B301) No. 1 — Chassis ground: DTC 25; (B301) No. 19 — Chassis ground: DTC 27; (B301) No. 3 — Chassis ground:	Go to step 19.	Repair the harness between ABSCM&H/U and ABS wheel speed sensor. Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
19	CHECK POOR CONTACT OF CONNECTOR.	Repair the connector.	Go to step 20.
20	CHECK ABSCM&H/U. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Replace the ABSCM only.	Go to step 21.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

Step	Check	Yes	No
21 CHECK OTHER DTC DETECTION.	Is there any other DTC detected?	Perform the diagnosis according to DTC.	Temporary poor contact occurs. NOTE: Check the harness and connector between ABSCM&H/U and ABS wheel speed sensor.

E: DTC 22 FRONT ABS WHEEL SPEED SENSOR RH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL)

NOTE:

Refer to DTC 28 for diagnostic procedure. <Ref. to ABS(diag)-44, DTC 28 REAR ABS WHEEL SPEED SENSOR LH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

F: DTC 24 FRONT ABS WHEEL SPEED SENSOR LH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL)

NOTE:

Refer to DTC 28 for diagnostic procedure. <Ref. to ABS(diag)-44, DTC 28 REAR ABS WHEEL SPEED SENSOR LH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

G: DTC 26 REAR ABS WHEEL SPEED SENSOR RH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL)

NOTE:

Refer to DTC 28 for diagnostic procedure. <Ref. to ABS(diag)-44, DTC 28 REAR ABS WHEEL SPEED SENSOR LH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

H: DTC 28 REAR ABS WHEEL SPEED SENSOR LH MALFUNCTION (ABS WHEEL SPEED SENSOR ABNORMAL SIGNAL)

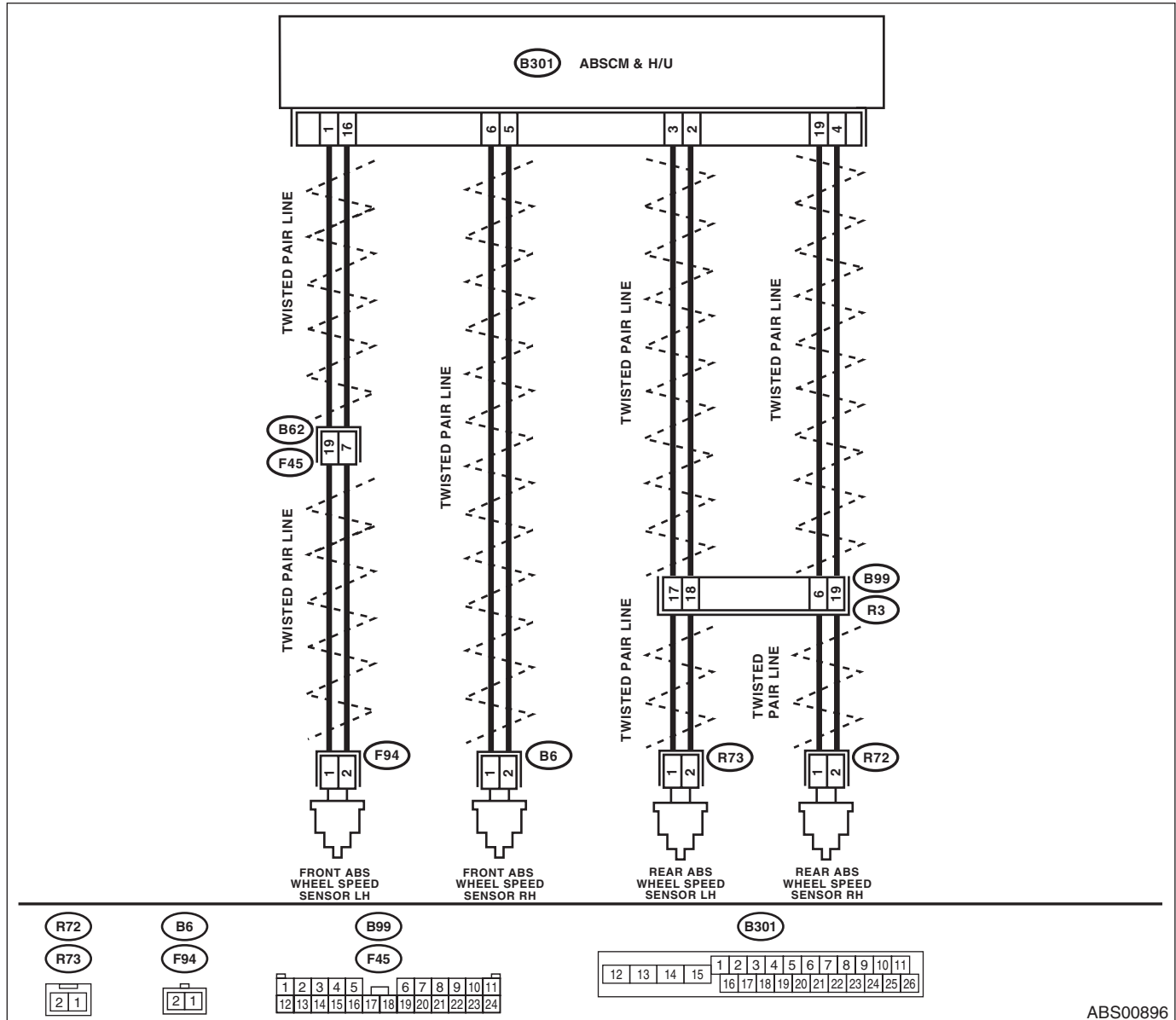
DTC DETECTING CONDITION:

- Defective ABS wheel speed sensor signal (noise, abnormal signal, etc.)
- Defective harness connector

TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:



ABS00896

Step	Check	Yes	No	
1	<p>CHECK OUTPUT OF ABS WHEEL SPEED SENSOR USING SUBARU SELECT MONITOR.</p> <p>1) Select {Current Data Display & Save} in Subaru Select Monitor.</p> <p>2) Read the ABS wheel speed sensor output corresponding to the faulty system in Subaru Select Monitor display mode.</p>	Does the speed indicated on the display change in response to the speedometer reading during acceleration or deceleration when the steering wheel is in the straight-ahead position?	Go to step 2.	Go to step 7.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

Step	Check	Yes	No
2	CHECK POOR CONTACT OF CONNECTOR. Turn the ignition switch to OFF.	Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?	Repair the connector. Go to step 3.
3	CHECK CAUSE OF SIGNAL NOISE.	Is the car telephone or the radio properly installed?	Go to step 4. Install the car phone or radio properly.
4	CHECK CAUSE OF SIGNAL NOISE.	Is there a noise source (such as an antenna) installed near the sensor harness?	Install the noise source apart from the sensor harness. Go to step 5.
5	CHECK ABSCM&H/U. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC still output?	Replace the ABSCM only. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).> Go to step 6.
6	CHECK OTHER DTC DETECTION.	Is there any other DTC detected?	Perform the diagnosis according to DTC. It results from a temporary noise interference.
7	CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.	Is the ABS wheel speed sensor installation bolt tightened to 33 N·m (3.3 kgf·m, 24 ft·lb)?	Go to step 8. Tighten the ABS wheel speed sensor installation bolts.
8	CHECK ABS WHEEL SPEED SENSOR GAP. Measure the gap between the ABS wheel speed sensor protrusion and tone wheel.	Is the gap within the following? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in) Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step 9. Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace the worn sensor or worn tone wheel.
9	PREPARE OSCILLOSCOPE.	Is an oscilloscope available?	Go to step 10. Go to step 11.
10	CHECK ABS WHEEL SPEED SENSOR SIGNAL. 1) Lift-up the vehicle. 2) Turn the ignition switch to OFF. 3) Connect the oscilloscope to the connector. 4) Turn the ignition switch to ON. 5) Start the wheel, and measure the voltage at the specified frequency. <Ref. to ABS(diag)-12, ELECTRICAL SPECIFICATION, Control Module I/O Signal.> NOTE: When this inspection is completed, ABSCM&H/U may record DTC 29 or DTC 56. Connector & terminal DTC 22; (B6) No. 1 (+) — No. 2 (-): DTC 24; (F94) No. 1 (+) — No. 2 (-): DTC 26; (B99) No. 6 (+) — No. 19 (-): DTC 28; (B99) No. 18 (+) — No. 17 (-):	Is the oscilloscope pattern the same voltage as shown in the table? <Ref. to ABS(diag)-12, ELECTRICAL SPECIFICATION, Control Module I/O Signal.>	Go to step 14. Go to step 11.
11	CHECK CONTAMINATION OF ABS WHEEL SPEED SENSOR OR TONE WHEEL. Remove the disc rotor or drum from the hub according to the DTC.	Is the ABS wheel speed sensor piece or the tone wheel contaminated by dirt or other foreign matter?	Thoroughly remove dirt or other foreign matter. Go to step 12.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

Step	Check	Yes	No
12	CHECK DAMAGE OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.	Go to step 13.	Replace the ABS wheel speed sensor or tone wheel. Front: <Ref. to ABS-14, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-17, Rear ABS Wheel Speed Sensor.> and front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>
13	CHECK TONE WHEEL RUNOUT. Measure the tone wheel runout.	Go to step 14.	Replace the tone wheel. Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>
14	CHECK RESISTANCE OF THE ABS WHEEL SPEED SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ABS wheel speed sensor. 3) Measure the resistance of the ABS wheel speed sensor connector terminals by shaking the harness lightly. Connector & terminal Front RH No. 1 — No. 2: Front LH No. 1 — No. 2: Rear RH No. 1 — No. 2: Rear LH No. 1 — No. 2:	Go to step 15. Is the resistance within the following? Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-14, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-17, Rear ABS Wheel Speed Sensor.>
15	CHECK GROUND SHORT OF ABS WHEEL SPEED SENSOR. Measure the resistance between ABS wheel speed sensor and chassis ground. Connector & terminal Front RH No. 1 — Chassis ground: Front LH No. 1 — Chassis ground: Rear RH No. 1 — Chassis ground: Rear LH No. 1 — Chassis ground:	Go to step 16. Is the resistance 1 MΩ or more?	Replace the ABS wheel speed sensor. Front: <Ref. to ABS-14, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-17, Rear ABS Wheel Speed Sensor.>
16	CHECK HARNESS CONNECTOR BETWEEN ABSCM&H/U AND ABS WHEEL SPEED SENSOR. 1) Connect the connector to the ABS wheel speed sensor. 2) Disconnect the ABSCM&H/U connectors. 3) Measure the resistance between ABSCM&H/U connector terminals. Connector & terminal DTC 22; (B301) No. 6 — No. 5: DTC 24; (B301) No. 1 — No. 16: DTC 26; (B301) No. 19 — No. 4: DTC 28; (B301) No. 3 — No. 2:	Go to step 17. Is the resistance within the following? Front: 1 — 1.5 kΩ Rear: 1.025 — 1.265 kΩ	Repair the harness connector between ABSCM&H/U and ABS wheel speed sensor.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

Step	Check	Yes	No
17 CHECK GROUND SHORT OF HARNESS. Measure the resistance between the ABSCM&H/U connector and chassis ground. <i>Connector & terminal</i> <i>DTC 22; (B301) No. 6 — Chassis ground:</i> <i>DTC 24; (B301) No. 1 — Chassis ground:</i> <i>DTC 26; (B301) No. 19 — Chassis ground:</i> <i>DTC 28; (B301) No. 3 — Chassis ground:</i>	Is the resistance 1 M Ω or more?	Go to step 18.	Repair the harness connector between ABSCM&H/U and ABS wheel speed sensor.
18 CHECK THE ABSCM&H/U GROUND CIRCUIT. Measure the resistance between the ABSCM&H/U and chassis ground. <i>Connector & terminal</i> <i>(B301) No. 15 — Chassis ground:</i>	Is the resistance less than 0.5 Ω ?	Go to step 19.	Repair the ABSCM&H/U ground harness.
19 CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact in connectors between ABSCM&H/U and ABS wheel speed sensor?	Repair the connector.	Go to step 20.
20 CHECK CAUSE OF SIGNAL NOISE.	Is the car telephone or the radio properly installed?	Go to step 21.	Install the car phone or radio properly.
21 CHECK CAUSE OF SIGNAL NOISE.	Is there a noise source (such as an antenna) installed near the sensor harness?	Install the noise source apart from the sensor harness.	Go to step 22.
22 CHECK ABSCM&H/U. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC still output?	Replace the ABSCM only. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 23.
23 CHECK OTHER DTC DETECTION.	Is there any other DTC detected?	Perform the diagnosis according to DTC.	It results from a temporary noise interference. NOTE: Though the ABS warning light remains on at this time, this is normal. Drive the vehicle at more than 12 km/h (7.46 MPH) in order to turn ABS warning light off. Be sure to drive the vehicle and check that the warning light goes off.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

I: DTC 29 ABS WHEEL SPEED SENSOR SIGNAL MALFUNCTION IN ONE OF FOUR WHEELS

DTC DETECTING CONDITION:

- Defective ABS wheel speed sensor signal (noise, abnormal signal, etc.)
- Defective magnetic encoder
- When a wheel is turned freely for a long time

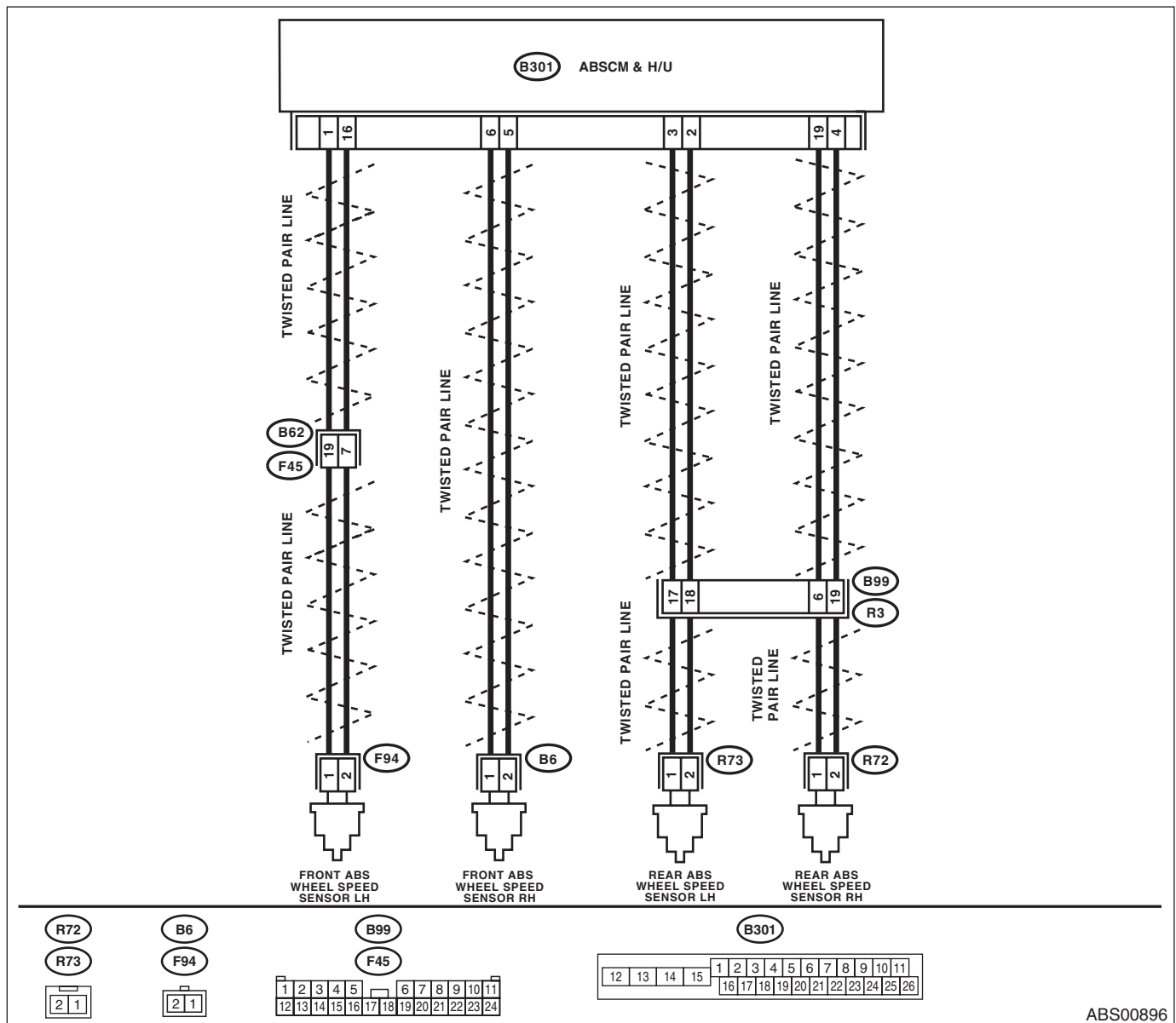
TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

NOTE:

Brake warning light comes on as well as the ABS warning light.

WIRING DIAGRAM:



ABS00896

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

	Step	Check	Yes	No
1	WHETHER A WHEEL TURNED FREELY OR NOT.	Did the wheels turn freely for more than one minute, such as when the vehicle is jacked-up, under full-lock cornering or when the wheels are not in contact with road surface?	ABS is normal. Erase the memory. NOTE: This diagnostic trouble code may sometimes occur if the wheels turn freely for a long time, for example when the vehicle is towed or jacked-up, or when steering wheel is continuously turned all the way.	Go to step 2.
2	CHECK TIRE SPECIFICATIONS. Turn the ignition switch to OFF.	Are the tire specifications correct?	Go to step 3.	Replace the tire.
3	CHECK WEAR OF TIRE.	Is the tire worn excessively?	Replace the tire.	Go to step 4.
4	CHECK TIRE PRESSURE.	Is the tire pressure correct?	Go to step 5.	Adjust the tire pressure.
5	CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.	Is the ABS wheel speed sensor installation bolt tightened to 33 N·m (3.3 kgf-m, 24 ft-lb)?	Go to step 6.	Tighten the ABS wheel speed sensor installation bolts.
6	CHECK ABS WHEEL SPEED SENSOR GAP. Measure the gap between the ABS wheel speed sensor protrusion and tone wheel.	Is the gap within the following? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in); Rear wheel: 0.7 — 1.2 mm (0.028 — 0.047 in)	Go to step 7.	Adjust the gap. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace the worn sensor or worn tone wheel.
7	PREPARE OSCILLOSCOPE.	Is an oscilloscope available?	Go to step 8.	Go to step 9.
8	CHECK ABS WHEEL SPEED SENSOR SIGNAL. 1) Lift-up the vehicle. 2) Turn the ignition switch to OFF. 3) Connect the oscilloscope according to the DTC. 4) Turn the ignition switch to ON. 5) Start the wheel, and measure the voltage at the specified frequency. <Ref. to ABS(diag)-12, ELECTRICAL SPECIFICATION, Control Module I/O Signal.> NOTE: When this inspection is completed, ABSCM&H/U may record DTC 29. Connector & terminal Front RH (B6) No. 1 (+) — No. 2 (-): Front LH (F94) No. 1 (+) — No. 2 (-): Rear RH (B99) No. 6 (+) — No. 19 (-): Rear LH (B99) No. 17 (+) — No. 18 (-):	Is the oscilloscope pattern the same voltage as shown in the table? <Ref. to ABS(diag)-12, ELECTRICAL SPECIFICATION, Control Module I/O Signal.>	Go to step 12.	Go to step 9.
9	CHECK CONTAMINATION OF ABS WHEEL SPEED SENSOR OR TONE WHEEL. Remove the disc rotor or drum from the hub.	Is the ABS wheel speed sensor piece or the tone wheel contaminated by dirt or other foreign matter?	Thoroughly remove dirt or other foreign matter.	Go to step 10.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

Step	Check	Yes	No	
10	CHECK DAMAGE OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.	Are there cracked or damaged teeth in the protrusion of the ABS wheel speed sensor or the tone wheel?	Replace the ABS wheel speed sensor or tone wheel. Front: <Ref. to ABS-14, Front ABS Wheel Speed Sensor.> Rear: <Ref. to ABS-17, Rear ABS Wheel Speed Sensor.> and front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>	Go to step 11.
11	CHECK TONE WHEEL RUNOUT. Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step 12.	Replace the tone wheel. Front: <Ref. to ABS-20, Front Tone Wheel.> Rear: <Ref. to ABS-21, Rear Tone Wheel.>
12	CHECK ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Connect all the connectors. 3) Erase the memory. 4) Perform the Inspection Mode. 5) Read the DTC.	Is the same DTC still output?	Replace the ABSCM only. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 13.
13	CHECK OTHER DTC DETECTION.	Is there any other DTC detected?	Perform the diagnosis according to DTC.	Temporary poor contact occurs.

J: DTC 31 FRONT INLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:

Refer to DTC 38 for diagnostic procedure. <Ref. to ABS(diag)-52, DTC 38 REAR OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

K: DTC 32 FRONT OUTLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:

Refer to DTC 38 for diagnostic procedure. <Ref. to ABS(diag)-52, DTC 38 REAR OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

L: DTC 33 FRONT INLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:

Refer to DTC 38 for diagnostic procedure. <Ref. to ABS(diag)-52, DTC 38 REAR OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

M: DTC 34 FRONT OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:

Refer to DTC 38 for diagnostic procedure. <Ref. to ABS(diag)-52, DTC 38 REAR OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

N: DTC 35 REAR INLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:

Refer to DTC 38 for diagnostic procedure. <Ref. to ABS(diag)-52, DTC 38 REAR OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

O: DTC 36 REAR OUTLET SOLENOID VALVE RH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:

Refer to DTC 38 for diagnostic procedure. <Ref. to ABS(diag)-52, DTC 38 REAR OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

P: DTC 37 REAR INLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

NOTE:

Refer to DTC 38 for diagnostic procedure. <Ref. to ABS(diag)-52, DTC 38 REAR OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

Q: DTC 38 REAR OUTLET SOLENOID VALVE LH MALFUNCTION IN ABS CONTROL MODULE AND HYDRAULIC CONTROL UNIT (ABSCM&H/U)

DTC DETECTING CONDITION:

- Defective harness connector
- Defective inlet solenoid valve or outlet solenoid valve in ABSCM&H/U

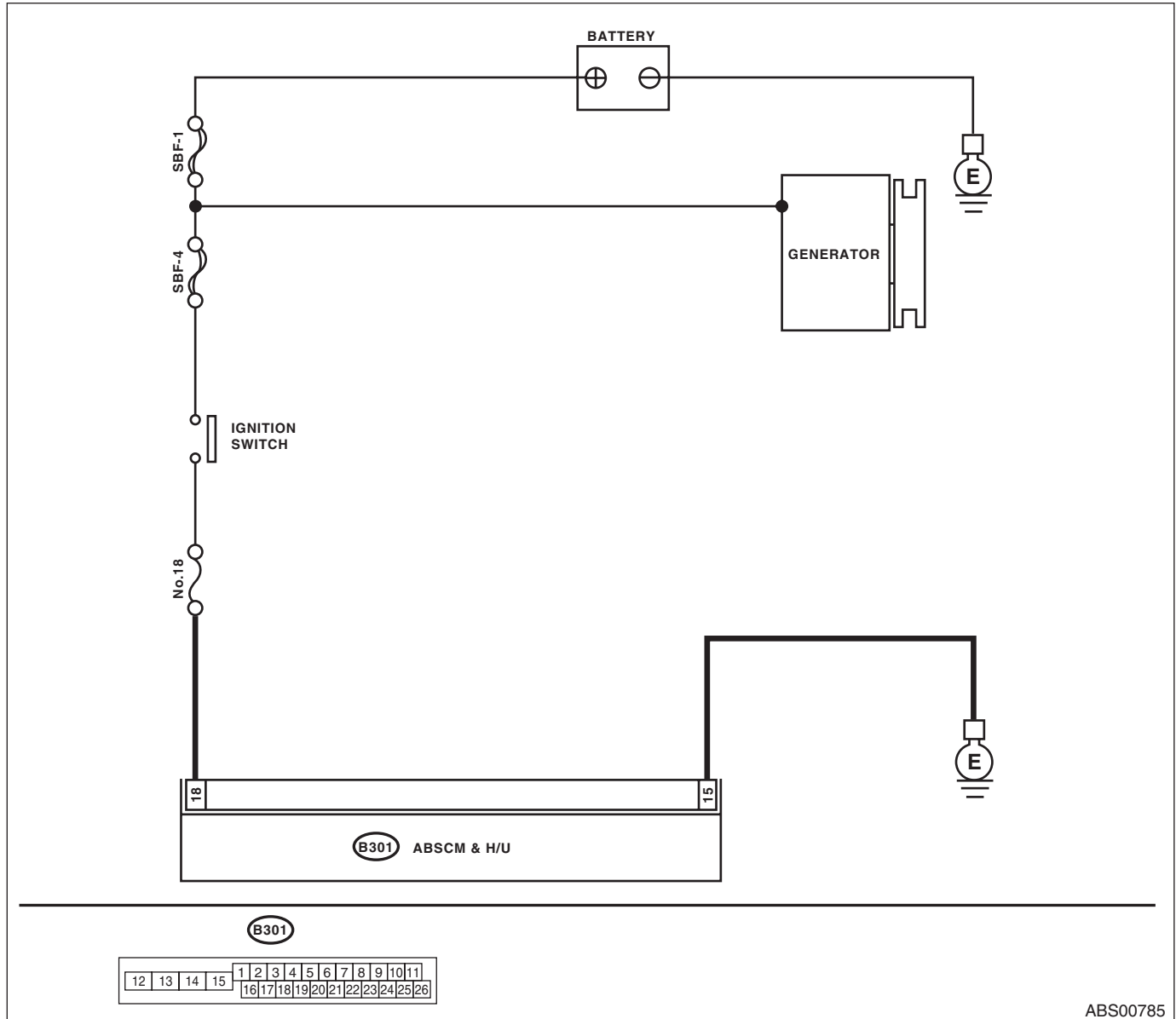
TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

NOTE:

Brake warning light comes on as well as the ABS warning light.

WIRING DIAGRAM:



ABS00785

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U connectors. 3) Run the engine at idle. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. <i>Connector & terminal</i> <i>(B301) No. 18 (+) — Chassis ground (-):</i>	Is the voltage 10 — 15 V?	Go to step 2.	Repair the ABSCM&H/U power circuit.
2 CHECK THE ABSCM&H/U GROUND CIRCUIT. 1) Turn the ignition switch to OFF. 2) Measure the resistance between the ABSCM&H/U connector and chassis ground. <i>Connector & terminal</i> <i>(B301) No. 15 — Chassis ground:</i>	Is the resistance less than 0.5 Ω ?	Go to step 3.	Repair the ABSCM&H/U ground harness.
3 CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step 4.
4 CHECK ABSCM&H/U. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 5.
5 CHECK ANY OTHER DTC ON DISPLAY.	Is there any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-35, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

R: DTC 41 ABS CONTROL MODULE MALFUNCTION

DTC DETECTING CONDITION:

Defective ABSCM&H/U

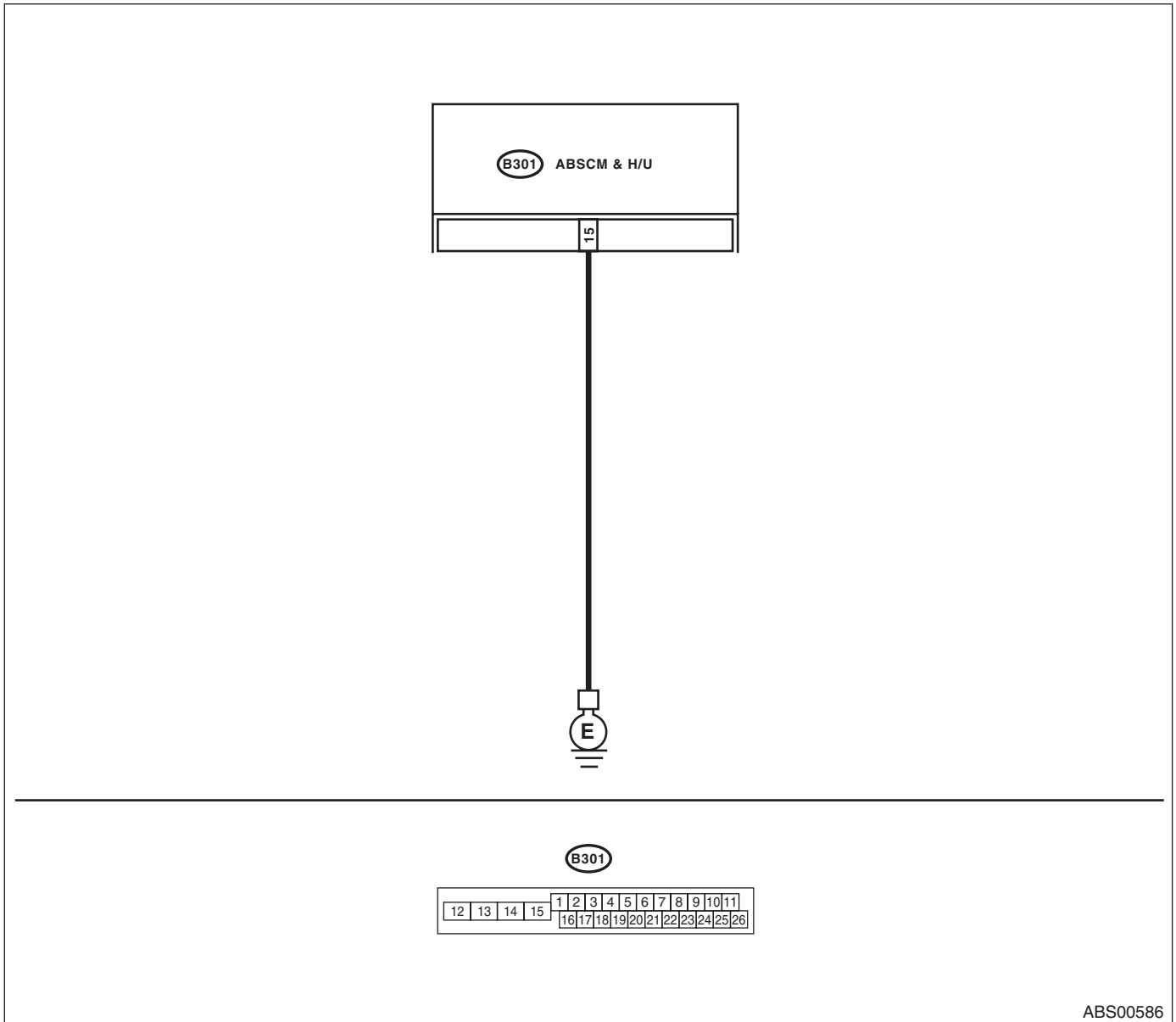
TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate.

NOTE:

Brake warning light comes on as well as the ABS warning light.

WIRING DIAGRAM:



ABS00586

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK THE ABSCM&H/U GROUND CIRCUIT. 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U connectors. 3) Measure the resistance between the ABSCM&H/U and chassis ground. Connector & terminal (B301) No. 15 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 2.	Repair the ABSCM&H/U ground harness.
2 CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact of the connector between the battery, ignition switch and ABSCM&H/U?	Repair the connector.	Go to step 3.
3 CHECK CAUSE OF SIGNAL NOISE.	Is the car telephone or the radio properly installed?	Go to step 4.	Properly install the car telephone or the wireless transmitter.
4 CHECK CAUSE OF SIGNAL NOISE.	Is there a noise source (such as an antenna) installed near the sensor harness?	Install the noise source apart from the sensor harness.	Go to step 5.
5 CHECK ABSCM&H/U. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 6.
6 CHECK ANY OTHER DTC ON DISPLAY.	Is there any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-35, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

S: DTC 42 POWER VOLTAGE MALFUNCTION

DTC DETECTING CONDITION:

Power supply voltage of the ABSCM&H/U is too low or too high.

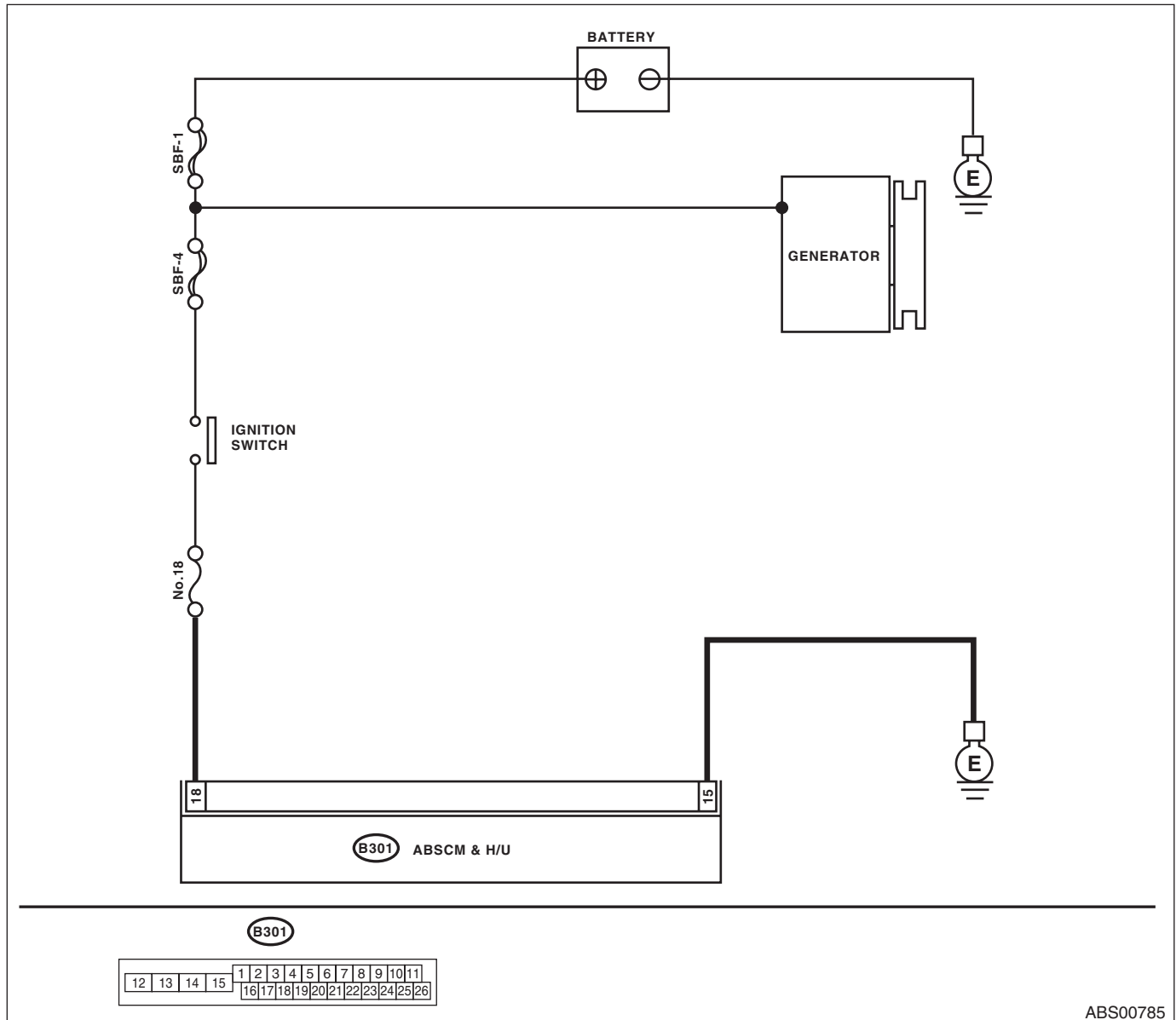
TROUBLE SYMPTOM:

- ABS does not operate.
- EBD may not operate.

NOTE:

If EBD does not operate, the brake warning light illuminates in addition to ABS warning light. Both warning lights go off if voltage returns.

WIRING DIAGRAM:



ABS00785

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK GENERATOR. 1) Start the engine. 2) Run the engine at idle after warming up. 3) Measure the voltage between generator terminal B and chassis ground. Terminals Generator B terminal (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 2.	Repair the generator.
2 CHECK BATTERY TERMINAL. Turn the ignition switch to OFF.	Are the positive and negative battery terminals tightened securely?	Go to step 3.	Tighten the terminal.
3 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Disconnect the ABSCM&H/U connectors. 2) Run the engine at idle. 3) Operate devices such as headlights, air conditioner, defogger, etc. which produce an electrical load. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 18 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 4.	Repair the ABSCM&H/U power circuit.
4 CHECK THE ABSCM&H/U GROUND CIRCUIT. 1) Turn the ignition switch to OFF. 2) Measure the resistance between the ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 15 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 5.	Repair the ABSCM&H/U ground harness.
5 CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step 6.
6 CHECK ABSCM&H/U. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 7.
7 CHECK ANY OTHER DTC ON DISPLAY.	Is there any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-35, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

T: DTC 47 IMPROPER CAN COMMUNICATION

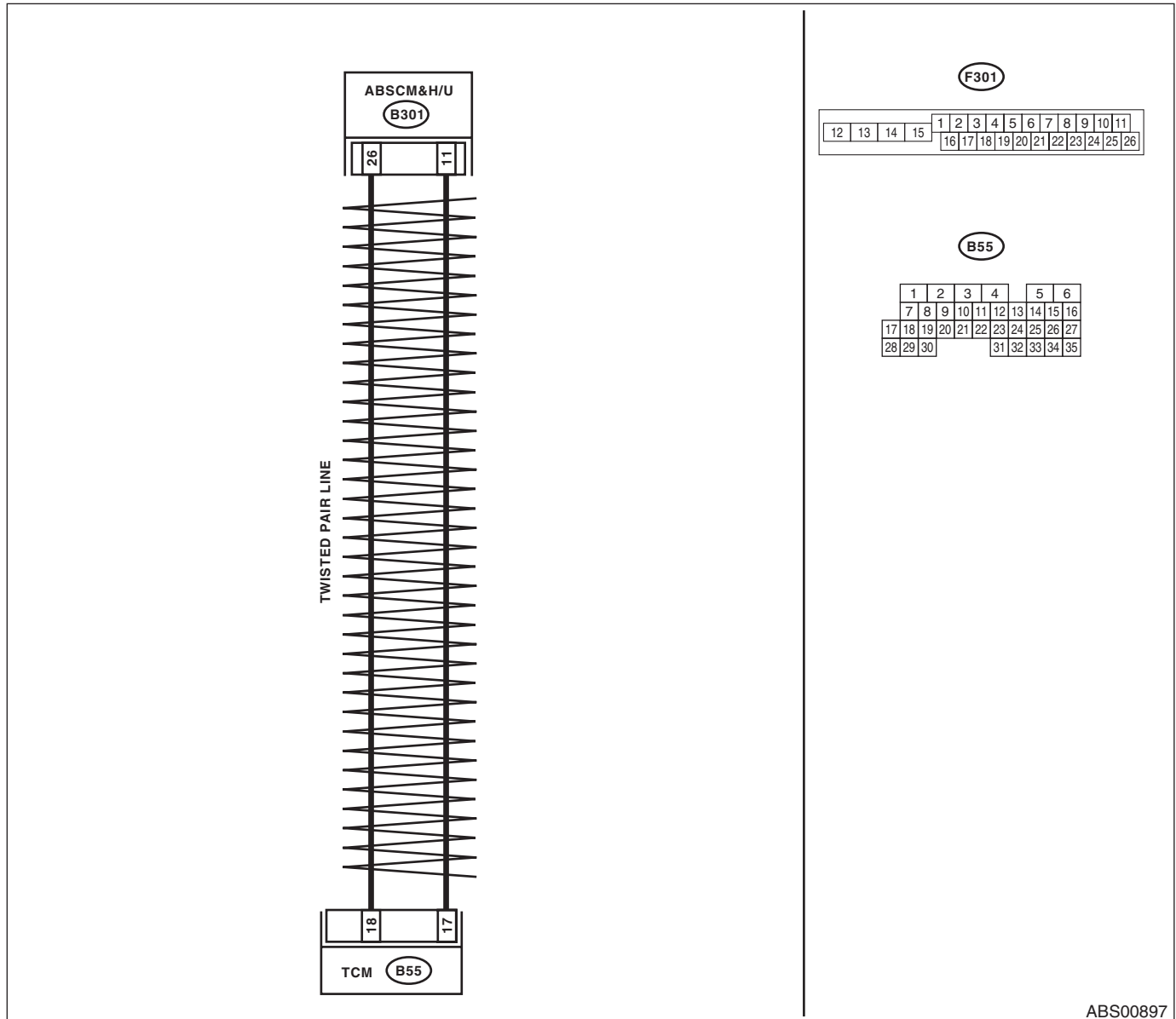
DTC DETECTING CONDITION:

CAN communication line is damaged or circuit is shorted.

TROUBLE SYMPTOM:

Tight corner braking phenomenon occurs.

WIRING DIAGRAM:



ABS00897

Step	Check	Yes	No
<p>1</p> <p>CHECK HARNESS CONNECTOR BETWEEN ABSCM&H/U AND TCM.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from ABSCM&H/U and TCM.</p> <p>3) Measure the resistance of the harness connector between ABSCM&H/U and TCM.</p> <p>Connector & terminal</p> <p>(B301) No. 26 — (B55) No. 18:</p> <p>(B301) No. 11 — (B55) No. 17:</p>	<p>Is the resistance less than 0.5 Ω?</p>	<p>Go to step 2.</p>	<p>Repair or replace the harness connector between ABSCM&H/U and TCM.</p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

Step	Check	Yes	No
<p>2 CHECK GROUND SHORT OF HARNESS CONNECTOR BETWEEN ABSCM&H/U AND TCM.</p> <p>1) Measure the resistance between the ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 26 — Chassis ground: (B301) No. 11 — Chassis ground:</p>	Is the resistance 1 MΩ or more?	Go to step 3.	Repair or replace the harness connector between ABSCM&H/U and TCM.
<p>3 CHECK BATTERY SHORT OF HARNESS CONNECTOR BETWEEN ABSCM&H/U AND TCM.</p> <p>1) Turn the ignition switch to ON. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 26 (+) — Chassis ground (-): (B301) No. 11 (+) — Chassis ground (-):</p>	Is the voltage less than 1.0 V?	Go to step 4.	Repair or replace the harness connector between ABSCM&H/U and TCM.
<p>4 CHECK ABSCM&H/U.</p> <p>1) Turn the ignition switch to OFF. 2) Connect the connector to ABSCM&H/U. 3) Measure the resistance between TCM connector terminals. Connector & terminal (B55) No. 17 — (B55) No. 18:</p>	Is the resistance 120±6 Ω?	Go to step 6.	Go to step 5.
<p>5 CHECK POOR CONTACT OF ABSCM&H/U.</p>	Is there poor contact?	Repair the poor contact of ABSCM&H/U connector.	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
<p>6 CHECK TCM.</p> <p>1) Connect the connector to TCM. 2) Disconnect the ABSCM&H/U connectors. 3) Measure the resistance between the ABSCM&H/U connector terminals. Connector & terminal (B301) No. 11 — (B301) No. 26:</p>	Is the resistance 120±6 Ω?	Go to step 8.	Go to step 7.
<p>7 CHECK POOR CONTACT OF TCM CONNECTORS.</p>	Is there poor contact?	Repair the poor contact of TCM connector.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>
<p>8 CHECK DTC DETECTION.</p>	Is DTC 47 output?	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 9.
<p>9 CHECK IF DTC P1718 FOR TCM SYSTEM IS OUTPUT.</p>	Is DTC P1718 output?	Replace the TCM. <Ref. to 4AT-61, REMOVAL, Transmission Control Module (TCM).>	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

U: DTC 51 VALVE RELAY MALFUNCTION

DTC DETECTING CONDITION:

Defective valve relay

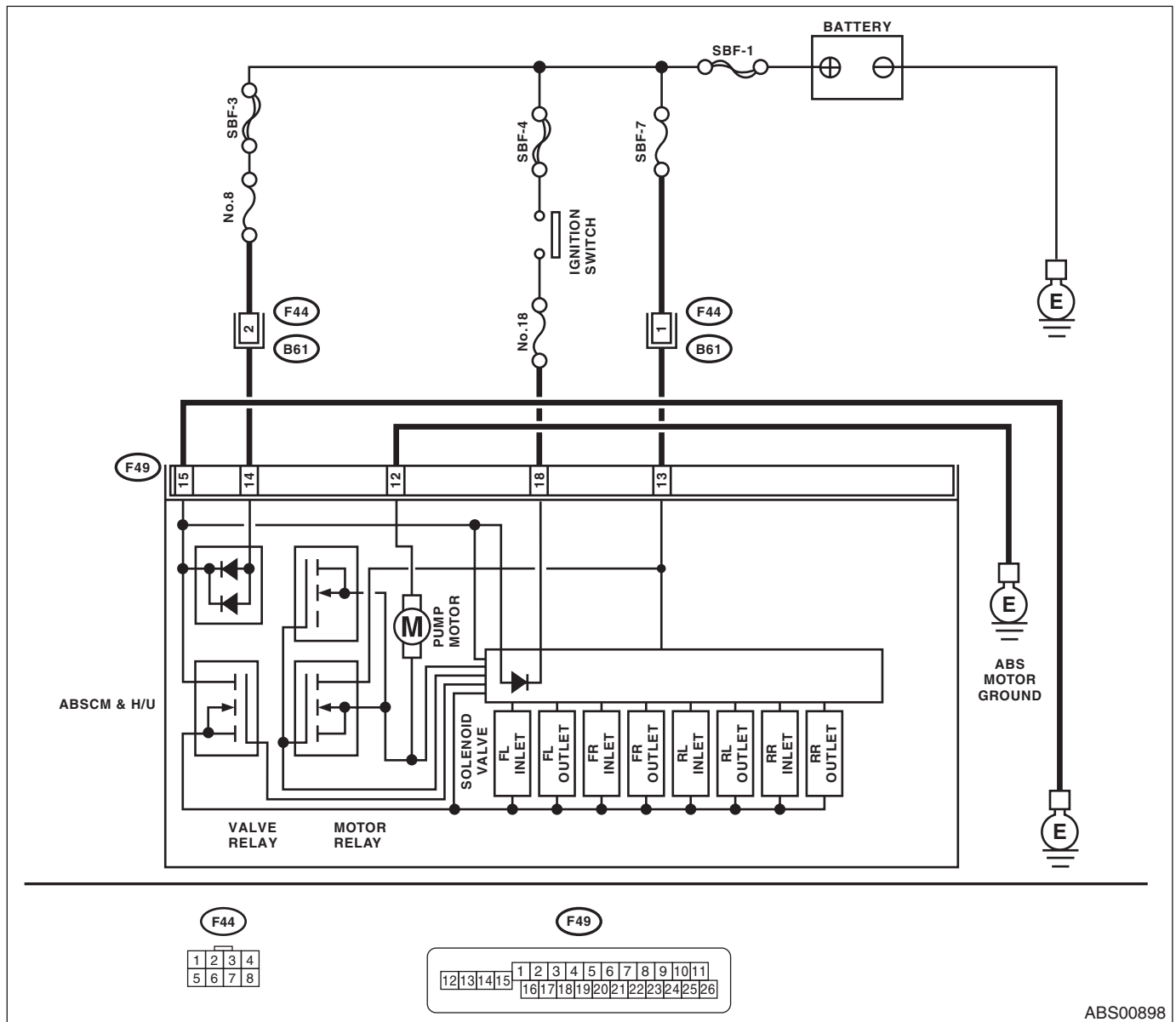
TROUBLE SYMPTOM:

- ABS does not operate.
- EBD does not operate depending on the trouble contents.

NOTE:

Brake warning light comes on as well as ABS warning light when EBD does not operate.

WIRING DIAGRAM:



ABS00898

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U connectors. 3) Run the engine at idle. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. <i>Connector & terminal</i> <i>(B301) No. 18 (+) — Chassis ground (-):</i> <i>(B301) No. 14 (+) — Chassis ground (-):</i>	Is the voltage 10 — 15 V?	Go to step 2.	Repair the harness connector between battery and ABSCM&H/U.
2 CHECK THE ABSCM&H/U GROUND CIRCUIT. 1) Turn the ignition switch to OFF. 2) Measure the resistance between the ABSCM&H/U connector and chassis ground. <i>Connector & terminal</i> <i>(B301) No. 15 — Chassis ground:</i>	Is the resistance less than 0.5 Ω?	Go to step 3.	Repair the ABSCM&H/U ground harness.
3 CHECK VALVE RELAY IN ABSCM&H/U. Measure the resistance between the ABSCM&H/U terminals. <i>Terminals</i> <i>No. 14 — No. 15:</i>	Is the resistance 1 MΩ or more?	Go to step 4.	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>
4 CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step 5.
5 CHECK ABSCM&H/U. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 6.
6 CHECK ANY OTHER DTC ON DISPLAY.	Is there any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-35, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

V: DTC 52 MOTOR/MOTOR RELAY MALFUNCTION

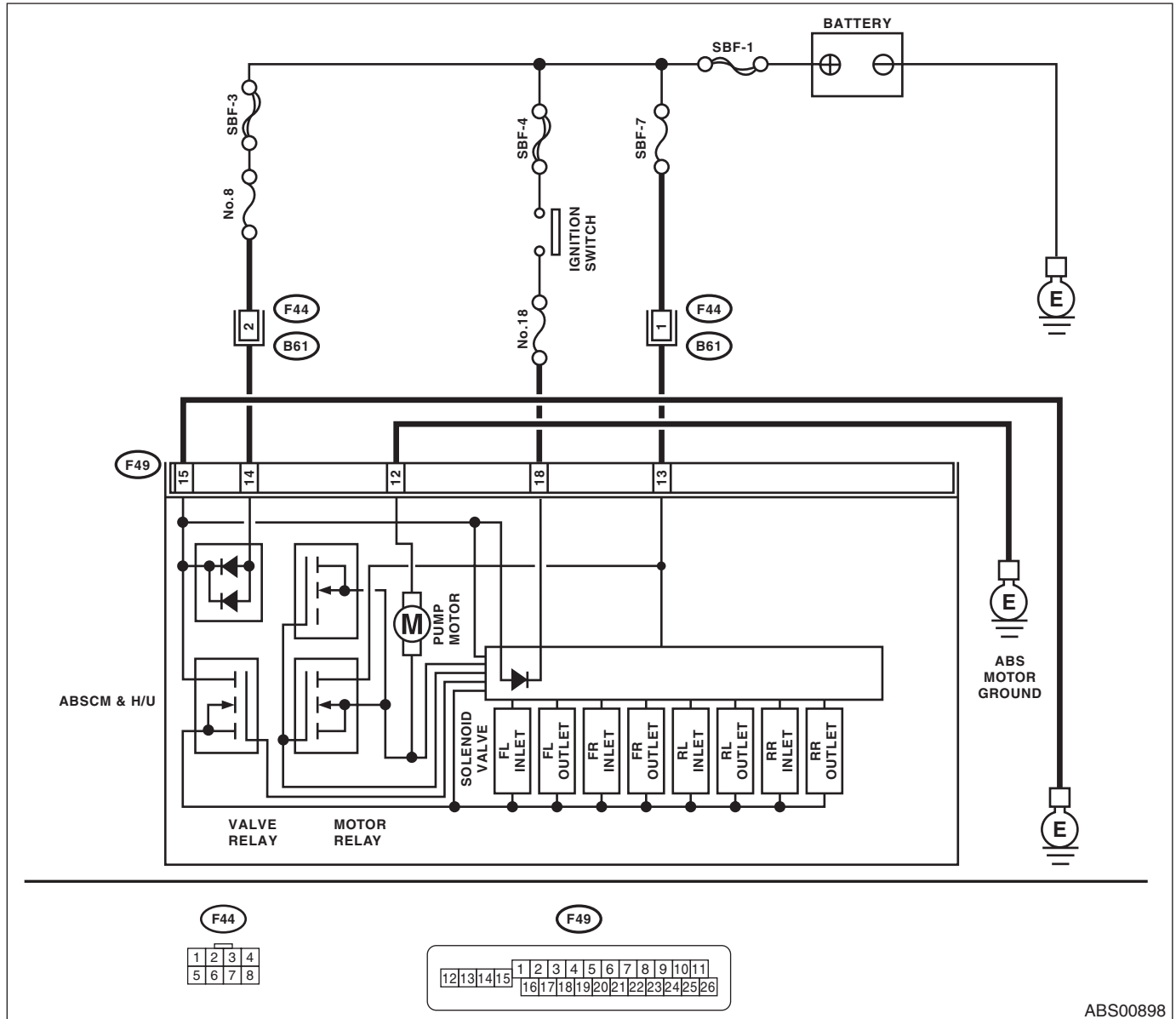
DTC DETECTING CONDITION:

- Defective motor
- Defective motor relay
- Defective harness connector

TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:



ABS00898

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FOR LOOSENED GROUND BOLT. Check for looseness in the ABSCM&H/U motor ground bolt (B302).	Is ground bolt loosened?	Tighten the bolt to 13 N·m (1.3 kgf-m, 9.4 ft-lb) torque.	Go to step 2.
2 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U connectors. 3) Turn the ignition switch to ON. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 13 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 3.	Repair the harness connector between battery and ABSCM&H/U.
3 CHECK GROUND CIRCUIT OF MOTOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between the ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 12 — Chassis ground:	Is the resistance less than 0.5 Ω?	Go to step 4.	Repair the ABSCM&H/U ground harness.
4 CHECK INPUT VOLTAGE OF ABSCM&H/U. 1) Run the engine at idle. 2) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 18 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 5.	Repair the harness connector between battery, ignition switch and ABSCM&H/U.
5 CHECK THE ABSCM&H/U GROUND CIRCUIT. 1) Turn the ignition switch to OFF. 2) Measure the resistance between the ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 15 — Chassis ground:	Is the resistance less than 0.5 Ω?	Go to step 6.	Repair the ABSCM&H/U ground harness.
6 CHECK POOR CONTACT OF CONNECTOR. Turn the ignition switch to OFF.	Is there poor contact in connector between generator, battery and ABSCM&H/U?	Repair the connector.	Go to step 7.
7 CHECK ABSCM&H/U. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM&H/U. <Ref. to ABS-6, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 8.
8 CHECK ANY OTHER DTC ON DISPLAY.	Is there any other DTC displayed?	Check DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to ABS(diag)-35, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs. NOTE: Though the ABS warning light remains on at this time, this is normal. Drive the vehicle at more than 12 km/h (7 MPH) in order to turn ABS warning light off. Be sure to drive the vehicle and check that the warning light goes off.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

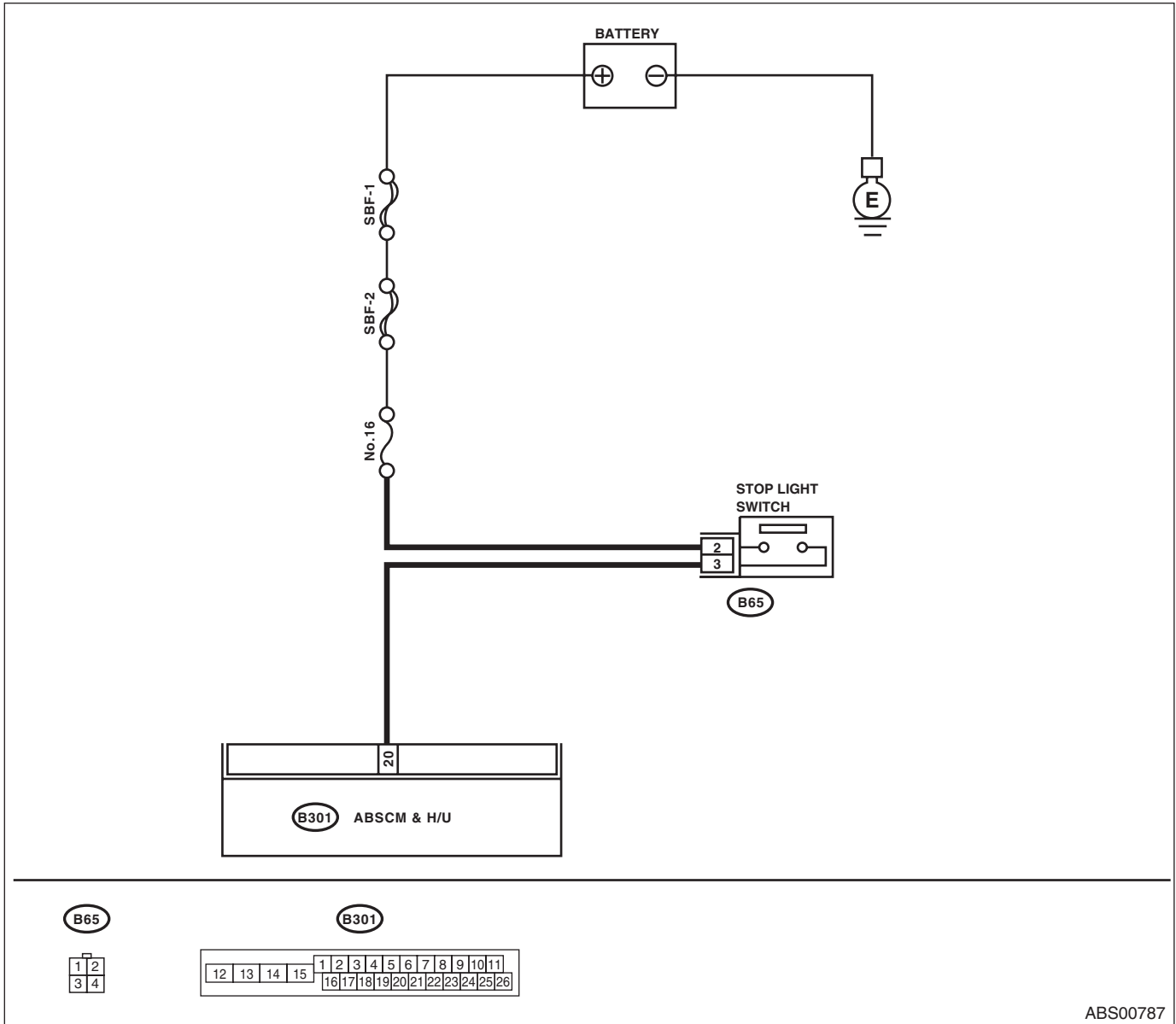
ABS (DIAGNOSTICS)

W: DTC 54 FAULTY STOP LIGHT SWITCH

DTC DETECTING CONDITION:

Defective stop light switch

WIRING DIAGRAM:



ABS00787

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT OF STOP LIGHT SWITCH USING SUBARU SELECT MONITOR. 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Release the brake pedal. 3) Read the stop light switch signal in Subaru Select Monitor.	Is "OFF" displayed on the screen?	Go to step 2.	Go to step 3.
2 CHECK OUTPUT OF STOP LIGHT SWITCH USING SUBARU SELECT MONITOR. 1) Depress the brake pedal. 2) Read the stop light switch output in Subaru Select Monitor.	Is "ON" displayed on the screen?	Go to step 5.	Go to step 3.
3 CHECK IF STOP LIGHTS COME ON. Depress the brake pedal.	Does the stop light illuminate?	Go to step 4.	Repair the stop light circuit.
4 CHECK OPEN CIRCUIT IN HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U connectors. 3) Depress the brake pedal. 4) Measure the voltage between ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 20 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 5.	Repair the harness between stop light switch and ABSCM&H/U connector.
5 CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact in the connector between stop light switch and ABSCM&H/U?	Go to step 6.	Repair the connector.
6 CHECK ABSCM&H/U. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 7.
7 CHECK ANY OTHER DTC ON DISPLAY.	Is there any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-35, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

X: DTC 56 G SENSOR OUTPUT VOLTAGE MALFUNCTION

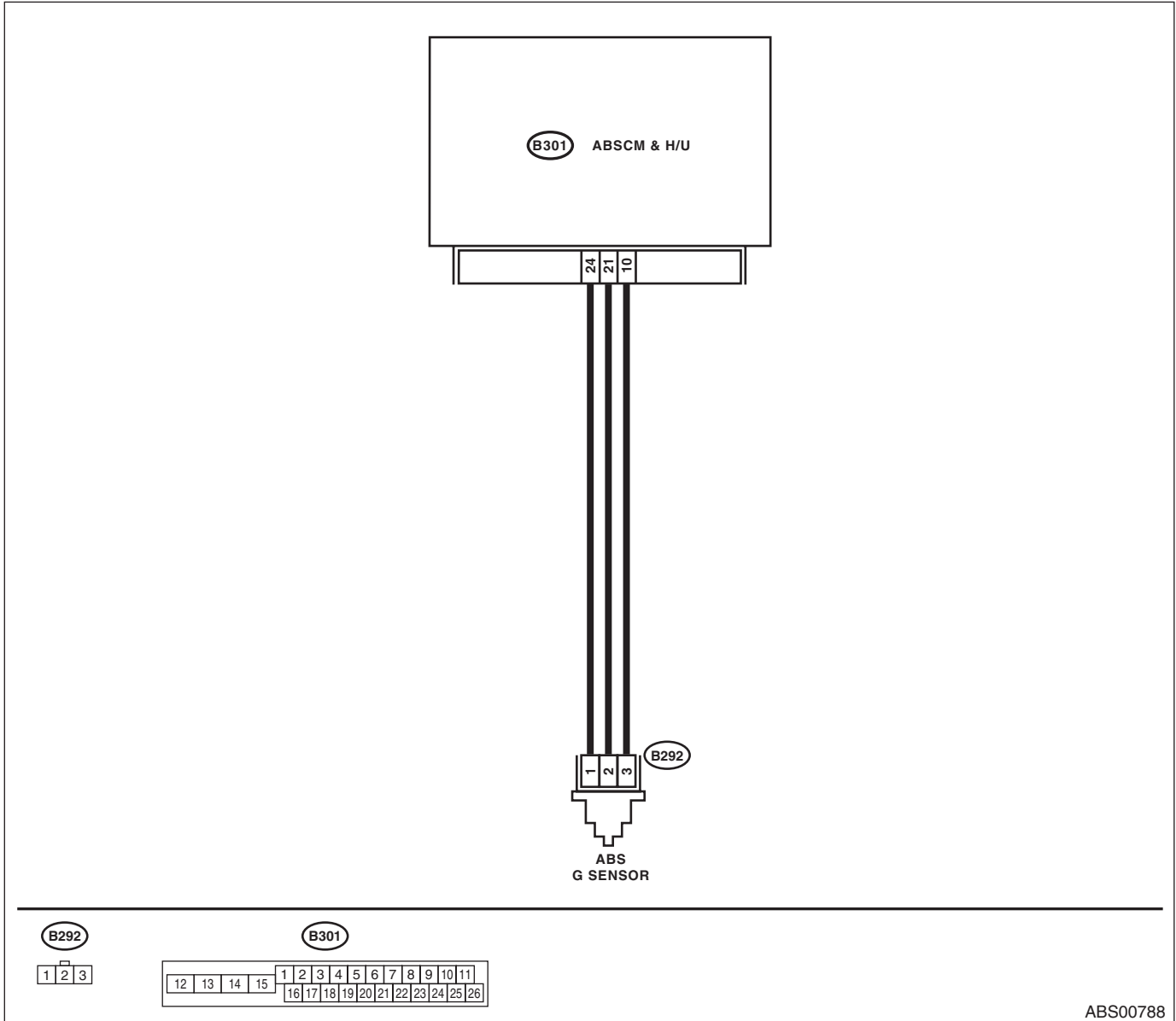
DTC DETECTING CONDITION:

Defective G sensor

TROUBLE SYMPTOM:

ABS does not operate.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

Step	Check	Yes	No
1	WHETHER A WHEEL TURNED FREELY OR NOT.	ABS is normal. Erase the memory.	Go to step 2.
2	CHECK OUTPUT OF G SENSOR USING SUBARU SELECT MONITOR. 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the G sensor output on Subaru Select Monitor.	Go to step 3.	Go to step 6.
3	CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact in connectors between ABSCM&H/U and G sensor?	Repair the connector. Go to step 4.
4	CHECK ABSCM&H/U. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).> Go to step 5.
5	CHECK ANY OTHER DTC ON DISPLAY.	Is there any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to ABS(diag)-35, List of Diagnostic Trouble Code (DTC).> Temporary poor contact occurs.
6	CHECK INPUT VOLTAGE OF G SENSOR. 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Remove the G sensor from vehicle. (Do not disconnect the connector.) 4) Turn the ignition switch to ON. 5) Measure the voltage between G sensor connector terminals. Connector & terminal (B292) No. 1 (+) — No. 3 (-):	Is the voltage 4.75 — 5.25 V?	Go to step 7. Repair the harness connector between the G sensor and ABSCM&H/U.
7	CHECK OPEN CIRCUIT IN G SENSOR OUTPUT HARNESS AND GROUND HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the ABSCM&H/U connectors. 3) Measure the resistance between ABSCU&H/U connector terminals. Connector & terminal (B301) No. 21 — No. 10:	Is the resistance between 1.8 and 2.4 kΩ?	Go to step 8. Repair the harness connector between the G sensor and ABSCM&H/U.
8	CHECK GROUND SHORT IN G SENSOR OUTPUT HARNESS. 1) Disconnect the connector from the G sensor. 2) Measure the resistance between the ABSCM&H/U connector and chassis ground. Connector & terminal (B301) No. 21 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 9. Repair the harness between the G sensor and ABSCM&H/U.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

ABS (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK G SENSOR. 1) Connect the connector to G sensor. 2) Connect the connector to ABSCM&H/U. 3) Turn the ignition switch to ON. 4) Measure the voltage between G sensor connector terminals. <i>Connector & terminal</i> <i>(B292) No. 2 (+) — No. 3 (-):</i>	Is the voltage 2.1 — 2.5 V when G sensor is in horizontal position?	Go to step 10.	Replace G sensor. <Ref. to ABS-22, G Sensor.>
10 CHECK G SENSOR. Measure the voltage between G sensor connector terminals. <i>Connector & terminal</i> <i>(B292) No. 2 (+) — No. 3 (-):</i>	Is the voltage 3.6 — 4.1 V when the G sensor is inclined forward to 90°?	Go to step 11.	Replace G sensor. <Ref. to ABS-22, G Sensor.>
11 CHECK G SENSOR. Measure the voltage between G sensor connector terminals. <i>Connector & terminal</i> <i>(B292) No. 2 (+) — No. 3 (-):</i>	Is the voltage 0.5 — 1.0 V when G sensor is inclined back 90°?	Go to step 12.	Replace G sensor. <Ref. to ABS-22, G Sensor.>
12 CHECK POOR CONTACT OF CONNECTOR. Turn the ignition switch to OFF.	Is there poor contact in connectors between ABSCM&H/U and G sensor?	Repair the connector.	Go to step 13.
13 CHECK ABSCM&H/U. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the ABSCM only. <Ref. to ABS-7, REPLACEMENT, ABS Control Module and Hydraulic Control Unit (ABSCM&H/U).>	Go to step 14.
14 CHECK ANY OTHER DTC ON DISPLAY.	Is there any other DTC displayed?	Check DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to ABS(diag)-35, List of Diagnostic Trouble Code (DTC).>	Temporary poor contact occurs.

13. General Diagnostic Table

A: INSPECTION

Symptoms		Problem parts
Vehicle instability during braking	Vehicle is pulled to either right or left side.	<ul style="list-style-type: none"> • ABSCM&H/U (solenoid valve) • ABS wheel speed sensor • Brake (caliper, piston and pad) • Wheel alignment • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections • Road surface (uneven, camber)
	Vehicle spins.	<ul style="list-style-type: none"> • ABSCM&H/U (solenoid valve) • ABS wheel speed sensor • Brake (pad) • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections
Poor brake performance	Long braking/stopping distance	<ul style="list-style-type: none"> • ABSCM&H/U (solenoid valve) • Brake (pad) • Air in brake line • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections
	Wheel locks.	<ul style="list-style-type: none"> • ABSCM&H/U (solenoid valve, motor) • ABS wheel speed sensor • Incorrect wiring or piping connections
	Brake drag	<ul style="list-style-type: none"> • ABSCM&H/U (solenoid valve) • ABS wheel speed sensor • Master cylinder • Brake (caliper and piston) • Parking brake • Axle and wheels • Brake pedal play
	Long brake pedal stroke	<ul style="list-style-type: none"> • Air in brake line • Brake pedal play
	Vehicle vertical pitching	<ul style="list-style-type: none"> • Suspension play or fatigue (reduced damping) • Incorrect wiring or piping connections • Road surface (uneven)
	Unstable or uneven braking	<ul style="list-style-type: none"> • ABSCM&H/U (solenoid valve) • ABS wheel speed sensor • Brake (caliper, piston and pad) • Tire specifications, tire wear and air pressures • Incorrect wiring or piping connections • Road surface (uneven)
	Excessive pedal vibration	<ul style="list-style-type: none"> • Incorrect wiring or piping connections • Road surface (uneven)
Vibration and/or noise (while driving on slippery roads)	Noise from the ABSCM&H/U	<ul style="list-style-type: none"> • ABSCM&H/U (mount bushing) • ABS wheel speed sensor • Brake line
	Noise from front of vehicle	<ul style="list-style-type: none"> • ABSCM&H/U (mount bushing) • ABS wheel speed sensor • Master cylinder • Brake (caliper, piston, pad and rotor) • Brake line • Brake booster and check valve • Suspension play or fatigue
	Noise from rear of vehicle	<ul style="list-style-type: none"> • ABS wheel speed sensor • Brake (caliper, piston, pad and rotor) • Parking brake • Brake line • Suspension play or fatigue

General Diagnostic Table

ABS (DIAGNOSTICS)

General Description

VEHICLE DYNAMICS CONTROL (VDC)

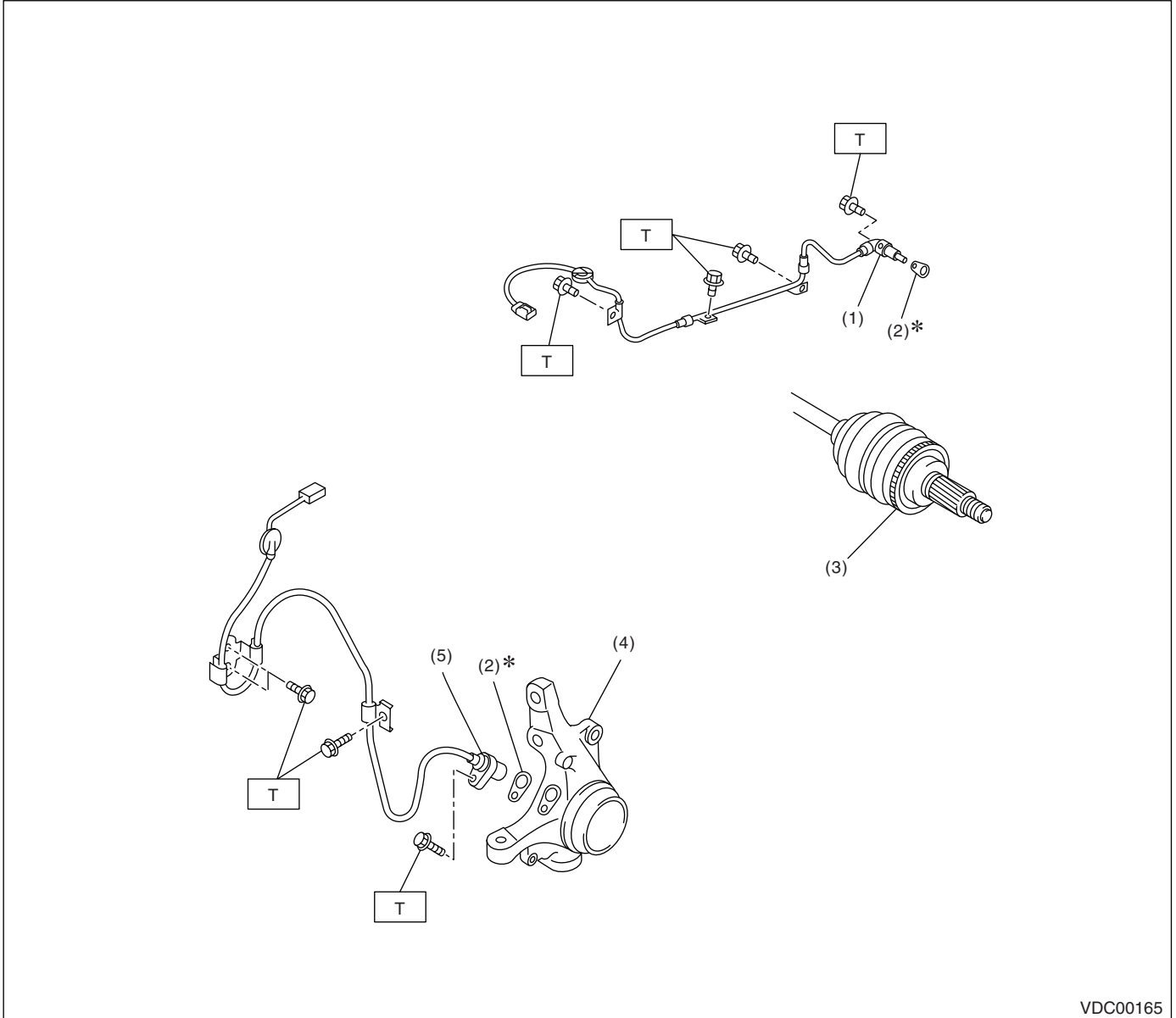
1. General Description

A: SPECIFICATION

Item		Standard value or identification	
ABS wheel speed sensor	ABS wheel speed sensor gap	Front	0.3 — 0.8 mm (0.012 — 0.031 in)
		Rear	0.7 — 1.2 mm (0.0276 — 0.0472 in)
	ABS wheel speed sensor resistance	Front/Rear	1.25±0.25 kΩ/1.15±0.115 kΩ
	Identifications of harness (Colors)	Front LH	Blue
		Front RH	Red
		Rear LH	Yellow
Rear RH		White	
Yaw rate and lateral G sensor	Lateral G sensor voltage	2.5± 0.2 V	
VDCH/M identification		D3	
Identification of VDCCM.		N9	

B: COMPONENT

1. ABS WHEEL SPEED SENSOR



VDC00165

- | | |
|---------------------------------|----------------------------------|
| (1) Rear ABS wheel speed sensor | (4) Housing |
| (2) Adjusting spacer | (5) Front ABS wheel speed sensor |
| (3) Rear tone wheel | |

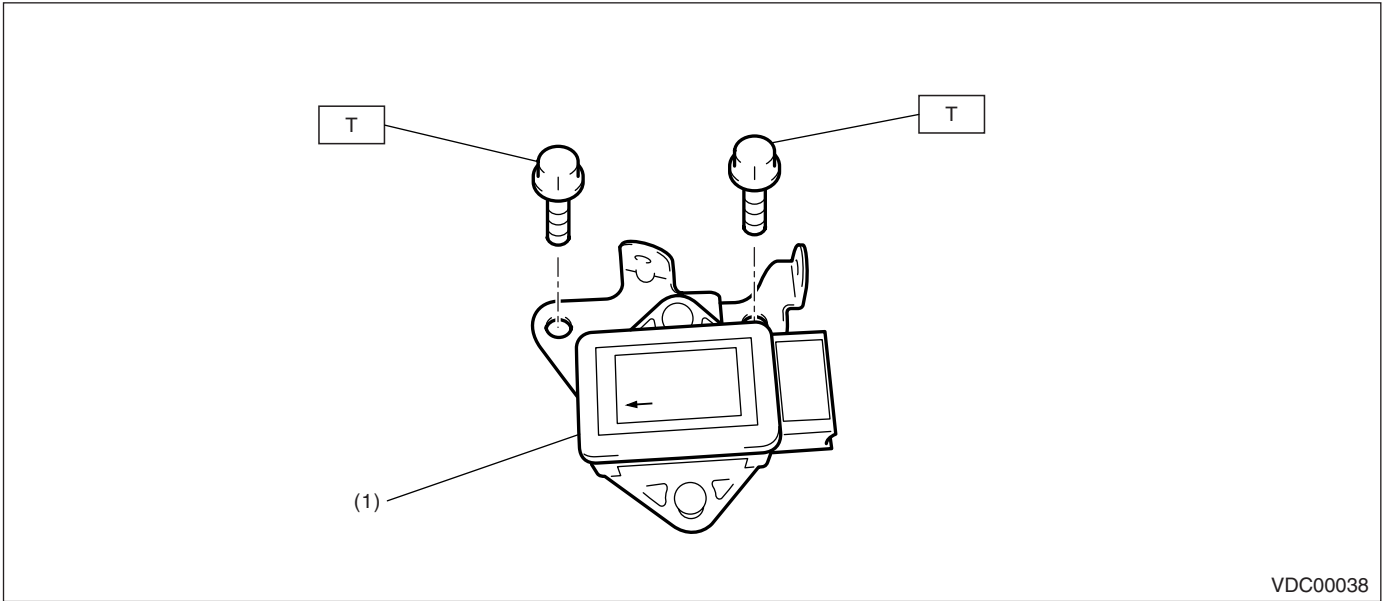
Tightening torque: N·m (kgf·m, ft·lb)

T: 33 (3.3, 23.9)

General Description

VEHICLE DYNAMICS CONTROL (VDC)

2. YAW RATE and LATERAL G SENSOR

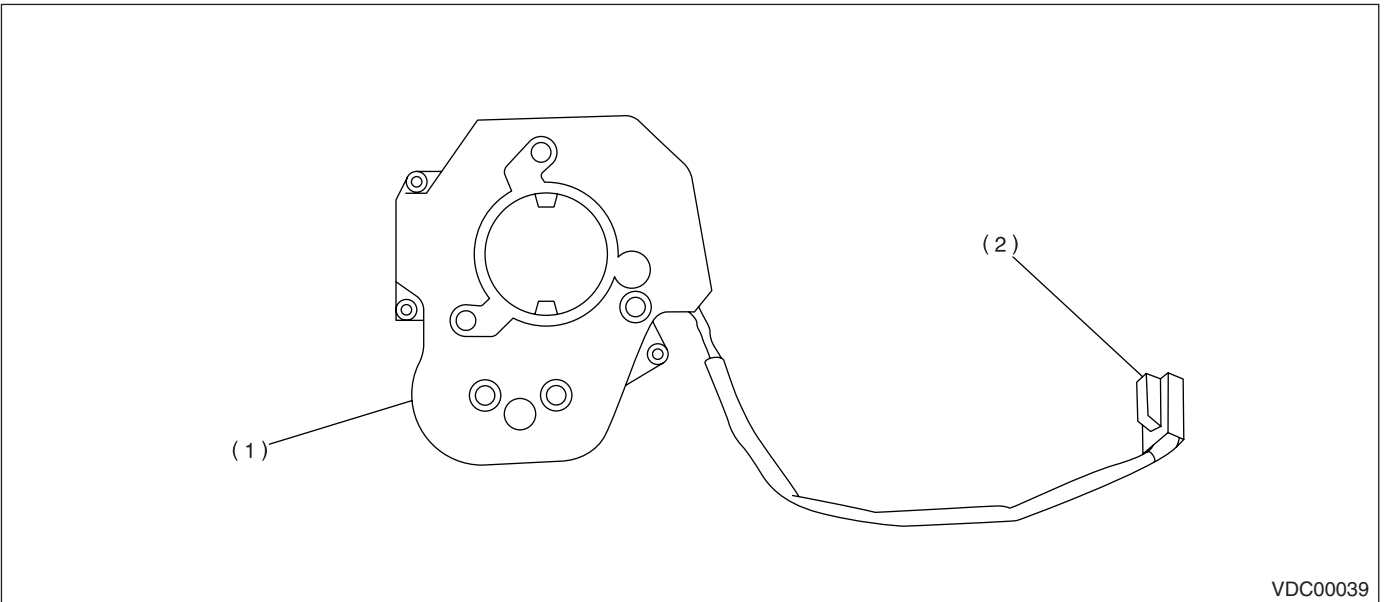


VDC00038

(1) Yaw rate and lateral G sensor

Tightening torque: N·m (kgf·m, ft·lb)
T: 18 (1.8, 13.0)

3. STEERING ANGLE SENSOR

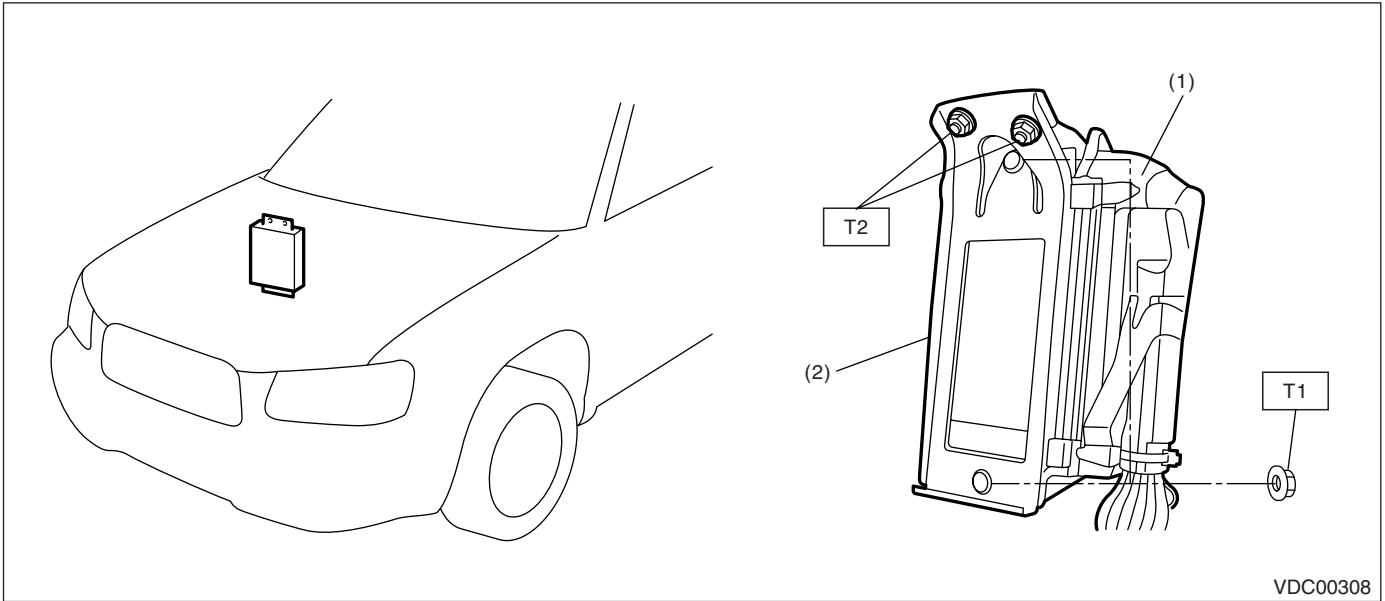


VDC00039

(1) Steering angle sensor

(2) Connector

4. VDC CONTROL MODULE (VDCCM)



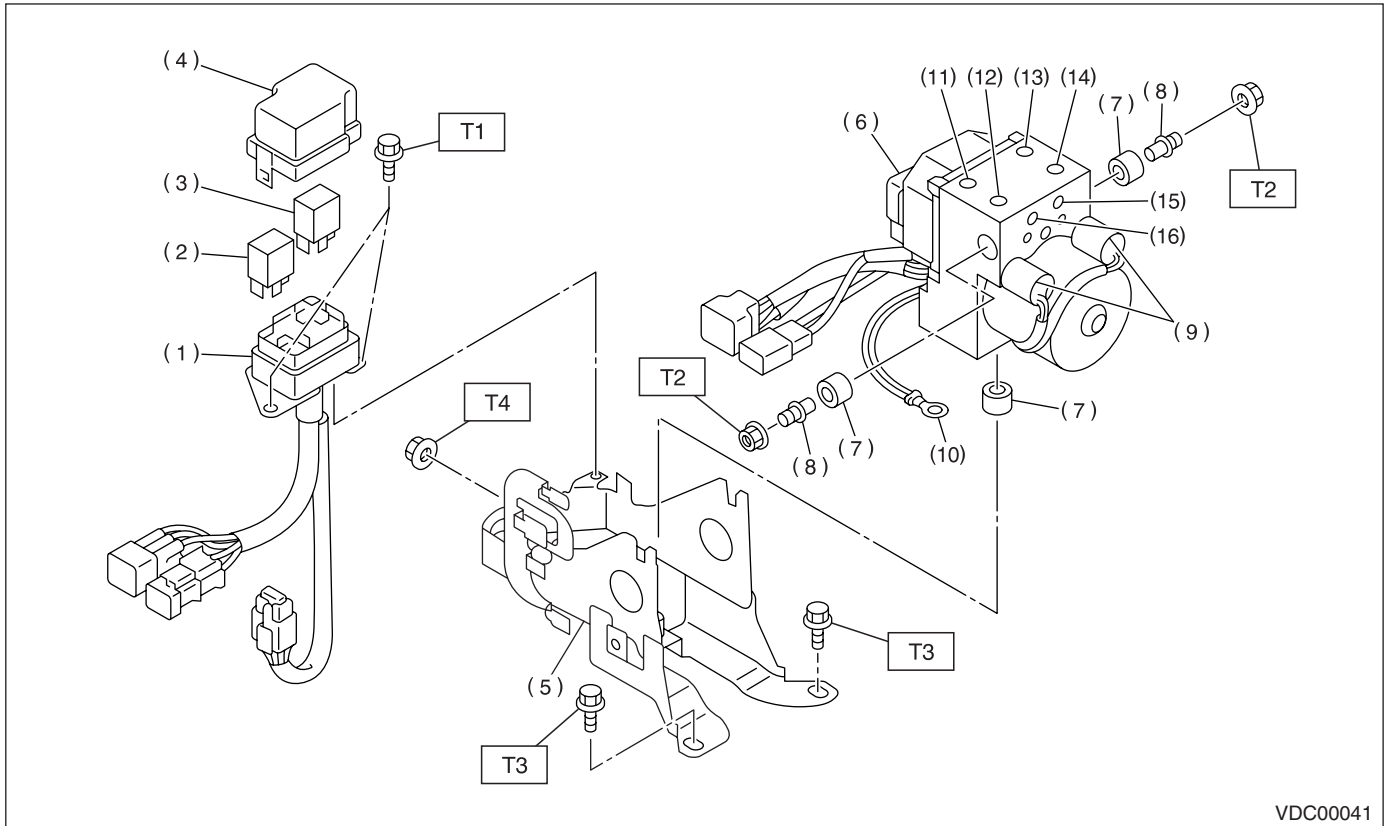
- (1) VDC control module (VDCCM)
- (2) Bracket

Tightening torque: N-m (kgf-m, ft-lb)
T1: 7.5 (0.76, 5.5)
T2: 18 (1.8, 13.0)

General Description

VEHICLE DYNAMICS CONTROL (VDC)

5. VDC HYDRAULIC CONTROL MODULE (VDCH/M)



VDC00041

- | | | |
|---|----------------------|---------------------|
| (1) Relay box | (8) Stud bolt | (16) Rear RH outlet |
| (2) Motor relay | (9) Pressure sensor | |
| (3) Valve relay | (10) Ground terminal | |
| (4) Cap | (11) Front LH outlet | |
| (5) Bracket | (12) Secondary inlet | |
| (6) VDC hydraulic control module (VDCH/M) | (13) Front RH outlet | |
| (7) Damper | (14) Primary inlet | |
| | (15) Rear LH outlet | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 13 (1.3, 9.4)

T2: 18 (1.8, 13.0)

T3: 33 (3.3, 23.9)

T4: 38 (3.8, 27.5)

CAUTION:

Parts other than the valve relay and motor relay cannot be disassembled.

C: CAUTION

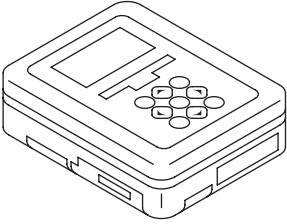
- Wear work clothing, including a cap, protective goggles and protective shoes during operation.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before disconnecting connectors of sensors or units, be sure to disconnect the ground cable from the battery.

General Description

VEHICLE DYNAMICS CONTROL (VDC)

D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B020XU0	1B020XU0	SUBARU SELECT MONITOR KIT	Used for troubleshooting for the electrical system.

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.
Pressure gauge	Used for measuring oil pressure.
Oscilloscope	Used for measuring the sensor.
Steering puller	Used for removing the steering wheel.

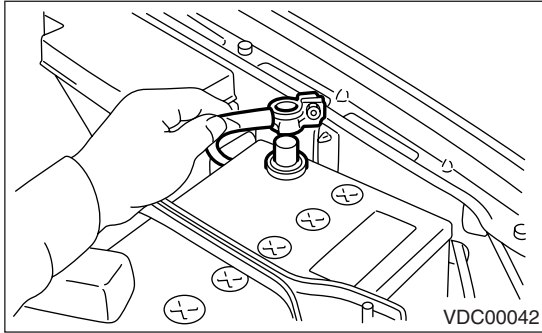
VDC Control Module (VDCCM)

VEHICLE DYNAMICS CONTROL (VDC)

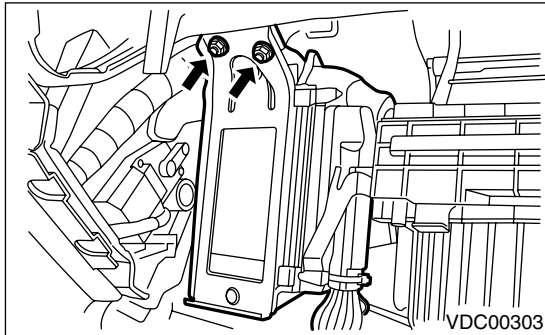
2. VDC Control Module (VDCCM)

A: REMOVAL

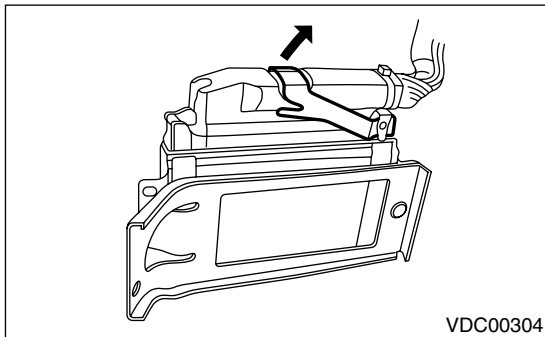
- 1) Disconnect the ground cable from battery.



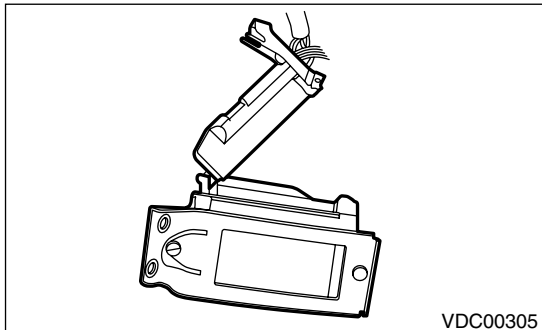
- 2) Remove the glove box.
- 3) Remove the two nuts which secures the bracket.



- 4) Disable the securing holder and disconnect the connector from VDCCM.



- 5) Remove the VDCCM.



- 6) Remove the bracket from VDCCM.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

Refer to "COMPONENT" of "General Description". <Ref. to VDC-5, VDC CONTROL MODULE (VDCCM), COMPONENT, General Description.>

CAUTION:

After installation, always make the following two settings.

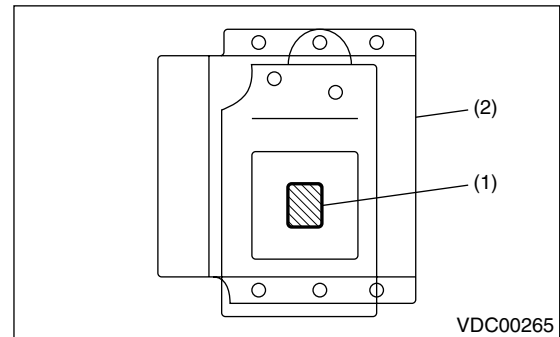
- SRS roll connector and steering angle sensor centering setting

• Yaw rate & lateral G sensor 0 point setting
These two procedures are required to make the VDCCM recognize what position the vehicle is in later. Refer to Adjustments for the procedures for above settings. <Ref. to VDC-9, ADJUSTMENT, VDC Control Module (VDCCM).>

C: INSPECTION

Check the VDCCM identification.

Refer to "SPECIFICATION" for the identification mark. <Ref. to VDC-2, SPECIFICATION, General Description.>



- (1) Identification mark
- (2) VDCCM

D: ADJUSTMENT

When the following replacement, removal and installation are performed, be sure to perform the centering setting of steering angle sensor and to set the zero point of the yaw rate & lateral G sensor.

- VDCCM
- Steering angle sensor
- Yaw rate & lateral G sensor
- Steering wheel parts (Including airbag)
- Suspension parts
- Wheel alignment adjustment

1. WITH SUBARU SELECT MONITOR

1) Park the vehicle straight on a level surface. (Place the gear in “P” or “N” range and run the engine.)

2) Check that steering wheel is positioned at the center. (When the center position is not correct, adjust the wheel alignment.)

3) Set the Subaru Select Monitor to the vehicle, and select “Set mode Str. A. Sen. N & Lat. Gsen. Op” in the “Function Check Sequence” display. (Follow the instructions on the screen.)

4) When the above work is completed, select “Current Data Display & Save” on the “Brake Control” display screen, and check that the steering angle sensor displays “0 deg.”

5) If “0 deg” is not displayed on the screen, repeat the above steps and check whether “0 deg” is displayed.

6) Drive for approximately 10 minutes, then check that the ABS warning light and VDC warning light do not light.

7) Also, when driving, repeat steps 1 to 6 if there is any unnecessary operation of the VDC (VDC indicator light or buzzer) or if steering is unnecessarily pulled by the system.

VDC Hydraulic Control Module (VDCH/M)

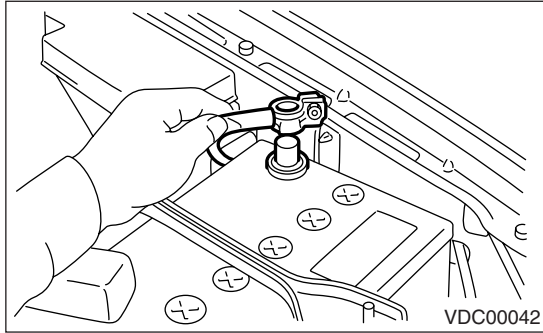
VEHICLE DYNAMICS CONTROL (VDC)

3. VDC Hydraulic Control Module (VDCH/M)

A: REMOVAL

1. VDCH/M

- 1) Disconnect the ground cable from battery.



- 2) Remove the air intake duct from engine room to make it easier to remove the VDCH/M.
- 3) Disconnect the connector from the VDCH/M.

CAUTION:

Be careful to keep water and other foreign materials from coming into contact with the VDCH/M terminals.

- 4) Remove the cable clip.
- 5) Remove the brake pipes from the VDCH/M.

CAUTION:

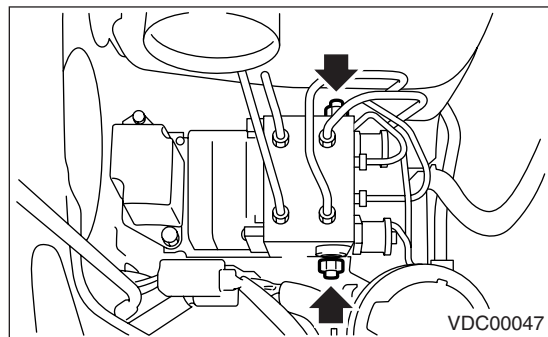
Wrap the brake pipe in a vinyl bag so that brake fluid does not splash on the vehicle body.

- 6) Remove the ground wire of the VDCH/M.

- 7) Remove the two bolts which hold the VDCH/M, then remove the VDCH/M from the engine room.

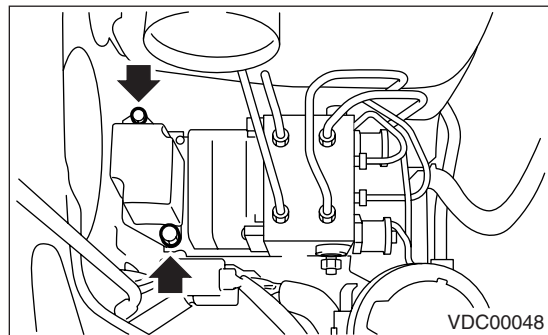
CAUTION:

- The VDCH/M is not to be disassembled. Do not attempt to loosen the bolts and nuts.
- Do not drop or bump the VDCH/M.
- Do not turn VDCH/M upside down or place it sideways.
- Be careful to prevent foreign particles from getting into the VDCH/M.
- After installing the new VDCH/M, tighten the bracket bolts then apply rust-proofing wax (Nippeco LT or GB) to the bracket bolts.
- Do not pull on the harness when disconnecting the harness connector.



2. RELAY BOX

- 1) Disconnect the ground cable from battery.
- 2) Remove the air intake duct from engine room to make it easier to remove the relay box.
- 3) Disconnect the connector from relay box.
- 4) Remove the cable clip.
- 5) Remove the bolts which secure the relay box, and remove the relay box and connector bracket.



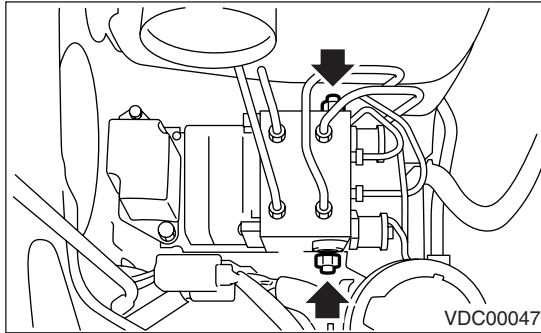
CAUTION:

Do not drop or bump the relay box.

B: INSTALLATION

1. VDCH/M

- 1) Install the VDCH/M.



Tightening torque:

18 N·m (1.8 kgf·m, 13.0 ft·lb)

- 2) Secure the grounding wire of the VDCH/M and apply the specified grease to the ground terminals.

Specified grease:

Nippeco LT or GB

Tightening torque:

33 N·m (3.3 kgf·m, 23.9 ft·lb)

- 3) Connect brake pipes to the VDCH/M connectors.

Tightening torque:

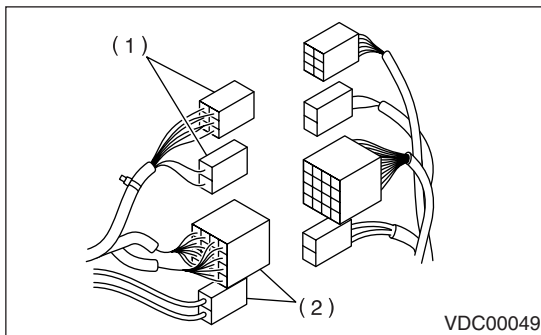
15 N·m (1.5 kgf·m, 10.8 ft·lb)

- 4) Fasten the VDCH/M connector to the connector bracket.

CAUTION:

Match the connector to the corresponding socket.

- 5) Connect the connector to VDCH/M.



(1) Relay box connector

(2) VDCH/M connector

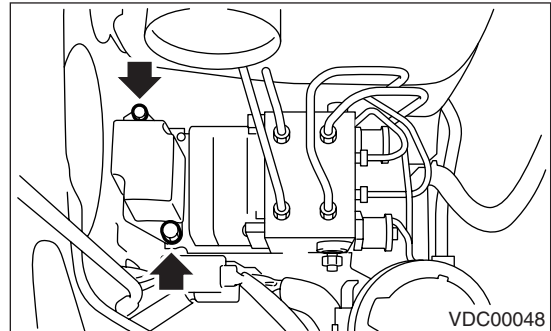
- 6) Install the air intake duct.
- 7) Connect the ground cable to the battery.
- 8) Bleed air from the brake system.

2. RELAY BOX

- 1) Install the relay box and connector bracket.

Tightening torque:

13 N·m (1.3 kgf·m, 9.4 ft·lb)

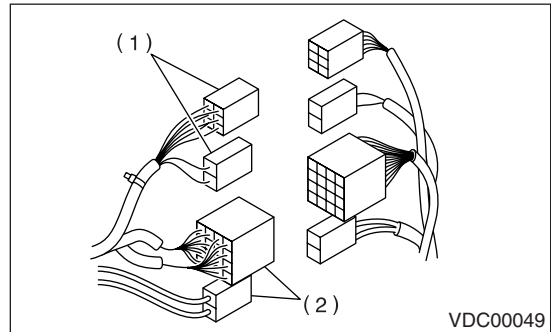


- 2) Affix the relay box connector to the connector bracket.

CAUTION:

Match the connector to the corresponding socket.

- 3) Connect the connector to the relay box.



(1) Relay box connector

(2) VDCH/M connector

- 4) Install the air intake duct.
- 5) Connect the ground cable to the battery.

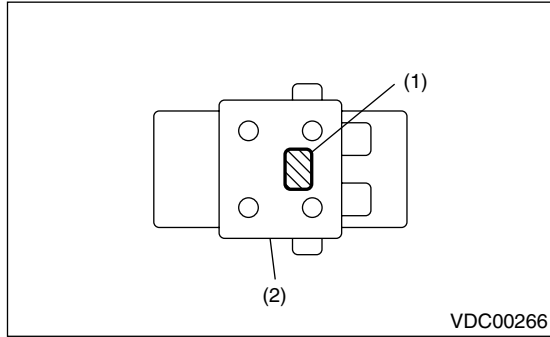
C: INSPECTION

- 1) Check the connection and fixture of the connector.
- 2) Inspect the valve relay and motor relay for broken wires or short circuits.
- 3) Inspect the identification of the VDCH/M.

VDC Hydraulic Control Module (VDCH/M)

VEHICLE DYNAMICS CONTROL (VDC)

Refer to "SPECIFICATION" for the identification mark. <Ref. to VDC-2, SPECIFICATION, General Description.>



- (1) Identification mark
- (2) VDCH/M

	Condition	Terminal No.	Standard	
Valve relay	When not applying voltage	85 — 86	103±10 Ω	<p>VDC00050</p>
		30 — 87a	Less than 0.5 Ω	
		30 — 87	1 MΩ or more	
	When voltage (DC 12 V) is applied between terminal numbers 85 and 86.	30 — 87a	1 MΩ or more	
30 — 87		Less than 0.5 Ω		
Motor relay	When not applying voltage	85 — 86	80±10 Ω	<p>VDC00051</p>
		30 — 87	1 MΩ or more	
	When voltage (DC 12 V) is applied between terminal numbers 85 and 86.	30 — 87	Less than 0.5 Ω	

VDC Hydraulic Control Module (VDCH/M)

VEHICLE DYNAMICS CONTROL (VDC)

1. CHECKING THE VDC HYDRAULIC CONTROL MODULE (VDCH/M) ABS OPERATION BY PRESSURE GAUGE

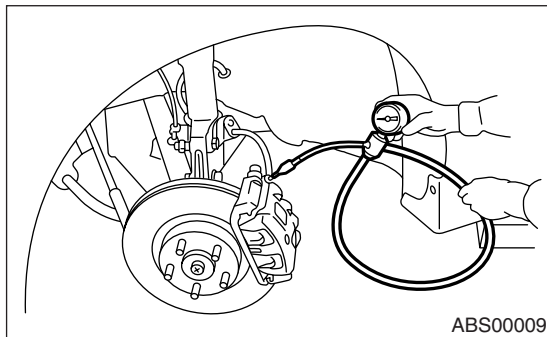
- 1) Lift-up the vehicle and remove the wheel.
- 2) Disconnect the air bleeder screws from FL and FR caliper bodies.
- 3) Connect two pressure gauges to FL and FR caliper bodies.

CAUTION:

- Use a pressure gauge used exclusively for brake fluid measurement.
- Do not use a pressure gauge used previously for measurement of transmission oil pressure, as the piston seal may expand and deform.

NOTE:

Wrap sealing tape around the pressure gauge.



- 4) Bleed air from the pressure gauge.
- 5) Perform ABS sequence control. <Ref. to VDC-16, ABS Sequence Control.>
- 6) When the VDCH/M begins to work, first the FL side performs decompression, hold and compression, and then the FR side performs decompression, hold and compression.
- 7) Read values indicated on the pressure gauge and check whether the fluctuation of the values between decompression and compression meets the standard values. Also check whether any irregular tightness of the brake pedal can be felt.

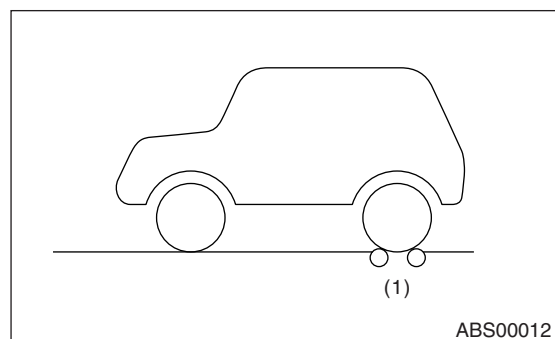
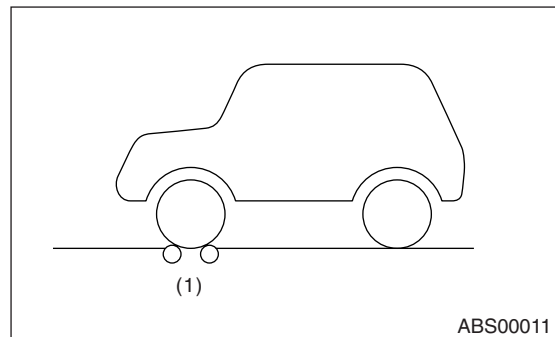
	Front wheel	Rear wheel
Initial value	3,500 kPa (36 kgf/cm ² , 508 psi)	3,500 kPa (36 kgf/cm ² , 508 psi)
When depressurized	500 kPa (5 kgf/cm ² , 73 psi) or less	500 kPa (5 kgf/cm ² , 73 psi) or less
When pressurized	3,500 kPa (36 kgf/cm ² , 508 psi) or more	3,500 kPa (36 kgf/cm ² , 508 psi) or more

- 8) Disconnect the pressure gauges from FL and FR caliper bodies.

- 9) Install the air bleeder screws of FL and FR caliper bodies.
- 10) Remove the air bleeder screws from RL and RR caliper bodies.
- 11) Connect two pressure gauges to RL and RR caliper bodies.
- 12) Bleed air from RL and RR caliper bodies, and pressure gauge.
- 13) Perform ABS sequence control. <Ref. to VDC-16, ABS Sequence Control.>
- 14) When the VDCH/M begins to work, first the RR side performs decompression, hold and compression, and then the RL side performs decompression, hold and compression.
- 15) Read the values indicated on the pressure gauges and check if it is within specification.
- 16) After checking, remove the pressure gauges from the caliper bodies.
- 17) Install the air bleeder screws of RL and RR caliper bodies.
- 18) Bleed air from the brake line.

2. CHECKING THE VDC HYDRAULIC CONTROL MODULE (VDCH/M) ABS OPERATION WITH BRAKE TESTER

- 1) Prepare for ABS sequence control. <Ref. to VDC-16, ABS Sequence Control.>
- 2) Set the front wheels or rear wheels on the brake tester and set the select lever position to the "N" range.



(1) Brake tester

- 3) Operate the brake tester.

VDC Hydraulic Control Module (VDCH/M)

VEHICLE DYNAMICS CONTROL (VDC)

4) Perform ABS sequence control. <Ref. to VDC-16, ABS Sequence Control.>

5) When the VDCH/M begins to work, check the following working sequence.

(1) The FL wheel performs decompression, hold and compression in sequence, and subsequently the FR wheel repeats the cycle.

(2) The RR wheel performs decompression, hold and compression in sequence, and subsequently the RL wheel repeats the cycle.

6) Read values indicated on the brake tester and check if the fluctuation of the values between decompression and compression meets specification.

	Front wheel	Rear wheel
Initial value	1,000 N (102 kgf, 224 lb)	1,000 N (102 kgf, 224 lb)
When depressurized	500 N (51 kgf, 112 lb) or less	500 N (51 kgf, 112 lb) or less
When pressurized	1,000 N (102 kgf, 224 lb) or more	1,000 N (102 kgf, 224 lb) or more

7) After checking, press the brake pedal and check whether any irregular tightness of the brake pedal can be felt.

3. CHECKING THE VDC HYDRAULIC CONTROL MODULE (VDCH/M) VDC OPERATION BY PRESSURE GAUGE

1) Lift-up the vehicle and remove the wheel.

2) Disconnect the air bleeder screws from FL and FR caliper bodies.

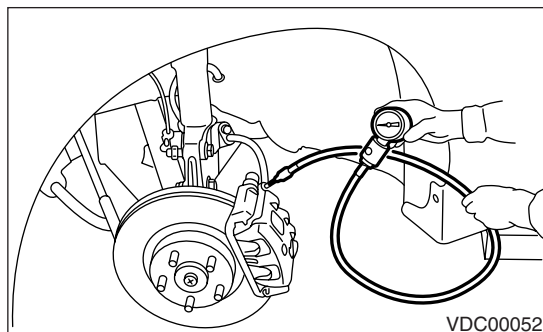
3) Connect two pressure gauges to FL and FR caliper bodies.

CAUTION:

- Use a pressure gauge used exclusively for brake fluid measurement.
- Do not use a pressure gauge used previously for measurement of transmission oil pressure, as the piston seal may expand and deform.

NOTE:

Wrap sealing tape around the pressure gauge.



4) Bleed air from the pressure gauge.

5) Perform VDC sequence control.

<Ref. to VDC-19, VDC Sequence Control.>

6) When the VDCH/M begins to work, first the FL side performs hold, decompression, and compression, and then the FR side performs decompression, hold and compression.

7) Read values indicated on the pressure gauge and check if the fluctuation of the values between decompression and compression meets the standard values. Also check whether any irregular tightness of the brake pedal can be felt.

	Front wheel	Rear wheel
When pressurized	3,000 kPa (31 kg/cm ² , 435 psi) or more	2,000 kPa (20 kg/cm ² , 290 psi) or more
When depressurized	500 kPa (5 kg/cm ² , 73 psi) or less	500 kPa (5 kg/cm ² , 73 psi) or less

8) Disconnect the pressure gauges from FL and FR caliper bodies.

9) Connect the air bleeder screws to the FL and FR caliper bodies.

10) Remove the air bleeder screws from RL and RR caliper bodies.

11) Connect two pressure gauges to RL and RR caliper bodies.

12) Bleed air from RL and RR caliper bodies, and pressure gauge.

13) Perform VDC sequence control.

<Ref. to VDC-19, VDC Sequence Control.>

14) When the hydraulic unit begins to work, first the RR side performs hold, decompression, and compression, and then the RL side performs hold, decompression, and compression.

15) Read the values indicated on the pressure gauges and check if it is within specification.

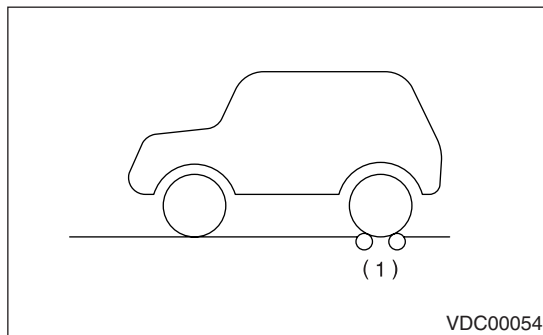
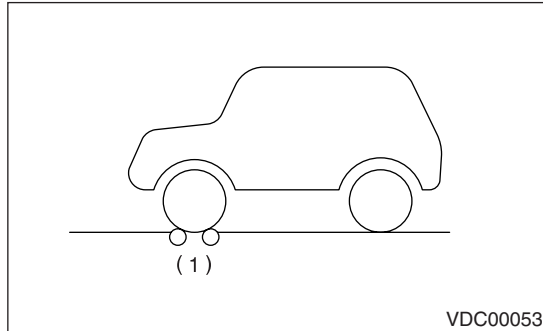
16) After checking, remove the pressure gauges from the caliper bodies.

17) Connect the air bleeder screws to RL and RR caliper bodies.

18) Bleed air from the brake line.

4. CHECKING THE VDC HYDRAULIC CONTROL MODULE (VDCH/M) VDC OPERATION BRAKE TESTER

- 1) Prepare for the VDC sequence control.
<Ref. to VDC-19, VDC Sequence Control.>
- 2) Set the front wheels or rear wheels on the brake tester and set the select lever position to the "N" range.



(1) Brake tester

- 3) Operate the brake tester.
- 4) Perform ABS sequence control. <Ref. to VDC-16, ABS Sequence Control.>
- 5) When the VDCH/M begins to work, check the working sequence in the following order.
 - (1) The FL wheel performs decompression, hold and compression in sequence, and subsequently the FR wheel repeats the cycle.
 - (2) The RR wheel performs decompression, hold and compression in sequence, and subsequently the RL wheel repeats the cycle.
- 6) Read values indicated on the brake tester and check if the fluctuation of the values between decompression and compression meets specification.

	Front wheel	Rear wheel
When pressurized	2,000 N (203 kgf, 447 lb) or more	1,000 N (102 kgf, 224 lb) or more
When depressurized	500 N (51 kgf, 112 lb) or less	500 N (51 kgf, 112 lb) or less

- 7) After inspection, check whether any irregular brake pedal tightness can be felt.

4. ABS Sequence Control

A: OPERATION

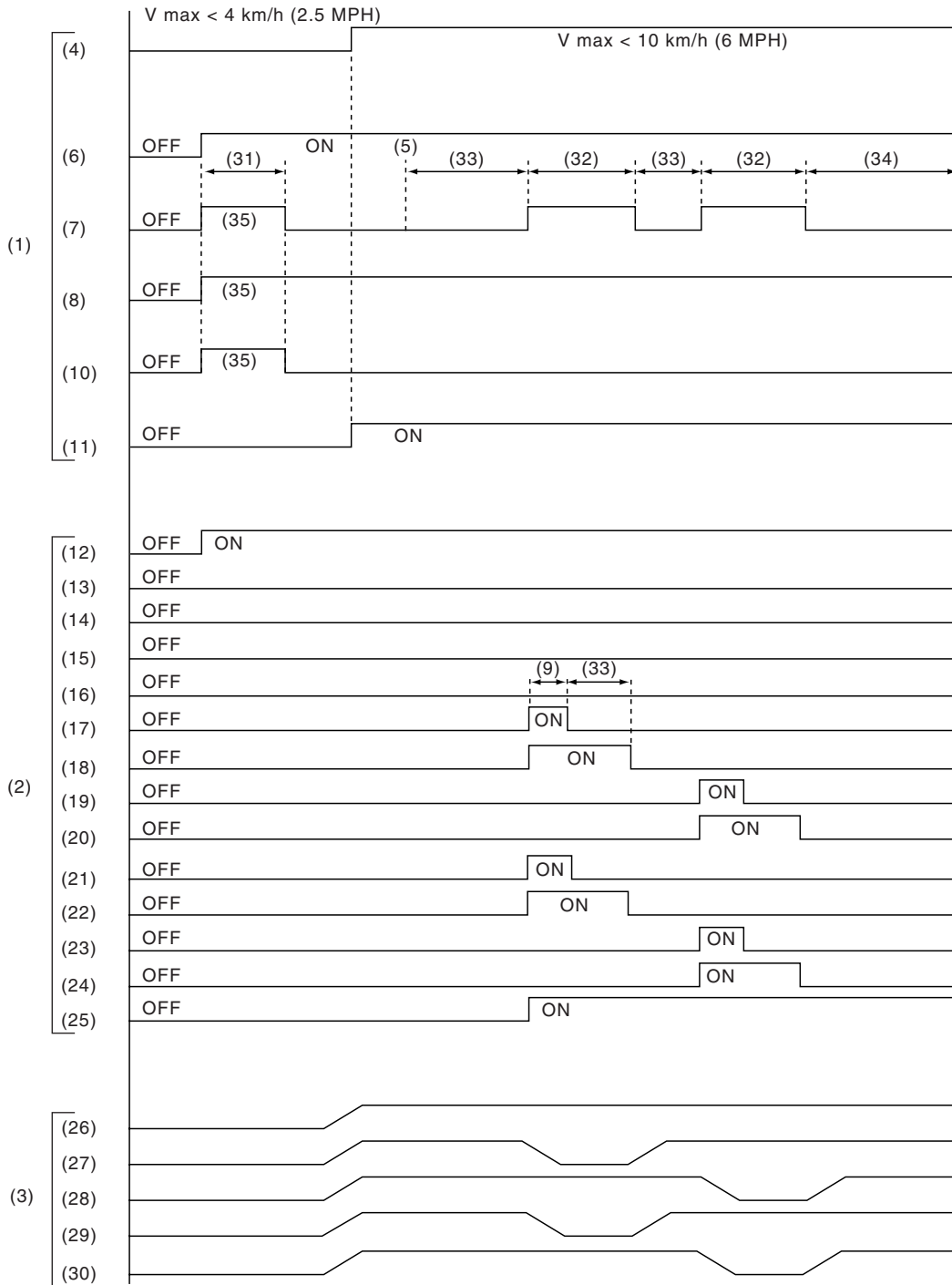
- 1) While the ABS sequence control is being performed, the operation of the VDCH/M can be checked after the operation of the VDCH/M solenoid valve, using the brake tester or pressure gauge.
- 2) ABS sequence control can be started by the Subaru Select Monitor.

1. ABS SEQUENCE CONTROL WITH SUBARU SELECT MONITOR

- 1) Connect the Subaru Select Monitor to the Subaru data link connector under the driver's side instrument panel lower cover.
- 2) Turn the ignition switch ON.
- 3) Run the Subaru Select Monitor.
- 4) Set the Subaru Select Monitor to "BRAKE CONTROL" mode.
- 5) When the "Function check sequence" is selected, the "ABS sequence control" will start.
- 6) Execute the following operations when the message "Press Brake Pedal with braking force of 100 to 150 kgf" is displayed.
 - (1) When using a brake tester, press the brake pedal with a force of 1,000 N (102 kgf, 224 lb).
 - (2) When using the pressure gauge, press the brake pedal so as to make the pressure gauge indicate 3,500 kPa (36 kg/cm², 508 psi).
- 7) "OK" will be displayed. Select the «OK».
- 8) The brake system being operated is displayed on the Subaru Select Monitor.

ABS Sequence Control

2. CONDITIONS FOR ABS SEQUENCE CONTROL



VDC00353

ABS Sequence Control

VEHICLE DYNAMICS CONTROL (VDC)

- | | | |
|--|-------------------------------|---------------------------------|
| (1) Operation guide line of the sequence control | (11) Pressure sensor | (24) RL inlet solenoid valve |
| (2) Operation pattern of sequence control | (12) Valve relay | (25) Pump motor |
| (3) Operating pressure of sequence control | (13) Secondary cut valve | (26) Master cylinder pressure |
| (4) All wheel speeds | (14) Primary cut valve | (27) FL wheel cylinder pressure |
| (5) Point A | (15) Secondary suction valve | (28) FR wheel cylinder pressure |
| (6) Ignition switch | (16) Primary suction valve | (29) RR wheel cylinder pressure |
| (7) ABS warning light | (17) FL outlet solenoid valve | (30) RL wheel cylinder pressure |
| (8) VDC warning light | (18) FL inlet solenoid valve | (31) 1.5 seconds |
| (9) 0.4 second | (19) FR outlet solenoid valve | (32) 1.4 seconds |
| (10) VDC operation indicator light | (20) FR inlet solenoid valve | (33) 1.0 second |
| | (21) RR outlet solenoid valve | (34) 0.6 second |
| | (22) RR inlet solenoid valve | (35) Light ON |
| | (23) RL outlet solenoid valve | |

NOTE:

Operation starts from point A.

B: SPECIFICATION

1. CONDITIONS FOR COMPLETION OF ABS SEQUENCE CONTROL

When the following conditions develop, the ABS sequence control stops and ABS operation is returned to the normal mode.

- 1) When the speed of at least one wheel reaches 10 km/h (6 MPH).
- 2) When the brake pedal is released during sequence control and the stop lamp switch becomes OFF.
- 3) After completion of the sequence control.
- 4) When a problem is detected.

5. VDC Sequence Control

A: OPERATION

- 1) While the VDC sequence control is performed, the operation of the VDCH/M can be checked after operation of the VDCH/M solenoid valve, using the brake tester or pressure gauge.
- 2) VDC sequence control can be started by Subaru Select Monitor.

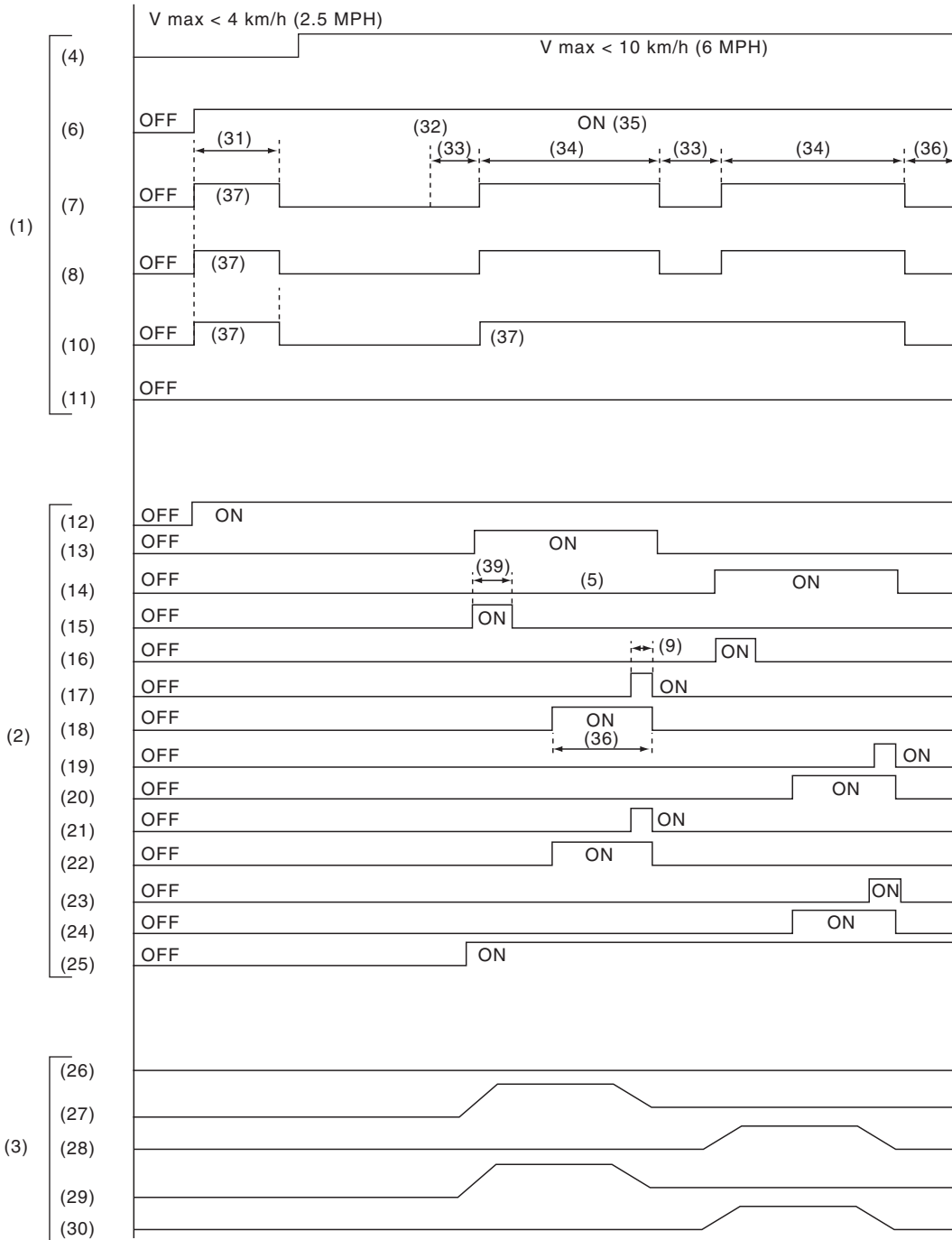
1. VDC SEQUENCE CONTROL WITH SUBARU SELECT MONITOR

- 1) Connect the Subaru Select Monitor to the Subaru data link connector, located next to the lower cover under the driver's side instrument panel.
- 2) Turn the ignition switch ON.
- 3) Run the Subaru Select Monitor.
- 4) Set the Subaru Select Monitor to the "BRAKE CONTROL" mode.
- 5) When the "VDC Check Mode" is selected from the "Function check sequence" menu, the "VDC sequence control" will start.
- 6) "OK" will be displayed. Select the «OK».
- 7) The brake system being operated is displayed on the Subaru Select Monitor.

VDC Sequence Control

VEHICLE DYNAMICS CONTROL (VDC)

2. CONDITIONS FOR VDC SEQUENCE CONTROL



VDC00354

VDC Sequence Control

VEHICLE DYNAMICS CONTROL (VDC)

(1) Operation guide line of the sequence control	(12) Valve relay	(26) Master cylinder pressure
(2) Operation pattern of sequence control	(13) Secondary cut valve	(27) FL wheel cylinder pressure
(3) Operating pressure of sequence control	(14) Primary cut valve	(28) FR wheel cylinder pressure
(4) All wheel speeds	(15) Secondary suction valve	(29) RR wheel cylinder pressure
(5) Within 0.4 second	(16) Primary suction valve	(30) RL wheel cylinder pressure
(6) Ignition switch	(17) FL outlet solenoid valve	(31) 1.5 seconds
(7) ABS warning light	(18) FL inlet solenoid valve	(32) Point A
(8) VDC warning light	(19) FR outlet solenoid valve	(33) 1.0 second
(9) 0.4 second	(20) FR inlet solenoid valve	(34) 3.4 seconds
(10) VDC operation indicator light	(21) RR outlet solenoid valve	(35) Engine ON
(11) Pressure sensor	(22) RR inlet solenoid valve	(36) 1.6 seconds
	(23) RL outlet solenoid valve	(37) Light ON
	(24) RL inlet solenoid valve	(38) 0.8 second
	(25) Pump motor	

NOTE:

Operation starts from point A.

B: SPECIFICATION

1. CONDITIONS FOR COMPLETION OF VDC SEQUENCE CONTROL

When the following conditions develop, the VDC sequence control stops and VDC operation is returned to the normal mode.

- 1) When the speed of at least one wheel reaches 10 km/h (6 MPH).
- 2) When the brake pedal is pressed during sequence control and the stop lamp switch is set to ON.
- 3) After completion of the sequence control.
- 4) When a problem is detected.

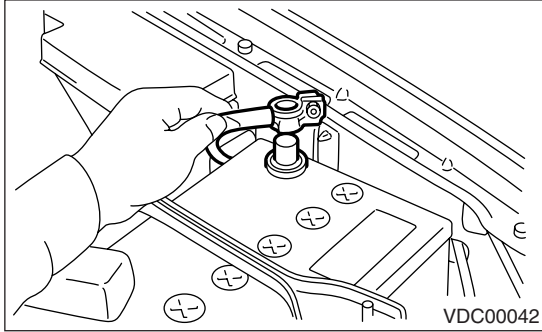
Yaw Rate & Lateral G Sensor

VEHICLE DYNAMICS CONTROL (VDC)

6. Yaw Rate & Lateral G Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the console box.

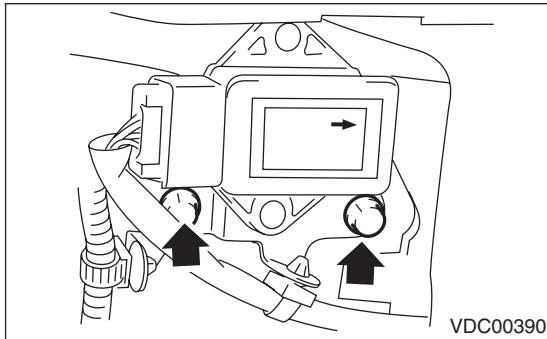
<Ref. to EI-38, Console Box.>

3) Disconnect the connector from yaw rate & lateral G sensor.

4) Remove the yaw rate & lateral G sensor.

CAUTION:

- Do not drop or bump the yaw rate & lateral G sensor.
- The sensor and bracket is considered a single part. Do not disassemble.

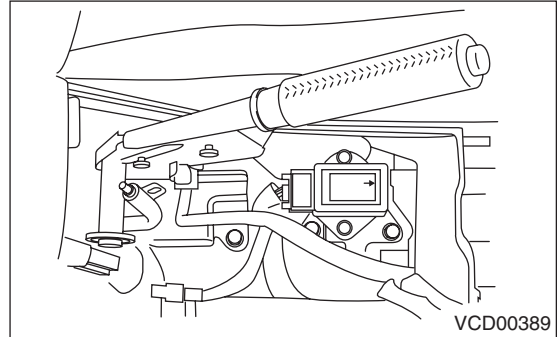


B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

Do not install the yaw rate & lateral G sensors facing an incorrect direction. There is an arrow mark on the sensor showing the front direction of the vehicle.



Tightening torque:

18 N·m (1.8 kgf·m, 13.0 ft·lb)

CAUTION:

Do not drop or bump the yaw rate & lateral G sensor. After installation, always make the following two settings.

- Steering angle sensor centering setting
 - Yaw rate & lateral G sensor 0 point setting
- These two procedures are required to make the VDCCM recognize what position the vehicle is in later. Refer to VDCCM Adjustments for procedures regarding the above settings. <Ref. to VDC-9, ADJUSTMENT, VDC Control Module (VDCCM).>

Yaw Rate & Lateral G Sensor

VEHICLE DYNAMICS CONTROL (VDC)

C: INSPECTION

1. LATERAL G SENSOR SIGNAL

	Step	Check	Yes	No
1	CHECK SUBARU SELECT MONITOR.	Is the Subaru Select Monitor available?	Go to step 5.	Go to step 2.
2	CHECK YAW RATE & LATERAL G SENSOR. 1) Move the vehicle to a level surface. 2) Turn the ignition switch to OFF. 3) Connect the connector to the yaw rate & lateral G sensor. 4) Turn the ignition switch ON. 5) Measure the voltage between connector terminals of the yaw rate & lateral G sensor when the yaw rate & lateral G sensor is horizontally positioned. Connector & terminal (B230) No. 5 (+) — No. 6 (-)	Is the voltage 2.3 — 2.7 V?	Go to step 3.	Replace the yaw rate & lateral G sensor.
3	CHECK YAW RATE & LATERAL G SENSOR. 1) Remove the yaw rate & lateral G sensors from vehicle. 2) Measure the voltage between connector terminals of the yaw rate & lateral G sensor when the yaw rate & lateral G sensor are inclined 90° to the right. Connector & terminal (B230) No. 5 (+) — No. 6 (-) NOTE: When the yaw rate & lateral G sensor is moved with its power supply on, DTC of yaw rate & lateral G sensor may be recorded.	Is the voltage 3.3 — 3.7 V?	Go to step 4.	Replace the yaw rate & lateral G sensor.
4	CHECK YAW RATE & LATERAL G SENSOR. Measure the voltage between connector terminals of the yaw rate & lateral G sensor when the yaw rate & lateral G sensor are inclined 90° to the left. Connector & terminal (B230) No. 5 (+) — No. 6 (-) NOTE: When the yaw rate & lateral G sensor is moved with its power supply on, DTC of yaw rate & lateral G sensor may be recorded.	Is the voltage 1.3 — 1.7 V?	Yaw rate & lateral G sensors are normal.	Replace the yaw rate & lateral G sensor.
5	CHECK YAW RATE & LATERAL G SENSOR. 1) Turn the ignition switch to OFF. 2) Connect the Subaru data link connector to the data link connector. 3) Turn the ignition switch ON. 4) Set the Subaru Select Monitor to {Current Data Display & Save} mode. 5) Set the screen to the {Current Data Display & Save} mode. 6) Read the output voltage of yaw rate & lateral G sensor when the vehicle is in a flat horizontal position. NOTE: When the yaw rate & lateral G sensor is moved with its power supply on, DTC of yaw rate & lateral G sensor may be recorded.	Is the reading indicated on monitor display 2.3 to 2.7 V?	Go to step 6.	Replace the yaw rate & lateral G sensor.

Yaw Rate & Lateral G Sensor

VEHICLE DYNAMICS CONTROL (VDC)

Step	Check	Yes	No
6 CHECK YAW RATE & LATERAL G SENSOR. 1) Remove the console box. 2) Remove the yaw rate & lateral G sensors from vehicle. (Do not disconnect the connector.) 3) Read the Subaru Select Monitor display when the yaw rate & lateral G sensor are inclined 90° to the right. NOTE: When the yaw rate & lateral G sensor is moved with its power supply on, DTC of yaw rate & lateral G sensor may be recorded.	Is the reading indicated on monitor display 3.3 to 3.7 V?	Go to step 7.	Replace the yaw rate & lateral G sensor.
7 CHECK YAW RATE & LATERAL G SENSOR. Read the Subaru Select Monitor display when the yaw rate & lateral G sensor are inclined 90° to the left. NOTE: When the yaw rate & lateral G sensor is moved with its power supply on, DTC of yaw rate & lateral G sensor may be recorded.	Is the reading indicated on monitor display 1.3 to 1.7 V?	Yaw rate & lateral G sensors are normal.	Replace the yaw rate & lateral G sensor.

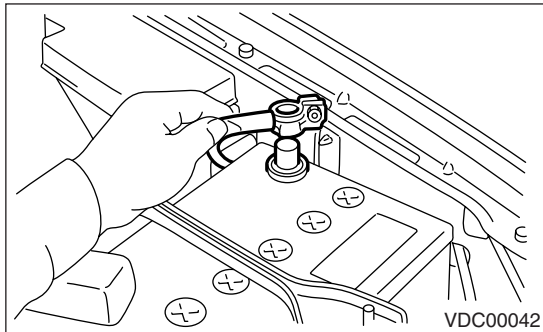
2. YAW RATE SENSOR SIGNAL

Step	Check	Yes	No
1 CHECK YAW RATE & LATERAL G SENSORS USING AN OSCILLOSCOPE. 1) Connect all the connectors. 2) Set the oscilloscope to the connector terminal of yaw rate & lateral G sensor. Positive probe; (B230) No. 4 Grounding wire; (B230) No. 6 3) Start the engine. 4) Measure the signal voltage indicated on oscilloscope. <Ref. to VDC(diag)-16, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>	Is the voltage 2.1 to 2.9 V?	Go to step 2.	Replace the yaw rate & lateral G sensor.
2 INSPECT USING AN OSCILLOSCOPE. 1) Turn the ignition switch to OFF. 2) Set the oscilloscope to the connector terminal of yaw rate & lateral G sensor. Positive probe; (B230) No. 2 Grounding wire; (B230) No. 6 3) Start the engine. 4) Measure the signal voltage indicated on oscilloscope. <Ref. to VDC(diag)-16, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>	Is the voltage 5 V?	Yaw rate & lateral G sensors are normal.	Replace the yaw rate & lateral G sensor.

7. Steering Angle Sensor

A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the airbag module. <Ref. to AB-14, REMOVAL, Driver's Airbag Module.>

WARNING:

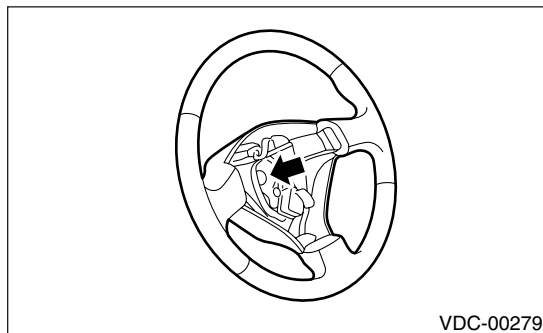
Always refer to "Air Bag System" before performing service on the air bag modules.

<Ref. to AB-4, CAUTION, General Description.>

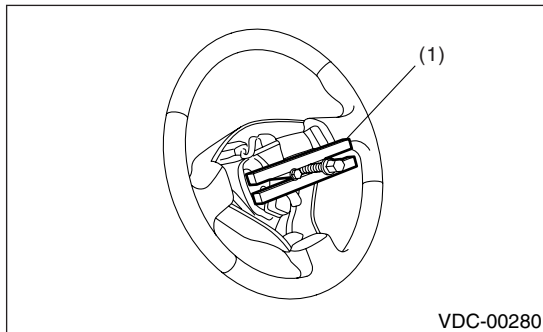
3) Remove the steering wheel nut.

NOTE:

Always remove the steering wheel with it positioned straight-ahead.

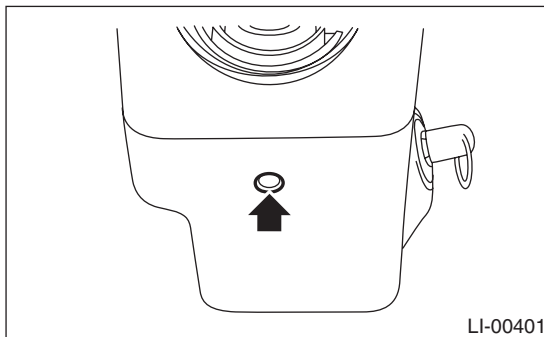


4) Pull off the steering wheel from the shaft using a steering puller.



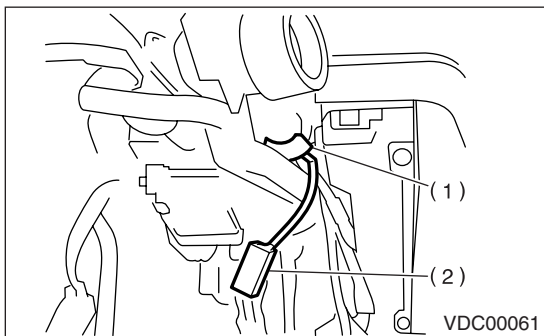
(1) Steering puller

5) Remove the screw securing the steering column lower cover.



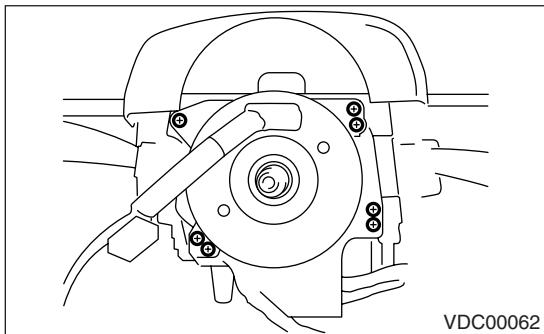
6) Remove the two screws securing the steering column upper cover.

7) Unlock the harness band and disconnect the connector of the steering angle sensor.



(1) Harness band
(2) Connector

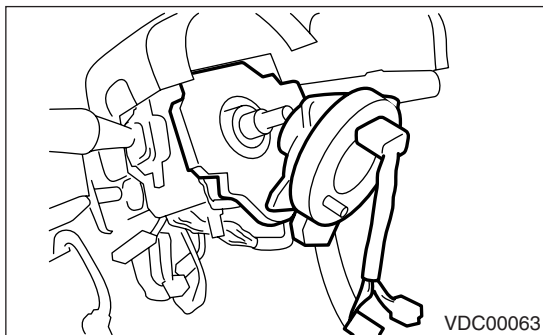
8) Remove the bolt which secure the roll connector and steering angle sensor to the steering column.



Steering Angle Sensor

VEHICLE DYNAMICS CONTROL (VDC)

9) Remove the roll connector and steering angle sensor.



NOTE:

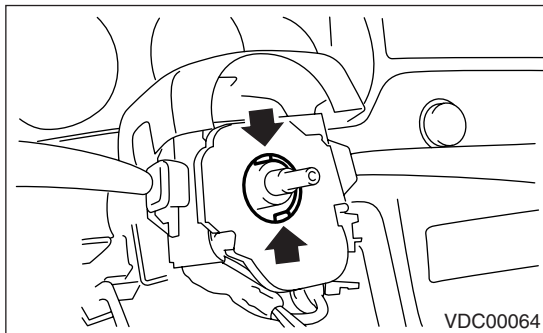
Do not rotate the steering angle sensor because the center position will be recognized by the VDC-CM.

B: INSTALLATION

CAUTION:

Check that front wheels are positioned in a straight ahead direction.

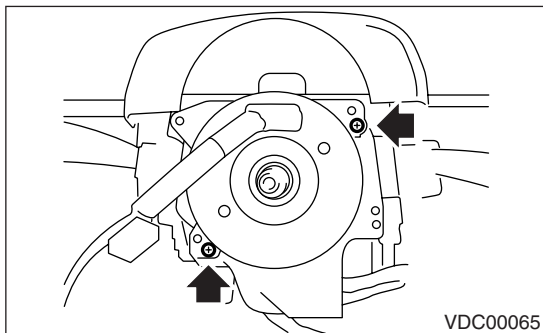
1) Install the steering angle sensor to the steering column while confirming that the sensor is positioned as shown in the figure.



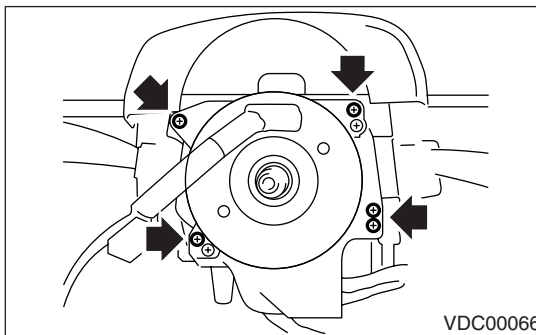
2) Align the roll connector with the center.

<Ref. to AB-20, INSTALLATION, Roll Connector.>

3) Place the roll connector on top of the steering angle sensor, then tighten the bolts that secure the roll connector and steering angle sensor.



4) Tighten the bolts which secure the roll connector and steering angle sensor to the steering column.



5) Put the steering wheel in a neutral position and install it onto the steering shaft.

Tightening torque:

45 N·m (4.6 kgf-m, 33.3 ft-lb)

Column cover-to-steering wheel clearance:

2 — 4 mm (0.08 — 0.16 in)

CAUTION:

Insert the roll connector guide pin into the guide hole on lower end of steering wheel surface, being careful not to damage them. Remove by drawing out the airbag system connector, horn connector and cruise control connectors from the guide hole of steering wheel lower end.

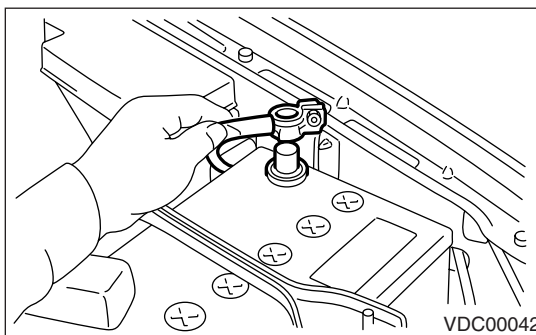
6) Install the airbag module to the steering wheel. <Ref. to AB-14, INSTALLATION, Driver's Airbag Module.>

WARNING:

Always refer to "Air Bag System" before servicing.

<Ref. to AB-4, CAUTION, General Description.>

7) Connect the ground cable to the battery.



CAUTION:

After installation, always make the following two settings.

- SRS roll connector and steering angle sensor center setting
- Yaw rate & lateral G sensor 0 point setting

These two procedures are required to make the VDCCM recognize what position the vehicle is in later. Refer to VDCCM Adjustments for procedures regarding the above settings. <Ref. to VDC-9, ADJUSTMENT, VDC Control Module (VDCCM).>

C: INSPECTION

Refer to “VDC (Diagnostics) Section” for inspection procedures of the steering angle sensor.

<Ref. to VDC(diag)-105, DTC 71 STEERING ANGLE SENSOR OFFSET IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

<Ref. to VDC(diag)-107, DTC 71 CHANGE RANGE OF STEERING ANGLE SENSOR IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

<Ref. to VDC(diag)-109, DTC 71 STEERING ANGLE SENSOR MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

<Ref. to VDC(diag)-111, DTC 71 STEERING ANGLE SENSOR COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Front ABS Wheel Speed Sensor

VEHICLE DYNAMICS CONTROL (VDC)

8. Front ABS Wheel Speed Sensor

A: NOTE

Vehicles equipped with VDC have the same ABS wheel speed sensor as installed on vehicles equipped with ABS. Refer to "Front ABS Wheel Speed Sensor" for removal, installation and inspection procedure.

<Ref. to ABS-14, Front ABS Wheel Speed Sensor.>

9. Rear ABS Wheel Speed Sensor

A: NOTE

Vehicles equipped with VDC have the same ABS wheel speed sensor as installed on vehicles equipped with ABS. Refer to "Rear ABS Wheel Speed Sensor" for removal, installation and inspection procedure.

<Ref. to ABS-17, Rear ABS Wheel Speed Sensor.>

10. Front Tone Wheel

A: NOTE

The front tone wheel is built into the front drive shaft. For removal, installation and inspection, refer to the "DS" section.

<Ref. to DS-29, Front Drive Shaft.>

11.Rear Tone Wheel

A: REMOVAL

Remove the bolt to remove the hub from the tone wheel.

<Ref. to DS-21, REMOVAL, Rear Axle.>

B: INSTALLATION

Remove any dirt on the contact surface of the hub and tone wheel, then install the tone wheel to the hub using the bolts.

<Ref. to DS-24, INSTALLATION, Rear Axle.>

C: INSPECTION

Visually check the tone wheel's teeth (44 pieces) for cracks or dents. If necessary, replace with a new tone wheel.

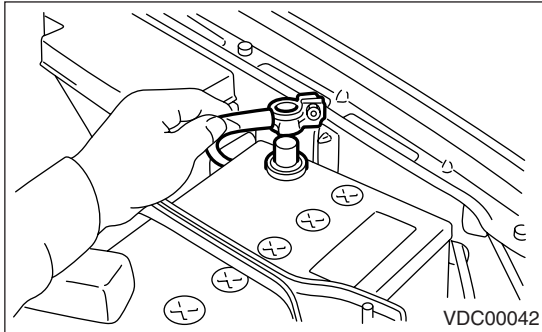
VDC OFF Switch

VEHICLE DYNAMICS CONTROL (VDC)

12.VDC OFF Switch

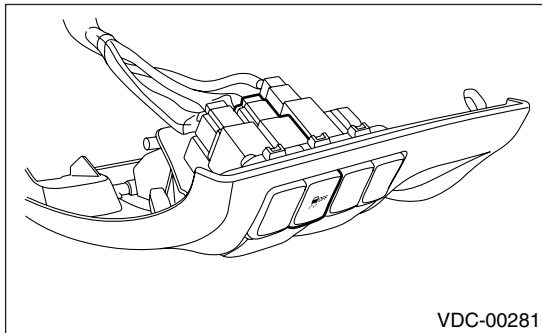
A: REMOVAL

1) Disconnect the ground cable from battery.



2) Remove the instrument panel lower cover. <Ref. to EI-39, REMOVAL, Instrument Panel Assembly.>

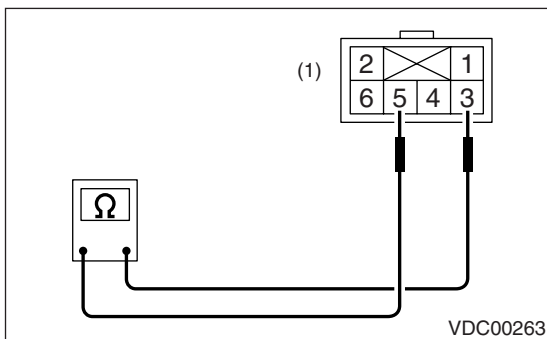
3) Disconnect the VDC OFF switch connector, push outside, and press the VDC OFF switch.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION



(1) VDC OFF switch side

Inspect the resistance between VDC OFF switch terminals.

Switch position	Tester connection	Standard
OFF	3 — 5	1 M Ω or more
ON	3 — 5	Less than 1 Ω

If NG, replace the VDC OFF switch.

Basic Diagnostic Procedure

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

NOTE:

- To check harness for broken wires or short circuits, shake it while holding it or the connector.
- Check List for Interview <Ref. to VDC(diag)-3, Check List for Interview.>

	Step	Check	Yes	No
1	<p>PERFORM THE PRE-INSPECTION.</p> <p>1) Ask the customer when and how the trouble occurred using the interview check list. <Ref. to VDC(diag)-3, Check List for Interview.></p> <p>2) Before performing diagnosis, inspect the unit which might influence the VDC problem. <Ref. to VDC(diag)-8, INSPECTION, General Description.></p>	Is the component that might influence the VDC problem working properly?	Go to step 2.	Repair or replace each component.
2	<p>CHECK INDICATION OF DTC ON SCREEN.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Connect the Subaru Select Monitor to the data link connector.</p> <p>3) Turn the ignition switch to ON and the Subaru Select Monitor ON.</p> <p>4) Read the DTC. <Ref. to VDC(diag)-23, OPERATION, Read Diagnostic Trouble Code (DTC).></p> <p>5) Record all DTCs and freeze frame data.</p>	Is DTC displayed?	Go to step 4.	Go to step 3.
3	<p>PERFORM GENERAL DIAGNOSTICS.</p> <p>1) Inspect using "General Diagnostic Table". <Ref. to VDC(diag)-139, INSPECTION, General Diagnostic Table.></p> <p>2) Perform the Clear Memory Mode. <Ref. to VDC(diag)-25, OPERATION, Clear Memory Mode.></p> <p>3) Perform the Inspection Mode. <Ref. to VDC(diag)-24, OPERATION, Inspection Mode.></p> <p>4) Read the DTC. <Ref. to VDC(diag)-23, OPERATION, Read Diagnostic Trouble Code (DTC).></p> <p>5) Check the DTC is not displayed.</p>	Is the warning light pattern normal? <Ref. to VDC(diag)-26, Warning Light Illumination Pattern.>	Finish the diagnosis.	Check the warning light. Refer to "List of Diagnostic Trouble Code (DTC)" for the contents of the diagnosis. <Ref. to VDC(diag)-28, List of Diagnostic Trouble Code (DTC).>
4	<p>PERFORM DIAGNOSIS.</p> <p>1) Inspect using the "Diagnostic Procedure with Diagnostic Trouble Code (DTC)". <Ref. to VDC(diag)-34, Diagnostic Procedure with Diagnostic Trouble Code (DTC).></p> <p>NOTE: Refer to "List of Diagnostic Trouble Code (DTC)" for the DTC list. <Ref. to VDC(diag)-28, LIST, List of Diagnostic Trouble Code (DTC).></p> <p>2) Correct the cause of trouble.</p> <p>3) Perform the Clear Memory Mode. <Ref. to VDC(diag)-25, OPERATION, Clear Memory Mode.></p> <p>4) Perform the Inspection Mode. <Ref. to VDC(diag)-24, OPERATION, Inspection Mode.></p> <p>5) Read the DTC. <Ref. to ABS(diag)-16, READ DIAGNOSTIC TROUBLE CODE, OPERATION, Subaru Select Monitor.></p>	Is DTC displayed?	Inspect using the "Diagnostic Procedure with Diagnostic Trouble Code (DTC)". <Ref. to VDC(diag)-34, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Check List for Interview

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

2. Check List for Interview

A: CHECK

Inspect the following item about the vehicle's state.

1. STATE OF ABS/VDC WARNING LIGHT

ABS/VDC warning lights illuminate.	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Only once <input type="checkbox"/> Does not come on • When and for how long does it illuminate?		
Ignition key position	<input type="checkbox"/> LOCK <input type="checkbox"/> ACC <input type="checkbox"/> ON (before starting engine) <input type="checkbox"/> START <input type="checkbox"/> ON after starting (Engine is running)		
Timing	<input type="checkbox"/> Immediately after turning the ignition ON. <input type="checkbox"/> Immediately after turning the ignition to START		
	<input type="checkbox"/> When accelerating	—	km/h
		—	MPH
	<input type="checkbox"/> While driving at a constant speed	km/h	MPH
	<input type="checkbox"/> When decelerating	—	km/h
		—	MPH
	<input type="checkbox"/> When turning to the right	Steering angle:	deg
		Steering time:	Sec.
	<input type="checkbox"/> When turning to the left	Steering angle:	deg
		Steering time:	Sec.
	<input type="checkbox"/> When other electrical parts are operating • Part name: • Operating condition:		

Check List for Interview

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

2. STATE OF VDC WARNING LIGHT/VDC OFF INDICATOR LIGHT

VDC warning light/ VDC OFF indicator light illuminate.	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Only once <input type="checkbox"/> Does not come on • When and for how long does it illuminate?		
Ignition key position	<input type="checkbox"/> LOCK <input type="checkbox"/> ACC <input type="checkbox"/> ON (before starting engine) <input type="checkbox"/> START <input type="checkbox"/> ON after starting (Engine is running) <input type="checkbox"/> ON after starting (Engine is stopped)		
Timing	<input type="checkbox"/> Immediately after turning the ignition ON. <input type="checkbox"/> Immediately after turning the ignition to START		
	<input type="checkbox"/> When accelerating	—	km/h
		—	MPH
	<input type="checkbox"/> While driving at a constant speed	km/h	MPH
	<input type="checkbox"/> When decelerating	—	km/h
		—	MPH
	<input type="checkbox"/> When turning to the right	Steering angle:	deg
		Steering time:	Sec.
	<input type="checkbox"/> When turning to the left	Steering angle:	deg
		Steering time:	Sec.
	<input type="checkbox"/> When other electrical parts are operating		
	• Part name:		
	• Operating condition:		

Check List for Interview

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

3. STATE OF VDC OPERATION INDICATOR LIGHT

VDC operation indicator light illuminate.	<input type="checkbox"/> Always <input type="checkbox"/> Sometimes <input type="checkbox"/> Only once <input type="checkbox"/> Does not come on • When and for how long does it illuminate?		
Ignition key position	<input type="checkbox"/> LOCK <input type="checkbox"/> ACC <input type="checkbox"/> ON (before starting engine) <input type="checkbox"/> START <input type="checkbox"/> ON after starting (Engine is running) <input type="checkbox"/> ON after starting (Engine is stopped)		
Timing	<input type="checkbox"/> Immediately after turning the ignition ON. <input type="checkbox"/> Immediately after turning the ignition to START		
	<input type="checkbox"/> When accelerating	—	km/h
		—	MPH
	<input type="checkbox"/> While driving at a constant speed	km/h	MPH
	<input type="checkbox"/> When decelerating	—	km/h
		—	MPH
	<input type="checkbox"/> When turning to the right	Steering angle:	deg
		Steering time:	Sec.
	<input type="checkbox"/> When turning to the left	Steering angle:	deg
		Steering time:	Sec.
	<input type="checkbox"/> When other electrical parts are operating		
	• Part name:		
	• Operating condition:		

Check List for Interview

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

4. CONDITIONS UNDER WHICH TROUBLE OCCURS

Environment	a) Weather	<input type="checkbox"/> Fine <input type="checkbox"/> Cloudy <input type="checkbox"/> Rainy <input type="checkbox"/> Snowy <input type="checkbox"/> Others:
	b) Ambient temperature	°C (°F)
	c) Road	<input type="checkbox"/> Inner city <input type="checkbox"/> Suburbs <input type="checkbox"/> Highway <input type="checkbox"/> Local street <input type="checkbox"/> Uphill <input type="checkbox"/> Downhill <input type="checkbox"/> Paved road <input type="checkbox"/> Gravel road <input type="checkbox"/> Muddy road <input type="checkbox"/> Sandy place <input type="checkbox"/> Straight road <input type="checkbox"/> Sharp curve <input type="checkbox"/> Gentle curve <input type="checkbox"/> S-curve <input type="checkbox"/> Road with a slope on both sides <input type="checkbox"/> Others:
	d) Road surface	<input type="checkbox"/> Dry <input type="checkbox"/> Wet <input type="checkbox"/> Covered with fresh snow <input type="checkbox"/> Covered with hardened snow <input type="checkbox"/> Frozen slope <input type="checkbox"/> Others:

Check List for Interview

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Condition	a) Brakes	Deceleration: G
		<input type="checkbox"/> Intermittent / <input type="checkbox"/> Temporary
	b) Accelerator	Acceleration: G
		<input type="checkbox"/> Intermittent / <input type="checkbox"/> Temporary
	c) Vehicle speed	km/h MPH
		<input type="checkbox"/> Advancing
		<input type="checkbox"/> When accelerating
		<input type="checkbox"/> When decelerating
		<input type="checkbox"/> At low speed
		<input type="checkbox"/> When turning
		<input type="checkbox"/> Others:
	d) Tire inflation pressure	Front RH tire: kPa
		Front LH tire: kPa
		Rear RH tire: kPa
		Rear LH tire: kPa
e) Degree of wear	Front RH tire:	
	Front LH tire:	
	Rear RH tire:	
	Rear LH tire:	
f) Steering wheel	<input type="checkbox"/> Sharp turn	
	<input type="checkbox"/> Gentle turn	
	<input type="checkbox"/> Straight	
	<input type="checkbox"/> Slow return	
	<input type="checkbox"/> Fast return	
g) Tire/Wheel size	<input type="checkbox"/> Within specification	
	<input type="checkbox"/> Except specification ()	
h) Tire type	<input type="checkbox"/> Summer tire	
	<input type="checkbox"/> Studless tire (Manufacture:)	
i) Chain is passed around tires: <input type="checkbox"/> Yes / <input type="checkbox"/> No		
j) T-type tire is used. : <input type="checkbox"/> Yes / <input type="checkbox"/> No		
k) Condition of wheel alignment:		
l) Loading state:		
m) Repair parts are used: <input type="checkbox"/> Yes / <input type="checkbox"/> No		
• Part name:		
n) Others:		

General Description

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

3. General Description

A: CAUTION

1. SUPPLEMENTAL RESTRAINT SYSTEM “AIRBAG”

The airbag system wiring harness is routed near the ABS wheel speed sensor VDCCM and VDCH/U.

CAUTION:

- All airbag system wiring harnesses and connectors are yellow. Do not use the electrical test equipment on these circuits.
- Be careful not to damage the airbag system wiring harness when servicing the ABS wheel speed sensor, VDCCM and VDCH/U.

B: INSPECTION

Before performing diagnosis, check the following items which might affect VDC problems.

1. BATTERY

Measure the battery voltage and check electrolyte.

Standard voltage:

12 V or more

Specific gravity:

1.260 or more

2. GROUND

Check the tightening of VDC ground bolt.

3. BRAKE FLUID

- 1) Check the brake fluid level. <Ref. to BR-41, INSPECTION, Brake Fluid.>
- 2) Check for brake fluid leaks. <Ref. to BR-41, INSPECTION, Brake Fluid.>

4. HYDRAULIC UNIT

Check the VDCH/U.

- When using the brake tester <Ref. to VDC-15, CHECKING THE VDC HYDRAULIC CONTROL MODULE (VDCH/M) VDC OPERATION BRAKE TESTER, INSPECTION, VDC Hydraulic Control Module (VDCH/M).>
- When not using the brake tester <Ref. to VDC-14, CHECKING THE VDC HYDRAULIC CONTROL MODULE (VDCH/M) VDC OPERATION BY PRESSURE GAUGE, INSPECTION, VDC Hydraulic Control Module (VDCH/M).>

5. BRAKE DRAG

Check for brake drag.

6. BRAKE PAD AND ROTOR

Check the brake pad and rotor.

- Front <Ref. to BR-16, INSPECTION, Front Brake Pad.>, <Ref. to BR-17, INSPECTION, Front Disc Rotor.>
- Rear <Ref. to BR-21, INSPECTION, Rear Brake Pad.>, <Ref. to BR-22, Rear Disc Rotor.>

7. TIRE

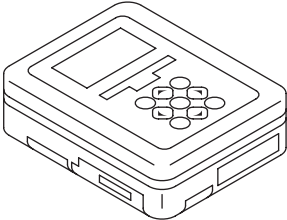
Check the tire specifications, tire wear and air pressure. <Ref. to WT-2, SPECIFICATION, General Description.>

General Description

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

C: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B020XU0	1B020XU0	SUBARU SELECT MONITOR KIT	Used for diagnosing electrical system.

2. GENERAL TOOL

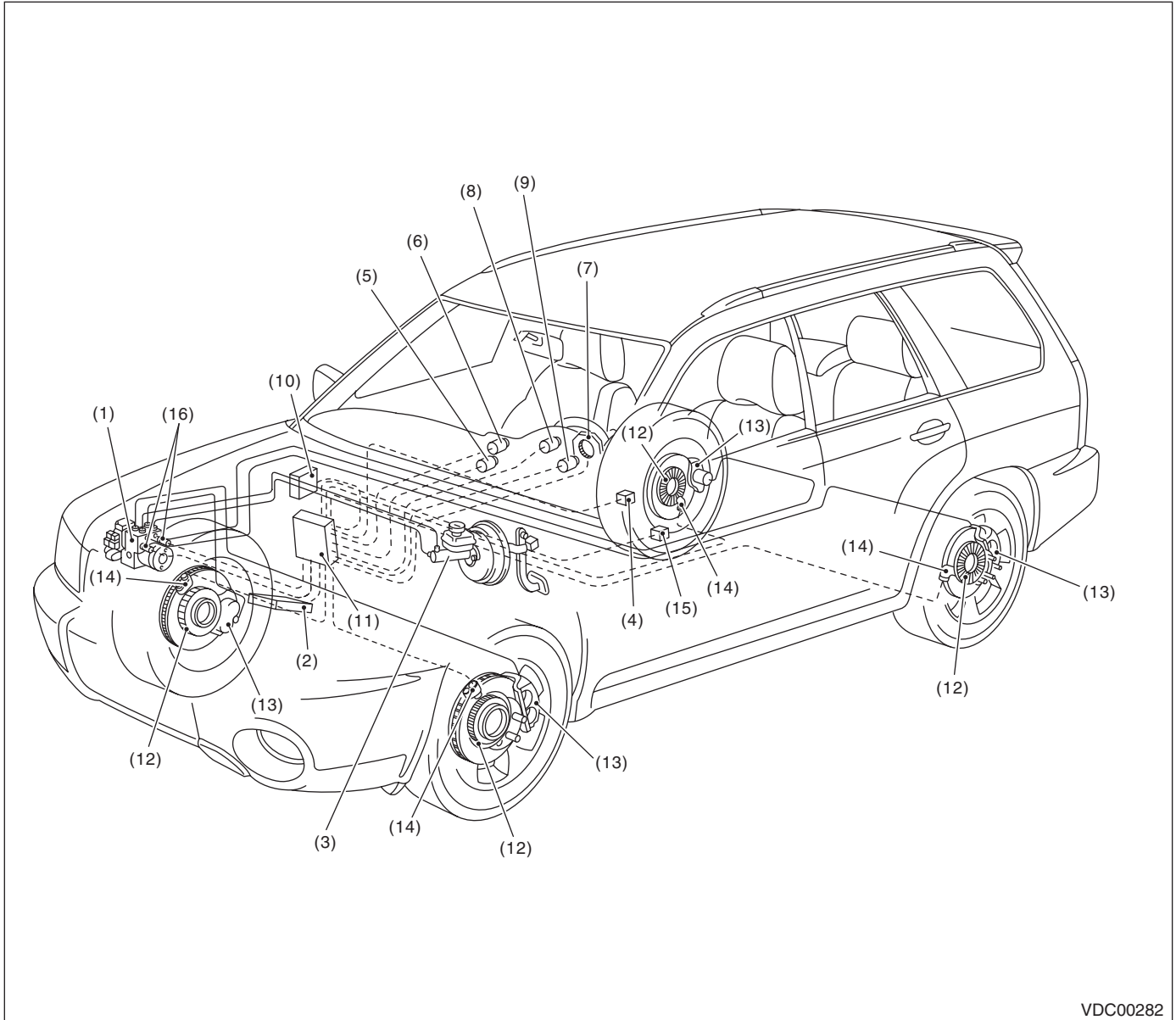
TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.
Oscilloscope	Used for measuring the sensor.

Electrical Component Location

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

4. Electrical Component Location

A: LOCATION

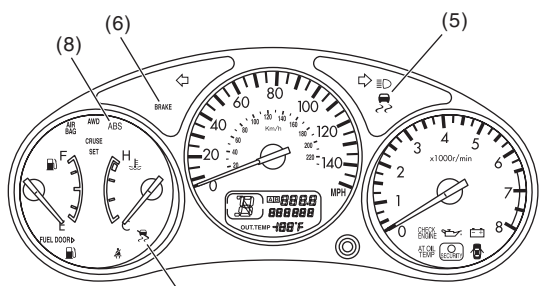
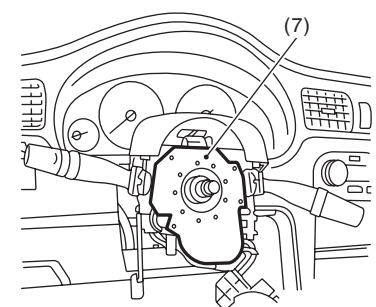
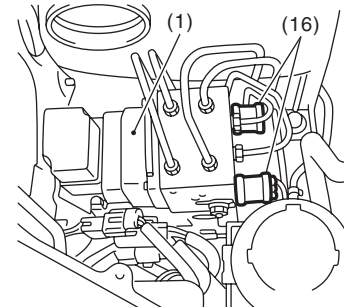
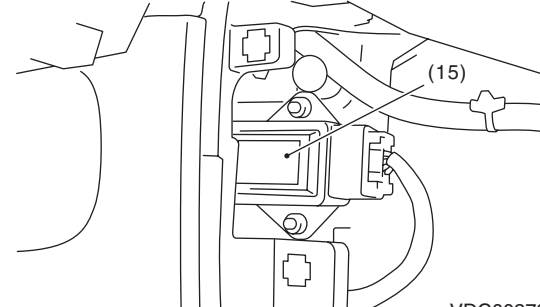
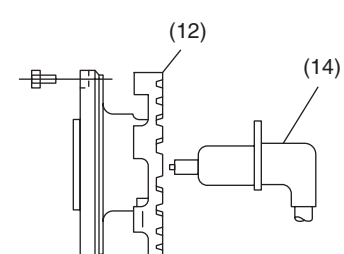
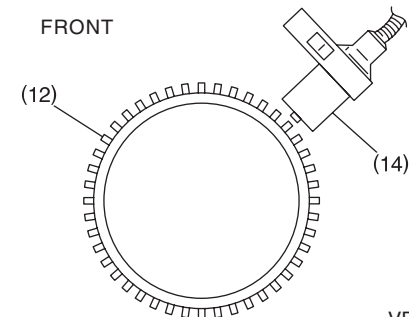


VDC00282

- | | | |
|---|---|----------------------------------|
| (1) VDC hydraulic control unit (VDCH/U) | (7) Steering angle sensor | (11) VDC control module (VDCCM) |
| (2) Engine control module (ECM) | (8) ABS warning light | (12) Tone wheel |
| (3) Master cylinder | (9) VDC warning light/VDC OFF indicator light | (13) Wheel cylinder |
| (4) VDC OFF switch | (10) Transmission control module (TCM) | (14) ABS wheel speed sensor |
| (5) VDC indicator light | | (15) Yaw rate & lateral G sensor |
| (6) Brake warning light (EBD warning light) | | (16) Pressure sensor |

Electrical Component Location

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

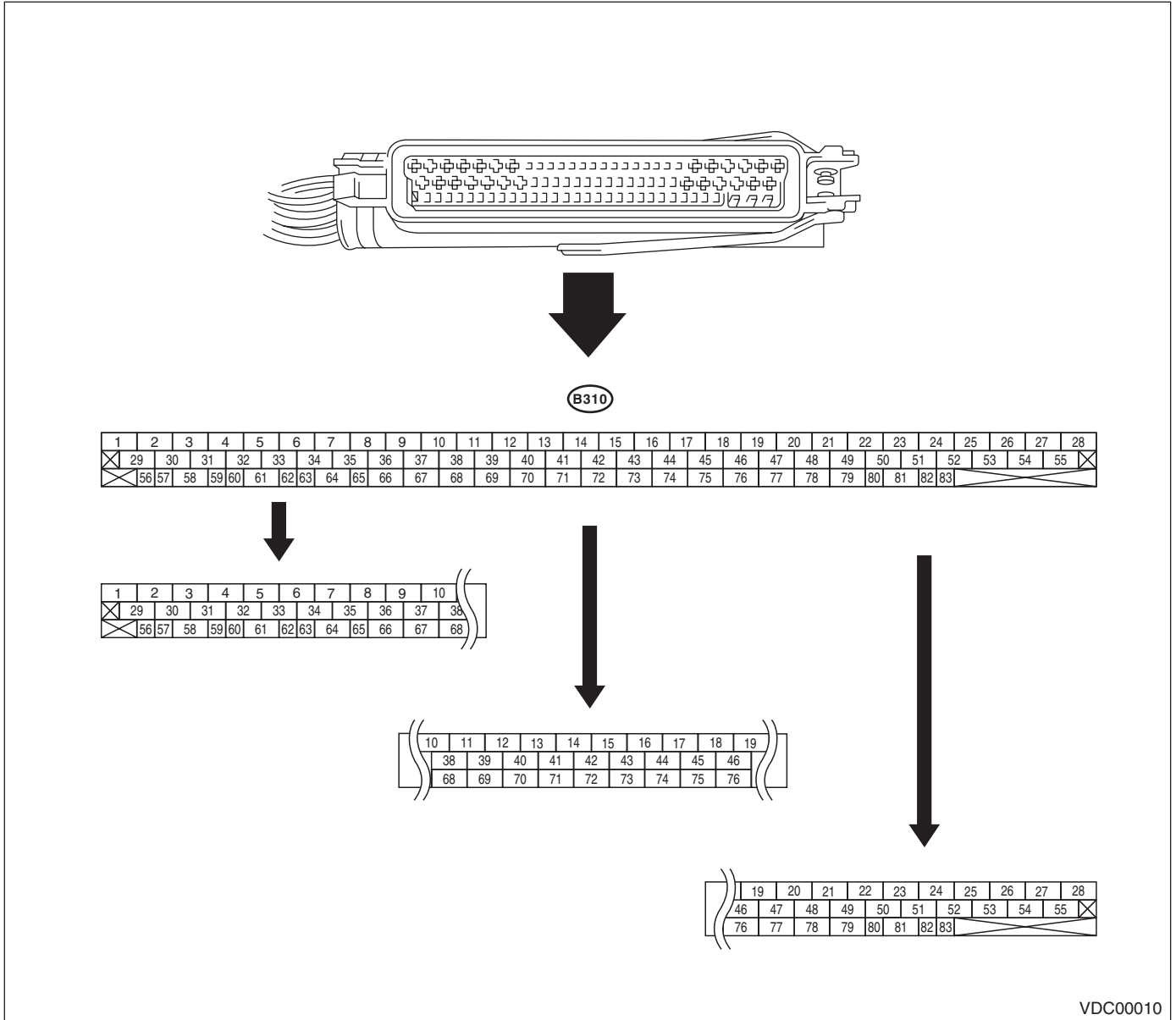
 <p>VDC00283</p>	 <p>VDC00009</p>
 <p>VDC00004</p>	 <p>VDC00273</p>
<p>REAR</p>  <p>VDC00167</p>	<p>FRONT</p>  <p>VDC00008</p>

Control Module I/O Signal

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

5. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



NOTE:

- Terminal numbers in the VDCCM connector are as shown in the figure.
- When the connector is removed from VDCCM, the connector switch closes the circuit between terminals No. 53 and 54. Then, ABS warning light and brake warning light (EBD warning light) illuminates.

Control Module I/O Signal

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Description		Terminal No. (+) — (-)	Input/Output signal
			Measured value and measuring condition
Ignition switch		28 — 1	When the ignition switch is ON, 10 — 15 V.
ABS wheel speed sensor (Wheel speed sensor)	Front wheel LH	19 — 21	0.12 — 1 V (at 20 Hz)
	Front wheel RH	13 — 14	
	Rear wheel LH	15 — 16	
	Rear wheel RH	17 — 18	
Yaw rate & lateral G sensor	Output (Lateral G sensor)	11 — 64	2.2 — 2.8 V, when the vehicle is on level surface
	Power supply	50 — 64	When the ignition switch is ON, 10 — 15 V.
	Output (Yaw rate sensor)	65 — 64	Waveform <Ref. to VDC(diag)-16, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>
	Reference (Yaw rate sensor)	66 — 64	2.1 — 2.9 V
	Test	67 — 64	1 V — 5 cycles for a 40 ms pulse signal. <Ref. to VDC(diag)-16, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>
	Ground	64	—
CAN communication line (+)		83 — 1	2.5 — 1.5 V pulse signal <Ref. to VDC(diag)-16, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>
CAN communication line (-)		81 — 1	3.5 — 2.5 V pulse signal <Ref. to VDC(diag)-16, WAVEFORM, MEASUREMENT, Control Module I/O Signal.>
Relay box	Valve relay power supply	27 — 1	When the ignition switch is ON, 10 — 15 V.
	Valve relay drive	48 — 1	When the ignition switch is ON, less than 15 V.
	Motor relay drive	22 — 1	1.5 V or less (ABS/TCS/VDC Operation): 10 V or more (ABS/TCS/VDC not operated)
	Motor monitor	9 — 1	1.5 V or less (ABS/TCS/VDC Operation): 10 V or more (ABS/TCS/VDC not operated)
VDCH/U	Front inlet (hold) solenoid valve LH	24 — 1	When the valve turns OFF, 10 — 15 V. When the valve turns ON, less than 1.5 V.
	Front inlet (hold) solenoid valve RH	3 — 1	
	Rear inlet (hold) solenoid valve LH	31 — 1	
	Rear inlet (hold) solenoid valve RH	23 — 1	
	Front outlet (decompression) solenoid valve LH	26 — 1	
	Front outlet (decompression) solenoid valve RH	29 — 1	
	Rear outlet (decompression) solenoid valve LH	4 — 1	
	Rear outlet (decompression) solenoid valve RH	25 — 1	
	Primary cut solenoid valve	34 — 1	
	Secondary cut solenoid valve	35 — 1	
	Primary suction solenoid valve	32 — 1	
	Secondary suction solenoid valve	30 — 1	
Pressure sensor	Power supply	77 — 75	When the ignition switch is ON, 4.75 — 5.25 V.
	Primary output	76 — 75	0.48 — 0.72 V (when the brake pedal is released)
	Ground	75	—
	Secondary output	44 — 75	0.48 — 0.72 V (when the brake pedal is released)

Control Module I/O Signal

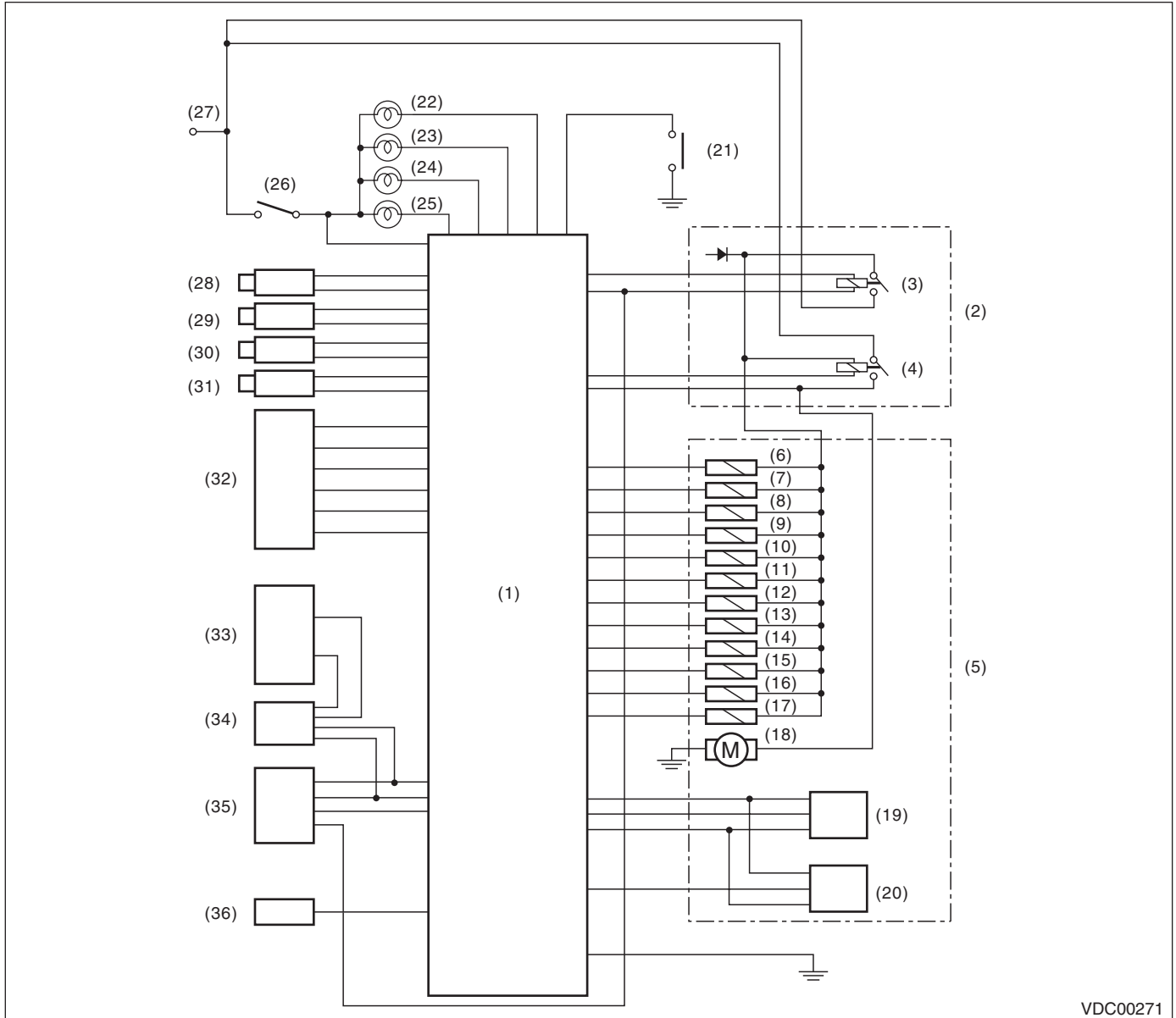
VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Description	Terminal No. (+) — (-)	Input/Output signal
		Measured value and measuring condition
VDC indicator light	72 — 1	After turning the ignition switch to ON, less than 1.5 V during 1.5 seconds and 10 — 15 V after 1.5 seconds passed.
VDC warning light/VDC OFF indicator light	61 — 1	After turning the ignition switch to ON, less than 1.5 V during 1.5 seconds and 10 — 15 V after 1.5 seconds passed.
ABS warning light	53 — 1	After turning the ignition switch to ON, less than 1.5 V during 2.6 seconds and 10 — 15 V after 1.5 seconds passed.
Subaru Select Monitor	38 — 1	0 — 12 V pulse signal (in communication)
VDC OFF switch	40 — 1	When the ignition switch is ON, 10 — 15 V. 0 V (While pressing the switch)
Ground	1	—
Ground	55	—
Brake warning light (EBD warning light)	54 — 1	After turning the ignition switch to ON, less than 1.5 V during 3.6 seconds and 10 — 15 V after 1.5 seconds passed.

Control Module I/O Signal

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

B: WIRING DIAGRAM



VDC00271

- | | | |
|---|--|--|
| (1) VDC control module (VDCCM) | (14) Primary suction solenoid valve | (26) Ignition relay |
| (2) Relay box | (15) Primary cut solenoid valve | (27) Battery |
| (3) Valve relay | (16) Secondary suction solenoid valve | (28) Front ABS wheel speed sensor LH |
| (4) Motor relay | (17) Secondary cut solenoid valve | (29) Front ABS wheel speed sensor RH |
| (5) VDC hydraulic control unit (VDCH/U) | (18) Motor | (30) Rear ABS wheel speed sensor LH |
| (6) Front inlet valve LH | (19) Primary pressure sensor | (31) Rear ABS wheel speed sensor RH |
| (7) Front outlet valve LH | (20) Secondary pressure sensor | |
| (8) Front inlet valve RH | (21) VDC OFF switch | |
| (9) Front outlet valve RH | (22) ABS warning light | |
| (10) Rear inlet valve LH | (23) VDC warning light/VDC OFF indicator light | |
| (11) Rear outlet valve LH | (24) VDC indicator light | |
| (12) Rear inlet valve RH | (25) Brake warning light (EBD warning light) | |
| (13) Rear outlet valve RH | | (32) Yaw rate & lateral G sensor |
| | | (33) Engine control module (ECM) |
| | | (34) Transmission control module (TCM) |
| | | (35) Steering angle sensor |
| | | (36) Data link connector |

Control Module I/O Signal

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

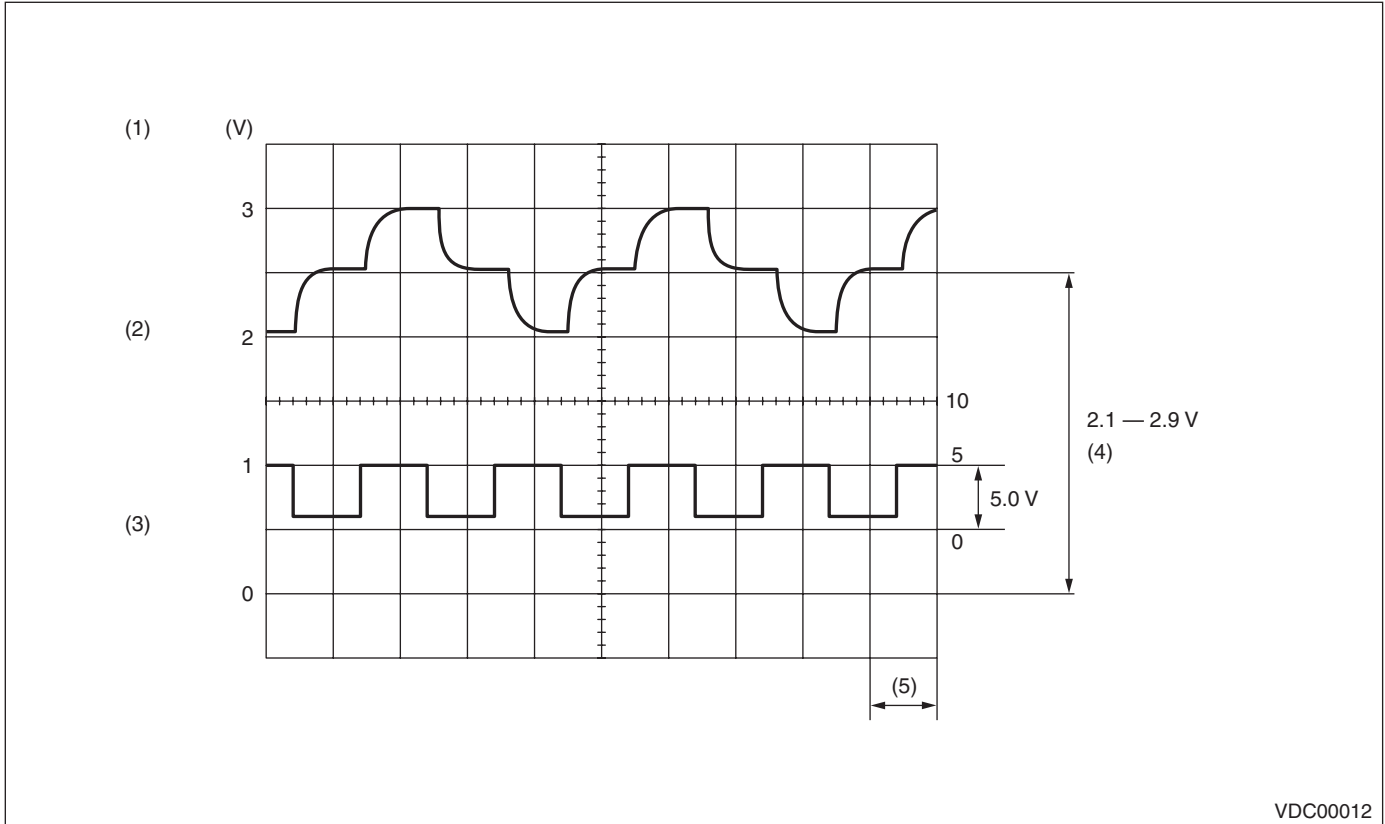
C: MEASUREMENT

Measure the input and output signal voltages.

NOTE:

Measure while the VDCCM connector cover is removed. <Ref. to VDC(diag)-18, VDCCM Connector Cover.>

1. WAVEFORM



(1) Yaw rate sensor

(3) Terminals No. 67 — 64

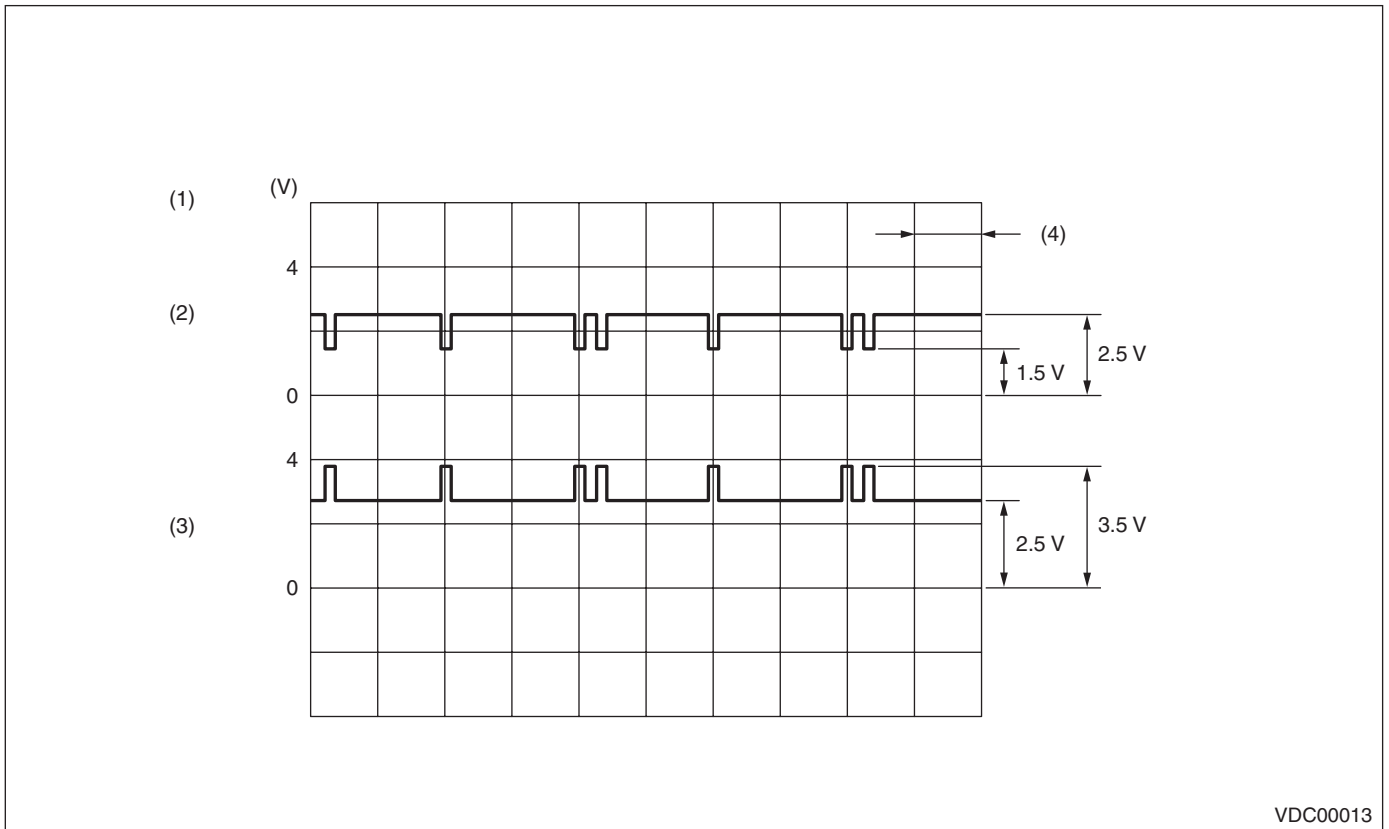
(5) 20 ms

(2) Terminals No. 65 — 64

(4) Vehicle is at a standstill.

Control Module I/O Signal

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)



VDC00013

(1) CAN communication line

(3) Terminals No. 81 — 1

(4) 5 ms

(2) Terminals No. 83 — 1

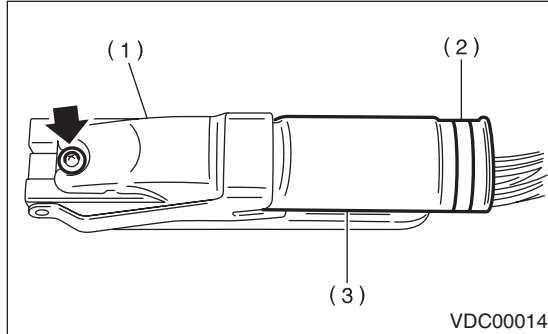
VDCCM Connector Cover

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

6. VDCCM Connector Cover

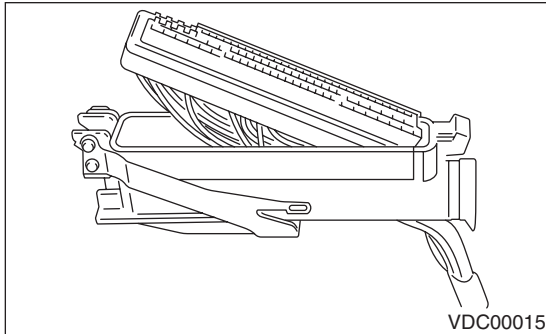
A: REMOVAL

- 1) Turn the ignition switch to OFF.
- 2) Disconnect the connectors from VDCCM.
- 3) Remove the band.
- 4) Remove the cable clamp cover.
- 5) Remove the screw securing the connector cover.



- (1) Connector cover
- (2) Band
- (3) Cable clamp cover

- 6) Remove the connector cover.

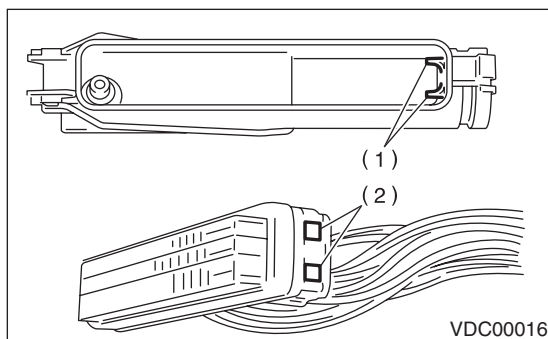


B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Align the rib on the connector cover with the connector hole before installation.



- (1) Rib
- (2) Hole

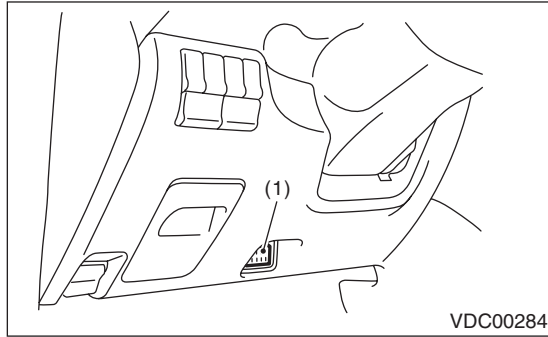
7. Subaru Select Monitor

A: OPERATION

1. READ DTC

- 1) Prepare the Subaru Select Monitor kit.
- 2) Connect the diagnosis cable to the Subaru Select Monitor.
- 3) Connect the Subaru Select Monitor to the data link connector.

(1) Data link connector is located in the lower portion of the instrument panel (on the driver's side).



(1) Data link connector

- (2) Connect the diagnosis cable to the data link connector.
- 4) Turn the ignition switch to ON (engine is OFF), and run the Subaru Select Monitor.
- 5) On the «Main Menu» display screen, select the {Each System Check}.
- 6) On the «System Selection Menu» display screen, select the {Brake Control}.
- 7) Select the [OK] after the {VDC} is displayed.
- 8) On the «Brake Control Diagnosis» screen, select the {Diagnostic Code(s) Display}.

NOTE:

- For details concerning operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.
 - For details concerning DTC, refer to “List of Diagnostic Trouble Code (DTC)”.
- <Ref. to VDC(diag)-28, List of Diagnostic Trouble Code (DTC).>
- Up to 3 DTCs are displayed in the order of detection.
 - If a particular DTC is not stored in memory properly at the occurrence of problem (due to a drop in ABSCM&H/U power supply etc.), the DTC suffixed with a question mark “?” is displayed on Subaru Select Monitor display screen. This shows it may be an unreliable reading.

Display	Contents of Display
Current	The current DTC is displayed on Subaru Select Monitor display screen.
Old	The latest DTC from the history of previous problems is displayed on Subaru Select Monitor display screen.
Second previous	The second latest DTC from the history of previous problems is displayed on the Subaru Select Monitor display screen.
Third previous	The third latest DTC from the history of previous problems is displayed on Subaru Select Monitor display screen.

Subaru Select Monitor

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

2. READ CURRENT DATA

- 1) On the «Main Menu» display screen, select the {Each System Check}.
 - 2) On the «System Selection Menu» display screen, select the {Brake Control}.
 - 3) Select the [OK] after the {VDC} is displayed.
 - 4) On the «Brake Control Diagnosis» display screen, select the {Current Data Display/Save} .
 - 5) On the «Data Display Menu» screen, select the {Data Display}.
 - 6) Using the scroll key, scroll the display screen up or down until the desired data is shown on the screen.
- A list of the support data is shown in the following table.

Display	Contents to be monitored	Unit of measure
FR Wheel Speed	Wheel speed detected by front ABS wheel speed sensor RH is displayed.	km/h
FL Wheel Speed	Wheel speed detected by front ABS wheel speed sensor LH is displayed.	km/h
RR Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor RH is displayed.	km/h
RL Wheel Speed	Wheel speed detected by rear ABS wheel speed sensor LH is displayed.	km/h
Steering Angle Sensor	Steering wheel angle detected by steering angle sensor is displayed.	deg
Yaw Rate Sensor	Vehicle angular speed detected by yaw rate sensor is displayed.	deg (deg/s)
Pressure Sensor (P)	Brake fluid pressure detected by the primary pressure sensor is displayed.	bar
Pressure Sensor (S)	Brake fluid pressure detected by the secondary pressure sensor is displayed.	bar
Lateral G Sensor	Vehicle lateral direction acceleration detected by lateral G sensor is displayed.	m/s (m/s ²)
IG Power Supply Voltage	Voltage supplied to the VDCCM is displayed.	V
Valve Relay Signal	The valve relay operating condition is displayed.	ON or OFF
Motor Relay Signal	The motor relay operating condition is displayed.	ON or OFF
Motor Relay Monitor	The motor relay operating condition is displayed.	ON or OFF
VDC Operation Light	VDC operation condition is displayed.	ON or OFF
VDC Warning Light	ON/OFF condition of the VDC warning light/VDC OFF indicator light is displayed. (ON is displayed when there is a VDC failure.)	ON or OFF
ABS Warning Light	ON/OFF condition of the ABS warning light is displayed.	ON or OFF
VDC OFF Light	ON/OFF condition of the VDC warning light/VDC OFF indicator light is displayed. (ON/OFF is displayed by operating the VDC OFF switch and EAM signal.)	ON or OFF
EBD Warning Light	ON/OFF condition of the EBD warning light is displayed.	ON or OFF
EAM Signal	Engine control command signal is displayed.	1 or 0
PATA Signal	ON/OFF condition of the VDC OFF switch is displayed.	ON or OFF
Gear Position	Gear position is displayed by number. 0: N or P, 1: 1st, 2: 2nd, 3: 3rd, 4: 4th, 7: R	—
Engine Speed	Engine speed is displayed.	rpm
PW Signal	Acceleration opening is displayed.	%
Car Line	Vehicle type is displayed by number. Normally "1"	—

NOTE:

For details concerning operation procedure, refer to the "SUBARU SELECT MONITOR OPERATION MANUAL".

Subaru Select Monitor

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

3. CLEAR MEMORY MODE

- 1) On the «Main Menu» display screen, select the {2. Each System Check}.
- 2) On the «System Selection Menu» display screen, select the {Brake Control}.
- 3) Select the [OK] after the {VDC} is displayed.
- 4) On the «Brake Control Diagnosis» display screen, select the {Clear Memory}.
- 5) When the “Done” is shown on the display screen, turn the Subaru Select Monitor and ignition switch to OFF.

NOTE:

For details concerning operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

4. FUNCTION CHECK

Display	Contents of Display	Index No.
ABS check mode	Operate the valve and pump motor by turns to perform the ABS sequence control.	<Ref. to VDC-16, ABS Sequence Control.>
VDC check mode	Operate the valve and pump motor by turns to perform the VDC sequence control.	<Ref. to VDC-19, VDC Sequence Control.>
Steering angle sensor neutral & lateral G sensor 0 pt mode	Set the steering angle sensor neutral position and the lateral G sensor “0” points.	<Ref. to VDC-25, Steering Angle Sensor.>

Subaru Select Monitor

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

5. FREEZE FRAME DATA

NOTE:

- Data stored at the time of failure occurred is shown on display.
- Each time a failure occurs, the latest information is stored in the freeze frame data in memory.
- 1 freeze frame data is stored.
- If a freeze frame data is not properly stored in memory (due to a drop in VDCCM power supply, etc.), a DTC suffixed with a question mark “?” appears on the Subaru Select Monitor display. This shows it may be an unreliable reading.

FREEZE FRAME DATA LIST

Display	Contents to be monitored
FR Wheel Speed	Wheel speed detected by the front ABS wheel speed sensor RH is displayed in km/h.
FL Wheel Speed	Wheel speed detected by the front ABS wheel speed sensor LH is displayed in km/h.
RR Wheel Speed	Wheel speed detected by the rear ABS wheel speed sensor RH is displayed in km/h.
RL Wheel Speed	Wheel speed detected by the rear ABS wheel speed sensor LH is displayed in km/h.
Steering Angle Sensor	Steering wheel angle detected by steering angle sensor is displayed.
Yaw Rate Sensor	Vehicle angular speed detected by the yaw rate sensor is converted and displayed in volts.
Lateral G Sensor	Vehicle lateral direction acceleration detected by lateral G sensor is converted and displayed in volts.
Primary Pressure Sensor	Brake fluid pressure detected by the primary pressure sensor is converted and displayed in volts.
Secondary Pressure Sensor	Brake fluid pressure detected by the secondary pressure sensor is converted and displayed in volts.
Vehicle Speed	The vehicle speed is displayed.
Required Torque	Engine torque required by the driver is displayed.
Current Torque	Current engine torque is displayed.
Target Torque	The target torque is displayed.
Acceleration Opening Angle	Acceleration opening is displayed.
Engine Speed	Engine speed is displayed.
Gear Position	Gear position is displayed.
IG Power Supply Voltage	Voltage supplied to VDC control module is displayed.
ABS Warning Light	ON/OFF condition of the ABS warning light is displayed.
EBD Warning Light	ON/OFF condition of the EBD warning light is displayed.
VDC Warning Light	ON/OFF condition of the VDC warning light/VDC OFF indicator light is displayed. (ON is displayed when there is a VDC failure.)
VDC OFF Light	ON/OFF condition of the VDC warning light/VDC OFF indicator light is displayed. (ON/OFF is displayed by operating the VDC OFF switch and EAM signal.)
VDC Operation Light	ON/OFF condition of VDC OFF indicator light is displayed.
Valve Relay Signal	The valve relay operating condition is displayed.
Motor Relay Driving Vibration	The motor relay operating condition is displayed.
Motor Relay Monitor	The motor relay operating condition is displayed.
Decreasing Required Torque	Engine torque decrease request is displayed.
EAM Signal	Engine control command signal is displayed.
VDC O Control Flag	VDC operation condition (over-steering) is displayed.
VDC U Control Flag	VDC operation condition (under-steering) is displayed.
ABS Control Flag	ABS operating condition is displayed.
VDC OK B Signal	VDC sensor normal flag

Read Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

8. Read Diagnostic Trouble Code (DTC)

A: OPERATION

For details concerning DTC, refer to the “Subaru Select Monitor”. <Ref. to VDC(diag)-19, Subaru Select Monitor.> When doing so, read the detail code displayed under the DTC at the same time.

Inspection Mode

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

9. Inspection Mode

A: OPERATION

Reproduce the malfunction occurrence condition as much as possible.

Drive the vehicle for ten minutes or more.

NOTE:

While driving normally, check that the vehicle does not veer to the left or right from the straight-ahead direction.

10. Clear Memory Mode

A: OPERATION

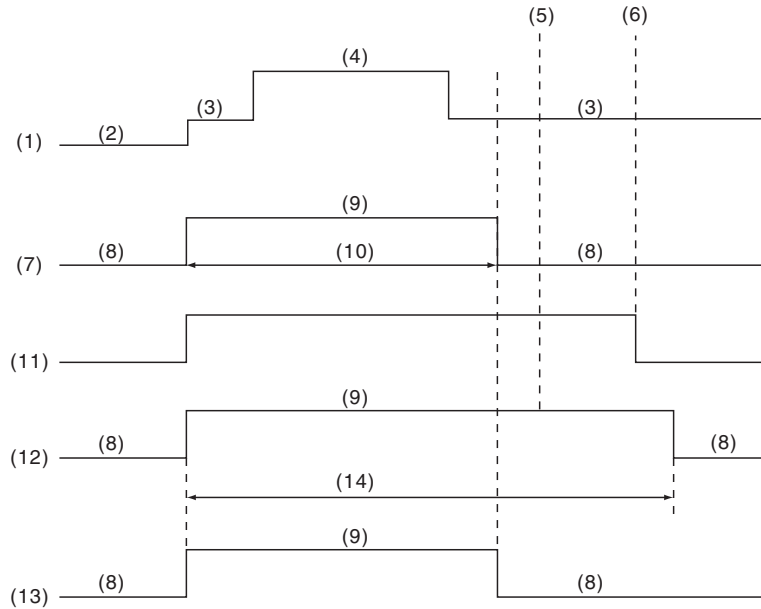
For details concerning DTC clear operation, refer to "Subaru Select Monitor". <Ref. to VDC(diag)-19, Subaru Select Monitor.>

Warning Light Illumination Pattern

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

11.Warning Light Illumination Pattern

A: INSPECTION



VDC00274

- | | | |
|----------------------------|--|---|
| (1) Ignition switch | (7) ABS warning light | (12) VDC warning light/VDC OFF indicator light |
| (2) OFF | (8) Light OFF | (13) VDC indicator light |
| (3) ON | (9) Light ON | (14) Few seconds (Depends on the coolant temperature) |
| (4) Engine start | (10) Approx. 2 sec. | |
| (5) Engine start | (11) Brake warning light (EBD warning light) | |
| (6) Parking brake released | | |

Warning Light Illumination Pattern

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

1) When warning lights or indicator lights do not illuminate in accordance with this illumination pattern, there must be an electrical malfunction.

2) When warning lights or indicator lights remain constantly OFF, repair or diagnose the warning light or indicator light circuits. <Ref. to VDC(diag)-37, ABS WARNING LIGHT, VDC WARNING LIGHT/VDC OFF INDICATOR LIGHT, BRAKE WARNING LIGHT (EBD WARNING LIGHT) OR VDC INDICATOR LIGHT DOES NOT COME ON, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to VDC(diag)-40, ABS WARNING LIGHT, VDC WARNING LIGHT/VDC OFF INDICATOR LIGHT, BRAKE WARNING LIGHT (EBD WARNING LIGHT) DOES NOT GO OFF, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to VDC(diag)-43, VDC INDICATOR LIGHT DOES NOT GO OFF, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

NOTE:

- Even though the ABS warning light does not go out approx. after 2 seconds from ABS warning light illumination, the ABS system operates normally when the warning light goes out while driving at approximately 12 km/h (7.46 MPH). However, the ABS does not work while the ABS warning light is illuminated.
- If the vehicle has been standing for some time in a low temperature area, there are instances in which the VDC warning light/VDC OFF indicator light will take several minutes to turn off. This is due to the low engine coolant temperature, and is not a malfunction.
- If one wheel is locked, or turns freely, a change is generated in the drive transmission to the other wheels. The status of the change in drive differs from what occurs during normal operation. This status is detected by the ABS wheel speed sensor. The ABS and VDC warning lights will illuminate. When the vehicle is operated while all four wheels are lifted off the ground, or the four wheels are placed on rollers, the VDCCM sometimes detects a problem in the speed sensor, and the ABS and VDC warning lights illuminate. In this case, this is not a malfunction. Erase the DTC from the memory.

List of Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

12. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Detail code No.	Display	Content of diagnosis	Reference target
—		Communication for initialization impossible	Subaru Select Monitor communication failure	<Ref. to VDC(diag)-34, COMMUNICATION FOR INITIALIZING IS IMPOSSIBLE (SUBARU SELECT MONITOR COMMUNICATION MALFUNCTION), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
—		No DTC	Even when the DTC is not displayed on the Subaru Select Monitor display, the ABS warning light, VDC warning light/VDC OFF indicator light and VDC operation indicator light do not come on.	<Ref. to VDC(diag)-37, ABS WARNING LIGHT, VDC WARNING LIGHT/VDC OFF INDICATOR LIGHT, BRAKE WARNING LIGHT (EBD WARNING LIGHT) OR VDC INDICATOR LIGHT DOES NOT COME ON, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
—		No DTC	Even when the DTC is not displayed on the Subaru Select Monitor display, the ABS warning light, VDC warning light/VDC OFF indicator light and brake warning light (EBD warning light) do not come on.	<Ref. to VDC(diag)-40, ABS WARNING LIGHT, VDC WARNING LIGHT/VDC OFF INDICATOR LIGHT, BRAKE WARNING LIGHT (EBD WARNING LIGHT) DOES NOT GO OFF, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
—		No DTC	Even when the DTC is not displayed on the Subaru Select Monitor display, the VDC operation indicator light does not extinguish.	<Ref. to VDC(diag)-43, VDC INDICATOR LIGHT DOES NOT GO OFF, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
21	6A0XH	Front Right ABS Sensor Circuit Open or Shorted Battery	Open or Short Circuit in Front ABS Wheel Speed Sensor RH Circuit	<Ref. to VDC(diag)-44, DTC 21 FRONT RIGHT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
22	68CXH 68EXH 690XH 694XH	Front Right ABS Wheel Sensor Signal Malfunction	Front ABS wheel speed sensor RH signal error	<Ref. to VDC(diag)-49, DTC 22 FRONT RIGHT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
23	620XH	Front Left ABS Sensor Circuit Open or Shorted Battery	Open or Short Circuit in Front ABS Wheel Speed Sensor LH Circuit	<Ref. to VDC(diag)-44, DTC 23 FRONT LEFT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
24	60CXH 60EXH 610XH 614XH	Front Left ABS Wheel Speed Sensor Signal Malfunction	Front ABS wheel speed sensor LH signal error	<Ref. to VDC(diag)-49, DTC 24 FRONT LEFT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
25	660XH	Open/High Input of Rear ABS Wheel Speed Sensor RH	Open or Short Circuit in Rear ABS Wheel Speed Sensor RH Circuit	<Ref. to VDC(diag)-44, DTC 25 REAR RIGHT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
26	64CXH 64EXH 650XH 654XH	Rear Right ABS Wheel Speed Sensor Signal Malfunction	Rear ABS wheel speed sensor RH signal error	<Ref. to VDC(diag)-49, DTC 26 REAR RIGHT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
27	6E0XH	Open/High Input of Rear ABS Wheel Speed Sensor LH	Open or Short Circuit in Rear ABS Wheel Speed Sensor LH Circuit	<Ref. to VDC(diag)-45, DTC 27 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
28	6CCXH 6CEXH 6D0XH 6D4XH	Rear Left ABS Wheel Speed Sensor Signal Malfunction	Rear ABS wheel speed sensor LH signal error	<Ref. to VDC(diag)-50, DTC 28 REAR LEFT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

DTC	Detail code No.	Display	Content of diagnosis	Reference target
29	604XH 606XH 608XH 644XH 646XH 648XH 684XH 686XH 688XH 6C4XH 6C6XH 6C8XH 702XH 704XH 720XH 70CXH	Any One of Four ABS Sensors Signal	One sensor signal error of any of the four ABS wheel speed sensors	<Ref. to VDC(diag)-55, DTC 29 ANY OF WHEEL SENSORS SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
31	320XH	FR hold valve malfunction	Front inlet solenoid valve RH malfunction	<Ref. to VDC(diag)-58, DTC 31 FRONT SOLENOID RIGHT INLET VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
32	360XH	FR pressure reducing valve malfunction	Front outlet solenoid valve RH malfunction	<Ref. to VDC(diag)-64, DTC 32 FRONT RIGHT OUTLET SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
33	220XH	FL hold valve malfunction	Front inlet solenoid valve LH malfunction	<Ref. to VDC(diag)-58, DTC 33 FRONT LEFT INLET SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
34	260XH	FL pressure reducing valve malfunction	Front outlet solenoid valve LH malfunction	<Ref. to VDC(diag)-64, DTC 34 FRONT LEFT OUTLET SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
35	2A0XH	RR hold valve malfunction	Rear inlet solenoid valve RH malfunction	<Ref. to VDC(diag)-58, DTC 35 REAR RIGHT INLET SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
36	2E0XH	RR pressure reducing valve malfunction	Rear outlet solenoid valve RH malfunction	<Ref. to VDC(diag)-64, DTC 36 REAR RIGHT OUTLET SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
37	3A0XH	RL hold valve malfunction	Rear inlet solenoid valve LH malfunction	<Ref. to VDC(diag)-58, DTC 37 REAR LEFT INLET SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
38	3E0XH	RL pressure reducing valve malfunction	Rear outlet solenoid valve LH malfunction	<Ref. to VDC(diag)-64, DTC 38 REAR LEFT OUTLET SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

DTC	Detail code No.	Display	Content of diagnosis	Reference target
41	000XH 002XH 004XH 006XH 014XH 016XH 018XH 024XH 026XH 028XH 02CXH 02EXH 030XH 03AXH 03EXH 034XH 036XH 038XH 9D4XH 9E0XH	ECM	VDCCM malfunction	<Ref. to VDC(diag)-70, DTC 41 ECM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
42	7CEXH 7D0XH	Low power supply voltage	Power supply voltage malfunction	<Ref. to VDC(diag)-72, DTC 42 POWER VOLTAGE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
44	9A0XH	AT communication	TCM communication line malfunction	<Ref. to VDC(diag)-74, DTC 44 TCM COMMUNICATION CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
45	970XH	Different control module specification	Incorrect VDCCM	<Ref. to VDC(diag)-76, DTC 45 INCORRECT VDC CONTROL MODULE SPECIFICATIONS, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
45	972XH	AT ECM	TCM error specifications	<Ref. to VDC(diag)-76, DTC 45 TCM MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
46	9CEXH	5 V power supply	5 V power supply voltage error	<Ref. to VDC(diag)-77, DTC 46 ABNORMAL VOLTAGE OF 5V POWER SUPPLY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
47	788XH 78CXH 7A0XH 7A4XH	Improper CAN communication	Defective CAN communication line	<Ref. to VDC(diag)-80, DTC 47 CAN COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
51	048XH	Valve relay OFF malfunction	Defective valve relay	<Ref. to VDC(diag)-83, DTC 51 VALVE RELAY OFF MALFUNCTION/ VALVE RELAY TEST MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	064XH	Valve relay ON malfunction		<Ref. to VDC(diag)-89, DTC 51 VALVE RELAY ON FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	06AXH	Valve relay test malfunction		<Ref. to VDC(diag)-83, DTC 51 VALVE RELAY OFF MALFUNCTION/ VALVE RELAY TEST MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

DTC	Detail code No.	Display	Content of diagnosis	Reference target
52	5A0XH	Motor/Motor relay OFF malfunction	Defective motor and motor relay OFF	<Ref. to VDC(diag)-93, DTC 52 MOTOR/MOTOR RELAY OFF MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	58EXH	Motor/Motor relay ON malfunction	Defective motor and motor relay ON	<Ref. to VDC(diag)-96, DTC 52 MOTOR/MOTOR RELAY ON MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	58CXH	Motor	Defective motor	<Ref. to VDC(diag)-100, DTC 52 MOTOR MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
57	820XH	EGI ECM signal	ECM communication malfunction	<Ref. to VDC(diag)-103, DTC 57 ECM COMMUNICATION CIRCUIT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
61	4A0XH	VDC switching valve 1 (S)	Secondary cut valve malfunction	<Ref. to VDC(diag)-58, DTC 61 SECONDARY CUT SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
62	4E0XH	VDC switching valve 1 (P)	Primary cut valve malfunction	<Ref. to VDC(diag)-59, DTC 62 PRIMARY CUT SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
63	520XH	VDC switching valve 2 (S)	Secondary suction valve malfunction	<Ref. to VDC(diag)-64, DTC 63 SECONDARY SUCTION SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
64	560XH	VDC switching valve 2 (P)	Primary suction valve malfunction	<Ref. to VDC(diag)-65, DTC 64 PRIMARY SUCTION SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
71	148XH	Steering angle sensor offset is too big	The steering angle sensor offset is too large.	<Ref. to VDC(diag)-105, DTC 71 STEERING ANGLE SENSOR OFFSET IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	14AXH	Change range of steering angle sensor is too big	The steering angle sensor change range is too large.	<Ref. to VDC(diag)-107, DTC 71 CHANGE RANGE OF STEERING ANGLE SENSOR IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	142XH 144XH 146XH 158XH 15AXH 15CXH 15EXH	Steering angle sensor output	Defective steering angle sensor	<Ref. to VDC(diag)-109, DTC 71 STEERING ANGLE SENSOR MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	14CXH 14EXH 150XH 152XH 160XH	No signal from steering angle sensor	Signals from the steering angle sensor are not sent.	<Ref. to VDC(diag)-111, DTC 71 STEERING ANGLE SENSOR COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

DTC	Detail code No.	Display	Content of diagnosis	Reference target
72	180XH 182XH 184XH 186XH 188XH 18BXH 18EXH 190XH 192XH 194XH 196XH 198XH 19AXH	Yaw rate sensor output	Yaw rate sensor output error	<Ref. to VDC(diag)-114, DTC 72 ABNORMAL YAW RATE SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1A0XH	Yaw rate sensor power/output	Voltage input to the yaw rate sensor exceeds specifications.	<Ref. to VDC(diag)-116, DTC 72 VOLTAGE INPUTTED TO YAW RATE SENSOR EXCEEDS SPECIFICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	19CXH	Yaw rate sensor reference	Yaw rate sensor reference voltage malfunction	<Ref. to VDC(diag)-118, DTC 72 ABNORMAL YAW RATE SENSOR REFERENCE VOLTAGE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	18CXH	Excessive variation amount of yaw rate sensor output	The yaw rate sensor signal change range is too large.	<Ref. to VDC(diag)-120, DTC 72 CHANGE RANGE OF YAW RATE SENSOR SIGNAL IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
73	1C8XH 1CAXH	Excessive amount of lateral G sensor output offset	The lateral G sensor offset is too large.	<Ref. to VDC(diag)-122, DTC 73 LATERAL G SENSOR OFFSET IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1C0XH 1C6XH 1D8XH	Lateral G sensor output	Lateral G sensor output malfunction	<Ref. to VDC(diag)-122, DTC 73 ABNORMAL LATERAL G SENSOR OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1CCXH	Excessive variation amount of lateral G sensor output	The lateral G sensor change range is too large.	<Ref. to VDC(diag)-122, DTC 73 CHANGE RANGE OF LATERAL G SENSOR SIGNAL IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1D2XH	Excessive lateral G sensor output	Excessive Lateral G Sensor Signal	<Ref. to VDC(diag)-123, DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	1E0XH	Lateral G sensor power/output	Voltage input to the lateral G sensor exceeds specifications.	<Ref. to VDC(diag)-125, DTC 73 VOLTAGE INPUTTED TO LATERAL G SENSOR EXCEEDS SPECIFICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
74	120XH	Primary pressure sensor power/output	Voltage input to the primary pressure sensor exceeds specifications.	<Ref. to VDC(diag)-128, DTC 74 PRIMARY PRESSURE SENSOR POWER/OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	122XH	Secondary pressure sensor power/output	Voltage input to the secondary pressure sensor exceeds specifications.	<Ref. to VDC(diag)-131, DTC 74 SECONDARY PRESSURE SENSOR POWER/OUTPUT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	110XH	Primary pressure sensor offset is too big	The primary pressure sensor offset is too big.	<Ref. to VDC(diag)-133, DTC 74 PRIMARY PRESSURE SENSOR OFFSET IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	112XH	Secondary pressure sensor offset is too big	The secondary pressure sensor offset is too big.	<Ref. to VDC(diag)-134, DTC 74 SECONDARY PRESSURE SENSOR OFFSET IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
	10AXH	Differential pressure of pressure sensor is too big	The differential pressure of the pressure sensor is too big.	<Ref. to VDC(diag)-136, DTC 74 DIFFERENTIAL PRESSURE OF PRESSURE SENSOR IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

If either of the following multiple of DTC are in the memory, check the part that corresponds to the first DTC. If a problem is not detected, check the portions that correspond to the other DTC in the order that the codes appear.

Combination of DTC	Problem portions	Reference target
46 5 V power supply voltage error 74 Voltage input to the pressure sensor exceeds specifications.	(B310) — No. 77 lead circuit is shorted to the ground or battery.	<Ref. to VDC(diag)-77, DTC 46 ABNORMAL VOLTAGE OF 5V POWER SUPPLY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
44 TCM communication circuit 71 Signals from the steering angle sensor are not sent.	(B310) — No. 83 or 81 lead circuits are open.	<Ref. to VDC(diag)-111, DTC 71 STEERING ANGLE SENSOR COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
51 Valve relay 71 Signals from the steering angle sensor are not sent.	(B310) — No. 27 lead circuit is open.	<Ref. to VDC(diag)-111, DTC 71 STEERING ANGLE SENSOR COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
71 Signals from the steering angle sensor are not sent. 51 Valve relay 44 TCM communication circuit	(B310) — No. 27 lead circuit is open.	<Ref. to VDC(diag)-111, DTC 71 STEERING ANGLE SENSOR COMMUNICATION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
73 Voltage input to the lateral G sensor exceeds specifications. 72 Voltage input to the yaw rate sensor exceeds specifications.	(B310) — No. 50 lead circuit is open.	<Ref. to VDC(diag)-123, DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

13. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: COMMUNICATION FOR INITIALIZING IS IMPOSSIBLE (SUBARU SELECT MONITOR COMMUNICATION MALFUNCTION)

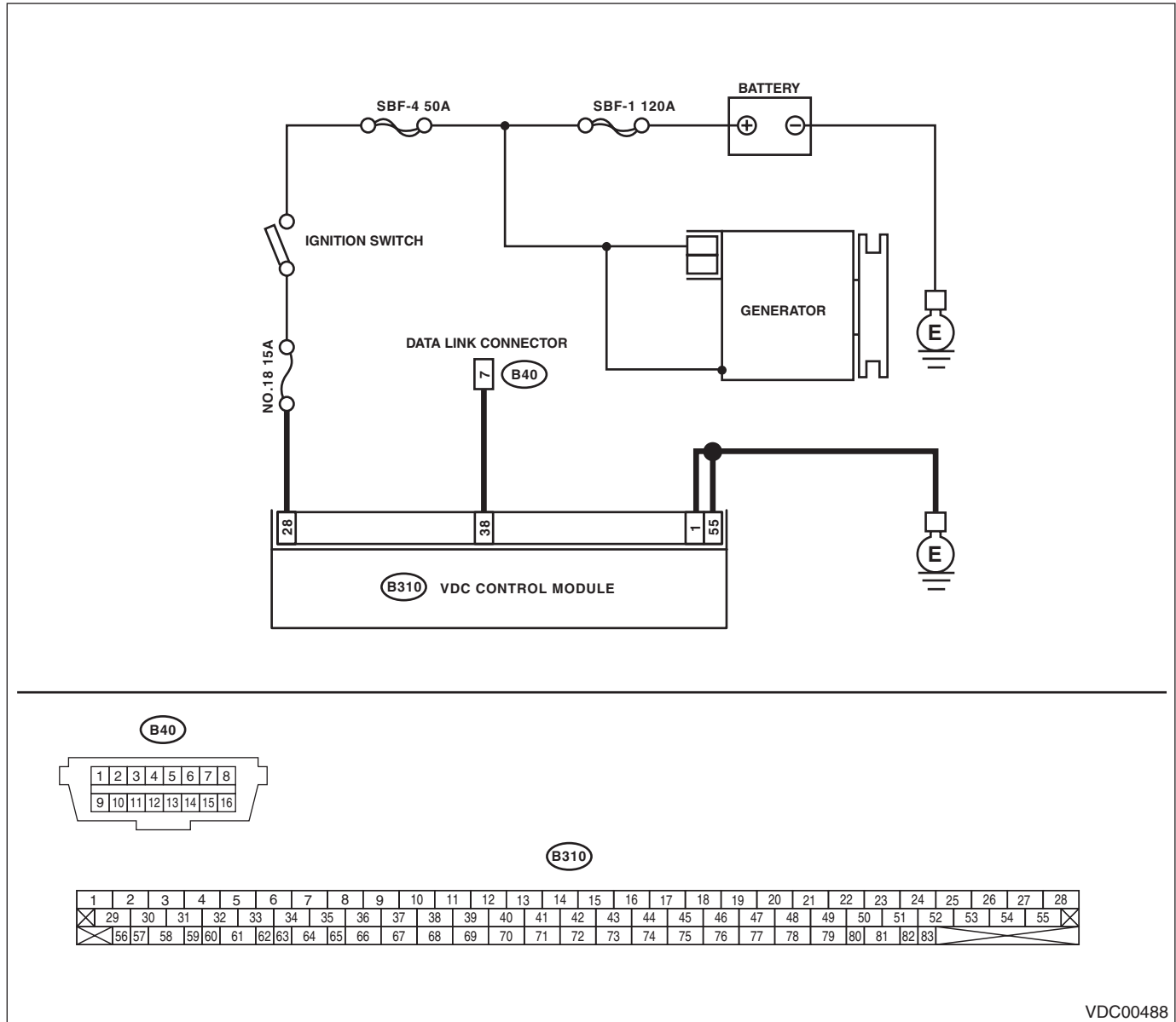
DTC DETECTING CONDITION:

Defective harness connector

TROUBLE SYMPTOM:

The ABS warning light is kept on.

WIRING DIAGRAM:



VDC00488

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK IGNITION SWITCH.	Is the ignition switch turned ON?	Go to step 2.	Turn the ignition switch to ON, and select VDCCM mode using Subaru Select Monitor.
2	CHECK BATTERY. 1) Turn the ignition switch to OFF. 2) Measure the battery voltage.	Is the voltage 11 V or more?	Go to step 3.	Charge or replace the battery.
3	CHECK BATTERY TERMINAL.	Is there poor contact at the battery terminal?	Repair or tighten the battery terminal.	Go to step 4.
4	CHECK SUBARU SELECT MONITOR COMMUNICATION. 1) Turn the ignition switch to ON. 2) Using the Subaru Select Monitor, check whether communication to other systems can be executed normally.	Are the system name and year displayed on Subaru Select Monitor?	Go to step 8.	Go to step 5.
5	CHECK SUBARU SELECT MONITOR COMMUNICATION. 1) Turn the ignition switch to OFF. 2) Disconnect the VDCCM connector. 3) Check whether communication to other systems can be executed normally.	Are the system name and model year displayed on Subaru Select Monitor?	Go to step 9.	Go to step 6.
6	CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the VDCCM connector. 3) Measure the resistance between data link connector and chassis ground. Connector & terminal (B40) No. 7 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 7.	Repair the harness and connector between each control module and data link connector.
7	CHECK OUTPUT SIGNAL FOR VDCCM. 1) Turn the ignition switch to ON. 2) Measure the voltage between data link connector and chassis ground. Connector & terminal (B40) No. 7 (+) — Chassis ground (-):	Is the voltage 1 V or more?	Repair the harness and connector between each control module and data link connector.	Go to step 8.
8	CHECK HARNESS CONNECTOR BETWEEN VDCCM AND DATA LINK CONNECTOR. Measure the resistance between VDCCM connector and data link connector. Connector & terminal (B310) No. 38 — (B40) No. 7:	Is the resistance less than 0.5 Ω?	Repair the harness and connector between VDCCM and data link connector.	Go to step 9.
9	CHECK INSTALLATION OF VDCCM CONNECTOR. Turn the ignition switch to OFF.	Is the VDCCM connector inserted into the VDCCM until the clamp is secured?	Go to step 10.	Insert the VDCCM connector into the VDCCM until the clamp is secured.
10	CHECK POWER SUPPLY CIRCUIT. 1) Turn the ignition switch to ON (engine is OFF). 2) Measure the ignition power supply voltage between the VDCCM connector and chassis ground. Connector & terminal (B310) No. 28 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 11.	Repair open circuit of harness between VDCCM and battery.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
11 CHECK HARNESS CONNECTOR BETWEEN VDCCM AND CHASSIS GROUND. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from VDCCM and transmission. 3) Measure the resistance of the harness between VDCCM and chassis ground. <i>Connector & terminal</i> <i>(B310) No. 1 — Chassis ground:</i> <i>(B310) No. 55 — Chassis ground:</i>	Is the resistance less than 1 Ω ?	Go to step 12.	Repair the open circuit of the harness between the VDCCM and inhibitor switch connector, and the poor contact of connector.
12 CHECK THE POOR CONTACT OF CONNECTOR.	Is there poor contact in control module power supply, ground line and in the data link connector?	Repair the connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

B: ABS WARNING LIGHT, VDC WARNING LIGHT/VDC OFF INDICATOR LIGHT, BRAKE WARNING LIGHT (EBD WARNING LIGHT) OR VDC INDICATOR LIGHT DOES NOT COME ON

DTC DETECTING CONDITION:

- ABS warning light circuit is open or shorted.
- VDC warning light/VDC OFF indicator light circuit is open or shorted.
- VDC operation indicator light circuit is open or shorted.
- Brake warning light (EBD warning light) circuit is open or shorted.

TROUBLE SYMPTOM:

When the ignition switch is ON (engine OFF), ABS warning light, VDC warning light/VDC OFF indicator light, VDC operation indicator light or brake warning light (EBD warning light) does not come on.

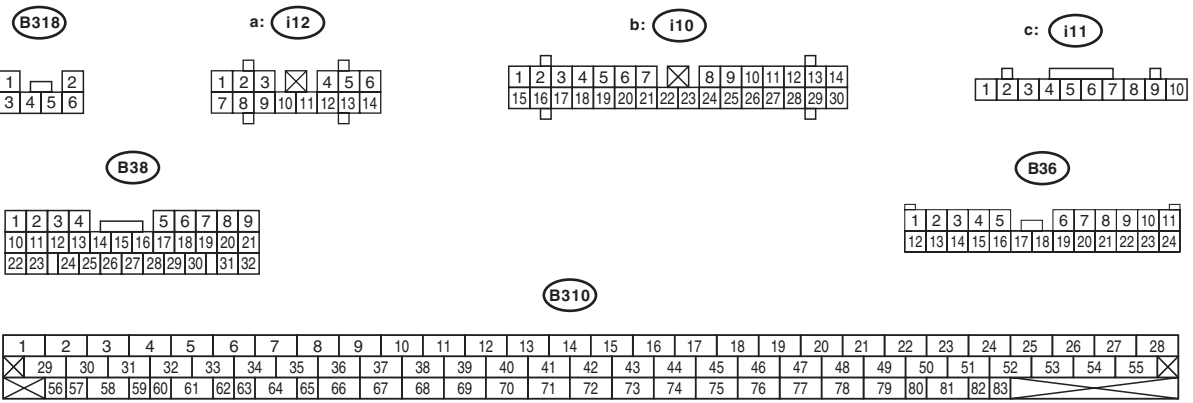
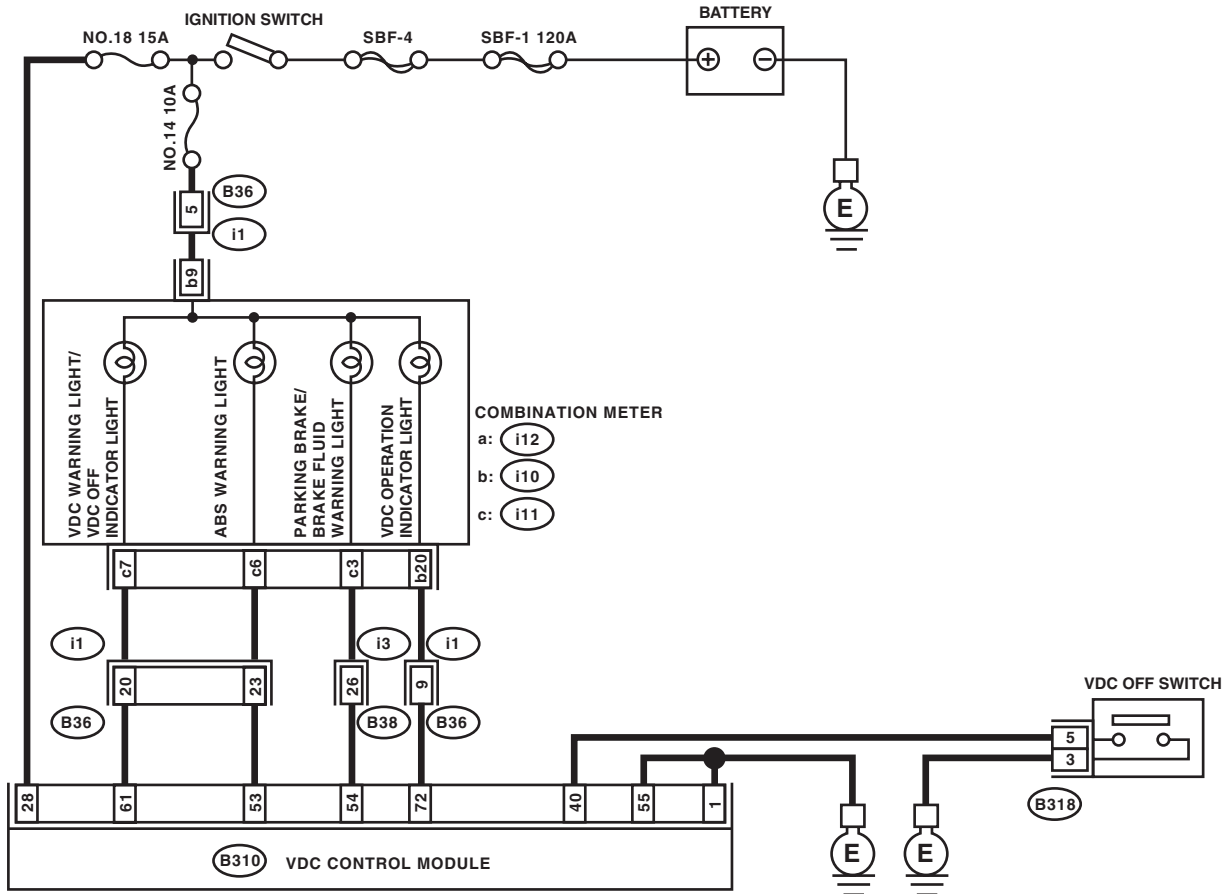
NOTE:

When the VDC OFF switch is held down for 10 seconds or more while the engine is running, the VDC warning light/VDC OFF indicator light will turn off and any following switch operations will be ignored. To recover VDC operation, turn the ignition switch from OFF to ON again.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

WIRING DIAGRAM:



VDC00489

Step	Check	Yes	No
1 CHECK ILLUMINATION OF OTHER WARNING LIGHT. Turn the ignition switch to ON (engine is OFF).	Do other warning lights illuminate?	Go to step 2.	Repair the combination meter. <Ref. to IDI-10, Combination Meter.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK BULBS. 1) Turn the ignition switch to OFF. 2) Remove the combination meter. 3) Check the ABS warning light bulb, VDC warning light bulb, VDC operation indicator light bulb or the brake warning light bulb, and the VDC OFF indicator light bulb.	Is the bulb OK?	Go to step 3.	Replace the defective bulbs. <Ref. to IDI-11, DISASSEMBLY, Combination Meter.>
3 CHECK BATTERY SHORT OF LIGHT HARNESS. 1) Disconnect the VDCCM connector from the VDCCM. 2) Fit one sheet of paper (thickness 1.5 mm (0.059 in)) into the switch of the VDCCM connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between VDC connector and chassis ground. Connector & terminal ABS warning light (B310) No. 53 (+) — Chassis ground (-): VDC warning light (B310) No. 61 (+) — Chassis ground (-): Brake warning light (B310) No. 54 (+) — Chassis ground (-): VDC indicator light (B310) No. 72 (+) — Chassis ground (-):	Is the voltage less than 3 V?	Go to step 4.	Repair the light harness.
4 CHECK WIRING HARNESS. 1) Turn the ignition switch to OFF. 2) Install the ABS warning light bulb to the combination meter. 3) Install the combination meter. 4) Fit one sheet of paper (thickness 1.5 mm (0.059 in)) into the switch of the VDCCM connector. 5) Turn the ignition switch to ON. 6) Measure the voltage between VDCCM connector and chassis ground. Connector & terminal ABS warning light (B310) No. 53 (+) — Chassis ground (-): VDC warning light (B310) No. 61 (+) — Chassis ground (-): Brake warning light (B310) No. 54 (+) — Chassis ground (-): VDC indicator light (B310) No. 72 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 5.	Repair the wiring harness.
5 CHECK POOR CONTACT OF CONNECTOR. Turn the ignition switch to OFF.	Is there poor contact in connectors between combination meter and the VDCCM?	Repair the connector.	Go to step 6.
6 CHECK WARNING LIGHT AND INDICATOR LIGHT. 1) Connect the connector to the VDCCM. 2) Turn the ignition switch to ON.	Do the ABS warning light, VDC warning light, brake warning light, VDC operation indicator light and VDC OFF indicator light illuminate?	Temporary poor contact occurs.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

C: ABS WARNING LIGHT, VDC WARNING LIGHT/VDC OFF INDICATOR LIGHT, BRAKE WARNING LIGHT (EBD WARNING LIGHT) DOES NOT GO OFF

DTC DETECTING CONDITION:

- ABS warning light circuit is open or shorted.
- VDC control warning light/VDC OFF indicator light circuit is open or shorted.
- Brake warning light (EBD warning light) circuit is open or shorted.
- Diagnosis circuit is open.
- VDC OFF switch is shorted.

TROUBLE SYMPTOM:

- When starting the engine, the ABS warning light and VDC warning light/VDC OFF indicator light are kept ON.
- After starting the engine, the brake warning light (EBD warning light) is kept on even though the parking brake is released.

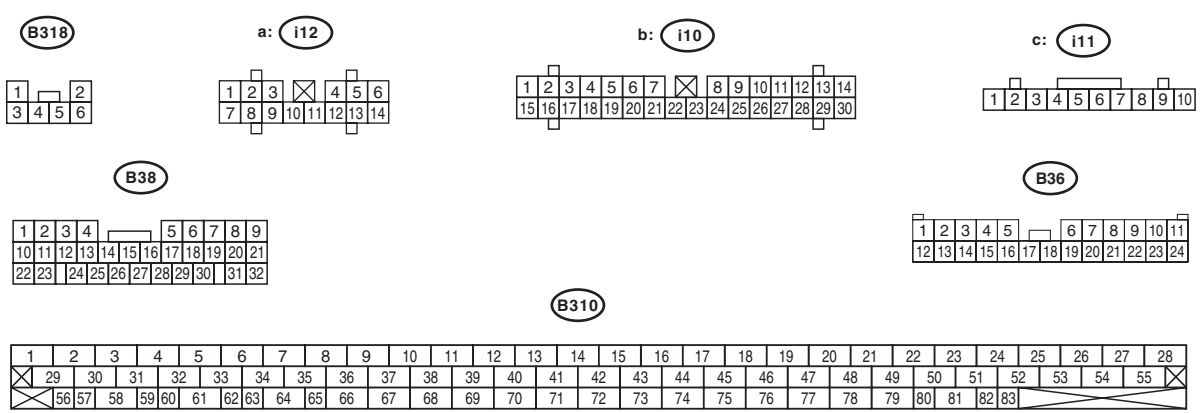
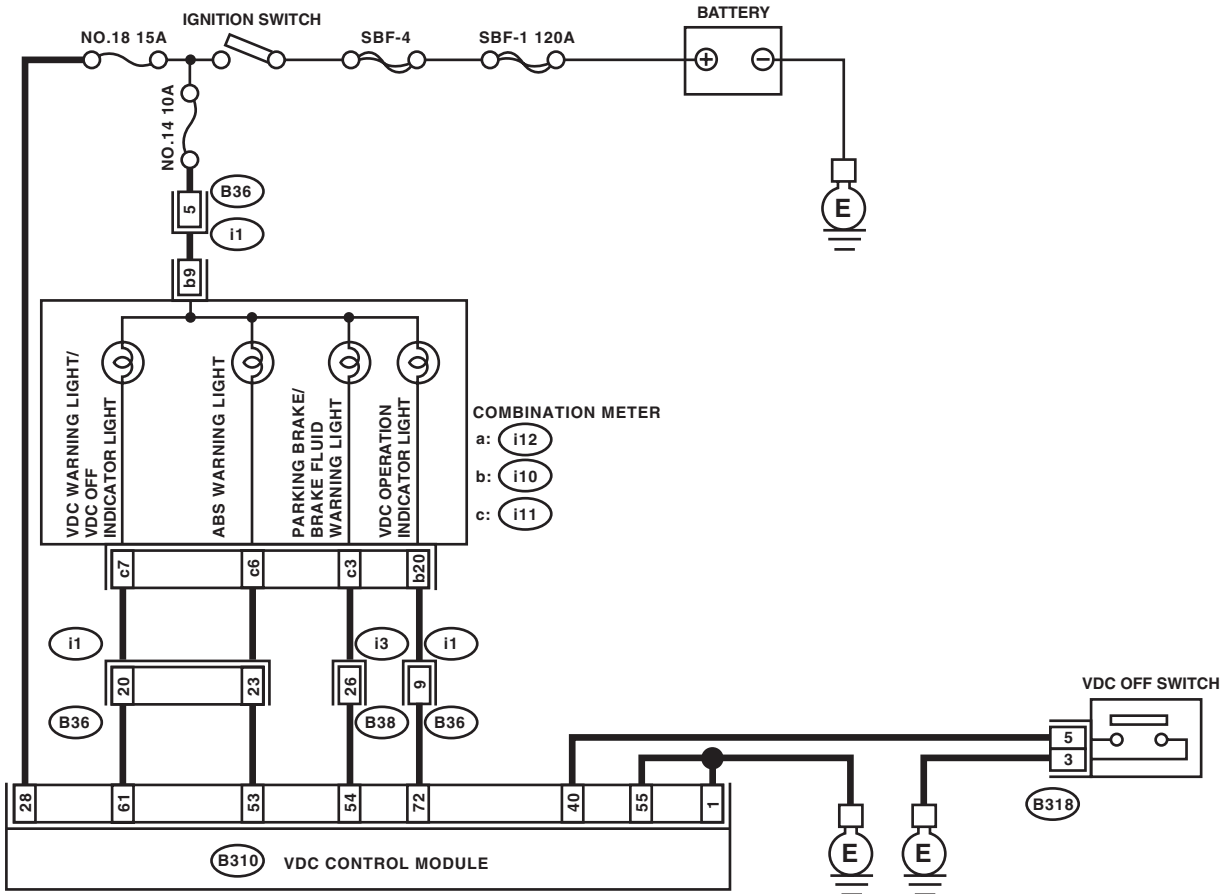
NOTE:

- When pressing the VDC OFF switch for 10 seconds or more while the engine is running, the VDC OFF indicator lights go off and the switch cannot be operated any more. To recover VDC operation, turn the ignition switch from OFF to ON again.
- When the engine coolant temperature is too low, the VDC OFF indicator light illuminates. The light will turn off when the engine is warmed up.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

WIRING DIAGRAM:



VDC00489

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INSTALLATION OF VDCCM CONNECTOR. Turn the ignition switch to OFF.	Is the VDCCM connector inserted into the VDCCM until the clamp is secured?	Go to step 2.	Insert the VDCCM connector into the VDCCM until the clamp is secured.
2 CHECK THE FAILURE LIGHT. Check the lights that do not extinguish.	Are the VDC warning light/VDC OFF indicator lights the ones that do not turn OFF?	Go to step 7.	Go to step 3.
3 CHECK WIRING HARNESS. 1) Fit one sheet of paper (thickness 1.5 mm (0.059 in)) into the switch of the VDCCM connector. 2) Turn the ignition switch to ON.	Are the ABS warning light and brake warning light (EBD warning light) still off?	Go to step 4.	Repair the front wiring harness.
4 CHECK PROTRUSION OF THE VDCCM. 1) Turn the ignition switch to OFF. 2) Check the damage to the VDCCM terminal protrusion.	Is the protrusion damaged?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 5.
5 CHECK VDCCM POWER SUPPLY. 1) Disconnect the connectors from VDCCM. 2) Start the engine. 3) Run the engine at idle. 4) Measure the voltage between VDCCM connector and chassis ground. <i>Connector & terminal (B310) No. 28 (+) — Chassis ground (-):</i>	Is the voltage 10 — 15 V?	Go to step 6.	Repair the power supply circuit of the VDCCM.
6 CHECK POOR CONTACT OF VDCCM CONNECTOR.	Is there poor contact in the VDCCM connector?	Repair the connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
7 OPERATION OF VDC OFF SWITCH. 1) Operate the VDC OFF switch. 2) Turn the ignition switch to OFF once and turn ON again.	Do the VDC warning light/VDC OFF indicator light extinguish?	VDC is normal.	Go to step 8.
8 CHECK ENGINE COOLANT TEMPERATURE.	Warm up the engine. Is there a change in the VDC warning light/VDC OFF indicator light illumination conditions?	VDC is normal.	Go to step 9.
9 CHECK VDC OFF SWITCH. Remove and check VDC OFF switch. <Ref. to VDC-32, VDC OFF Switch.>	Is the VDC OFF switch normal?	Go to step 10.	Replace the VDC OFF switch.
10 CHECK WIRING HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the VDCCM connector from the VDCCM. 3) Turn the ignition switch to ON.	Do the VDC warning light/VDC OFF indicator light remain off?	Go to step 11.	Repair the wiring harness.
11 CHECK VDC OFF SWITCH HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the ECM connector. 3) Check the insulation between ECM connector terminal and chassis ground. <i>Connector & terminal (B310) No. 40 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Repair the VDC OFF switch circuit.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

D: VDC INDICATOR LIGHT DOES NOT GO OFF

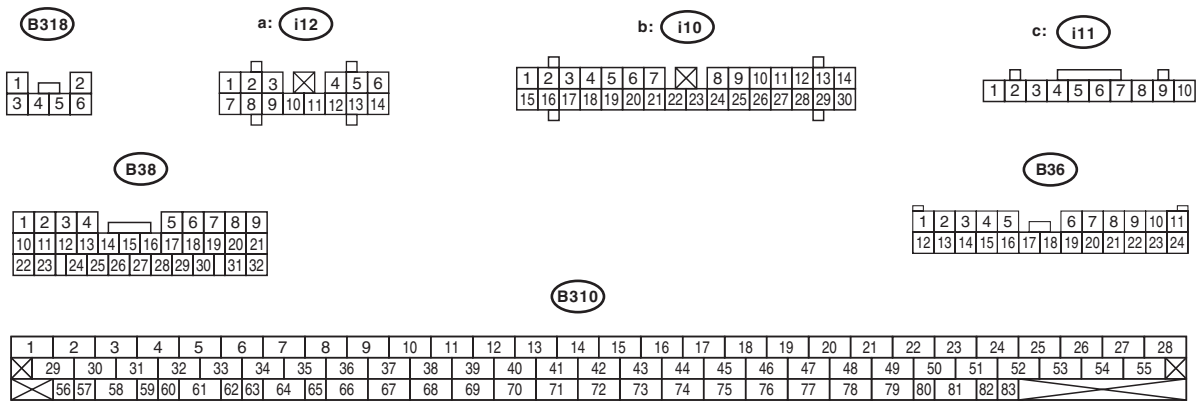
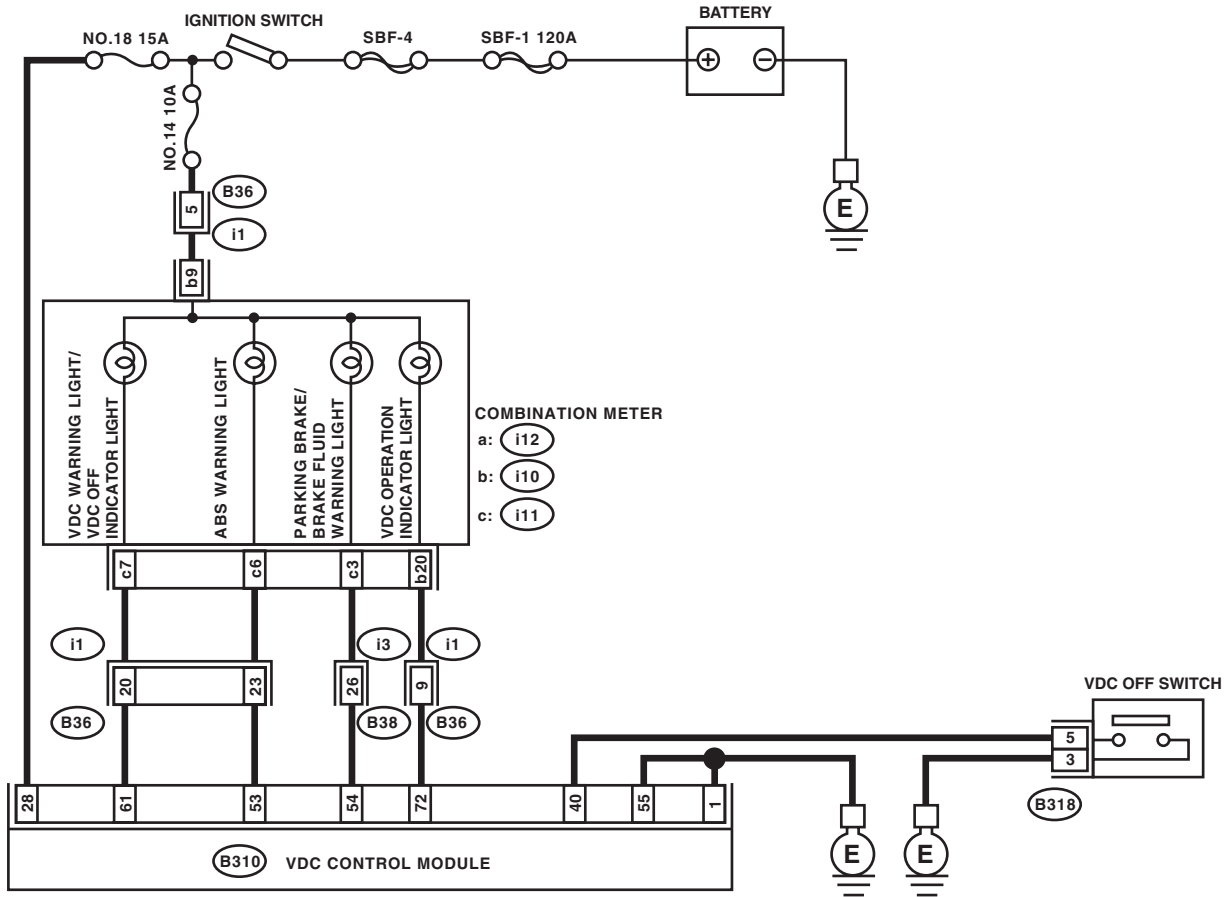
DTC DETECTING CONDITION:

VDC operation indicator light circuit is open or shorted.

TROUBLE SYMPTOM:

When starting the engine, the VDC indicator light remains ON.

WIRING DIAGRAM:



VDC00489

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK WIRING HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the VDCCM connector from the VDCCM. 3) Turn the ignition switch to ON.	Is the VDC operation indicator light off?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Repair the wiring harness.

E: DTC 21 FRONT RIGHT ABS SENSOR CIRCUIT OPEN OR SHORT

NOTE:

Refer to DTC 27 for the diagnostic procedure. <Ref. to VDC(diag)-45, DTC 27 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

F: DTC 23 FRONT LEFT ABS SENSOR CIRCUIT OPEN OR SHORT

NOTE:

Refer to DTC 27 for the diagnostic procedure. <Ref. to VDC(diag)-45, DTC 27 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

G: DTC 25 REAR RIGHT ABS SENSOR CIRCUIT OPEN OR SHORT

NOTE:

Refer to DTC 27 for the diagnostic procedure. <Ref. to VDC(diag)-45, DTC 27 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORT, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

H: DTC 27 REAR LEFT ABS SENSOR CIRCUIT OPEN OR SHORT

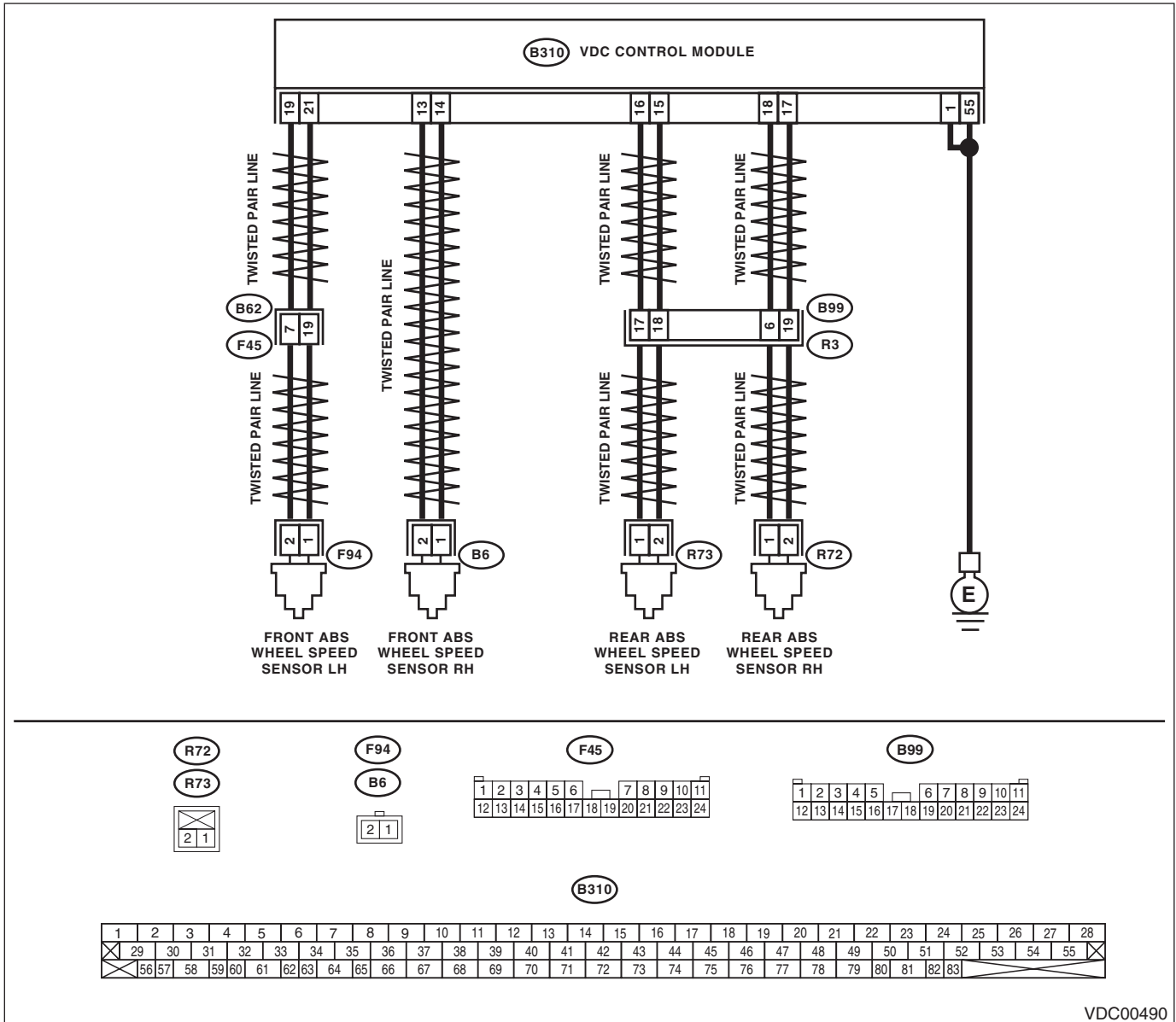
DTC DETECTING CONDITION:

- Defective ABS wheel speed sensor (broken wire, input voltage too high)
- Defective harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00490

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT OF ABS WHEEL SPEED SENSOR USING SUBARU SELECT MONITOR. 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the ABS wheel speed sensor output corresponding to the faulty area in the Subaru Select Monitor data display mode.	Does the speed indicated on the display change in response to the speedometer reading during acceleration/deceleration when the steering wheel is in the straight-ahead position?	Go to step 2.	Go to step 8.
2 CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.	Is the ABS wheel speed sensor installation bolt tightened to 33±10 N·m (3.4±1.0 kgf-m, 24.6±7.2 ft-lb)?	Go to step 3.	Tighten the ABS wheel speed sensor installation bolts.
3 CHECK CLEARANCE OF ABS WHEEL SPEED SENSOR. Measure the clearance between the tone wheel and protrusion around the entire area around the wheel.	Is the clearance within the following? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in); Rear wheel: 0.7 — 1.2 mm (0.0276 — 0.0472 in)	Go to step 4.	Adjust the clearance. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace the worn sensor or worn tone wheel.
4 CHECK TONE WHEEL RUNOUT. Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step 5.	Repair the tone wheel. Front: <Ref. to VDC-30, Front Tone Wheel.> Rear: <Ref. to VDC-31, Rear Tone Wheel.>
5 CHECK POOR CONTACT OF CONNECTOR. Turn the ignition switch to OFF.	Is there poor contact in connectors between VDCCM and ABS wheel speed sensor?	Repair the connector.	Go to step 6.
6 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 7.
7 CHECK ANY OTHER DTC ON DISPLAY.	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs. NOTE: Check the harness and connector between VDCCM and ABS wheel speed sensor.
8 CHECK ABS WHEEL SPEED SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ABS wheel speed sensor. 3) Measure the resistance between ABS wheel speed sensor connector terminals. Terminals <i>Front RH No. 1 — No. 2:</i> <i>Front LH No. 1 — No. 2:</i> <i>Rear RH No. 1 — No. 2:</i> <i>Rear LH No. 1 — No. 2:</i>	Is the resistance as shown below? Front: 1.0 — 1.5 kΩ, Rear: 1.025 — 1.265 kΩ	Go to step 9.	Replace the ABS wheel speed sensor. Front: <Ref. to VDC-28, Front ABS Wheel Speed Sensor.> Rear: <Ref. to VDC-29, Rear ABS Wheel Speed Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
<p>9 CHECK BATTERY SHORT OF ABS WHEEL SPEED SENSOR.</p> <p>1) Disconnect the connectors from VDCCM. 2) Measure the voltage between ABS wheel speed sensor and chassis ground.</p> <p>Terminals Front RH No. 1 (+) — Chassis ground (-): Front LH No. 1 (+) — Chassis ground (-): Rear RH No. 1 (+) — Chassis ground (-): Rear LH No. 1 (+) — Chassis ground (-):</p>	Is the voltage less than 1 V?	Go to step 10.	Replace the ABS wheel speed sensor. Front: <Ref. to VDC-28, Front ABS Wheel Speed Sensor.> Rear: <Ref. to VDC-29, Rear ABS Wheel Speed Sensor.>
<p>10 CHECK BATTERY SHORT OF ABS WHEEL SPEED SENSOR.</p> <p>1) Turn the ignition switch to ON. 2) Measure the voltage between ABS wheel speed sensor and chassis ground.</p> <p>Terminals Front RH No. 1 (+) — Chassis ground (-): Front LH No. 1 (+) — Chassis ground (-): Rear RH No. 1 (+) — Chassis ground (-): Rear LH No. 1 (+) — Chassis ground (-):</p>	Is the voltage less than 1 V?	Go to step 11.	Replace the ABS wheel speed sensor. Front: <Ref. to VDC-28, Front ABS Wheel Speed Sensor.> Rear: <Ref. to VDC-29, Rear ABS Wheel Speed Sensor.>
<p>11 CHECK HARNESS CONNECTOR BETWEEN VDCCM AND ABS WHEEL SPEED SENSOR.</p> <p>1) Turn the ignition switch to OFF. 2) Connect the connector to the ABS wheel speed sensor. 3) Measure the resistance between VDCCM connectors.</p> <p>Connector & terminal DTC 21 (B310) No. 14 — No. 13: DTC 23 (B310) No. 21 — No. 19: DTC 25 (B310) No. 18 — No. 17: DTC 27 (B310) No. 16 — No. 15:</p>	Is the resistance as shown below? Front: 1.0 — 1.5 k Ω , Rear: 1.025 — 1.265 k Ω	Go to step 12.	Repair the harness connector between VDCCM and ABS wheel speed sensor.
<p>12 CHECK BATTERY SHORT OF HARNESS.</p> <p>Measure the voltage between VDCCM connector and chassis ground.</p> <p>Connector & terminal DTC 21 (B310) No. 14 (+) — Chassis ground (-): DTC 23 (B310) No. 21 (+) — Chassis ground (-): DTC 25 (B310) No. 18 (+) — Chassis ground (-): DTC 27 (B310) No. 16 (+) — Chassis ground (-):</p>	Is the voltage less than 1 V?	Go to step 13.	Repair the harness between VDCCM and ABS wheel speed sensor.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
13 CHECK BATTERY SHORT OF HARNESS. 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM connector and chassis ground. Connector & terminal DTC 21 (B310) No. 14 (+) — Chassis ground (-): DTC 23 (B310) No. 21 (+) — Chassis ground (-): DTC 25 (B310) No. 18 (+) — Chassis ground (-): DTC 27 (B310) No. 16 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 14.	Repair the harness between VDCCM and ABS wheel speed sensor.
14 CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.	Is the ABS wheel speed sensor installation bolt tightened to 33±10 N·m (3.4±1.0 kgf-m, 24.6±7.2 ft-lb)?	Go to step 15.	Tighten the ABS wheel speed sensor installation bolts.
15 CHECK ABS WHEEL SPEED SENSOR CLEARANCE. Measure the clearance between the tone wheel and protrusion around the entire area around the wheel.	Is the clearance within the following? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in); Rear wheel: 0.7 — 1.2 mm (0.0276 — 0.0472 in)	Go to step 16.	Adjust the clearance. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace the worn sensor or worn tone wheel.
16 CHECK FOR RUNOUT OF THE HUB AND TONE WHEEL. Measure the runout of the hub and tone wheel.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step 17.	Repair the hub and tone wheel. Front: <Ref. to VDC-28, Front ABS Wheel Speed Sensor.> Rear: <Ref. to VDC-29, Rear ABS Wheel Speed Sensor.>
17 CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact in connectors between VDCCM and ABS wheel speed sensor?	Go to step 18.	Repair the connector.
18 CHECK THE VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 19.
19 CHECK ANY OTHER DTC ON DISPLAY.	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs. NOTE: Check the harness and connector between VDCCM and ABS wheel speed sensor.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

I: DTC 22 FRONT RIGHT ABS SENSOR SIGNAL

NOTE:

Refer to DTC 28 for the diagnostic procedure. <Ref. to VDC(diag)-50, DTC 28 REAR LEFT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

J: DTC 24 FRONT LEFT ABS SENSOR SIGNAL

NOTE:

Refer to DTC 28 for the diagnostic procedure. <Ref. to VDC(diag)-50, DTC 28 REAR LEFT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

K: DTC 26 REAR RIGHT ABS SENSOR SIGNAL

NOTE:

Refer to DTC 28 for the diagnostic procedure. <Ref. to VDC(diag)-50, DTC 28 REAR LEFT ABS SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

L: DTC 28 REAR LEFT ABS SENSOR SIGNAL

DTC DETECTING CONDITION:

- Defective ABS wheel speed sensor signal (noise, irregular signal, etc.)
- Defective harness connector

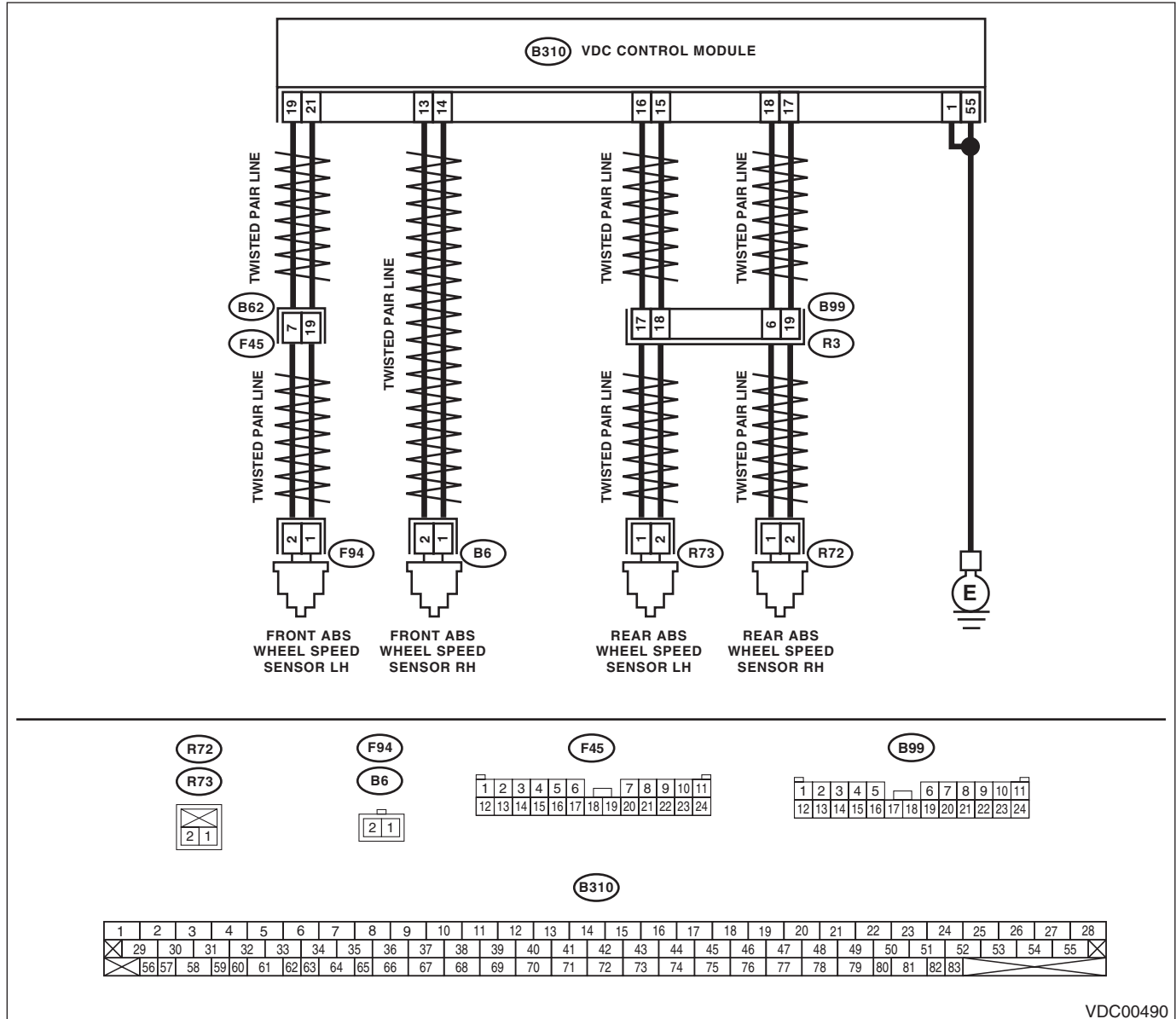
TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD does not operate.

NOTE:

At this time, the brake warning light illuminates as well as the VDC and ABS warning light.

WIRING DIAGRAM:



VDC00490

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK OUTPUT OF ABS WHEEL SPEED SENSOR USING SUBARU SELECT MONITOR. 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the ABS wheel speed sensor output corresponding to the faulty area in the Subaru Select Monitor data display mode.	Does the speed indicated on the display change in response to the speedometer reading during acceleration or deceleration when the steering wheel is in the straight-ahead position?	Go to step 2.	Go to step 7.
2	CHECK POOR CONTACT OF CONNECTOR. Turn the ignition switch to OFF.	Is there poor contact in connectors between VDCCM and ABS wheel speed sensor?	Repair the connector.	Go to step 3.
3	CHECK CAUSE OF SIGNAL NOISE.	Are the radio wave devices and electric components installed correctly?	Go to step 4.	Install the radio wave devices and electric components properly.
4	CHECK CAUSE OF SIGNAL NOISE.	Are causes of the noise (such as an antenna) installed near the sensor harness?	Install the noise sources away from the sensor harness.	Go to step 5.
5	CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 6.
6	CHECK ANY OTHER DTC ON DISPLAY.	Are other DTCs displayed?	Temporary noise interference occurs.	Go to the diagnosis corresponding to the DTC.
7	CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.	Is the ABS wheel speed sensor installation bolt tightened to 33±10 N·m (3.4±1.0 kgf-m, 24.6±7.2 ft-lb)?	Go to step 8.	Tighten the ABS wheel speed sensor installation bolts.
8	CHECK ABS WHEEL SPEED SENSOR CLEARANCE. Measure the clearance between the tone wheel and protrusion around the wheel.	Is the clearance within the following? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in); Rear wheel: 0.7 — 1.2 mm (0.0276 — 0.0472 in)	Go to step 9.	Adjust the clearance. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace the worn sensor or worn tone wheel.
9	CHECK USING OSCILLOSCOPE.	Is an oscilloscope available?	Go to step 10.	Go to step 11.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
10 CHECK ABS WHEEL SPEED SENSOR SIGNAL. 1) Jack up the vehicle until all four wheels are off the ground. 2) Turn the ignition switch to OFF. 3) Remove the VDCCM connector cover. <Ref. to VDC(diag)-18, VDCCM Connector Cover.> 4) Connect the oscilloscope to the connector. 5) Turn the ignition switch to ON. 6) Start the wheel, and measure the voltage at the specified frequency. NOTE: When this inspection is completed, VDCCM may record DTC 29. Connector & terminal DTC 22 (B310) No. 14 (+) — No. 13 (-): DTC 24 (B310) No. 21 (+) — No. 19 (-): DTC 26 (B310) No. 18 (+) — No. 17 (-): DTC 28 (B310) No. 16 (+) — No. 15 (-):	Is the oscilloscope pattern the same waveform as shown in the figure? <Ref. to ABS-16, OUTPUT VOLTAGE, INSPECTION, Front ABS Wheel Speed Sensor.>	Go to step 14.	Go to step 11.
11 CHECK CONTAMINATION OF ABS WHEEL SPEED SENSOR OR TONE WHEEL. Remove the disc rotor from the hub according to the DTC.	Is the ABS wheel speed sensor piece or the tone wheel contaminated by dirt or other foreign matter?	Thoroughly remove dirt or other foreign matter.	Go to step 12.
12 CHECK DAMAGE OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.	Is there breakage or damage in the protrusion of the ABS wheel speed sensor or the tone wheel?	Replace the ABS wheel speed sensor or tone wheel. Front: <Ref. to VDC-28, Front ABS Wheel Speed Sensor.> <Ref. to VDC-30, Front Tone Wheel.> Rear: <Ref. to VDC-29, Rear ABS Wheel Speed Sensor.> <Ref. to VDC-31, Rear Tone Wheel.>	Go to step 13.
13 CHECK TONE WHEEL RUNOUT. Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step 14.	Repair the tone wheel. Front: <Ref. to VDC-30, Front Tone Wheel.> Rear: <Ref. to VDC-31, Rear Tone Wheel.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
14 CHECK RESISTANCE OF THE ABS WHEEL SPEED SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the ABS wheel speed sensor. 3) Measure the resistance between ABS wheel speed sensor connector terminals. Terminals Front RH No. 1 — No. 2: Front LH No. 1 — No. 2: Rear RH No. 1 — No. 2: Rear LH No. 1 — No. 2:	Is the resistance as shown below? Front: 1.0 — 1.5 k Ω , Rear: 1.025 — 1.265 k Ω	Go to step 15.	Replace the ABS wheel speed sensor. Front: <Ref. to VDC-28, Front ABS Wheel Speed Sensor.> Rear: <Ref. to VDC-29, Rear ABS Wheel Speed Sensor.>
15 CHECK GROUND SHORT OF ABS WHEEL SPEED SENSOR. Measure the resistance between ABS wheel speed sensor and chassis ground. Terminals Front RH No. 1 — Chassis ground: Front LH No. 1 — Chassis ground: Rear RH No. 1 — Chassis ground: Rear LH No. 1 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 16.	Replace the ABS wheel speed sensor. Front: <Ref. to VDC-28, Front ABS Wheel Speed Sensor.> Rear: <Ref. to VDC-29, Rear ABS Wheel Speed Sensor.>
16 CHECK HARNESS CONNECTOR BETWEEN VDCCM AND ABS WHEEL SPEED SENSOR. 1) Connect the connector to the ABS wheel speed sensor. 2) Disconnect the connectors from VDCCM. 3) Measure the resistance between the VDCCM connector terminals. Connector & terminal DTC 22 (B310) No. 14 — No. 13: DTC 24 (B310) No. 21 — No. 19: DTC 26 (B310) No. 18 — No. 17: DTC 28 (B310) No. 16 — No. 15:	Is the resistance as shown below? Front: 1.0 — 1.5 k Ω , Rear: 1.025 — 1.265 k Ω	Go to step 17.	Repair the harness connector between VDCCM and ABS wheel speed sensor.
17 CHECK GROUND SHORT CIRCUIT OF HARNESS. Measure the resistance between VDCCM connector and chassis ground. Connector & terminal DTC 22 (B310) No. 14 — Chassis ground: DTC 24 (B310) No. 21 — Chassis ground: DTC 26 (B310) No. 18 — Chassis ground: DTC 28 (B310) No. 16 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 18.	Repair the harness connector between VDCCM and ABS wheel speed sensor.
18 CHECK GROUND CIRCUIT OF VDCCM. Measure the resistance between VDCCM and chassis ground. Connector & terminal (B310) No. 1 — Chassis ground: (B310) No. 55 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 19.	Repair the VDCCM ground harness.
19 CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact in connectors between VDCCM and ABS wheel speed sensor?	Repair the connector.	Go to step 20.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

	Step	Check	Yes	No
20	CHECK CAUSE OF SIGNAL NOISE.	Are the radio wave devices and electric components installed correctly?	Go to step 21.	Install the radio wave devices and electric components properly.
21	CHECK CAUSE OF SIGNAL NOISE.	Are causes of the noise (such as an antenna) installed near the sensor harness?	Install the noise sources away from the sensor harness.	Go to step 22.
22	CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 23.
23	CHECK ANY OTHER DTC ON DISPLAY.	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary noise interference occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

M: DTC 29 ANY OF WHEEL SENSORS SIGNAL

DTC DETECTING CONDITION:

- Defective ABS wheel speed sensor signal (noise, irregular signal, etc.)
- Faulty tone wheel
- When a wheel is turned freely for a long time

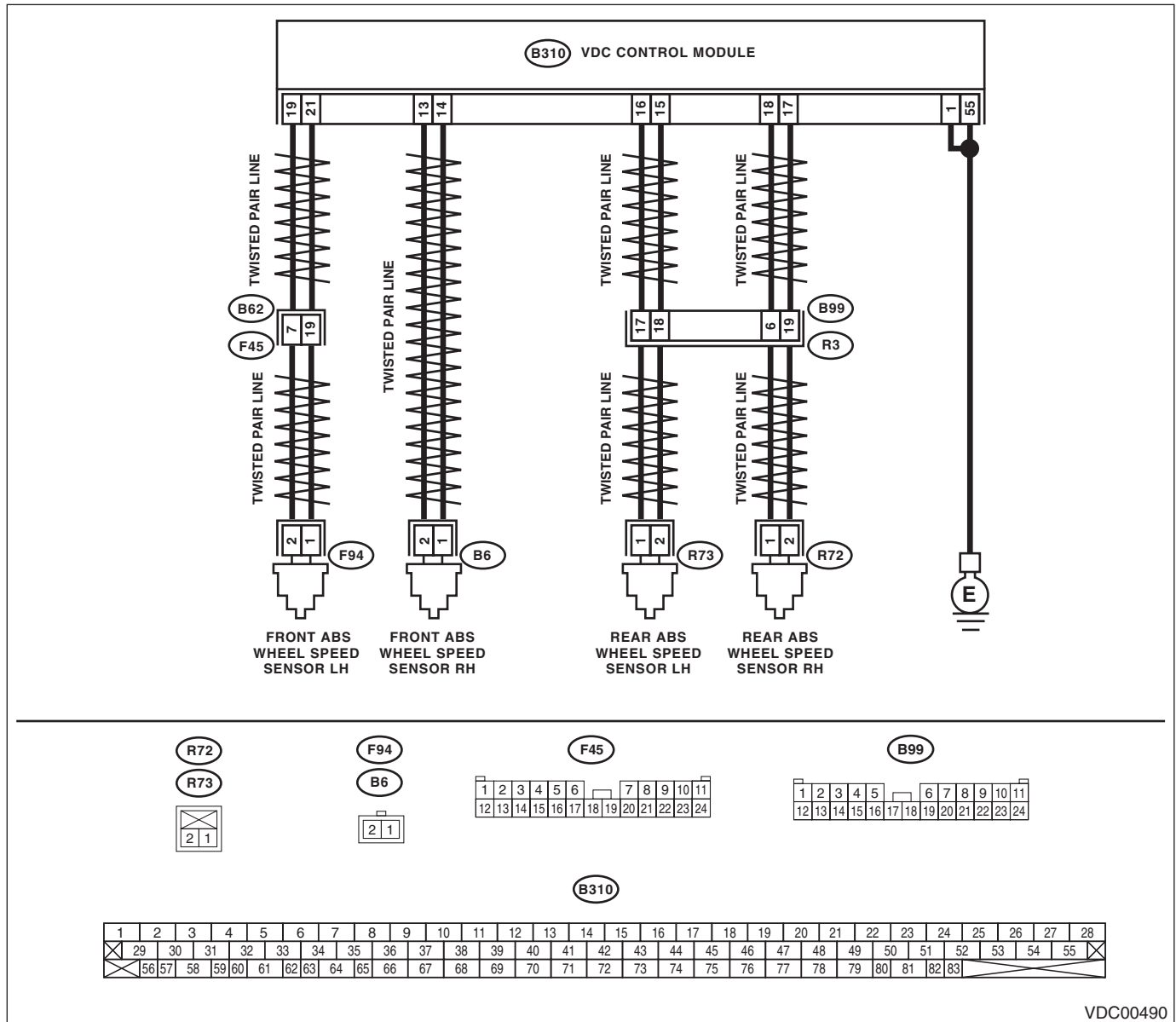
TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD does not operate. (Depends on the content of the malfunction.)

NOTE:

At this time, the brake warning light illuminates as well as the VDC and ABS warning light.

WIRING DIAGRAM:



VDC00490

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No	
1	CHECK WHETHER A WHEEL TURNED FREELY OR NOT.	Did the wheels turn freely for more than one minute, such as when the vehicle is jacked-up, under full-lock cornering or when the tires are not in contact with road surface?	VDC is normal. Delete the DTC. NOTE: There are cases in which the DTC is displayed when the wheel is freely rotated for a long period of time, such as when the vehicle is towed, jacked up, or held where the steering wheel is turned completely one direction.	Go to step 2.
2	CHECK TIRE SPECIFICATIONS.	Is the tire specification appropriate?	Go to step 3.	Replace the tire.
3	CHECK WEAR OF TIRE.	Is the tire worn excessively?	Replace the tire.	Go to step 4.
4	CHECK TIRE AIR PRESSURE.	Is the tire pressure correct?	Go to step 5.	Adjust the tire pressure.
5	CHECK INSTALLATION OF ABS WHEEL SPEED SENSOR.	Is the ABS wheel speed sensor installation bolt tightened to 33±10 N·m (3.3±1.0 kgf-m, 24±7 ft-lb)?	Go to step 6.	Tighten the ABS wheel speed sensor installation bolts.
6	CHECK ABS WHEEL SPEED SENSOR CLEARANCE. Measure the clearance between the tone wheel and protrusion around the wheel.	Is the clearance within the following? Front wheel: 0.3 — 0.8 mm (0.012 — 0.031 in); Rear wheel: 0.7 — 1.2 mm (0.0276 — 0.0472 in)	Go to step 7.	Adjust the clearance. NOTE: Adjust the gap using spacers (Part No. 26755AA000). If spacers cannot correct the gap, replace the worn sensor or worn tone wheel.
7	CHECK WITH AN OSCILLOSCOPE.	Is an oscilloscope available?	Go to step 8.	Go to step 9.
8	CHECK ABS WHEEL SPEED SENSOR SIGNAL. 1) Jack up the vehicle until all four wheels are off the ground. 2) Turn the ignition switch to OFF. 3) Remove the VDCCM connector cover. <Ref. to VDC(diag)-18, REMOVAL, VDCCM Connector Cover.> 4) Connect the oscilloscope to the connector. 5) Turn the ignition switch to ON. 6) Start the wheel, and measure the voltage at the specified frequency. NOTE: When this inspection is completed, VDCCM may record DTC 29. Connector & terminal (B310) No. 14 (+) — No. 13 (-) (Front RH): (B310) No. 21 (+) — No. 19 (-) (Front LH): (B310) No. 18 (+) — No. 17 (-) (Rear RH): (B310) No. 16 (+) — No. 15 (-) (Rear LH):	Is the oscilloscope pattern the same waveform as shown in the figure? <Ref. to ABS-16, OUTPUT VOLTAGE, INSPECTION, Front ABS Wheel Speed Sensor.>	Go to step 12.	Go to step 9.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

	Step	Check	Yes	No
9	CHECK CONTAMINATION OF ABS WHEEL SPEED SENSOR OR TONE WHEEL. Remove the disc rotor from the hub.	Is the ABS wheel speed sensor piece or the tone wheel contaminated by dirt or other foreign matter?	Thoroughly remove dirt or other foreign matter.	Go to step 10.
10	CHECK DAMAGE OF ABS WHEEL SPEED SENSOR OR TONE WHEEL.	Is there breakage or damage in the protrusion of the ABS wheel speed sensor or the tone wheel?	Replace the ABS wheel speed sensor or tone wheel. Front: <Ref. to VDC-28, Front ABS Wheel Speed Sensor.> and <Ref. to VDC-30, Front Tone Wheel.> Rear: <Ref. to VDC-29, Rear ABS Wheel Speed Sensor.> and <Ref. to VDC-31, Rear Tone Wheel.>	Go to step 11.
11	CHECK TONE WHEEL RUNOUT. Measure the tone wheel runout.	Is the runout less than 0.05 mm (0.0020 in)?	Go to step 12.	Repair the tone wheel. Front: <Ref. to VDC-30, Front Tone Wheel.> Rear: <Ref. to VDC-31, Rear Tone Wheel.>
12	CHECK VDCCM. 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the Inspection Mode. 5) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 13.
13	CHECK ANY OTHER DTC ON DISPLAY.	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs. NOTE: The ABS warning light will remain lit until the vehicle reaches approximately 12 km/h (7.46 MPH) even if the memory is cleared. This is normal.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

N: DTC 31 FRONT SOLENOID RIGHT INLET VALVE MALFUNCTION

NOTE:

Refer to DTC 62 for the diagnostic procedure. <Ref. to VDC(diag)-59, DTC 62 PRIMARY CUT SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

O: DTC 33 FRONT LEFT INLET SOLENOID VALVE MALFUNCTION

NOTE:

Refer to DTC 62 for the diagnostic procedure. <Ref. to VDC(diag)-59, DTC 62 PRIMARY CUT SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

P: DTC 35 REAR RIGHT INLET SOLENOID VALVE MALFUNCTION

NOTE:

Refer to DTC 62 for the diagnostic procedure. <Ref. to VDC(diag)-59, DTC 62 PRIMARY CUT SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Q: DTC 37 REAR LEFT INLET SOLENOID VALVE MALFUNCTION

NOTE:

Refer to DTC 62 for the diagnostic procedure. <Ref. to VDC(diag)-59, DTC 62 PRIMARY CUT SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

R: DTC 61 SECONDARY CUT SOLENOID VALVE MALFUNCTION

NOTE:

Refer to DTC 62 for the diagnostic procedure. <Ref. to VDC(diag)-59, DTC 62 PRIMARY CUT SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

S: DTC 62 PRIMARY CUT SOLENOID VALVE MALFUNCTION

DTC DETECTING CONDITION:

- Defective harness connector
- Defective VDCH/U solenoid valve

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD does not operate.

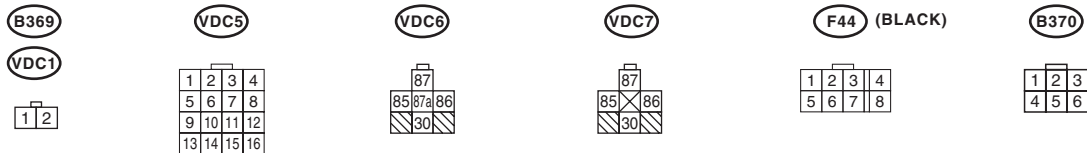
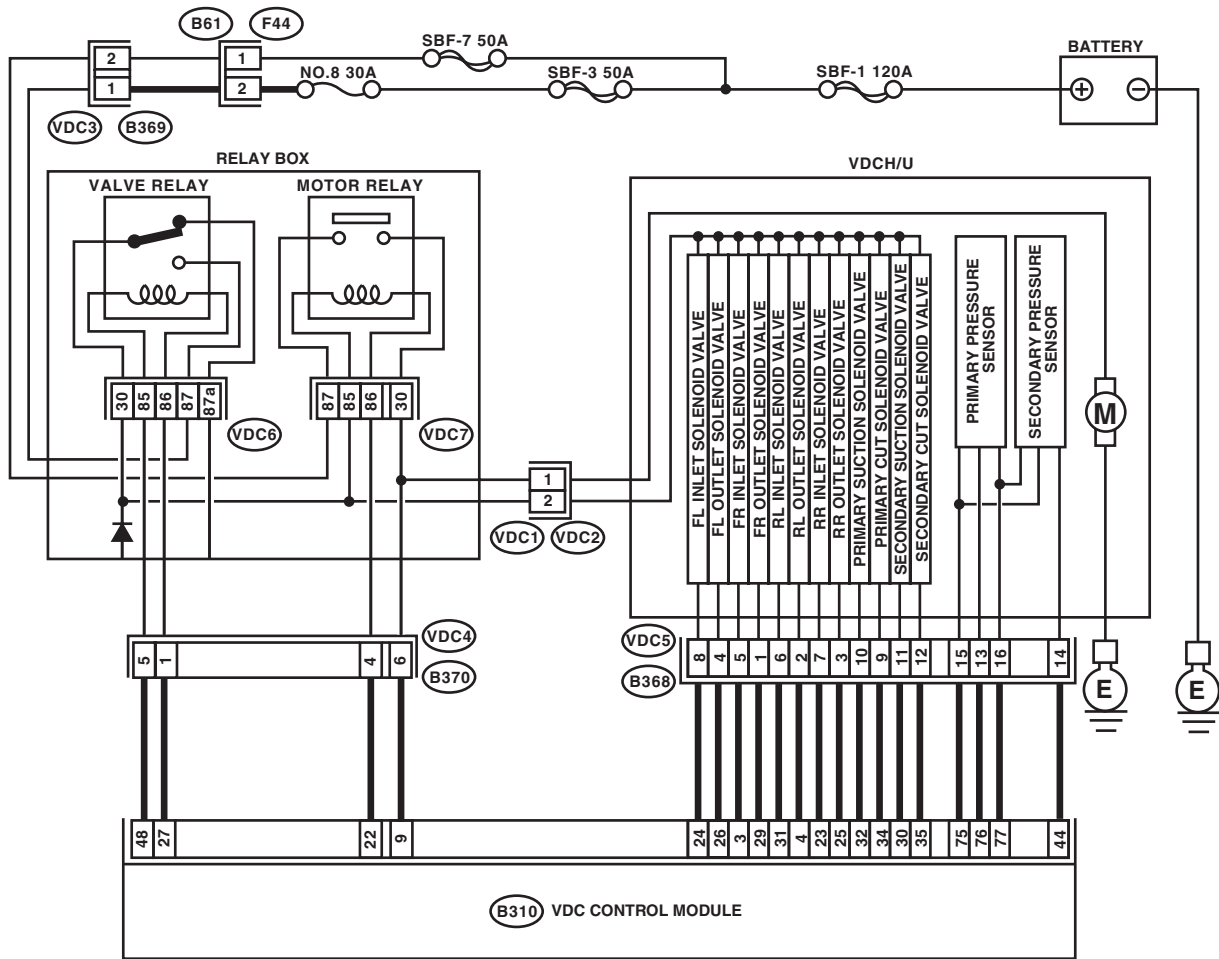
NOTE:

At this time, the brake warning light illuminates as well as the VDC and ABS warning light.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

WIRING DIAGRAM:



(B310)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83

VDC00491

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK RESISTANCE OF SOLENOID VALVE.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the two connectors (VDC1, F91) from VDCH/U.</p> <p>3) Measure the resistance between VDCH/U connector terminals.</p> <p>Connector & terminal</p> <p>DTC 31 (VDC5) No. 5 — (VDC2) No. 2:</p> <p>DTC 33 (VDC5) No. 8 — (VDC2) No. 2:</p> <p>DTC 35 (VDC5) No. 7 — (VDC2) No. 2:</p> <p>DTC 37 (VDC5) No. 6 — (VDC2) No. 2:</p> <p>DTC 61 (VDC5) No. 9 — (VDC2) No. 2:</p> <p>DTC 62 (VDC5) No. 12 — (VDC2) No. 2:</p>	Is the resistance between 8.04 — 9.04 Ω?	Go to step 2.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>
2	<p>CHECK SOLENOID VALVE GROUND SHORT.</p> <p>Measure the resistance between VDCH/U connector and chassis ground.</p> <p>Connector & terminal</p> <p>DTC 31 (VDC5) No. 5 — Chassis ground:</p> <p>DTC 33 (VDC5) No. 8 — Chassis ground:</p> <p>DTC 35 (VDC5) No. 7 — Chassis ground:</p> <p>DTC 37 (VDC5) No. 6 — Chassis ground:</p> <p>DTC 61 (VDC5) No. 9 — Chassis ground:</p> <p>DTC 62 (VDC5) No. 12 — Chassis ground:</p>	Is the resistance 1 MΩ or more?	Go to step 3.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>
3	<p>CHECK SOLENOID VALVE BATTERY SHORT.</p> <p>1) Disconnect the connector from VDCCM.</p> <p>2) Measure the voltage between VDCH/U connector and chassis ground.</p> <p>Connector & terminal</p> <p>DTC 31 (VDC5) No. 5 (+) — Chassis ground (-):</p> <p>DTC 33 (VDC5) No. 8 (+) — Chassis ground (-):</p> <p>DTC 35 (VDC5) No. 7 (+) — Chassis ground (-):</p> <p>DTC 37 (VDC5) No. 6 (+) — Chassis ground (-):</p> <p>DTC 61 (VDC5) No. 9 (+) — Chassis ground (-):</p> <p>DTC 62 (VDC5) No. 12 (+) — Chassis ground (-):</p>	Is the voltage less than 1 V?	Go to step 4.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
<p>4</p> <p>CHECK SOLENOID VALVE BATTERY SHORT.</p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between VDCH/U connector and chassis ground.</p> <p>Connector & terminal</p> <p>DTC 31 (VDC5) No. 5 (+) — Chassis ground (-):</p> <p>DTC 33 (VDC5) No. 8 (+) — Chassis ground (-):</p> <p>DTC 35 (VDC5) No. 7 (+) — Chassis ground (-):</p> <p>DTC 37 (VDC5) No. 6 (+) — Chassis ground (-):</p> <p>DTC 61 (VDC5) No. 9 (+) — Chassis ground (-):</p> <p>DTC 62 (VDC5) No. 12 (+) — Chassis ground (-):</p>	Is the voltage less than 1 V?	Go to step 5.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>
<p>5</p> <p>CHECK BATTERY SHORT OF HARNESS.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Measure the voltage between VDCCM connector and chassis ground.</p> <p>Connector & terminal</p> <p>DTC 31 (B310) No. 3 (+) — Chassis ground (-):</p> <p>DTC 33 (B310) No. 24 (+) — Chassis ground (-):</p> <p>DTC 35 (B310) No. 23 (+) — Chassis ground (-):</p> <p>DTC 37 (B310) No. 31 (+) — Chassis ground (-):</p> <p>DTC 61 (B310) No. 34 (+) — Chassis ground (-):</p> <p>DTC 62 (B310) No. 35 (+) — Chassis ground (-):</p>	Is the voltage less than 1 V?	Go to step 6.	Repair the harness between VDCCM and VDCH/U.
<p>6</p> <p>CHECK BATTERY SHORT OF HARNESS.</p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between VDCCM connector and chassis ground.</p> <p>Connector & terminal</p> <p>DTC 31 (B310) No. 3 (+) — Chassis ground (-):</p> <p>DTC 33 (B310) No. 24 (+) — Chassis ground (-):</p> <p>DTC 35 (B310) No. 23 (+) — Chassis ground (-):</p> <p>DTC 37 (B310) No. 31 (+) — Chassis ground (-):</p> <p>DTC 61 (B310) No. 34 (+) — Chassis ground (-):</p> <p>DTC 62 (B310) No. 35 (+) — Chassis ground (-):</p>	Is the voltage less than 1 V?	Go to step 7.	Repair the harness between VDCCM and VDCH/U.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
<p>7 CHECK GROUND SHORT CIRCUIT OF HARNESS.</p> <p>1) Turn the ignition switch to OFF. 2) Measure the resistance between VDCCM connector and chassis ground.</p> <p>Connector & terminal</p> <p>DTC 31 (B310) No. 3 — Chassis ground:</p> <p>DTC 33 (B310) No. 24 — Chassis ground:</p> <p>DTC 35 (B310) No. 23 — Chassis ground:</p> <p>DTC 37 (B310) No. 31 — Chassis ground:</p> <p>DTC 61 (B310) No. 34 — Chassis ground:</p> <p>DTC 62 (B310) No. 35 — Chassis ground:</p>	<p>Is the resistance 1 MΩ or more?</p>	<p>Go to step 8.</p>	<p>Repair the harness between VDCCM and VDCH/U.</p>
<p>8 CHECK HARNESS CONNECTOR BETWEEN VDCCM AND VDCH/U.</p> <p>1) Connect the connectors (B368) to VDCH/U. 2) Measure the resistance between the VDCCM connector and VDCH/U connector.</p> <p>Connector & terminal</p> <p>DTC 31 (B310) No. 3 — (VDC2) No. 2:</p> <p>DTC 33 (B310) No. 24 — (VDC2) No. 2:</p> <p>DTC 35 (B310) No. 23 — (VDC2) No. 2:</p> <p>DTC 37 (B310) No. 31 — (VDC2) No. 2:</p> <p>DTC 61 (B310) No. 34 — (VDC2) No. 2:</p> <p>DTC 62 (B310) No. 35 — (VDC2) No. 2:</p>	<p>Is the resistance between 7 — 10 Ω?</p>	<p>Go to step 9.</p>	<p>Repair the connector between VDCCM and VDCH/U.</p>
<p>9 CHECK POOR CONTACT OF CONNECTOR.</p>	<p>Is there poor contact in connector between the VDCCM and VDCH/U?</p>	<p>Repair the connector.</p>	<p>Go to step 10.</p>
<p>10 CHECK THE VDCCM.</p> <p>1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.</p>	<p>Is the same DTC displayed again?</p>	<p>Repair the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).></p>	<p>Go to step 11.</p>
<p>11 CHECK ANY OTHER DTC ON DISPLAY.</p>	<p>Are other DTCs displayed?</p>	<p>Go to the diagnosis corresponding to the DTC.</p>	<p>Temporary poor contact occurs.</p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

T: DTC 32 FRONT RIGHT OUTLET SOLENOID VALVE MALFUNCTION

NOTE:

Refer to DTC 64 for the diagnostic procedure. <Ref. to VDC(diag)-65, DTC 64 PRIMARY SUCTION SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

U: DTC 34 FRONT LEFT OUTLET SOLENOID VALVE MALFUNCTION

NOTE:

Refer to DTC 64 for the diagnostic procedure. <Ref. to VDC(diag)-65, DTC 64 PRIMARY SUCTION SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

V: DTC 36 REAR RIGHT OUTLET SOLENOID VALVE MALFUNCTION

NOTE:

Refer to DTC 64 for the diagnostic procedure. <Ref. to VDC(diag)-65, DTC 64 PRIMARY SUCTION SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

W: DTC 38 REAR LEFT OUTLET SOLENOID VALVE MALFUNCTION

NOTE:

Refer to DTC 64 for the diagnostic procedure. <Ref. to VDC(diag)-65, DTC 64 PRIMARY SUCTION SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

X: DTC 63 SECONDARY SUCTION SOLENOID VALVE MALFUNCTION

NOTE:

Refer to DTC 64 for the diagnostic procedure. <Ref. to VDC(diag)-65, DTC 64 PRIMARY SUCTION SOLENOID VALVE MALFUNCTION, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Y: DTC 64 PRIMARY SUCTION SOLENOID VALVE MALFUNCTION

DTC DETECTING CONDITION:

- Defective harness connector
- Defective VDCH/U solenoid valve

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD does not operate.

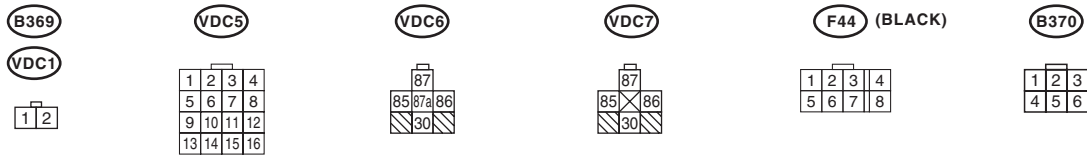
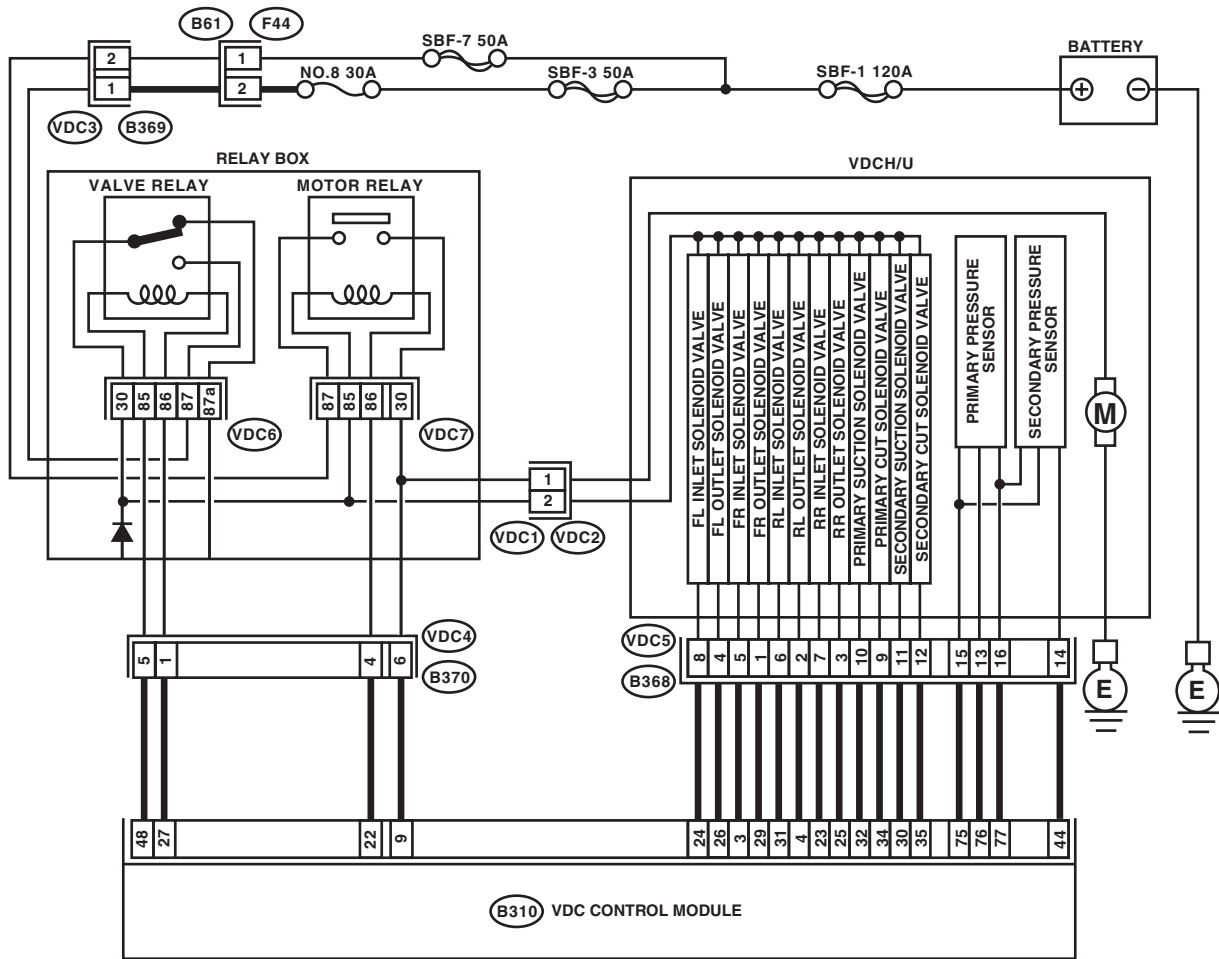
NOTE:

At this time, the brake warning light illuminates as well as the VDC and ABS warning light.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

WIRING DIAGRAM:



B310

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55		
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	

VDC00491

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK RESISTANCE OF SOLENOID VALVE.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect two connectors (VDC1, B368) from VDCH/U.</p> <p>3) Measure the resistance between VDCH/U connector terminals.</p> <p>Connector & terminal</p> <p>DTC 32 (VDC5) No. 1 — (VDC2) No. 2:</p> <p>DTC 34 (VDC5) No. 4 — (VDC2) No. 2:</p> <p>DTC 36 (VDC5) No. 3 — (VDC2) No. 2:</p> <p>DTC 38 (VDC5) No. 2 — (VDC2) No. 2:</p> <p>DTC 63 (VDC5) No. 10 — (VDC2) No. 2:</p> <p>DTC 64 (VDC5) No. 11 — (VDC2) No. 2:</p>	Is the resistance between 3.8 — 4.8 Ω?	Go to step 2.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>
2	<p>CHECK SOLENOID VALVE GROUND SHORT.</p> <p>Measure the resistance between VDCH/U connector and chassis ground.</p> <p>Connector & terminal</p> <p>DTC 32 (VDC5) No. 1 — Chassis ground:</p> <p>DTC 34 (VDC5) No. 4 — Chassis ground:</p> <p>DTC 36 (VDC5) No. 3 — Chassis ground:</p> <p>DTC 38 (VDC5) No. 2 — Chassis ground:</p> <p>DTC 63 (VDC5) No. 10 — Chassis ground:</p> <p>DTC 64 (VDC5) No. 11 — Chassis ground:</p>	Is the resistance 1 MΩ or more?	Go to step 3.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>
3	<p>CHECK SOLENOID VALVE BATTERY SHORT.</p> <p>1) Disconnect the connectors from VDCCM.</p> <p>2) Measure the voltage between VDCH/U connector and chassis ground.</p> <p>Connector & terminal</p> <p>DTC 32 (VDC5) No. 1 (+) — Chassis ground (-):</p> <p>DTC 34 (VDC5) No. 4 (+) — Chassis ground (-):</p> <p>DTC 36 (VDC5) No. 3 (+) — Chassis ground (-):</p> <p>DTC 38 (VDC5) No. 2 (+) — Chassis ground (-):</p> <p>DTC 63 (VDC5) No. 10 (+) — Chassis ground (-):</p> <p>DTC 64 (VDC5) No. 11 (+) — Chassis ground (-):</p>	Is the voltage less than 1 V?	Go to step 4.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
<p>4</p> <p>CHECK SOLENOID VALVE BATTERY SHORT.</p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between VDCH/U connector and chassis ground.</p> <p>Connector & terminal</p> <p>DTC 32 (VDC5) No. 1 (+) — Chassis ground (-):</p> <p>DTC 34 (VDC5) No. 4 (+) — Chassis ground (-):</p> <p>DTC 36 (VDC5) No. 3 (+) — Chassis ground (-):</p> <p>DTC 38 (VDC5) No. 2 (+) — Chassis ground (-):</p> <p>DTC 63 (VDC5) No. 10 (+) — Chassis ground (-):</p> <p>DTC 64 (VDC5) No. 11 (+) — Chassis ground (-):</p>	Is the voltage less than 1 V?	Go to step 5.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>
<p>5</p> <p>CHECK BATTERY SHORT OF HARNESS.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Measure the voltage between VDCCM connector and chassis ground.</p> <p>Connector & terminal</p> <p>DTC 32 (B310) No. 29 (+) — Chassis ground (-):</p> <p>DTC 34 (B310) No. 26 (+) — Chassis ground (-):</p> <p>DTC 36 (B310) No. 25 (+) — Chassis ground (-):</p> <p>DTC 38 (B310) No. 4 (+) — Chassis ground (-):</p> <p>DTC 63 (B310) No. 32 (+) — Chassis ground (-):</p> <p>DTC 64 (B310) No. 30 (+) — Chassis ground (-):</p>	Is the voltage less than 1 V?	Go to step 6.	Repair the harness between VDCCM and VDCH/U.
<p>6</p> <p>CHECK BATTERY SHORT OF HARNESS.</p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between VDCCM connector and chassis ground.</p> <p>Connector & terminal</p> <p>DTC 32 (B310) No. 29 (+) — Chassis ground (-):</p> <p>DTC 34 (B310) No. 26 (+) — Chassis ground (-):</p> <p>DTC 36 (B310) No. 25 (+) — Chassis ground (-):</p> <p>DTC 38 (B310) No. 4 (+) — Chassis ground (-):</p> <p>DTC 63 (B310) No. 32 (+) — Chassis ground (-):</p> <p>DTC 64 (B310) No. 30 (+) — Chassis ground (-):</p>	Is the voltage less than 1 V?	Go to step 7.	Repair the harness between VDCCM and VDCH/U.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
<p>7 CHECK GROUND SHORT OF HARNESS. 1) Turn the ignition switch to OFF. 2) Measure the resistance between VDCCM connector and chassis ground. Connector & terminal DTC 32 (B310) No. 29 — Chassis ground: DTC 34 (B310) No. 26 — Chassis ground: DTC 36 (B310) No. 25 — Chassis ground: DTC 38 (B310) No. 4 — Chassis ground: DTC 63 (B310) No. 32 — Chassis ground: DTC 64 (B310) No. 30 — Chassis ground:</p>	<p>Is the resistance 1 MΩ or more?</p>	<p>Go to step 8.</p>	<p>Repair the harness between VDCCM and VDCH/U.</p>
<p>8 CHECK HARNESS CONNECTOR BETWEEN VDCCM AND VDCH/U. 1) Connect the connectors (B368) to VDCH/U. 2) Measure the resistance between the VDCCM connector and VDCH/U connector. Connector & terminal DTC 32 (B310) No. 29 — (VDC2) No. 1: DTC 34 (B310) No. 26 — (VDC2) No. 1: DTC 36 (B310) No. 25 — (VDC2) No. 1: DTC 38 (B310) No. 4 — (VDC2) No. 1: DTC 63 (B310) No. 32 — (VDC2) No. 1: DTC 64 (B310) No. 30 — (VDC2) No. 1:</p>	<p>Is the resistance between 4 — 6 Ω?</p>	<p>Go to step 9.</p>	<p>Repair the harness connector between VDCCM and VDCH/U.</p>
<p>9 CHECK POOR CONTACT OF CONNECTOR.</p>	<p>Is there poor contact in connector between the VDCCM and VDCH/U?</p>	<p>Repair the connector.</p>	<p>Go to step 10.</p>
<p>10 CHECK THE VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.</p>	<p>Is the same DTC displayed again?</p>	<p>Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).></p>	<p>Go to step 11.</p>
<p>11 CHECK ANY OTHER DTC ON DISPLAY.</p>	<p>Are other DTCs displayed?</p>	<p>Go to the diagnosis corresponding to the DTC.</p>	<p>Temporary poor contact occurs.</p>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Z: DTC 41 ECM

DTC DETECTING CONDITION:

VDCCM malfunction

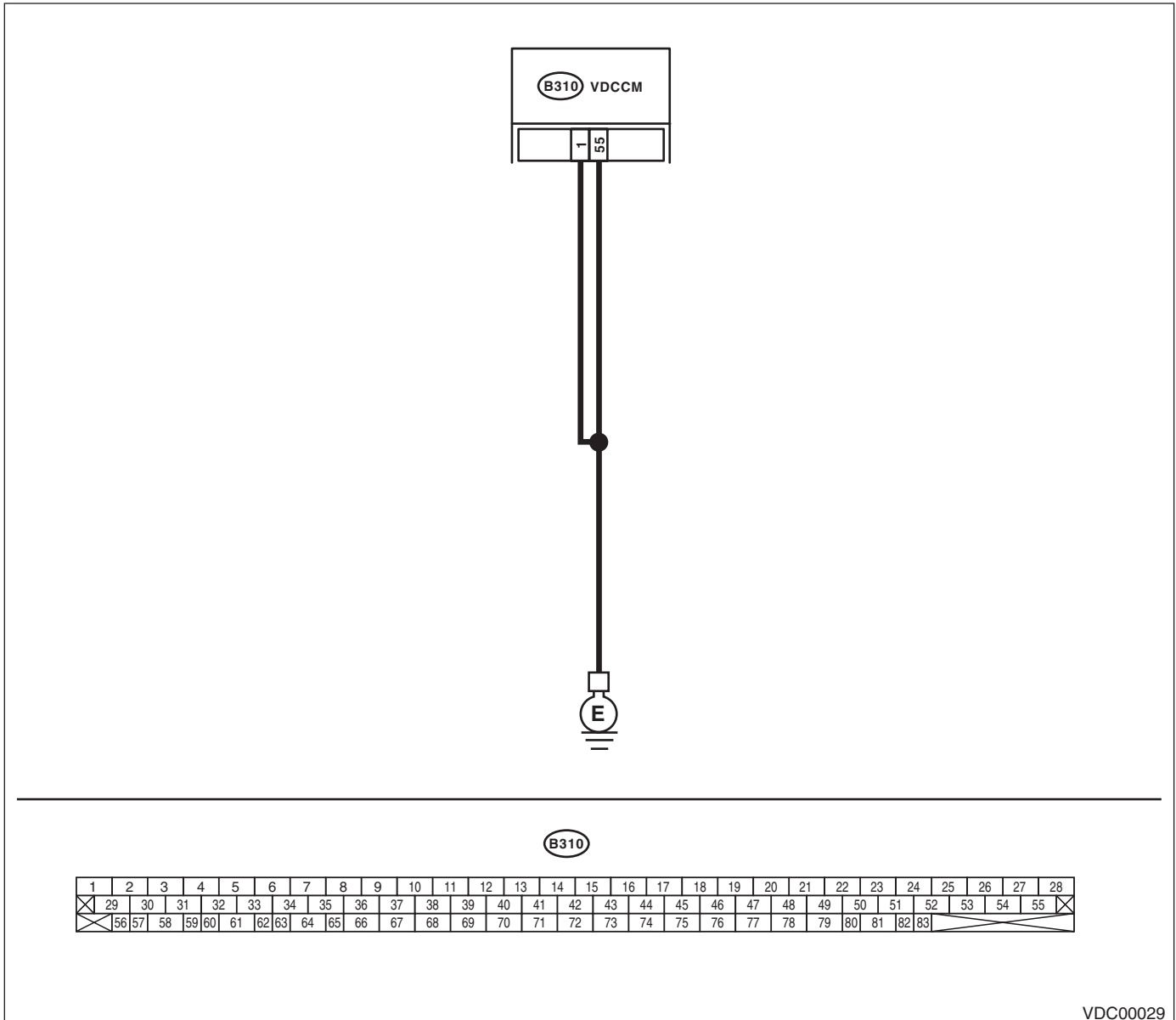
TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD does not operate.

NOTE:

At this time, the brake warning light illuminates as well as the VDC and ABS warning light.

WIRING DIAGRAM:



VDC00029

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK GROUND CIRCUIT OF VDCCM. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Measure the resistance between VDCCM and chassis ground. Connector & terminal (B310) No. 1 — Chassis ground: (B310) No. 55 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 2.	Repair the VDCCM ground harness.
2	CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact of the connectors between the battery, ignition switch and VDCCM?	Repair the connector.	Go to step 3.
3	CHECK CAUSE OF SIGNAL NOISE.	Are the radio wave devices and electric components installed correctly?	Go to step 4.	Install the radio wave devices and electric components properly.
4	CHECK CAUSE OF SIGNAL NOISE.	Are causes of the noise (such as an antenna) installed near the sensor harness?	Install the noise sources away from the sensor harness.	Go to step 5.
5	CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 6.
6	CHECK ANY OTHER DTC ON DISPLAY.	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AA:DTC 42 POWER VOLTAGE MALFUNCTION

DTC DETECTING CONDITION:

- Power voltage for VDCCM is low.
- VDCCM voltage is too high. (Warning lights go off if voltage returns.)

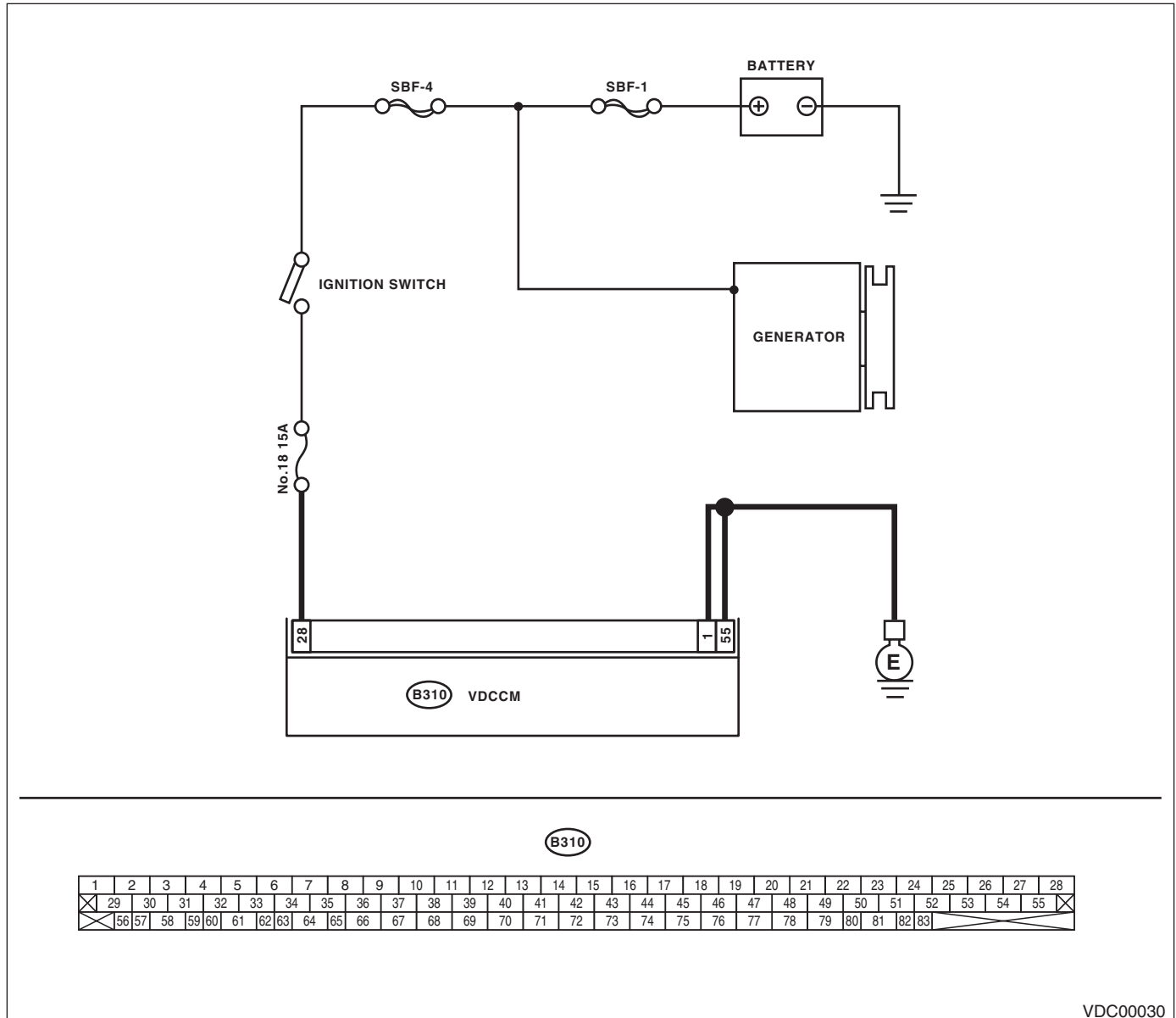
TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD does not operate. (When the voltage is excessively low or high)

NOTE:

At this time, the brake warning light illuminates as well as the VDC and ABS warning light.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK GENERATOR. 1) Start the engine. 2) Run the engine at idle after warming up. 3) Measure the voltage between generator terminal B and chassis ground. Terminals Generator B terminal — Chassis ground:	Is the voltage 10 — 15 V?	Go to step 2.	Repair the generator.
2	CHECK BATTERY TERMINAL. Turn the ignition switch to OFF.	Are the positive and negative battery terminals clamped tightly?	Go to step 3.	Tighten the clamp of terminal.
3	CHECK VDCCM INPUT VOLTAGE. 1) Disconnect the connectors from VDCCM. 2) Run the engine at idle. 3) Measure the voltage between VDCCM connector and chassis ground. Connector & terminal (B310) No. 28 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 4.	Repair the harness connectors between the battery, ignition switch and VDCCM.
4	CHECK GROUND CIRCUIT OF VDCCM. 1) Turn the ignition switch to OFF. 2) Measure the resistance between VDCCM and chassis ground. Connector & terminal (B310) No. 1 — Chassis ground: (B310) No. 55 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 5.	Repair the VDCCM ground harness.
5	CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact in connectors between generator, battery and VDCCM?	Repair the connector.	Go to step 6.
6	CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 7.
7	CHECK ANY OTHER DTC ON DISPLAY.	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AB:DTC 44 TCM COMMUNICATION CIRCUIT

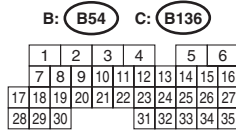
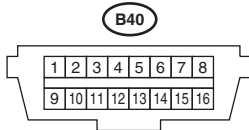
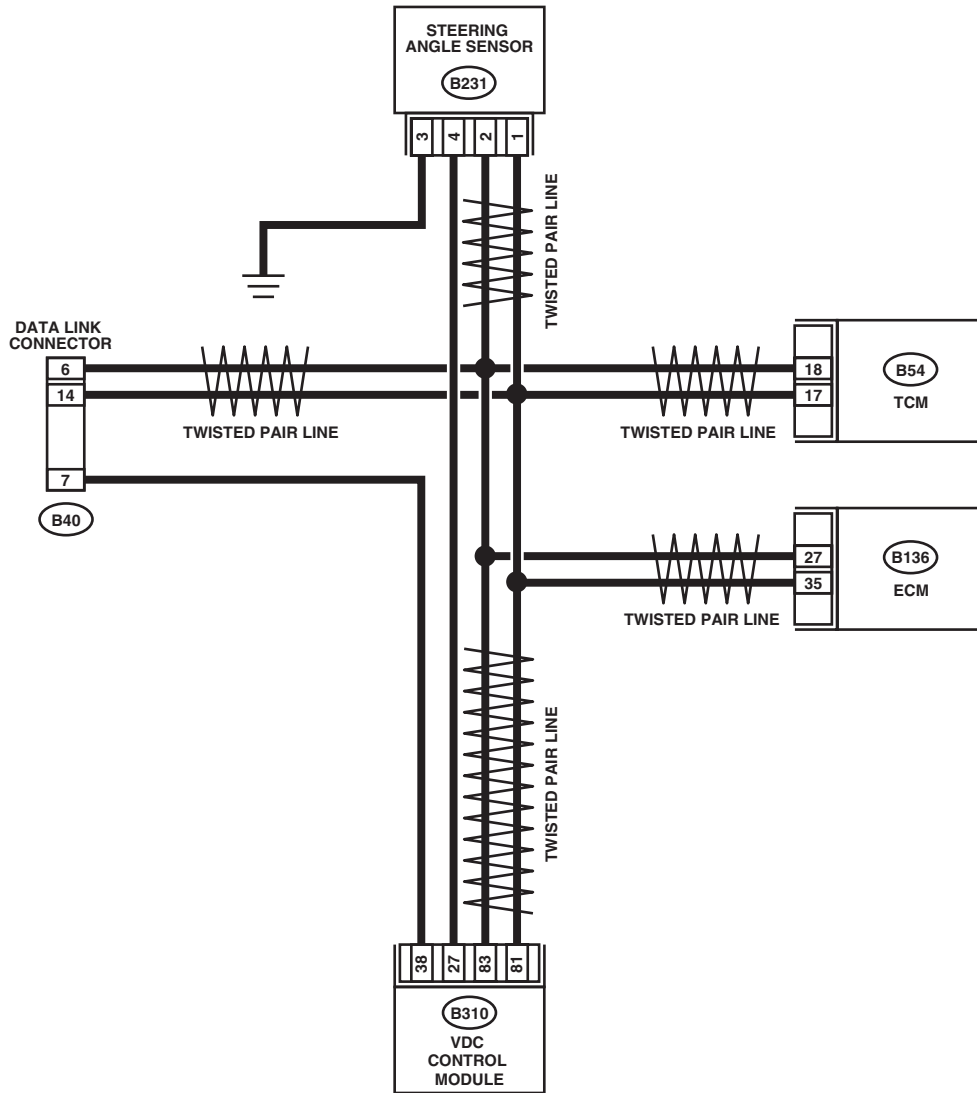
DTC DETECTING CONDITION:

TCM communication malfunction

TROUBLE SYMPTOM:

- VDC does not operate.
- ABS does not operate.

WIRING DIAGRAM:



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55		
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	

VDC00492

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK HARNESS RESISTANCE. 1) Turn the ignition switch to OFF. 2) Disconnect the two connectors from the TCM. 3) Measure the resistance between TCM connector terminals. Connector & terminal (B55) No. 18 — No. 17:	Is the resistance $60 \pm 3 \Omega$?	Go to step 2.	Repair the harness between TCM and VDCCM.
2	CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact in TCM connector?	Repair the connector.	Go to step 3.
3	CHECK TCM. 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the Inspection Mode. 5) Read the DTC.	Is the same DTC displayed again?	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>	Go to step 4.
4	CHECK ANY OTHER DTC ON DISPLAY.	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AC:DTC 45 INCORRECT VDC CONTROL MODULE SPECIFICATIONS

DTC DETECTING CONDITION:

Different control module specification

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

Step	Check	Yes	No	
1	CHECK THE VDCCM SPECIFICATION. Check the VDCCM identification mark.	Do the VDCCM identification mark and vehicle specification match?	Go to step 2.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
2	CHECK TCM SPECIFICATION. Check the TCM identification mark.	Do the TCM identification mark and vehicle specification match?	Go to step 3.	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>
3	CHECK TCM. 1) Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).> 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed again?	Go to step 4.	Defect exists in original TCM.
4	CHECK TCM.	In the current diagnosis, is the same DTC displayed again?	Go to the diagnosis corresponding to the DTC.	Go to step 5.
5	CHECK VDCCM. 1) Install the original TCM. 2) Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).> 3) Erase the memory. 4) Perform the Inspection Mode. 5) Read the DTC.	Is the same DTC displayed again?	Go to step 6.	Defect exists in original VDCCM.
6	CHECK VDCCM.	Is the same DTC as current diagnosis still displayed?	Replace the TCM. <Ref. to 4AT-61, Transmission Control Module (TCM).>	Proceed with the diagnosis corresponding to the DTC.

AD:DTC 45 TCM MALFUNCTION

DTC DETECTING CONDITION:

TCM or VDCCM malfunction

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

Step	Check	Yes	No	
1	CHECK AT SYSTEM. 1) Start the engine. 2) Check the DTC in AT system.	Is the DTC of AT system stored in memory?	Repair the AT system.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AE:DTC 46 ABNORMAL VOLTAGE OF 5V POWER SUPPLY

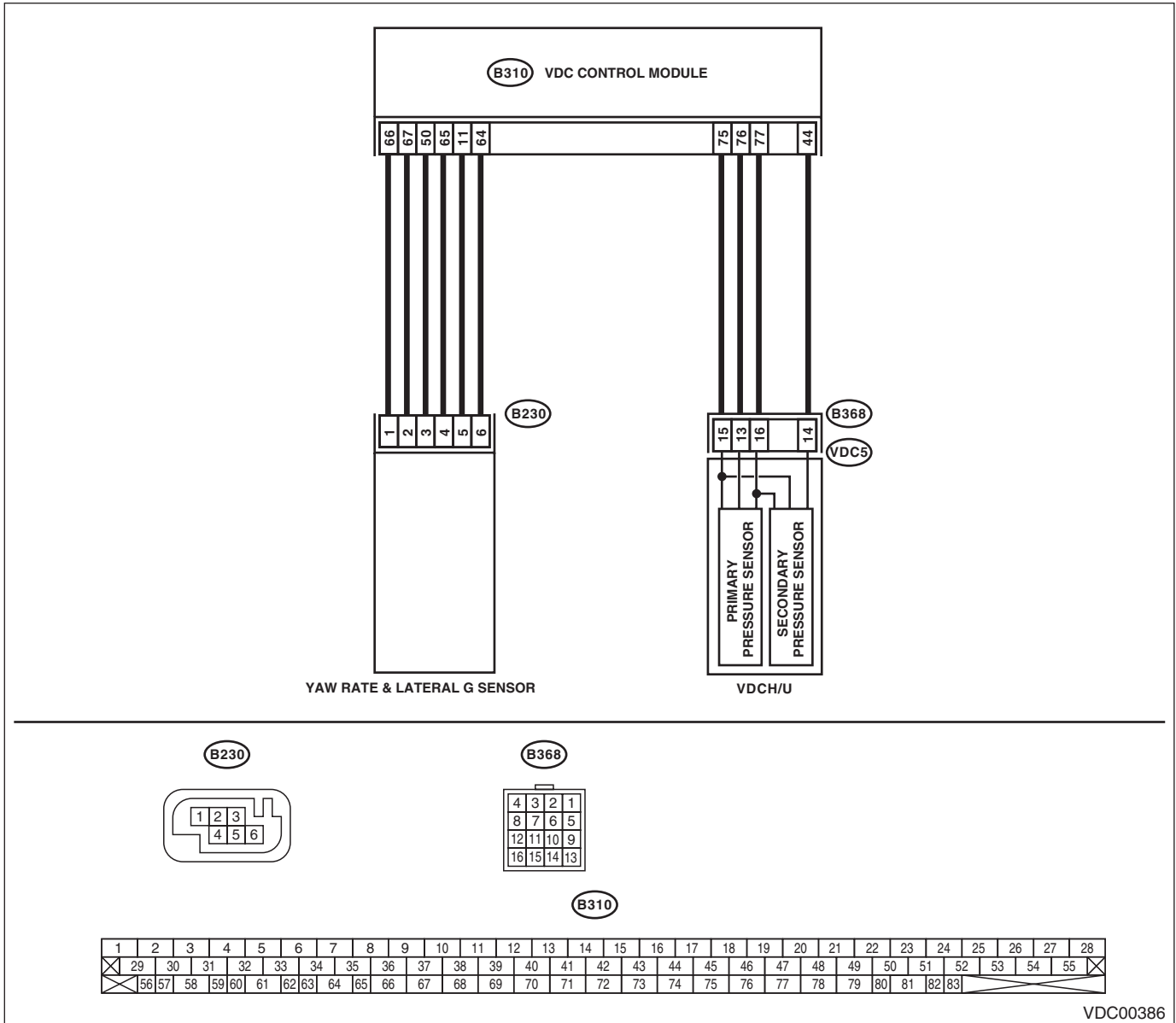
DTC DETECTING CONDITION:

5 V power supply voltage malfunction

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00386

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK GROUND SHORT IN SENSOR AND HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Measure the resistance between VDCCM connector and chassis ground. Connector & terminal (B310) No. 50 — Chassis ground (lateral G sensor): (B310) No. 77 — Chassis ground (pressure sensor):	Is the resistance 1 MΩ or more?	Go to step 3.	Go to step 2.
2 CHECK GROUND SHORT CIRCUIT OF HARNESS. 1) Disconnect the connector from the defective sensor. 2) Measure the resistance between VDCCM and chassis ground. Connector & terminal (B310) No. 50 — Chassis ground (lateral G sensor): (B310) No. 77 — Chassis ground (pressure sensor):	Is the resistance 1 MΩ or more?	Replace the defective sensor.	Repair or replace the harness connector between VDCCM and the defective sensor.
3 CHECK BATTERY SHORT IN SENSOR AND HARNESS. Measure the voltage between VDCCM and chassis ground. Connector & terminal (B310) No. 50 (+) — Chassis ground (-) (lateral G sensor): (B310) No. 77 (+) — Chassis ground (-) (pressure sensor):	Is the voltage less than 0.5 V?	Go to step 4.	Go to step 5.
4 CHECK BATTERY SHORT IN SENSOR AND HARNESS. 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM connector and chassis ground. Connector & terminal (B310) No. 50 (+) — Chassis ground (-) (lateral G sensor): (B310) No. 77 (+) — Chassis ground (-) (pressure sensor):	Is the voltage less than 0.5 V?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 5.
5 CHECK BATTERY SHORT OF HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the defective sensor. 3) Measure the voltage between VDCCM and chassis ground. Connector & terminal (B310) No. 50 (+) — Chassis ground (-) (lateral G sensor): (B310) No. 77 (+) — Chassis ground (-) (pressure sensor):	Is the voltage less than 0.5 V?	Go to step 6.	Repair or replace the harness connector between VDCCM and the defective sensor.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

	Step	Check	Yes	No
6 CHECK BATTERY SHORT OF HARNESS. 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM and chassis ground. Connector & terminal (B310) No. 50 (+) — Chassis ground (-) (lateral G sensor): (B310) No. 77 (+) — Chassis ground (-) (pressure sensor):		Is the voltage less than 0.5 V?	Replace the defective sensor.	Repair or replace the harness connector between VDCCM and the defective sensor.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AF:DTC 47 CAN COMMUNICATION

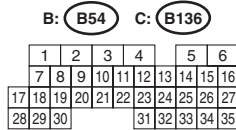
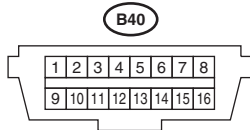
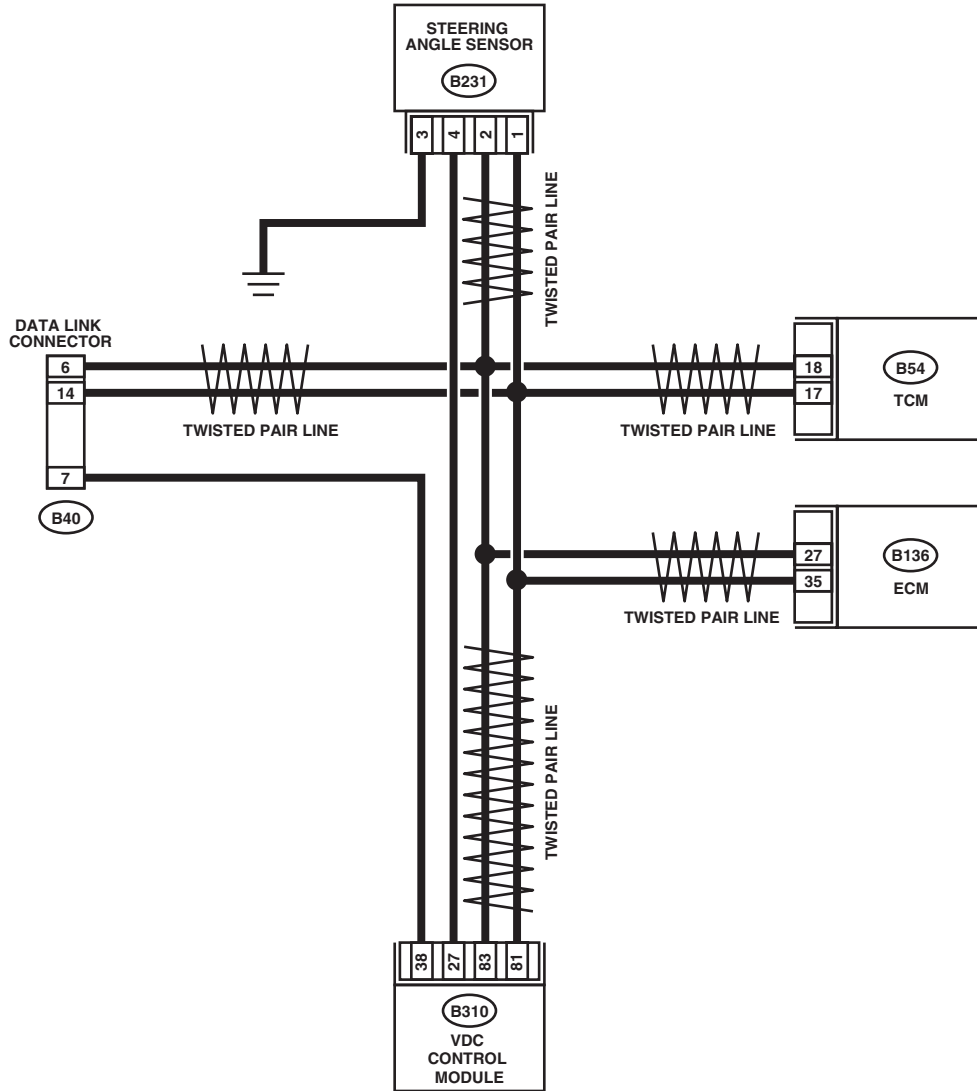
DTC DETECTING CONDITION:

CAN communication line is damaged or circuit is shorted.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55		
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	

VDC00492

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN VDCCM, STEERING ANGLE SENSOR AND TCM. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the VDCCM, TCM, ECM and the steering angle sensor. 3) Measure the resistance between the VDCCM, TCM, ECM and the steering angle sensor. <i>Connector & terminal</i> (B310) No. 83 — (B55) No. 18: (B310) No. 81 — (B55) No. 17: (B310) No. 83 — (B231) No. 2: (B310) No. 81 — (B231) No. 1: (B310) No. 83 — (B136) No. 27: (B310) No. 81 — (B136) No. 35:	Is the resistance less than 0.5 Ω?	Go to step 4.	Go to step 2.
2 CHECK HARNESS BETWEEN STEERING ANGLE SENSOR AND TCM. Measure the resistance between TCM and the steering angle sensor. <i>Connector & terminal</i> (B54) No. 18 — (B231) No. 2: (B54) No. 17 — (B231) No. 1:	Is the resistance less than 0.5 Ω?	Go to step 3.	Repair or replace the harness connector between the TCM and the steering angle sensor.
3 CHECK HARNESS BETWEEN STEERING ANGLE SENSOR AND ECM. Measure the resistance between ECM and the steering angle sensor. <i>Connector & terminal</i> (B231) No. 2 — (B136) No. 27: (B231) No. 1 — (B136) No. 35:	Is the resistance less than 0.5 Ω?	Repair or replace the harness connector between the VDCCM and ECM.	Repair or replace the harness connector between the steering angle sensor and ECM.
4 CHECK GROUND SHORT CIRCUIT OF HARNESS. Measure the resistance between VDCCM and chassis ground. <i>Connector & terminal</i> (B310) No. 83 — Chassis ground: (B310) No. 81 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 5.	Repair or replace the harness connectors between the VDCCM, TCM, ECM and the steering angle sensor.
5 CHECK BATTERY SHORT OF HARNESS. Measure the voltage between VDCCM and chassis ground. <i>Connector & terminal</i> (B310) No. 83 (+) — Chassis ground (-): (B310) No. 81 (+) — Chassis ground (-):	Is the voltage less than 0.5 V?	Go to step 6.	Repair or replace the harness connectors between the VDCCM, TCM, ECM and the steering angle sensor.
6 CHECK BATTERY SHORT OF HARNESS. 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM and chassis ground. <i>Connector & terminal</i> (B310) No. 83 (+) — Chassis ground (-): (B310) No. 81 (+) — Chassis ground (-):	Is the voltage less than 0.5 V?	Go to step 7.	Repair or replace the harness connectors between the VDCCM, TCM, ECM and the steering angle sensor.
7 CHECK STEERING ANGLE SENSOR. 1) Turn the ignition switch to OFF. 2) Connect the connector to the steering angle sensor. 3) Measure the resistance between the VDCCM connector terminals. <i>Connector & terminal</i> (B310) No. 83 — No. 81:	Is the resistance 120±6 Ω?	Go to step 9.	Go to step 8.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No	
8	CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact in steering angle sensor?	Repair or replace the steering angle sensor connector.	Replace the steering angle sensor.
9	CHECK VDCCM. 1) Connect the connector to VDCCM. 2) Disconnect the connector from steering angle sensor. 3) Measure the resistance between connector terminals of the steering angle sensor. Connector & terminal (B231) No. 1 — No. 2:	Is the resistance 1 M Ω or more?	Go to step 11.	Go to step 10.
10	CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact in the VDCCM?	Repair or replace the VDCCM connector.	Replace the VDCCM.
11	CHECK TCM. 1) Connect the connector to TCM. 2) Disconnect the connectors from VDCCM. 3) Measure the resistance between the steering angle sensor terminals. Connector & terminal (B231) No. 1 — No. 2:	Is the resistance 1 M Ω or more?	Go to step 13.	Go to step 12.
12	CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact in the TCM?	Repair or replace the TCM connector.	Replace the TCM.
13	CHECK ECM. 1) Connect the connector to ECM. 2) Disconnect the connector from TCM. 3) Measure the resistance between the steering angle sensor terminals. Connector & terminal (B231) No. 1 — No. 2:	Is the resistance 120 \pm 6 Ω ?	Go to step 15.	Go to step 14.
14	CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact in ECM?	Repair or replace the ECM connector.	Replace the ECM.
15	CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Are other DTCs displayed?	Go to step 16.	Temporary poor contact occurs.
16	CHECK ANY OTHER DTC ON DISPLAY.	Is the same DTC displayed again?	Go to step 17.	Go to the diagnosis corresponding to the DTC.
17	CHECK AT SYSTEM DTC DISPLAY.	Is the DTC P1718 of the AT system displayed?	Replace the steering angle sensor.	Replace the VDCCM.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AG:DTC 51 VALVE RELAY OFF MALFUNCTION/ VALVE RELAY TEST MALFUNCTION

DTC DETECTING CONDITION:

Defective valve relay

NOTE:

When the DTC 74 check is executed, DTC 51 is stored, but this does not indicate an error in the valve relay.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.
- EBD does not operate. (Depends on the content of the malfunction.)

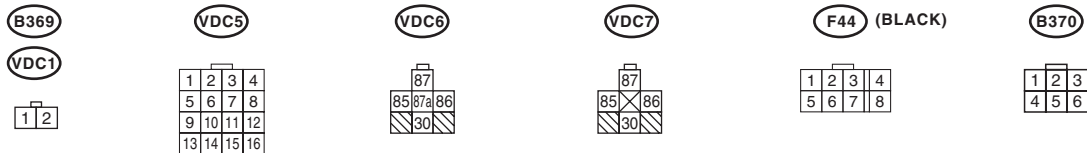
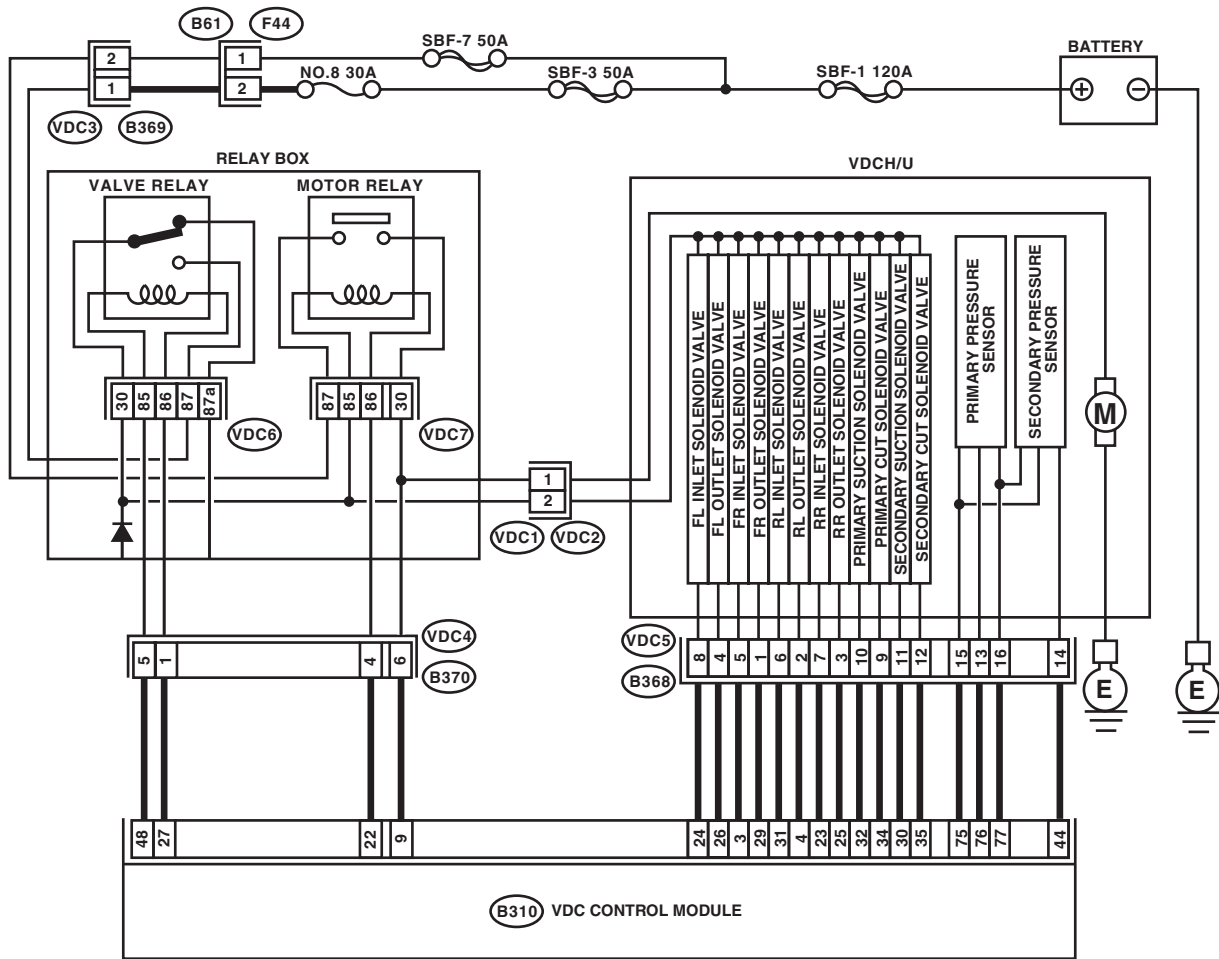
NOTE:

At this time, the brake warning light illuminates as well as the VDC and ABS warning light.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

WIRING DIAGRAM:



B310

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83

VDC00491

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK RESISTANCE OF VALVE RELAY.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Remove the valve relay from the relay box.</p> <p>3) Measure the resistance between valve relay terminals.</p> <p>Terminals No. 85 — No. 86:</p>	Is the resistance between 93 — 113 Ω ?	Go to step 2.	Replace the valve relay.
2	<p>CHECK CONTACT POINT OF VALVE RELAY.</p> <p>1) Connect the battery to the valve relay terminals No. 85 and No. 86.</p> <p>2) Measure the resistance between valve relay terminals.</p> <p>Terminals No. 30 — No. 87:</p>	Is the resistance less than 0.5 Ω ?	Go to step 3.	Replace the valve relay.
3	<p>CHECK CONTACT POINT OF VALVE RELAY.</p> <p>Measure the resistance between valve relay terminals.</p> <p>Terminals No. 30 — No. 87a:</p>	Is the resistance 1 M Ω or more?	Go to step 4.	Replace the valve relay.
4	<p>CHECK CONTACT POINT OF VALVE RELAY.</p> <p>1) Disconnect the battery from the valve relay terminals.</p> <p>2) Measure the resistance between valve relay terminals.</p> <p>Terminals No. 30 — No. 87:</p>	Is the resistance 1 M Ω or more?	Go to step 5.	Replace the valve relay.
5	<p>CHECK CONTACT POINT OF VALVE RELAY.</p> <p>Measure the resistance between valve relay terminals.</p> <p>Terminals No. 30 — No. 87a:</p>	Is the resistance less than 0.5 Ω ?	Go to step 6.	Replace the valve relay.
6	<p>CHECK VALVE RELAY SHORT.</p> <p>Measure the resistance between valve relay terminals.</p> <p>Terminals No. 86 — No. 87: No. 86 — No. 87a:</p>	Is the resistance 1 M Ω or more?	Go to step 7.	Replace the valve relay.
7	<p>CHECK POWER SUPPLY FOR VALVE RELAY.</p> <p>1) Disconnect the connectors (B369) from relay box.</p> <p>2) Turn the ignition switch to ON.</p> <p>3) Measure the voltage between the relay box connector and chassis ground.</p> <p>Connector & terminal (B369) No. 1 (+) — Chassis ground (-):</p>	Is the voltage 10 — 15 V?	Go to step 8.	Repair the harness between battery and relay box connector. Check fuse No. 8.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK GROUND SHORT AND OPEN CIRCUIT ON POWER SUPPLY CIRCUIT OF RELAY BOX. 1) Disconnect the connector (VDC1) from VDCH/U. 2) Connect the connectors (B369) to relay box. 3) Turn the ignition switch to ON. 4) Measure the relay box voltage. Connector & terminal Valve relay installation point No. 87 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 9.	Replace the relay box and check fuse No. 8.
9 CHECK OPEN CIRCUIT OF RELAY BOX CONTROL CIRCUIT. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors (B370) from relay box. 3) Measure the resistance between the relay box connector and valve relay installation point. Connector & terminal (VDC4) No. 5 — Valve relay installation point No. 85: (VDC4) No. 1 — Valve relay installation point No. 86:	Is the resistance less than 0.5 Ω?	Go to step 10.	Replace the relay box.
10 CHECK GROUND SHORT CIRCUIT OF THE RELAY BOX CONTACT POINT CIRCUIT. Measure the resistance between the relay box connector and chassis ground. Connector & terminal (VDC4) No. 5 — Chassis ground: (VDC4) No. 1 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 11.	Replace the relay box and check fuse SBF6.
11 CHECK OPEN CIRCUIT OF VALVE RELAY CONTROL SYSTEM HARNESS CIRCUIT. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Measure the resistance between VDCCM connector and relay box connector. Connector & terminal (B310) No. 48 — (B370) No. 5: (B310) No. 27 — (B370) No. 1:	Is the resistance less than 0.5 Ω?	Go to step 12.	Repair the harness between VDCCM and relay box.
12 CHECK GROUND SHORT OF THE VALVE RELAY CONTROL SYSTEM HARNESS. Measure the resistance between VDCCM connector and chassis ground. Connector & terminal (B310) No. 48 — Chassis ground: (B310) No. 27 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 13.	Repair the harness between VDCCM and relay box.
13 CHECK OPEN CIRCUIT OF THE RELAY BOX CONTACT POINT CIRCUIT. Measure the resistance between the VDCH/U connector and valve relay installation point. Connector & terminal (VDC1) No. 2 — Valve relay installation point No. 30:	Is the resistance less than 0.5 Ω?	Go to step 14.	Replace the relay box.
14 CHECK GROUND SHORT CIRCUIT IN THE RELAY BOX CONTACT POINT CIRCUIT. Measure the resistance between VDCH/U connector and chassis ground. Connector & terminal (VDC1) No. 2 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 15.	Replace the relay box and check fuse No. 8.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
<p>15 CHECK RESISTANCE OF HOLD VALVE AND CUT SOLENOID VALVE. 1) Disconnect the connector from VDCH/U. 2) Measure the resistance between VDCH/U connector terminals. Connector & terminal <i>(VDC5) No. 8 — (VDC2) No. 2:</i> <i>(VDC5) No. 5 — (VDC2) No. 2:</i> <i>(VDC5) No. 6 — (VDC2) No. 2:</i> <i>(VDC5) No. 7 — (VDC2) No. 2:</i> <i>(VDC5) No. 9 — (VDC2) No. 2:</i> <i>(VDC5) No. 12 — (VDC2) No. 2:</i></p>	Is the resistance between 8.04 — 9.04 Ω?	Go to step 16.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>
<p>16 CHECK RESISTANCE OF DECOMPRESION VALVE. Measure the resistance between VDCH/U connector terminals. Connector & terminal <i>(VDC5) No. 4 — (VDC2) No. 2:</i> <i>(VDC5) No. 1 — (VDC2) No. 2:</i> <i>(VDC5) No. 2 — (VDC2) No. 2:</i> <i>(VDC5) No. 3 — (VDC2) No. 2:</i> <i>(VDC5) No. 10 — (VDC2) No. 2:</i> <i>(VDC5) No. 11 — (VDC2) No. 2:</i></p>	Is the resistance between 4.04 — 4.54 Ω?	Go to step 17.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>
<p>17 CHECK SOLENOID VALVE GROUND SHORT. Measure the resistance between VDCH/U connector and chassis ground. Connector & terminal <i>(VDC2) No. 2 — Chassis ground:</i></p>	Is the resistance 1 MΩ or more?	Go to step 18.	Replace the VDCH/U and check all of the fuses. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>
<p>18 CHECK GROUND SHORT CIRCUIT OF HARNESS. 1) Turn the ignition switch to OFF. 2) Measure the resistance between VDCCM connector and chassis ground. Connector & terminal <i>(B310) No. 3 — Chassis ground:</i> <i>(B310) No. 24 — Chassis ground:</i> <i>(B310) No. 23 — Chassis ground:</i> <i>(B310) No. 31 — Chassis ground:</i> <i>(B310) No. 35 — Chassis ground:</i> <i>(B310) No. 34 — Chassis ground:</i> <i>(B310) No. 29 — Chassis ground:</i> <i>(B310) No. 26 — Chassis ground:</i> <i>(B310) No. 25 — Chassis ground:</i> <i>(B310) No. 4 — Chassis ground:</i> <i>(B310) No. 30 — Chassis ground:</i> <i>(B310) No. 32 — Chassis ground:</i></p>	Is the resistance 1 MΩ or more?	Go to step 19.	Repair the harness between VDCH/U and VDCCM.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
19 CHECK HARNESS CONNECTOR BETWEEN VDCCM AND VDCH/U. 1) Connect the connectors (B368) to VDCH/U. 2) Measure the resistance between the VDCCM connector and VDCH/U. <i>Connector & terminal</i> <i>(B310) No. 3 — (VDC2) No. 2:</i> <i>(B310) No. 24 — (VDC2) No. 2:</i> <i>(B310) No. 23 — (VDC2) No. 2:</i> <i>(B310) No. 31 — (VDC2) No. 2:</i> <i>(B310) No. 35 — (VDC2) No. 2:</i> <i>(B310) No. 34 — (VDC2) No. 2:</i>	Is the resistance between 8.0 — 10.0 Ω?	Go to step 20.	Repair the harness and connector between the VDCH/U and the VDCCM.
20 CHECK HARNESS CONNECTOR BETWEEN VDCCM AND VDCH/U. Measure the resistance between the VDCCM connector terminals. <i>Connector & terminal</i> <i>(B310) No. 29 — (VDC2) No. 2:</i> <i>(B310) No. 26 — (VDC2) No. 2:</i> <i>(B310) No. 25 — (VDC2) No. 2:</i> <i>(B310) No. 4 — (VDC2) No. 2:</i> <i>(B310) No. 30 — (VDC2) No. 2:</i> <i>(B310) No. 32 — (VDC2) No. 2:</i>	Is the resistance between 4.0 — 6.0 Ω?	Go to step 21.	Repair the harness connector between the VDCH/U and the VDCCM.
21 CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact in connector between the VDCCM and VDCH/U?	Repair the connector.	Go to step 22.
22 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 23.
23 CHECK ANY OTHER DTC ON DISPLAY.	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AH:DTC 51 VALVE RELAY ON FAILURE

DTC DETECTING CONDITION:

Defective valve relay

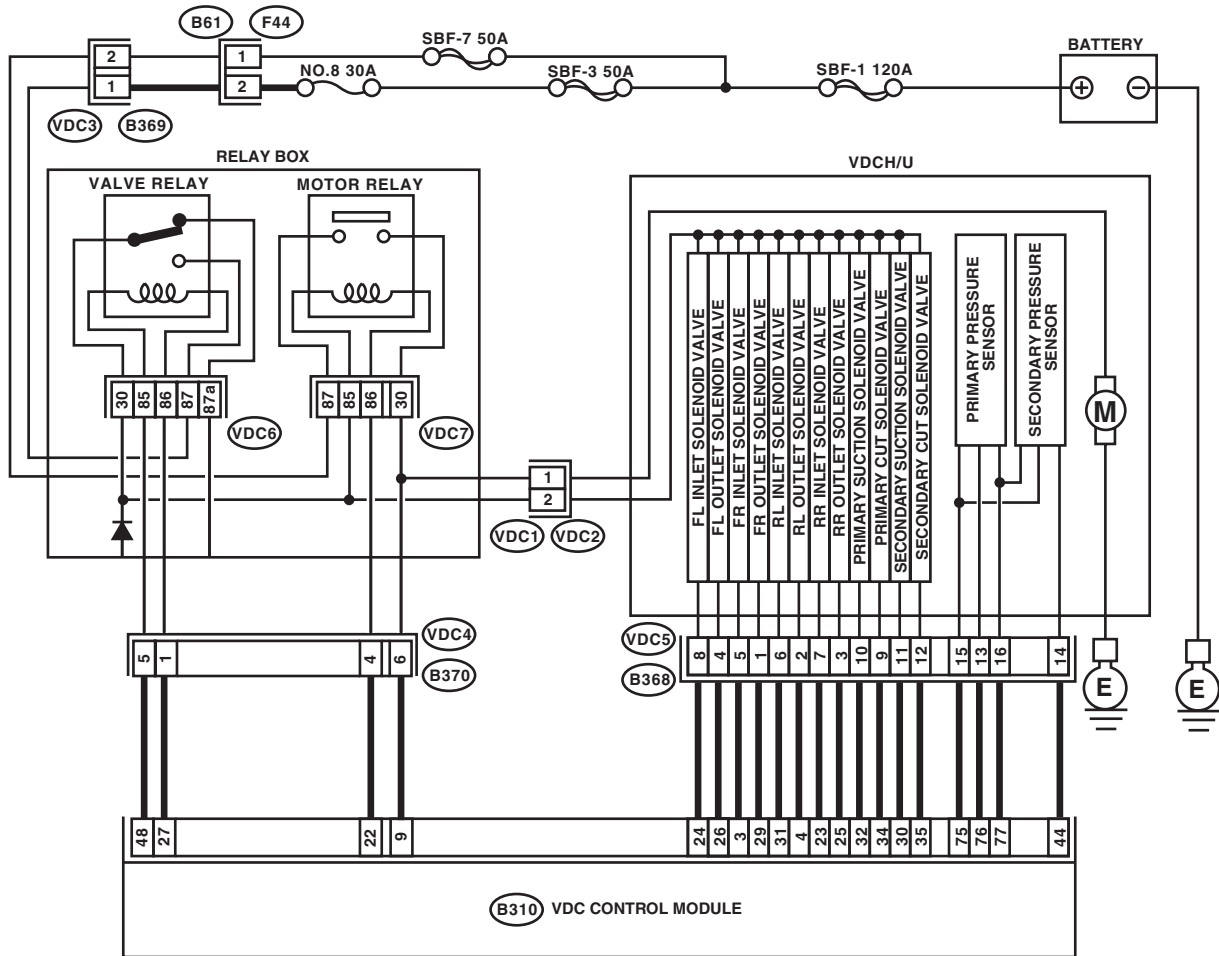
NOTE:

When the DTC 74 check is executed, DTC 51 is stored, but this does not indicate an error in the valve relay.

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



B310

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84

VDC00491

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CONTACT POINT OF VALVE RELAY. 1) Turn the ignition switch to OFF. 2) Remove the valve relay from the relay box. 3) Connect the battery to the valve relay terminals No. 85 and No. 86. 4) Measure the resistance between valve relay terminals. Terminals No. 30 — No. 87:	Is the resistance less than 0.5 Ω ?	Go to step 2.	Replace the valve relay.
2 CHECK CONTACT POINT OF VALVE RELAY. Measure the resistance between valve relay terminals. Terminals No. 30 — No. 87a:	Is the resistance 1 M Ω or more?	Go to step 3.	Replace the valve relay.
3 CHECK CONTACT POINT OF VALVE RELAY. 1) Disconnect the battery from the valve relay terminals. 2) Measure the resistance between valve relay terminals. Terminals No. 30 — No. 87:	Is the resistance 1 M Ω or more?	Go to step 4.	Replace the valve relay.
4 CHECK CONTACT POINT OF VALVE RELAY. Measure the resistance between valve relay terminals. Terminals No. 30 — No. 87a:	Is the resistance less than 0.5 Ω ?	Go to step 5.	Replace the valve relay.
5 CHECK VALVE RELAY SHORT. Measure the resistance between valve relay terminals. Terminals No. 86 — No. 87: No. 86 — No. 87a:	Is the resistance 1 M Ω or more?	Go to step 6.	Replace the valve relay.
6 CHECK BATTERY SHORT CIRCUIT IN THE RELAY BOX CONTACT POINT CIRCUIT. 1) Disconnect the connectors (B370) from relay box. 2) Measure the voltage between the relay box connector and chassis ground. Connector & terminal (VDC4) No. 5 (+) — Chassis ground (-): (VDC4) No. 1 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 7.	Replace the relay box. Check fuse No. 8 and SBF3.
7 CHECK BATTERY SHORT CIRCUIT IN THE RELAY BOX CONTACT POINT CIRCUIT. 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCH/U connector and chassis ground. Connector & terminal (VDC4) No. 5 (+) — Chassis ground (-): (VDC4) No. 1 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 8.	Replace the relay box. Check fuse No. 8 and SBF3.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK BATTERY SHORT OF THE VALVE RELAY CONTROL SYSTEM HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Disconnect the connector from VDCH/U. 4) Measure the voltage between VDCCM connector and chassis ground. Connector & terminal (B310) No. 27 (+) — Chassis ground (-): (B310) No. 48 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 9.	Repair the harness between VDCCM and relay box and check all of the fuses.
9 CHECK BATTERY SHORT OF THE VALVE RELAY CONTROL SYSTEM HARNESS. 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM connector and chassis ground. Connector & terminal (B310) No. 27 (+) — Chassis ground (-): (B310) No. 48 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 10.	Repair the harness between VDCCM and relay box and check all of the fuses.
10 CHECK BATTERY SHORT CIRCUIT IN THE RELAY BOX CONTACT POINT CIRCUIT. 1) Disconnect the (VDC1) connector from the relay box. 2) Measure the voltage between VDCH/U connector and chassis ground. Connector & terminal (VDC1) No. 2 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 11.	Replace the relay box.
11 CHECK BATTERY SHORT CIRCUIT IN THE RELAY BOX CONTACT POINT CIRCUIT. 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCH/U connector and chassis ground. Connector & terminal (VDC1) No. 2 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 12.	Replace the relay box.
12 CHECK SOLENOID VALVE BATTERY SHORT. 1) Turn the ignition switch to OFF. 2) Measure the voltage between VDCH/U connector and chassis ground. Connector & terminal (VDC2) No. 2 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 13.	Replace the VDCH/U and check all of the fuses. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>
13 CHECK SOLENOID VALVE BATTERY SHORT. 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCH/U connector and chassis ground. Connector & terminal (VDC2) No. 2 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 14.	Replace the VDCH/U and check all of the fuses. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
14 CHECK BATTERY SHORT OF HARNESS. 1) Turn the ignition switch to OFF. 2) Measure the voltage between VDCCM connector and chassis ground. Connector & terminal <i>(B310) No. 3 (+) — Chassis ground (-):</i> <i>(B310) No. 24 (+) — Chassis ground (-):</i> <i>(B310) No. 23 (+) — Chassis ground (-):</i> <i>(B310) No. 31 (+) — Chassis ground (-):</i> <i>(B310) No. 35 (+) — Chassis ground (-):</i> <i>(B310) No. 34 (+) — Chassis ground (-):</i> <i>(B310) No. 29 (+) — Chassis ground (-):</i> <i>(B310) No. 26 (+) — Chassis ground (-):</i> <i>(B310) No. 25 (+) — Chassis ground (-):</i> <i>(B310) No. 4 (+) — Chassis ground (-):</i> <i>(B310) No. 30 (+) — Chassis ground (-):</i> <i>(B310) No. 32 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 15.	Repair the harness between VDCH/U and VDCCM and check all of the fuses.
15 CHECK BATTERY SHORT OF HARNESS. 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM connector and chassis ground. Connector & terminal <i>(B310) No. 3 (+) — Chassis ground (-):</i> <i>(B310) No. 24 (+) — Chassis ground (-):</i> <i>(B310) No. 23 (+) — Chassis ground (-):</i> <i>(B310) No. 31 (+) — Chassis ground (-):</i> <i>(B310) No. 35 (+) — Chassis ground (-):</i> <i>(B310) No. 34 (+) — Chassis ground (-):</i> <i>(B310) No. 29 (+) — Chassis ground (-):</i> <i>(B310) No. 26 (+) — Chassis ground (-):</i> <i>(B310) No. 25 (+) — Chassis ground (-):</i> <i>(B310) No. 4 (+) — Chassis ground (-):</i> <i>(B310) No. 30 (+) — Chassis ground (-):</i> <i>(B310) No. 32 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 16.	Repair the harness between VDCH/U and VDCCM and check all of the fuses.
16 CHECK POOR CONTACT OF CONNECTOR. Turn the ignition switch to OFF.	Is there poor contact in connector between the VDCCM and VDCH/U?	Repair the connector.	Go to step 17.
17 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 18.
18 CHECK ANY OTHER DTC ON DISPLAY.	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AI: DTC 52 MOTOR/MOTOR RELAY OFF MALFUNCTION

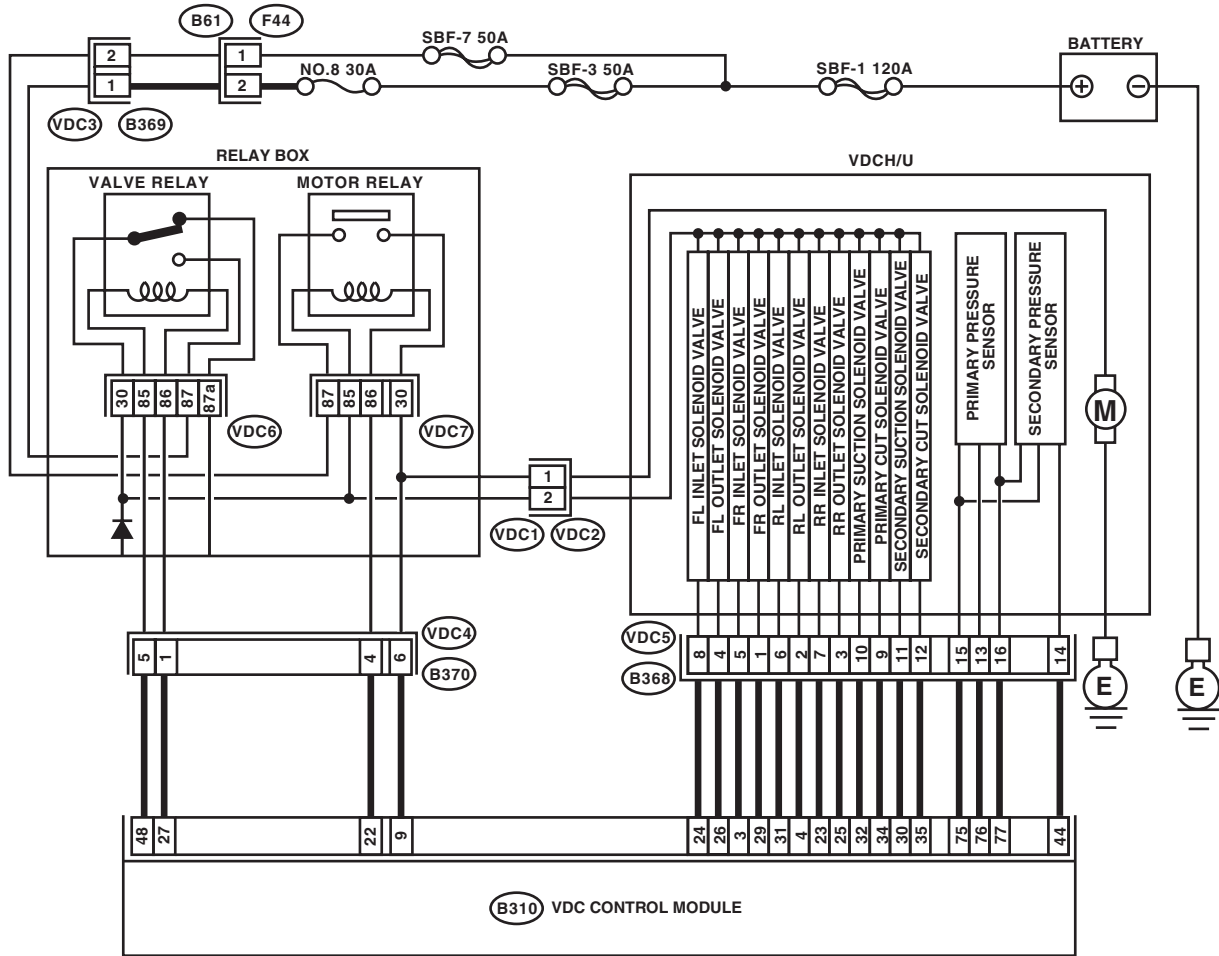
DTC DETECTING CONDITION:

- Defective motor relay
- Defective harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



B310

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84

VDC00491

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
1	CHECK MOTOR GROUND STATUS.	Go to step 2.	Tighten the motor ground terminal clamp.
2	CHECK CONTACT POINT OF MOTOR RELAY. 1) Turn the ignition switch to OFF. 2) Remove the motor relay from the relay box. 3) Measure the resistance between motor relay terminals. Terminals No. 30 — No. 87:	Go to step 3.	Replace the motor relay.
3	CHECK MOTOR RELAY SHORT. Measure the resistance between motor relay terminals. Terminals No. 85 — No. 30: No. 85 — No. 87:	Go to step 4.	Replace the motor relay.
4	CHECK GROUND SHORT CIRCUIT IN RELAY BOX CIRCUIT. 1) Disconnect the connectors (B370) from relay box. 2) Measure the resistance between the relay box connector unit and chassis ground. Connector & terminal (VDC4) No. 4 — Chassis ground:	Go to step 5.	Replace the relay box.
5	CHECK BATTERY SHORT CIRCUIT IN RELAY BOX CIRCUIT. Measure the voltage between the relay box connector and chassis ground. Connector & terminal (VDC4) No. 6 (+) — Chassis ground (-):	Go to step 6.	Replace the relay box.
6	CHECK BATTERY SHORT CIRCUIT IN RELAY BOX CIRCUIT. 1) Turn the ignition switch to ON. 2) Measure the voltage between the relay box connector and chassis ground. Connector & terminal (VDC4) No. 6 (+) — Chassis ground (-):	Go to step 7.	Replace the relay box.
7	CHECK HARNESS GROUND SHORT BETWEEN RELAY BOX AND VDCCM. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Measure the resistance between VDCCM connector and chassis ground. Connector & terminal (B310) No. 22 — Chassis ground:	Go to step 8.	Repair the harness between VDCCM and relay box. Check the fuse SBF holder.
8	CHECK HARNESS BATTERY SHORT BETWEEN RELAY BOX AND VDCCM. Measure the voltage between VDCCM connector and chassis ground. Connector & terminal (B310) No. 9 (+) — Chassis ground (-):	Go to step 9.	Repair the harness between VDCCM and relay box.
9	CHECK HARNESS BATTERY SHORT BETWEEN RELAY BOX AND VDCCM. 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM connector and chassis ground. Connector & terminal (B310) No. 9 (+) — Chassis ground (-):	Go to step 10.	Repair the harness between VDCCM and relay box.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
10 CHECK POOR CONTACT OF CONNECTOR. Turn the ignition switch to OFF.	Is there poor contact in connectors between the VDCH/U, relay box and VDCCM?	Repair the connector.	Go to step 11.
11 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 12.
12 CHECK ANY OTHER DTC ON DISPLAY.	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs. NOTE: The ABS warning light will remain lit until the vehicle reaches approximately 12 km/h (7.46 MPH) even when the memory is cleared. This is normal.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AJ:DTC 52 MOTOR/MOTOR RELAY ON MALFUNCTION

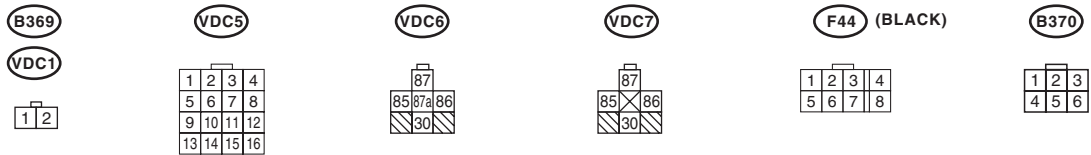
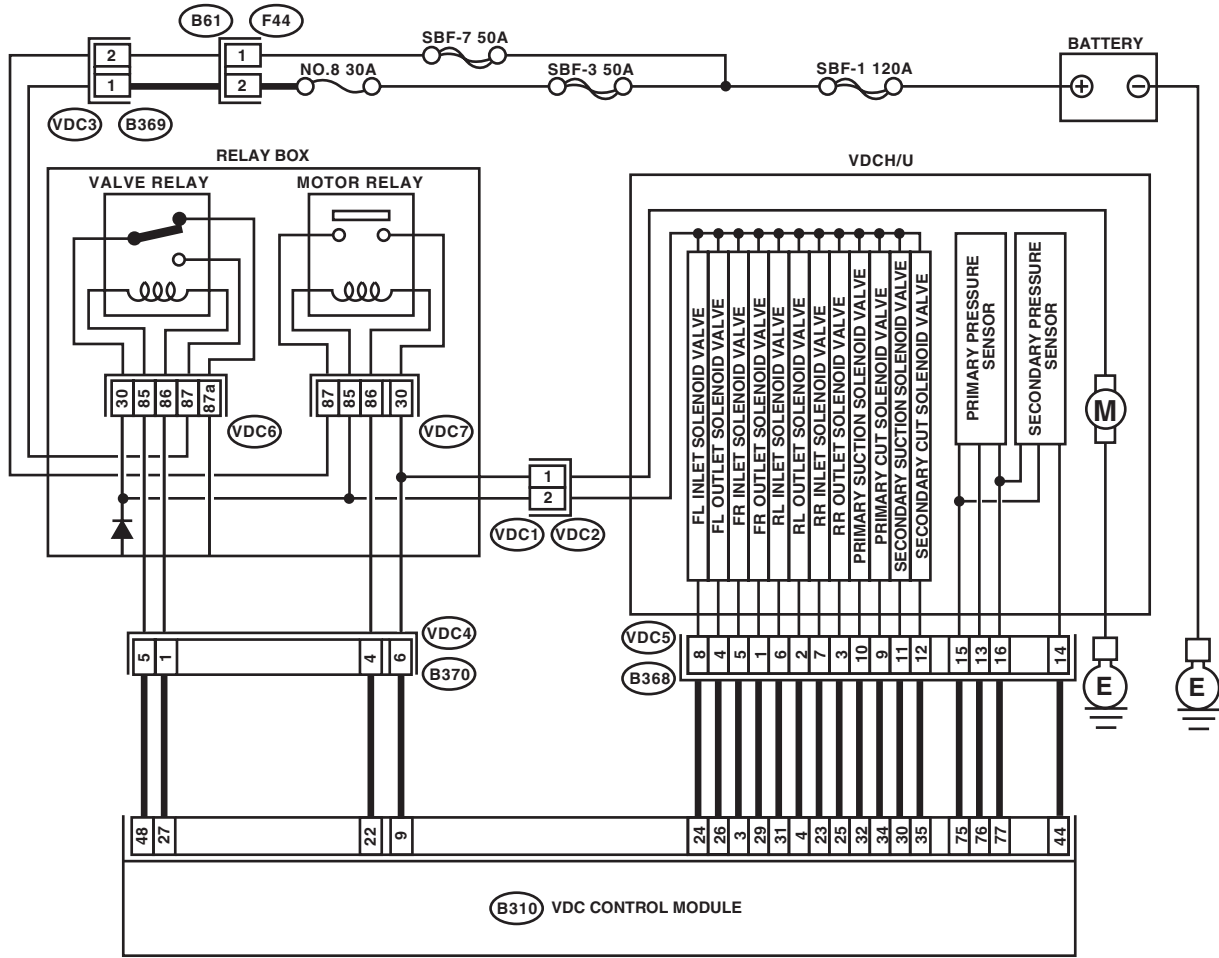
DTC DETECTING CONDITION:

- Defective motor relay
- Defective harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83

VDC00491

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK RESISTANCE OF MOTOR RELAY. 1) Turn the ignition switch to OFF. 2) Remove the motor relay from the relay box. 3) Measure the resistance between motor relay terminals. <i>Terminals</i> <i>No. 85 — No. 86:</i>	Is the resistance between 70 — 90 Ω ?	Go to step 2.	Replace the motor relay.
2	CHECK CONTACT POINT OF MOTOR RELAY. 1) Connect the battery to motor relay terminals No. 85 and No. 86. 2) Measure the resistance between motor relay terminals. <i>Terminals</i> <i>No. 30 — No. 87:</i>	Is the resistance less than 0.5 Ω ?	Go to step 3.	Replace the motor relay.
3	CHECK MOTOR RELAY SHORT. Measure the resistance between motor relay terminals. <i>Terminals</i> <i>No. 85 — No. 30:</i> <i>No. 85 — No. 87:</i>	Is the resistance 1 M Ω or more?	Go to step 4.	Replace the motor relay.
4	CHECK INPUT VOLTAGE OF RELAY BOX. 1) Disconnect the connectors (B369) from relay box. 2) Disconnect the connectors from VDCCM. 3) Turn the ignition switch to ON. 4) Measure the voltage between the relay box connector and chassis ground. <i>Connector & terminal</i> <i>(F369) No. 2 (+) — Chassis ground (-):</i>	Is the voltage 10 — 15 V?	Go to step 5.	Repair the harness connector between battery and relay box and check the fuse SBF-holder.
5	CHECK INPUT VOLTAGE OF MOTOR RELAY. 1) Turn the ignition switch to OFF. 2) Connect the connectors (B369) to relay box. 3) Turn the ignition switch to ON. 4) Measure the voltage between the relay box and chassis ground. <i>Connector & terminal</i> <i>Motor relay installation point No. 87 (+) — Chassis ground (-):</i>	Is the voltage 10 — 15 V?	Go to step 6.	Replace the relay box.
6	CHECK OPEN CIRCUIT OF THE RELAY BOX CONTACT POINT CIRCUIT. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors (VDC2), (B370) from relay box. 3) Measure the resistance between the relay box connector and motor relay installation point. <i>Connector & terminal</i> <i>(VDC1) No. 1 — Motor relay installation point No. 30:</i>	Is the resistance less than 0.5 Ω ?	Go to step 7.	Replace the relay box.
7	CHECK OPEN CIRCUIT OF RELAY BOX MONITOR SYSTEM. Measure the resistance between the relay box connector and motor relay installation point. <i>Connector & terminal</i> <i>(VDC4) No. 6 — Motor relay installation point No. 30:</i>	Is the resistance less than 0.5 Ω ?	Go to step 8.	Replace the relay box.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK OPEN CIRCUIT OF RELAY BOX CONTROL CIRCUIT. Measure the resistance between the motor relay installation point and the relay box connector. <i>Connector & terminal (VDC4) No. 4 — Motor relay installation point No. 86:</i>	Is the resistance less than 0.5 Ω ?	Go to step 9.	Replace the relay box.
9 CHECK OPEN CIRCUIT OF RELAY BOX CONTROL CIRCUIT. 1) Remove the valve relay from the relay box. 2) Measure the resistance between the motor relay installation point and the valve relay installation point. <i>Connector & terminal Motor relay installation point No. 86 — Valve relay installation point No. 30:</i>	Is the resistance less than 0.5 Ω ?	Go to step 10.	Replace the relay box.
10 CHECK GROUND SHORT CIRCUIT IN RELAY BOX CIRCUIT. Measure the resistance between the relay box connector and chassis ground. <i>Connector & terminal (VDC4) No. 4 — Chassis ground: (VDC4) No. 6 — Chassis ground:</i>	Is the resistance 1 M Ω or more?	Go to step 11.	Replace the relay box.
11 CHECK BATTERY SHORT CIRCUIT IN RELAY BOX CIRCUIT. Measure the voltage between the relay box connector and chassis ground. <i>Connector & terminal (VDC4) No. 6 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 12.	Replace the relay box.
12 CHECK BATTERY SHORT CIRCUIT IN RELAY BOX CIRCUIT. 1) Turn the ignition switch to ON. 2) Measure the voltage between the relay box connector and chassis ground. <i>Connector & terminal (VDC4) No. 6 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 13.	Replace the relay box.
13 CHECK OPEN CIRCUIT OF RELAY CONTROL SYSTEM HARNESS CIRCUIT. Measure the resistance between VDCCM connector and relay box connector. <i>Connector & terminal (B310) No. 22 — (B370) No. 4: (B310) No. 9 — (B370) No. 6:</i>	Is the resistance less than 0.5 Ω ?	Go to step 14.	Repair the harness connector between the VDCCM and relay box.
14 CHECK HARNESS GROUND SHORT BETWEEN RELAY BOX AND VDCCM. Measure the resistance between VDCCM connector and chassis ground. <i>Connector & terminal (B310) No. 22 — Chassis ground: (B310) No. 9 — Chassis ground:</i>	Is the resistance 1 M Ω or more?	Go to step 15.	Repair the harness between VDCCM and relay box. Check the fuse SBF holder.
15 CHECK HARNESS BATTERY SHORT BETWEEN RELAY BOX AND VDCCM. Measure the voltage between VDCCM connector and chassis ground. <i>Connector & terminal (B310) No. 9 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 16.	Repair the harness between VDCCM and relay box. Check the fuse SBF holder.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
16 CHECK HARNESS BATTERY SHORT BETWEEN RELAY BOX AND VDCCM. 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM connector and chassis ground. <i>Connector & terminal (B310) No. 9 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 17.	Repair the harness between VDCCM and relay box. Check the fuse SBF holder.
17 CHECK POOR CONTACT OF CONNECTOR. Turn the ignition switch to OFF.	Is there poor contact in connectors between the VDCH/U, relay box and VDCCM?	Repair the connector.	Go to step 18.
18 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 19.
19 CHECK ANY OTHER DTC ON DISPLAY.	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs. NOTE: The ABS warning light will remain lit until the vehicle reaches approximately 12 km/h (7.46 MPH) even when the memory is cleared. This is normal.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AK:DTC 52 MOTOR MALFUNCTION

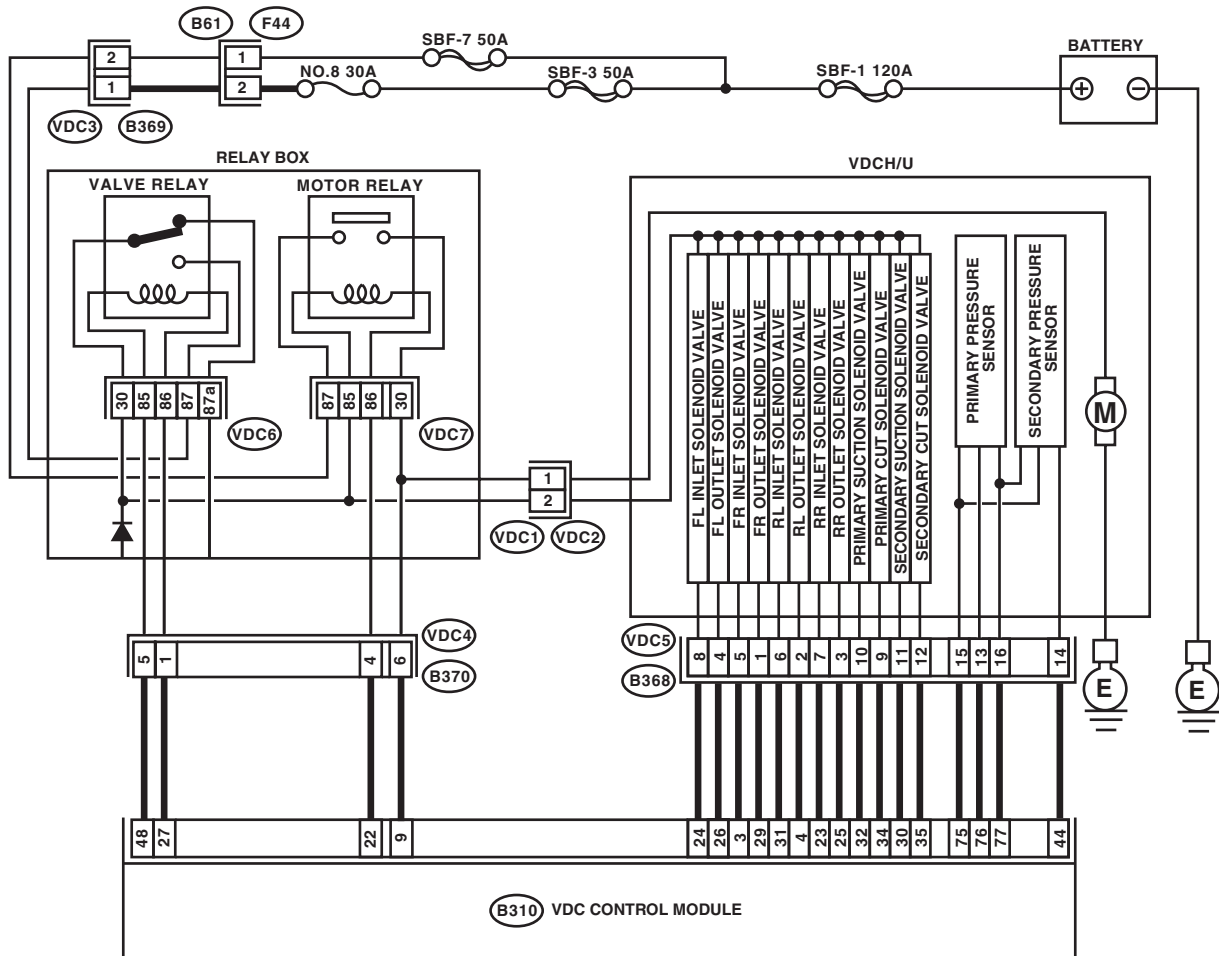
DTC DETECTING CONDITION:

- Defective motor
- Defective motor relay
- Defective harness connector

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



B310

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK CONTACT POINT OF MOTOR RELAY.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Remove the motor relay from the relay box.</p> <p>3) Connect the battery to motor relay terminals No. 85 and No. 86.</p> <p>4) Measure the resistance between motor relay terminals.</p> <p>Terminals No. 30 — No. 87:</p>	Is the resistance less than 0.5 Ω?	Go to step 2.	Replace the motor relay.
2	<p>CHECK CONTACT POINT OF MOTOR RELAY.</p> <p>1) Disconnect the battery from the motor relay terminals.</p> <p>2) Measure the resistance between motor relay terminals.</p> <p>Terminals No. 30 — No. 87:</p>	Is the resistance 1 MΩ or more?	Go to step 3.	Replace the motor relay.
3	<p>CHECK INPUT VOLTAGE OF RELAY BOX.</p> <p>1) Disconnect the connectors (B369) from relay box.</p> <p>2) Disconnect the connectors from VDCCM.</p> <p>3) Turn the ignition switch to ON.</p> <p>4) Measure the voltage between the relay box connector and chassis ground.</p> <p>Connector & terminal (B369) No. 2 (+) — Chassis ground (-):</p>	Is the voltage 10 — 15 V?	Go to step 4.	Repair the harness connector between battery and relay box and check the fuse SBF-holder.
4	<p>CHECK INPUT VOLTAGE OF MOTOR RELAY.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Connect the connectors (B369) to relay box.</p> <p>3) Turn the ignition switch to ON.</p> <p>4) Measure the voltage between the relay box and chassis ground.</p> <p>Connector & terminal Motor relay installation point No. 87 (+) — Chassis ground (-):</p>	Is the voltage 10 — 15 V?	Go to step 5.	Replace the relay box.
5	<p>CHECK MOTOR GROUND STATUS.</p>	Is the motor ground terminal tightened to 33±10 N·m (3.3±1.0 kgf-m, 24±7 ft-lb)?	Go to step 6.	Tighten the motor ground terminal clamp.
6	<p>CHECK VDCCM MOTOR DRIVE TERMINAL.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Remove the VDC connector cover. <Ref. to VDC(diag)-18, REMOVAL, VDCCM Connector Cover.></p> <p>3) Connect all connectors.</p> <p>4) Install the motor relay.</p> <p>5) Check the ABS sequence control. <Ref. to VDC-16, ABS Sequence Control.></p> <p>6) Measure the voltage between VDCCM connector terminals.</p> <p>Connector & terminal (B310) No. 22 (+) — No. 1 (-):</p>	Does the voltage fall from 10 V — 13 V to less than 1.5 V, and then rise to 10 V — 13 V again when checking the ABS sequence control?	Go to step 7.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
7	<p>CHECK MOTOR OPERATION.</p> <p>Check the ABS sequence control. <Ref. to VDC-19, VDC Sequence Control.></p>	Can the motor revolution noise (engine sound) be heard when checking the ABS sequence control?	Go to step 8.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK POOR CONTACT OF CONNECTOR. Turn the ignition switch to OFF.	Is there poor contact in connectors between the VDCH/U, relay box and VDCCM?	Repair the connector.	Go to step 9 .
9 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 10 .
10 CHECK ANY OTHER DTC ON DISPLAY.	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs. NOTE: The ABS warning light will remain lit until the vehicle reaches approximately 12 km/h (7.46 MPH) even when the memory is cleared. This is normal.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AL:DTC 57 ECM COMMUNICATION CIRCUIT

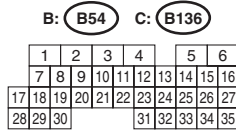
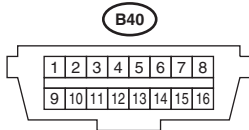
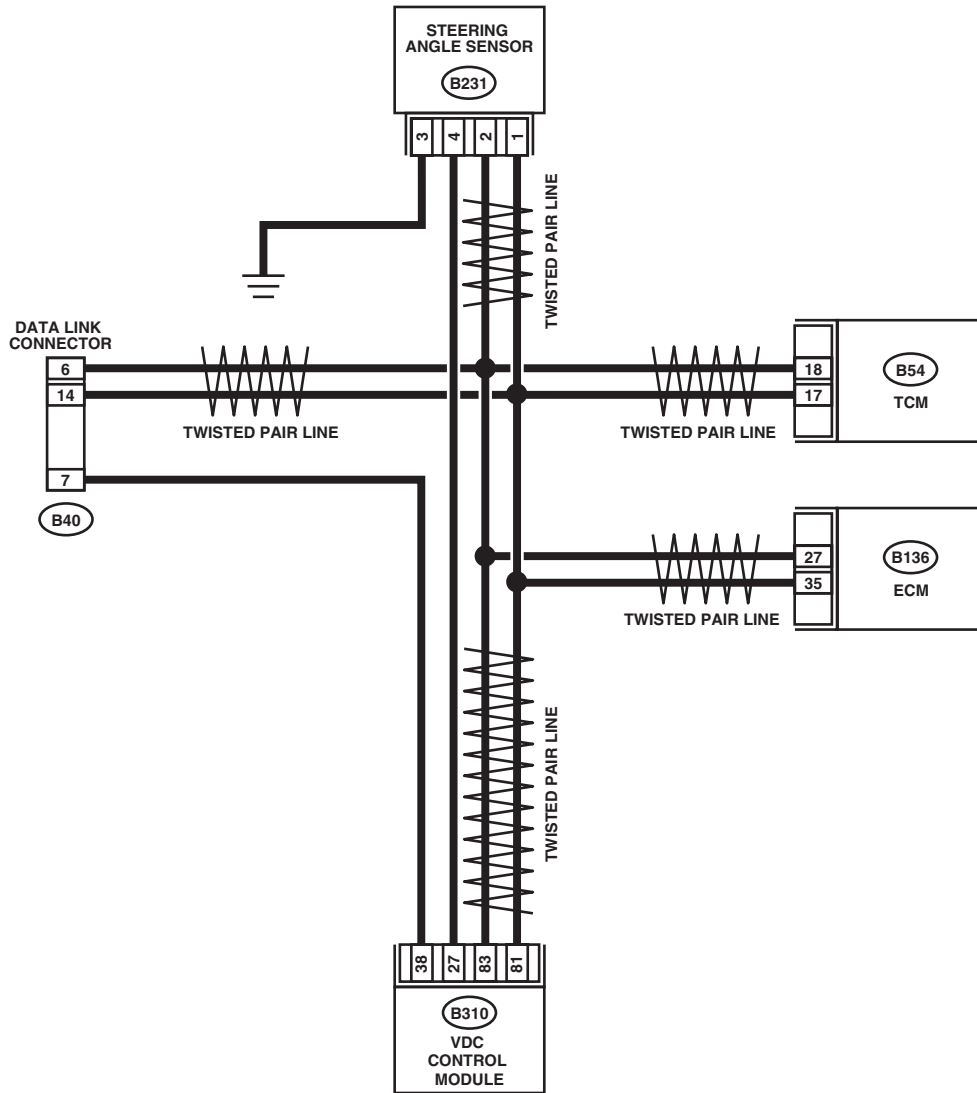
DTC DETECTING CONDITION:

Communication malfunction between engine control module

TROUBLE SYMPTOM:

- VDC does not operate.
- ABS does not operate.

WIRING DIAGRAM:



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55		
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	

VDC00492

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK HARNESS RESISTANCE. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from the ECM. 3) Measure the resistance between ECM connector terminals. Connector & terminal (B136) No. 35 — No. 27:	Is the resistance $60 \pm 3 \Omega$?	Go to step 2.	Repair the harness between ECM and VDCCM.
2	CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact in ECM connector?	Repair the connector.	Go to step 3.
3	CHECK ECM. 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the Inspection Mode. 5) Read the DTC.	Is the same DTC displayed again?	Replace the ECM.	Go to step 4.
4	CHECK ANY OTHER DTC ON DISPLAY.	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AM:DTC 71 STEERING ANGLE SENSOR OFFSET IS TOO BIG

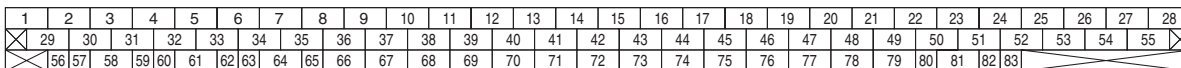
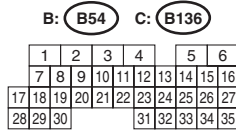
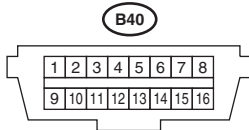
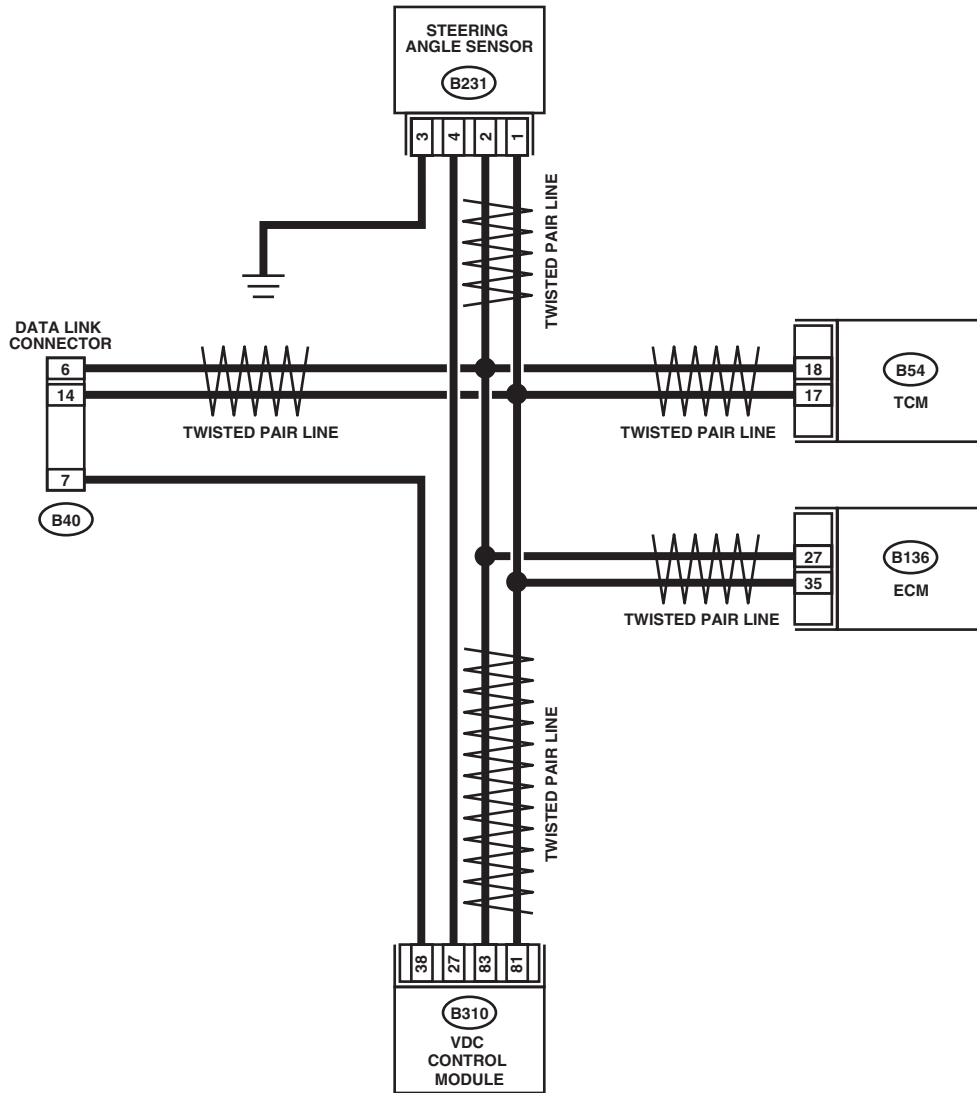
DTC DETECTING CONDITION:

Defective steering angle sensor

TROUBLE SYMPTOM:

- VDC does not operate.
- ABS does not operate.

WIRING DIAGRAM:



VDC00492

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK STEERING WHEEL. 1) Drive the vehicle on a flat road. 2) Stop the vehicle in a straight forward direction. 3) Check the steering wheel angle.	Is the deviation from the center of steering wheel less than 5°?	Go to step 2.	Perform the centering adjustment of steering wheel.
2	CHECK VDCCM. 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the Inspection Mode. 5) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 3.
3	CHECK ANY OTHER DTC ON DISPLAY.	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AN:DTC 71 CHANGE RANGE OF STEERING ANGLE SENSOR IS TOO BIG

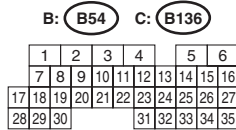
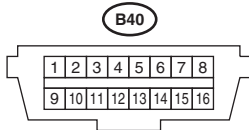
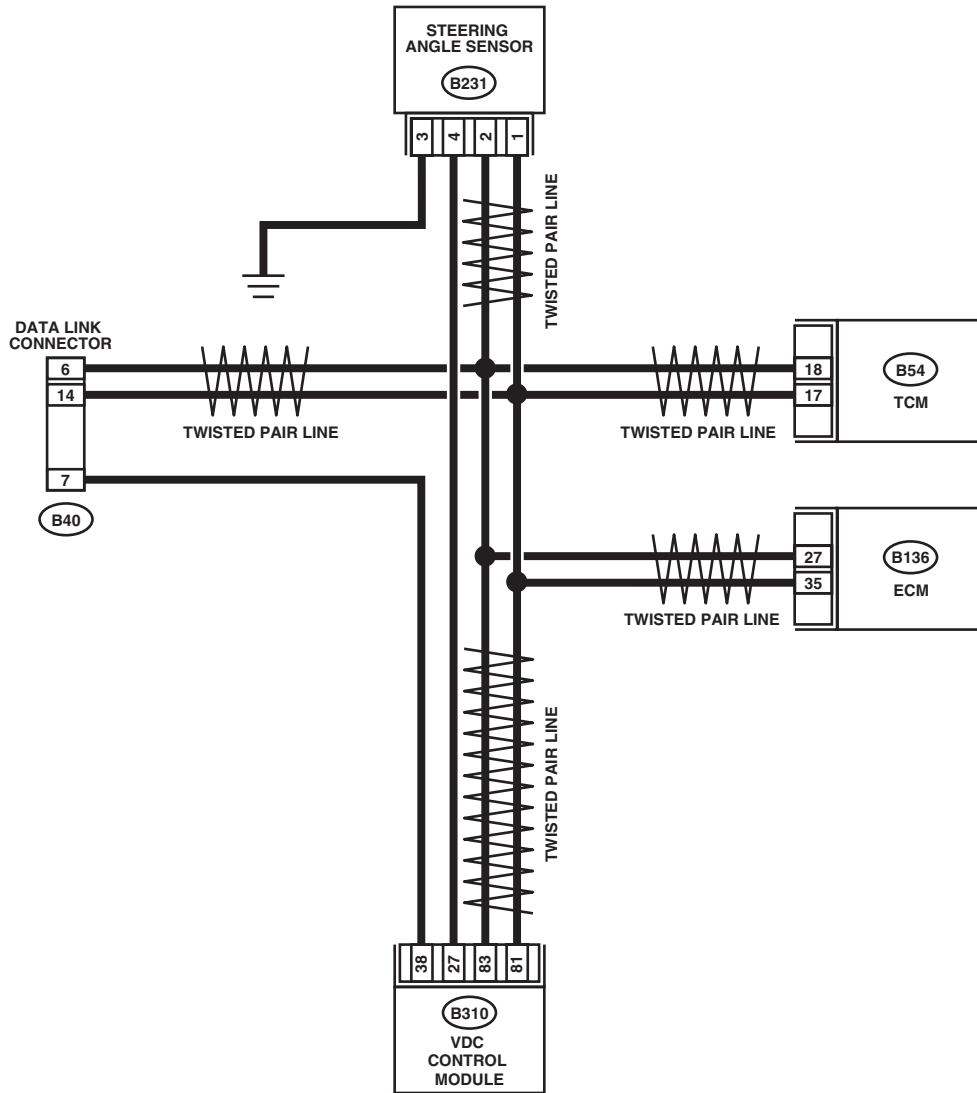
DTC DETECTING CONDITION:

Defective steering angle sensor

TROUBLE SYMPTOM:

- VDC does not operate.
- ABS does not operate.

WIRING DIAGRAM:



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55		
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	

VDC00492

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK THE VDCCM. 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the Inspection Mode. 5) Read the DTC.	Is the same DTC as current diagnosis still displayed?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 2.
2	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Proceed with the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AO:DTC 71 STEERING ANGLE SENSOR MALFUNCTION

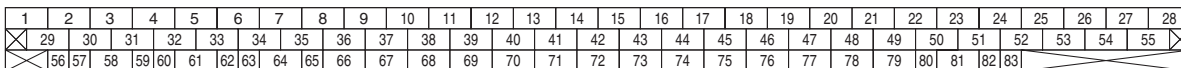
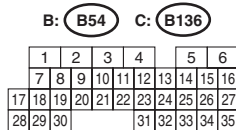
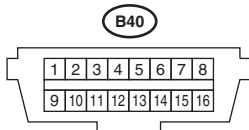
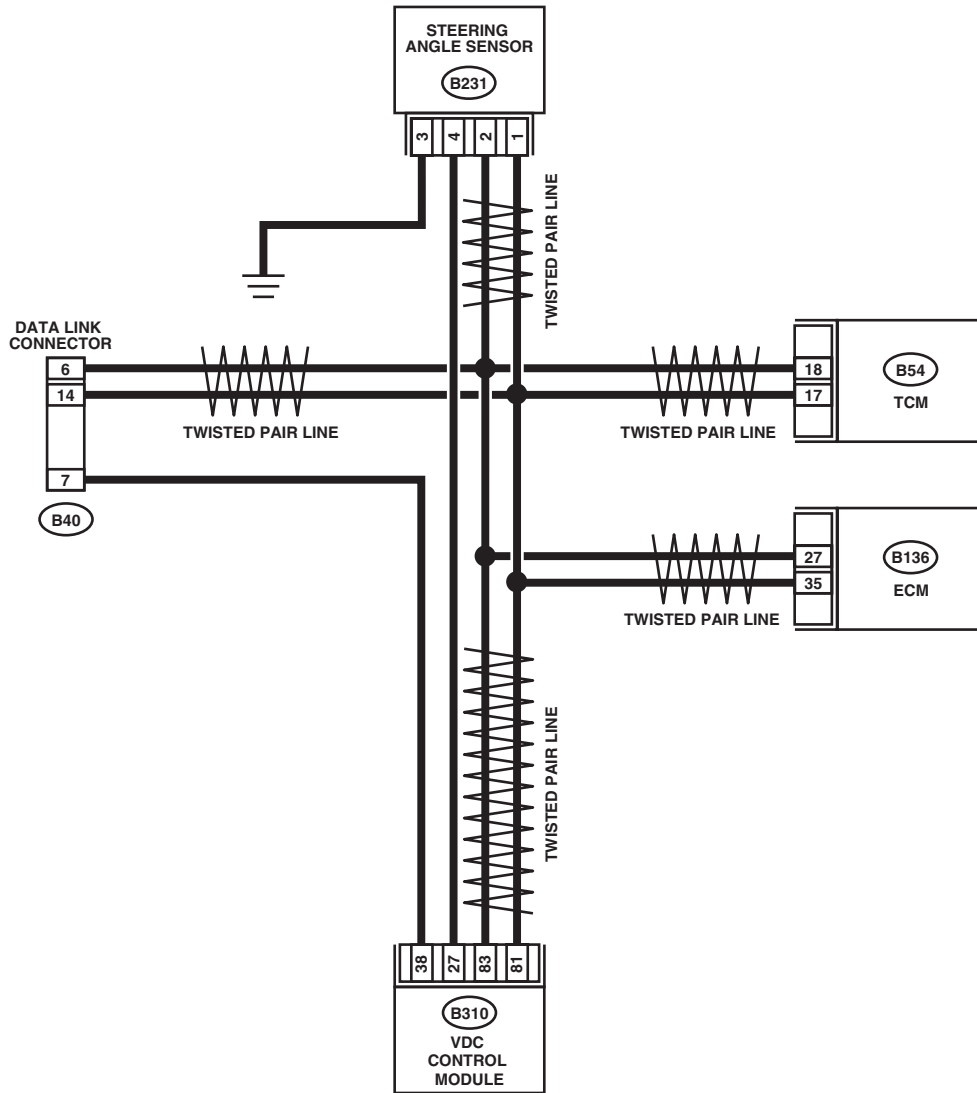
DTC DETECTING CONDITION:

Defective steering angle sensor

TROUBLE SYMPTOM:

- VDC does not operate.
- ABS does not operate.

WIRING DIAGRAM:



VDC00492

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK STEERING WHEEL. 1) Drive the vehicle on a flat road. 2) Stop the vehicle in a straight forward direction. 3) Check the steering wheel angle.	Is the angle from the center of steering wheel less than 5°?	Go to step 2.	Center the steering wheel.
2	CHECK OUTPUT OF STEERING ANGLE SENSOR USING SUBARU SELECT MONITOR. 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the steering sensor output on Subaru Select Monitor display.	Does the output of the steering sensor change on the monitor when the steering wheel turns either way?	Go to step 3.	Replace the steering angle sensor.
3	CHECK DRIVING ROAD. Interview whether the vehicle was driven on the road with banks or sandy surface.	Was the vehicle driven on the road with banks or sandy surface?	If driven on the road with banks or sandy surface, the VDCCM stores the DTC occasionally.	Go to step 4.
4	CHECK VDCCM. 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the Inspection Mode. 5) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 5.
5	CHECK ANY OTHER DTC ON DISPLAY.	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AP:DTC 71 STEERING ANGLE SENSOR COMMUNICATION

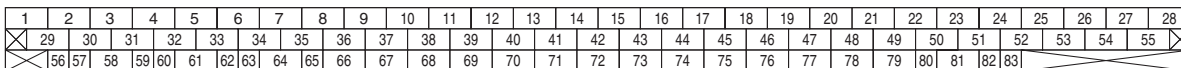
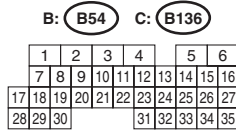
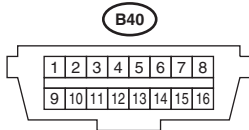
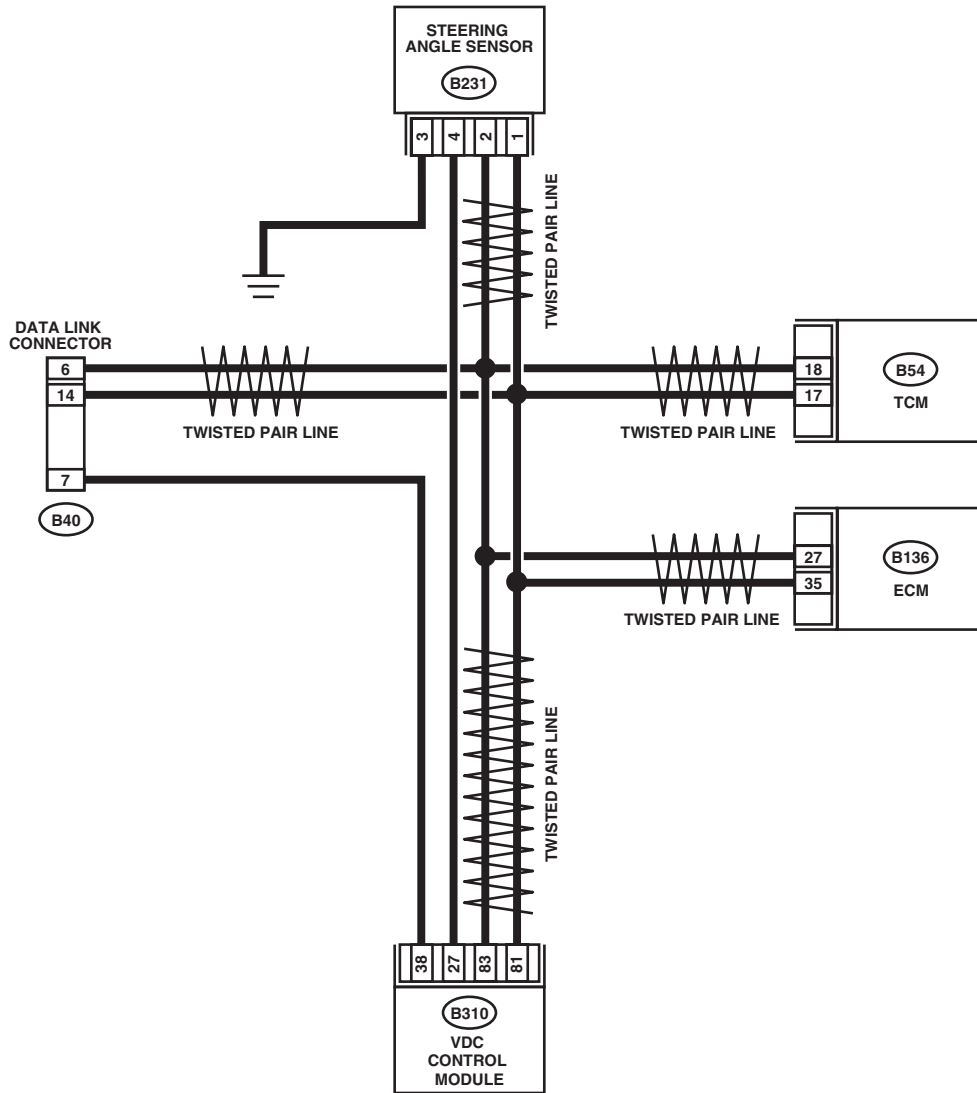
DTC DETECTING CONDITION:

Defective steering angle sensor

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00492

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK STEERING ANGLE SENSOR POWER SUPPLY. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from steering angle sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between the steering angle sensor and chassis ground. Connector & terminal (B231) No. 4 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 4.	Go to step 2.
2 CHECK VDCCM OUTPUT VOLTAGE. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Remove the VDCCM connector cover. <Ref. to VDC(diag)-18, VDCCM Connector Cover.> 4) Connect the connector to the VDCCM. 5) Turn the ignition switch to ON. 6) Measure the voltage between VDCCM and chassis ground. Connector & terminal (B310) No. 27 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Repair the harness between yaw rate sensor and VDCCM.	Go to step 3.
3 CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact in the yaw rate sensor connector?	Repair or replace the VDCCM connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
4 CHECK GROUND CIRCUIT OF STEERING ANGLE SENSOR. Measure the resistance between steering angle sensor and chassis ground. Connector & terminal (B231) No. 3 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 5.	Repair the steering angle sensor ground harness.
5 CHECK STEERING ANGLE SENSOR HARNESS. 1) Connect the connector to the steering angle sensor. 2) Disconnect the connector from VDCCM. 3) Measure the resistance between the VDCCM connector terminals. Connector & terminal (B310) No. 81 — No. 83:	Is the resistance 120 \pm 6 Ω ?	Repair the harness between the steering angle sensor and VDCCM.	Go to step 6.
6 CHECK STEERING ANGLE SENSOR. 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the Inspection Mode. 5) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Go to step 8.	Go to step 7.
7 CHECK ANY OTHER DTC ON DISPLAY.	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.
8 CHECK VDCCM. 1) Turn the ignition switch to OFF. 2) Replace the steering angle sensor. 3) Erase the memory. 4) Perform the Inspection Mode. 5) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 9.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

	Step	Check	Yes	No
9	CHECK ANY OTHER DTC ON DISPLAY.	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Original steering angle sensor malfunction

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AQ:DTC 72 ABNORMAL YAW RATE SENSOR OUTPUT

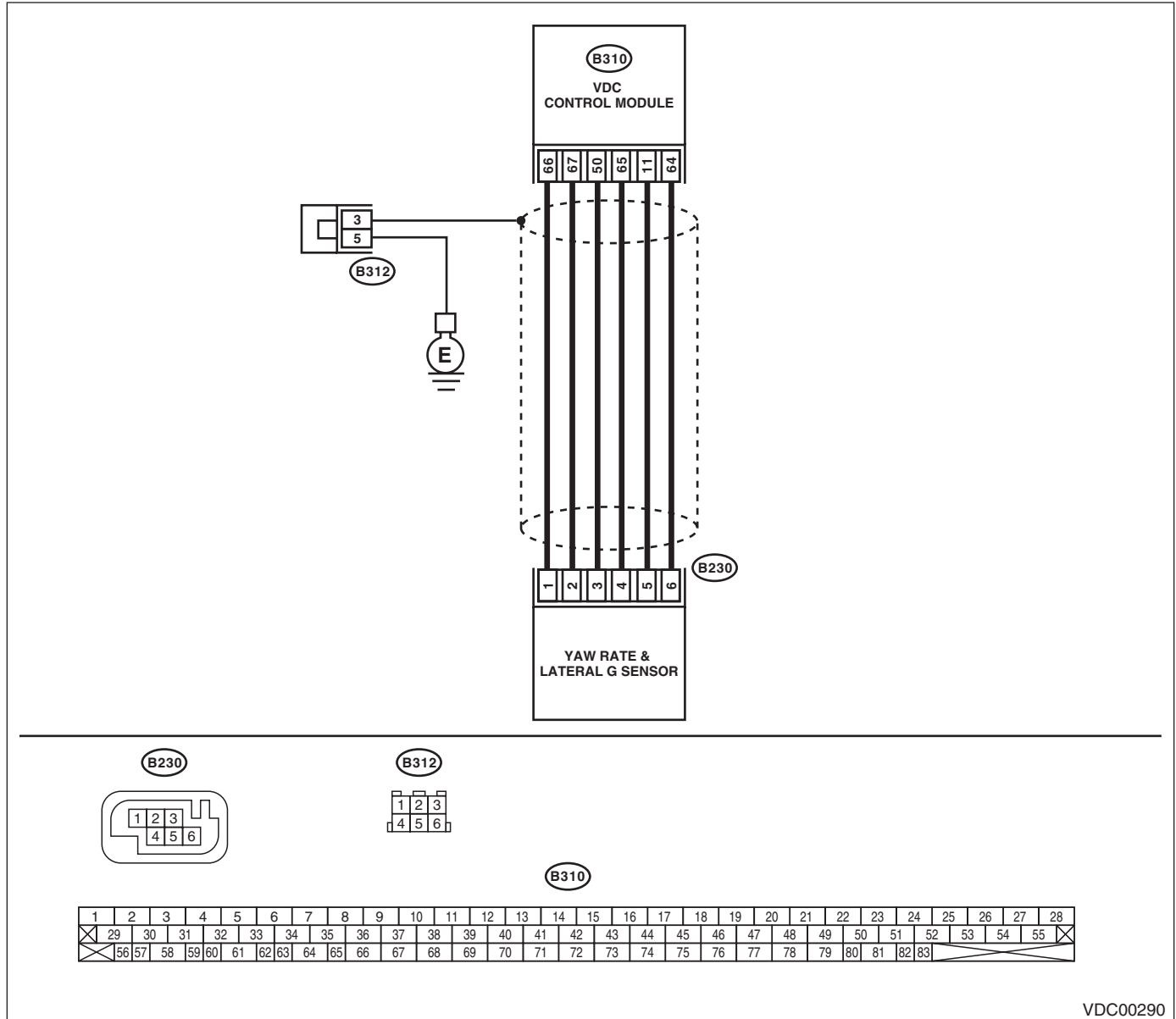
DTC DETECTING CONDITION:

Defective yaw rate sensor

TROUBLE SYMPTOM:

- VDC does not operate.
- ABS does not operate.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK DRIVING ROAD. Interview whether the vehicle was driven on the road with banks or sandy surface.	Was the vehicle driven on the road with banks or sandy surface?	If driven on the road with banks or sandy surface, the VDCCM stores the DTC occasionally.	Go to step 2.
2	CHECK YAW RATE & LATERAL G SENSOR INSTALLATION. Check the yaw rate & lateral G sensor installation.	Is the yaw rate & lateral G sensor tightened securely?	Go to step 3.	Tighten the yaw rate & lateral G sensor securely.
3	CHECK OUTPUT OF YAW RATE & LATERAL G SENSOR USING SUBARU SELECT MONITOR. 1) Drive the vehicle on a flat road. 2) Stop the vehicle in a straight forward direction. 3) Select {Current Data Display & Save} in Subaru Select Monitor. 4) Read the yaw rate & lateral G sensor output on the Subaru Select Monitor display.	Is the resistance 0 ± 5.25 deg/s?	Go to step 4.	Replace the yaw rate & lateral G sensor. <Ref. to VDC-22, Yaw Rate & Lateral G Sensor.>
4	CHECK OUTPUT OF STEERING ANGLE SENSOR USING SUBARU SELECT MONITOR. 1) Drive the vehicle on a flat road. 2) Stop the vehicle in a straight forward direction. 3) Select {Current Data Display & Save} in Subaru Select Monitor. 4) Read the steering angle sensor output on the Subaru Select Monitor display.	Is the resistance 0 ± 2.5 deg?	Go to step 5.	Perform the centering adjustment of steering wheel.
5	CHECK YAW RATE & LATERAL G SENSOR. 1) Turn the ignition switch to OFF. 2) Connect all connectors. 3) Erase the memory. 4) Perform the Inspection Mode. 5) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Go to step 7.	Go to step 6.
6	CHECK ANY OTHER DTC ON DISPLAY.	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.
7	CHECK VDCCM. 1) Turn the ignition switch to OFF. 2) Replace the yaw rate & lateral G sensor. 3) Erase the memory. 4) Perform the Inspection Mode. 5) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Go to step 8.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
8	CHECK THE DTC DISPLAY.	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Malfunction in original yaw rate & lateral G sensor.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AR:DTC 72 VOLTAGE INPUTTED TO YAW RATE SENSOR EXCEEDS SPECIFICATION

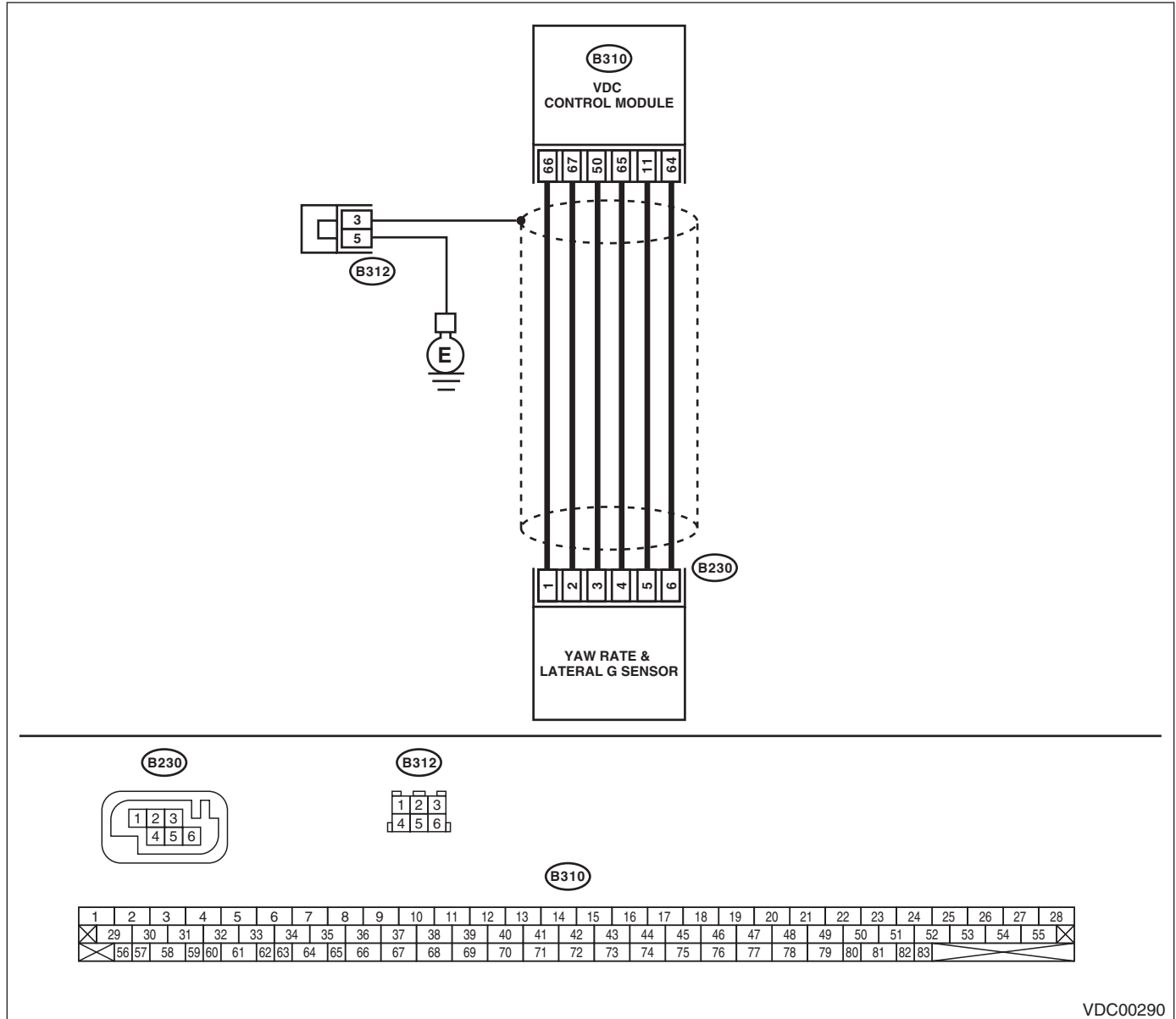
DTC DETECTING CONDITION:

Defective yaw rate sensor

TROUBLE SYMPTOM:

- VDC does not operate.
- ABS does not operate.

WIRING DIAGRAM:



VDC00290

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK YAW RATE & LATERAL G SENSOR POWER SUPPLY. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from yaw rate & lateral G sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between yaw rate & lateral G sensor and chassis ground. Connector & terminal (B230) No. 3 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 4.	Go to step 2.
2 CHECK VDCCM OUTPUT VOLTAGE. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Remove the VDCCM connector cover. <Ref. to VDC(diag)-18, VDCCM Connector Cover.> 4) Connect the connector to the VDCCM. 5) Turn the ignition switch to ON. 6) Measure the voltage between VDCCM and chassis ground. Connector & terminal (B310) No. 50 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Repair the harness between yaw rate & lateral G sensor and VDCCM.	Go to step 3.
3 CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact in connector between yaw rate & lateral G sensor?	Repair or replace the VDCCM connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
4 CHECK YAW RATE & LATERAL G SENSOR HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Measure the resistance between VDCCM and yaw rate & lateral G sensor. Connector & terminal (B310) No. 65 — (B230) No. 4:	Is the resistance less than 0.5 Ω ?	Go to step 5.	Repair the harness between yaw rate & lateral G sensor and VDCCM.
5 CHECK GROUND SHORT CIRCUIT OF HARNESS. Measure the resistance between VDCCM and chassis ground. Connector & terminal (B310) No. 65 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 6.	Repair the harness between yaw rate & lateral G sensor and VDCCM.
6 CHECK BATTERY SHORT OF HARNESS. Measure the voltage between VDCCM and chassis ground. Connector & terminal (B310) No. 65 (+) — Chassis ground (-):	Is the voltage less than 0.5 V?	Go to step 7.	Repair the harness between yaw rate & lateral G sensor and VDCCM.
7 CHECK BATTERY SHORT OF HARNESS. 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM and chassis ground. Connector & terminal (B310) No. 65 (+) — Chassis ground (-):	Is the voltage less than 0.5 V?	Replace the yaw rate & lateral G sensor. <Ref. to VDC-22, Yaw Rate & Lateral G Sensor.>	Repair the harness between yaw rate & lateral G sensor and VDCCM.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AS:DTC 72 ABNORMAL YAW RATE SENSOR REFERENCE VOLTAGE

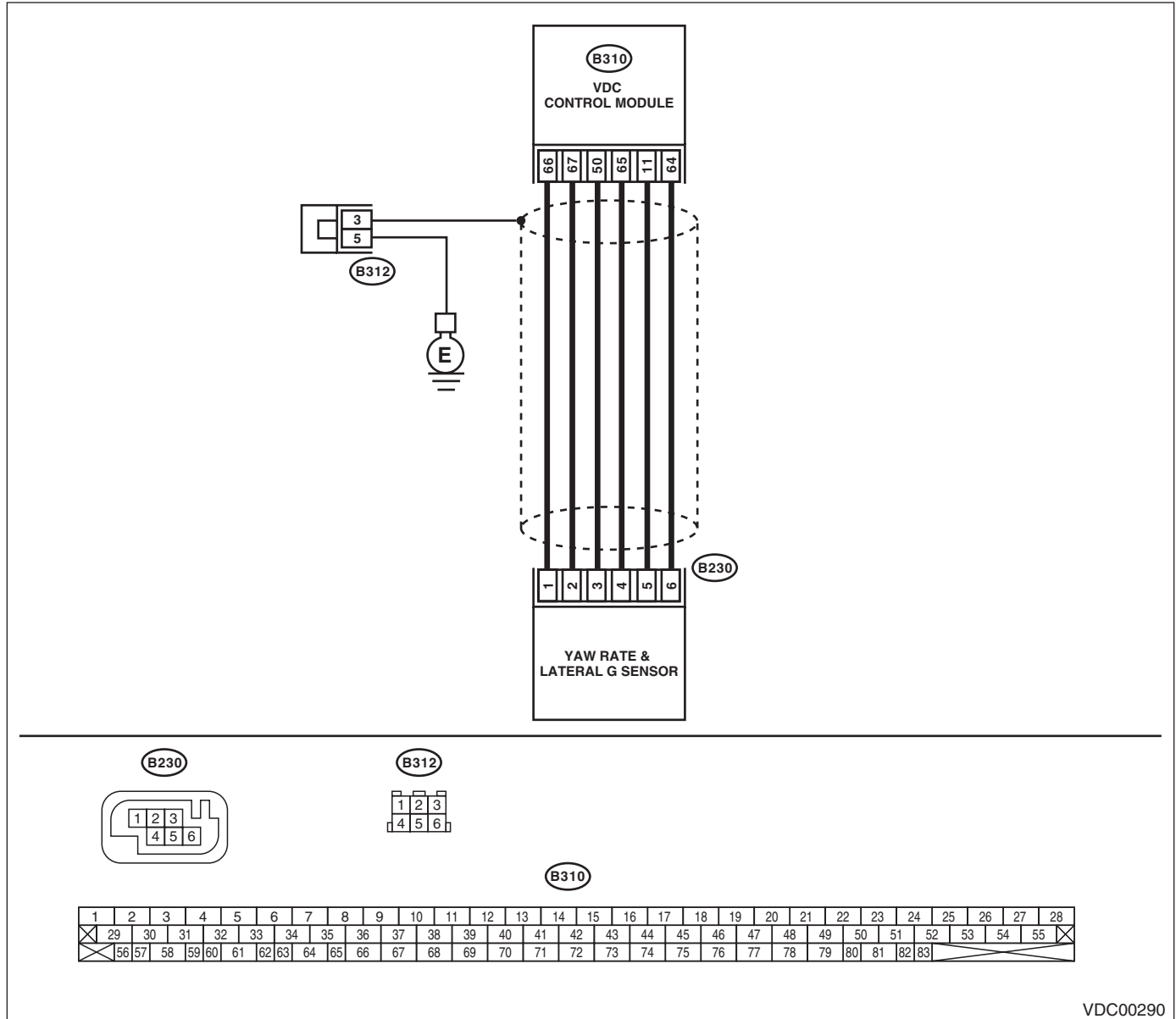
DTC DETECTING CONDITION:

Defective yaw rate sensor

TROUBLE SYMPTOM:

- VDC does not operate.
- ABS does not operate.

WIRING DIAGRAM:



VDC00290

Step	Check	Yes	No
1 CHECK YAW RATE & LATERAL G SENSOR POWER SUPPLY. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from yaw rate & lateral G sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between yaw rate & lateral G sensor and chassis ground. Connector & terminal (B230) No. 3 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 4.	Go to step 2.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
2 CHECK VDCCM OUTPUT VOLTAGE. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Remove the VDCCM connector cover. <Ref. to VDC(diag)-18, REMOVAL, VDCCM Connector Cover.> 4) Connect the connector to the VDCCM. 5) Turn the ignition switch to ON. 6) Measure the voltage between VDCCM and chassis ground. Connector & terminal (B310) No. 50 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 3.	Repair the harness between yaw rate & lateral G sensor and VDCCM.
3 CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact in connector between yaw rate & lateral G sensor?	Repair or replace the VDCCM connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
4 CHECK YAW RATE & LATERAL G SENSOR HARNESS. 1) Disconnect the connectors from VDCCM. 2) Measure the resistance between VDCCM and yaw rate & lateral G sensor. Connector & terminal (B310) No. 66 — (B230) No. 1:	Is the resistance less than 0.5 Ω ?	Go to step 5.	Repair the harness between yaw rate & lateral G sensor and VDCCM.
5 CHECK GROUND SHORT CIRCUIT OF HARNESS. Measure the resistance between VDCCM and chassis ground. Connector & terminal (B310) No. 66 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 6.	Repair the harness between yaw rate & lateral G sensor and VDCCM.
6 CHECK BATTERY SHORT OF HARNESS. Measure the voltage between VDCCM and chassis ground. Connector & terminal (B310) No. 66 (+) — Chassis ground (-):	Is the voltage less than 0.5 V?	Go to step 7.	Repair the harness between yaw rate & lateral G sensor and VDCCM.
7 CHECK BATTERY SHORT OF HARNESS. 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM and chassis ground. Connector & terminal (B310) No. 66 (+) — Chassis ground (-):	Is the voltage less than 0.5 V?	Go to step 8.	Repair the harness between yaw rate & lateral G sensor and VDCCM.
8 CHECK YAW RATE & LATERAL G SENSOR. 1) Turn the ignition switch to OFF. 2) Install the yaw rate & lateral G sensor to the body. 3) Remove the VDCCM connector cover. <Ref. to VDC(diag)-18, VDCCM Connector Cover.> 4) Connect all connectors. 5) Turn the ignition switch to ON. 6) Measure the voltage between VDCCM connector terminals. Connector & terminal (B310) No. 66 (+) — No. 64 (-):	Is the voltage 2.1 — 2.9 V?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Replace the yaw rate & lateral G sensor. <Ref. to VDC-22, Yaw Rate & Lateral G Sensor.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AT:DTC 72 CHANGE RANGE OF YAW RATE SENSOR SIGNAL IS TOO BIG

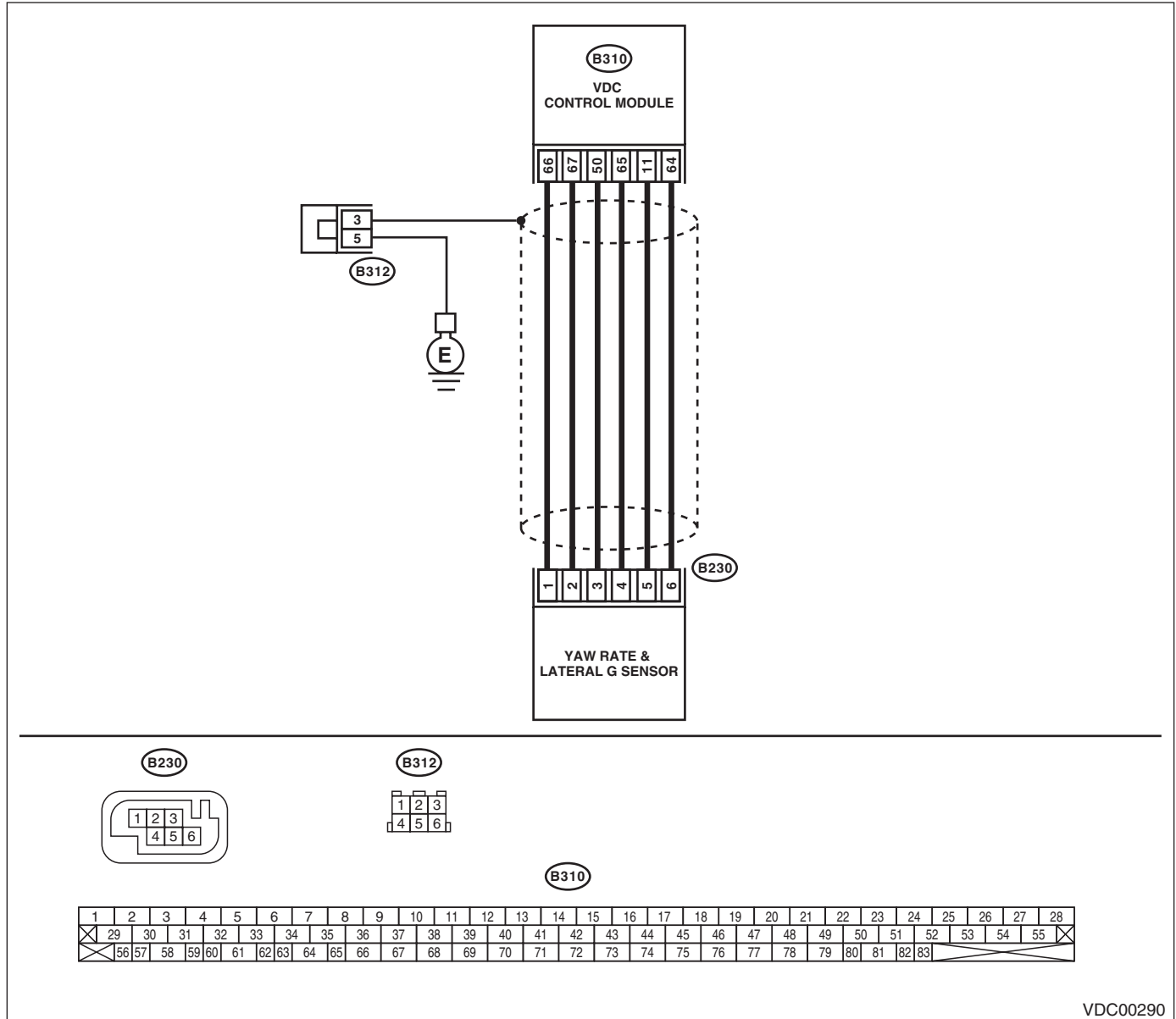
DTC DETECTING CONDITION:

Defective yaw rate sensor

TROUBLE SYMPTOM:

- VDC does not operate.
- ABS does not operate.

WIRING DIAGRAM:



VDC00290

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK DRIVING ROAD. Interview whether the vehicle was driven on the road with banks or sandy surface.	Was the vehicle driven on the road with banks or sandy surface?	If driven on the road with banks or sandy surface, the VDCCM stores the DTC occasionally.	Go to step 2.
2	CHECK YAW RATE & LATERAL G SENSOR INSTALLATION. Check the yaw rate & lateral G sensor installation.	Is the yaw rate & lateral G sensor tightened securely?	Go to step 3.	Tighten the yaw rate & lateral G sensor securely.
3	CHECK YAW RATE & LATERAL G SENSOR POWER SUPPLY. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from yaw rate & lateral G sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between yaw rate & lateral sensor and the chassis ground. Connector & terminal (B230) No. 3 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Go to step 6.	Go to step 4.
4	CHECK VDCCM OUTPUT VOLTAGE. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Remove the VDCCM connector cover. <Ref. to VDC(diag)-18, REMOVAL, VDCCM Connector Cover.> 4) Connect the connector to the VDCCM. 5) Turn the ignition switch to ON. 6) Measure the voltage between VDCCM and chassis ground. Connector & terminal (B310) No. 50 (+) — Chassis ground (-):	Is the voltage 10 — 15 V?	Repair the harness between yaw rate & lateral G sensor and VDCCM.	Go to step 5.
5	CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact in connector between yaw rate & lateral G sensor?	Repair or replace the VDCCM connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
6	CHECK YAW RATE & LATERAL G SENSOR GROUND CIRCUIT. Measure the resistance between the yaw rate & lateral G sensor and the chassis ground. Connector & terminal (B230) No. 6 — Chassis ground:	Is the resistance less than 0.5 Ω?	Go to step 9.	Go to step 7.
7	CHECK GROUND CIRCUIT OF VDCCM. 1) Disconnect the connectors from VDCCM. 2) Remove the VDCCM connector cover. <Ref. to VDC(diag)-18, REMOVAL, VDCCM Connector Cover.> 3) Connect the connector to the VDCCM. 4) Measure the resistance between VDCCM and chassis ground. Connector & terminal (B310) No. 64 — Chassis ground:	Is the resistance less than 0.5 Ω?	Repair the harness between yaw rate & lateral G sensor and VDCCM.	Go to step 8.
8	CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact in the VDCCM connector?	Repair or replace the VDCCM connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK YAW RATE & LATERAL G SENSOR HARNESS. 1) Disconnect the connectors from VDCCM. 2) Measure the resistance between VDCCM and yaw rate & lateral G sensor. <i>Connector & terminal</i> <i>(B310) No. 65 — (B230) No. 4:</i> <i>(B310) No. 66 — (B230) No. 1:</i> <i>(B310) No. 67 — (B230) No. 2:</i>	Is the resistance less than 0.5 Ω?	Go to step 10.	Repair the harness between yaw rate & lateral G sensor and VDCCM.
10 CHECK GROUND SHORT CIRCUIT OF HARNESS. Measure the resistance between VDCCM and chassis ground. <i>Connector & terminal</i> <i>(B310) No. 65 — Chassis ground:</i> <i>(B310) No. 66 — Chassis ground:</i> <i>(B310) No. 67 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 11.	Repair the harness between yaw rate & lateral G sensor and VDCCM.
11 CHECK BATTERY SHORT OF HARNESS. Measure the voltage between VDCCM and chassis ground. <i>Connector & terminal</i> <i>(B310) No. 65 (+) — Chassis ground (-):</i> <i>(B310) No. 66 (+) — Chassis ground (-):</i> <i>(B310) No. 67 (+) — Chassis ground (-):</i>	Is the voltage less than 0.5 V?	Go to step 12.	Repair the harness between yaw rate & lateral G sensor and VDCCM.
12 CHECK BATTERY SHORT OF HARNESS. 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCCM and chassis ground. <i>Connector & terminal</i> <i>(B310) No. 65 (+) — Chassis ground (-):</i> <i>(B310) No. 66 (+) — Chassis ground (-):</i> <i>(B310) No. 67 (+) — Chassis ground (-):</i>	Is the voltage less than 0.5 V?	Go to step 13.	Repair the harness between yaw rate & lateral G sensor and VDCCM.
13 CHECK YAW RATE & LATERAL G SENSOR. 1) Turn the ignition switch to OFF. 2) Install the yaw rate & lateral G sensor to the body. 3) Connect all connectors. 4) Turn the ignition switch to ON. 5) Measure the voltage between yaw rate & lateral G sensor connector terminals. <i>Connector & terminal</i> <i>(B310) No. 66 (+) — No. 64 (-):</i>	Is the voltage 2.1 — 2.9 V?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Replace the yaw rate & lateral G sensor. <Ref. to VDC-22, Yaw Rate & Lateral G Sensor.>

AU:DTC 73 LATERAL G SENSOR OFFSET IS TOO BIG

NOTE:

Refer to DTC 73 for the diagnostic procedure. <Ref. to VDC(diag)-123, DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AV:DTC 73 ABNORMAL LATERAL G SENSOR OUTPUT

NOTE:

Refer to DTC 73 for the diagnostic procedure. <Ref. to VDC(diag)-123, DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

AW:DTC 73 CHANGE RANGE OF LATERAL G SENSOR SIGNAL IS TOO BIG

NOTE:

Refer to DTC 73 for the diagnostic procedure. <Ref. to VDC(diag)-123, DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AX:DTC 73 EXCESSIVE LATERAL G SENSOR SIGNAL

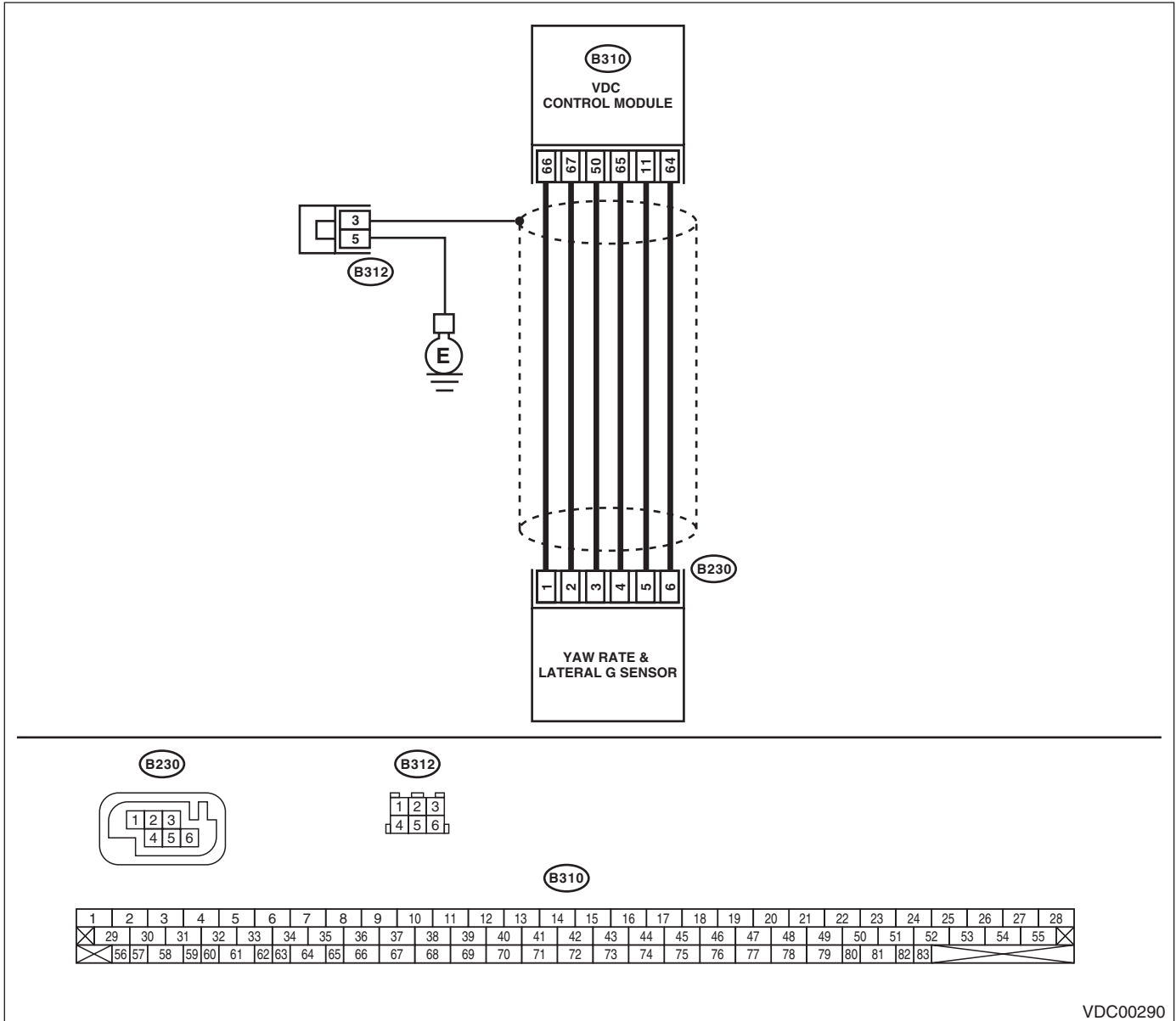
DTC DETECTING CONDITION:

Lateral G sensor malfunction

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00290

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK YAW RATE & LATERAL G SENSOR INSTALLATION. Check the yaw rate & lateral G sensor installation.	Is the yaw rate & lateral G sensor tightened securely?	Go to step 2.	Tighten the yaw rate & lateral G sensor securely.
2 CHECK OUTPUT OF LATERAL G SENSOR USING SUBARU SELECT MONITOR. 1) Stop the vehicle on a flat road. 2) Select {Current Data Display & Save} in Subaru Select Monitor. 3) Read the yaw rate & lateral G sensor output on the Subaru Select Monitor display.	Is the resistance 2.5 ± 0.2 V?	Go to step 3.	Replace the yaw rate & lateral G sensor. <Ref. to VDC-22, Yaw Rate & Lateral G Sensor.>
3 CHECK POOR CONTACT OF CONNECTOR. Turn the ignition switch to OFF.	Is there poor contact in connector between VDCCM and yaw rate & lateral G sensor?	Repair the connector.	Go to step 4.
4 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 5.
5 CHECK ANY OTHER DTC ON DISPLAY.	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AY:DTC 73 VOLTAGE INPUTTED TO LATERAL G SENSOR EXCEEDS SPECIFICATION

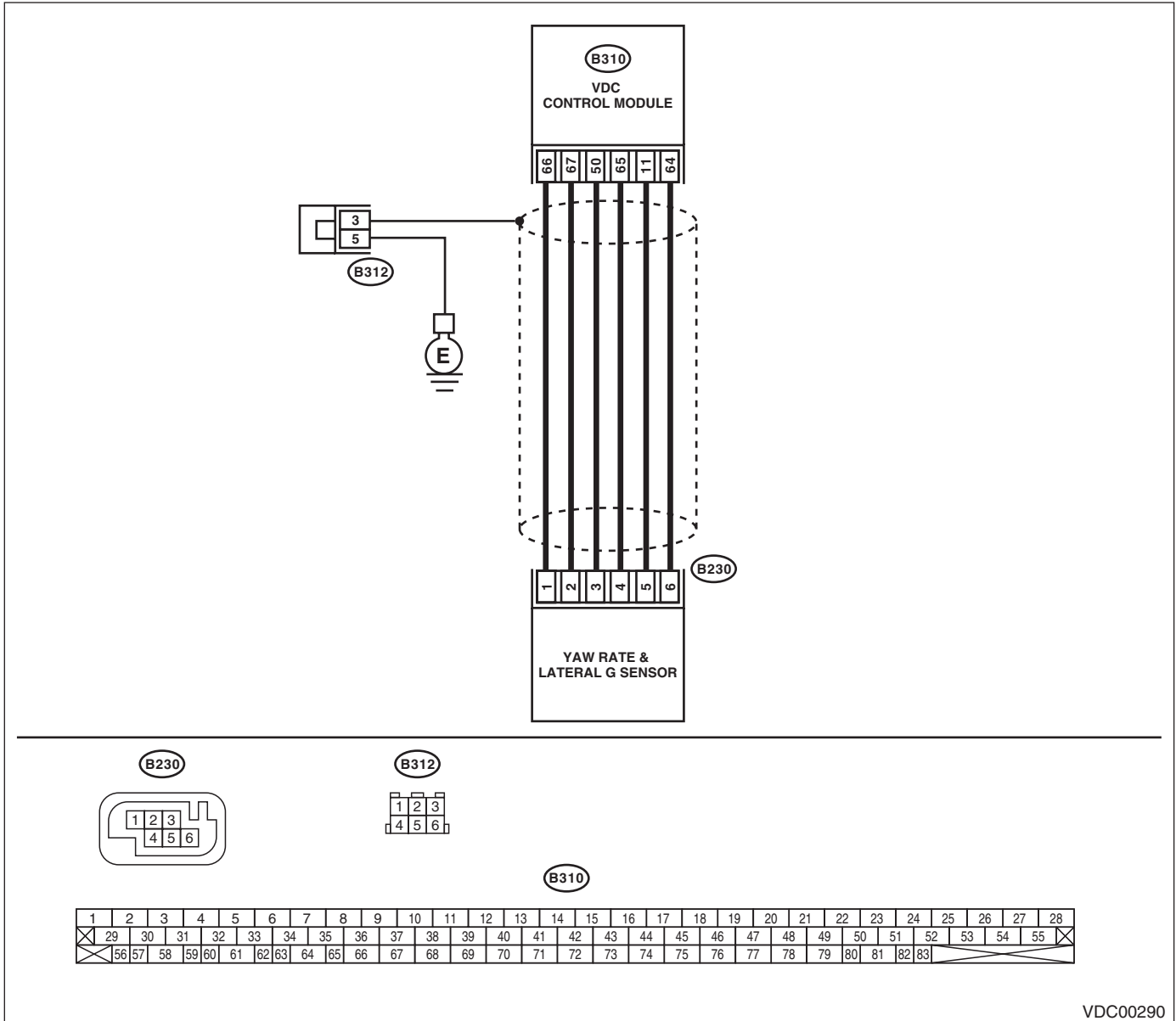
DTC DETECTING CONDITION:

Lateral G sensor malfunction

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00290

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK OUTPUT OF YAW RATE & LATERAL G SENSOR USING SUBARU SELECT MONITOR. 1) Stop the vehicle on a flat road. 2) Select {Current Data Display & Save} in Subaru Select Monitor. 3) Read the yaw rate & lateral G sensor output on the Subaru Select Monitor display.	Is the resistance 2.5 ± 0.2 V?	Go to step 2.	Go to step 5.
2 CHECK POOR CONTACT OF CONNECTOR. Turn the ignition switch to OFF.	Is there poor contact in connector between VDCCM and yaw rate & lateral G sensor?	Repair the connector.	Go to step 3.
3 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 4.
4 CHECK ANY OTHER DTC ON DISPLAY.	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.
5 CHECK YAW RATE & LATERAL G SENSOR INPUT VOLTAGE. 1) Turn the ignition switch to OFF. 2) Remove the console box. 3) Disconnect the connector from yaw rate & lateral G sensor. 4) Turn the ignition switch to ON. 5) Measure the voltage between yaw rate & lateral G sensor connector terminals. Connector & terminal (B230) No. 3 (+) — No. 6 (-):	Is the voltage 10 — 15 V?	Go to step 6.	Repair the harness or connector between yaw rate & lateral G sensor and VDCCM.
6 CHECK YAW RATE & LATERAL G SENSOR. 1) Turn the ignition switch to OFF. 2) Measure the resistance between yaw rate & lateral G sensor connector terminals. Terminals No. 3 — No. 5:	Is the resistance between 4.3 — 4.9 k Ω ?	Go to step 7.	Replace the yaw rate & lateral G sensor. <Ref. to VDC-22, Yaw Rate & Lateral G Sensor.>
7 CHECK OPEN CIRCUIT FOR OUTPUT HARNESS AND GROUND HARNESS OF YAW RATE & LATERAL G SENSOR. 1) Connect the connector to the yaw rate & lateral G sensor. 2) Disconnect the connectors from VDCCM. 3) Measure the resistance between the VDCCM connector terminals. Connector & terminal (B310) No. 11 — No. 64:	Is the resistance between 4.3 — 4.9 k Ω ?	Go to step 8.	Repair the harness between yaw rate & lateral G sensor and VDCCM.
8 CHECK GROUND SHORT IN YAW RATE & LATERAL G SENSOR HARNESS. 1) Disconnect the connector from yaw rate & lateral G sensor. 2) Measure the resistance between VDCCM connector and chassis ground. Connector & terminal (B310) No. 11 — Chassis ground:	Is the resistance 1 M Ω or more?	Go to step 9.	Repair the harness between yaw rate & lateral G sensor and VDCCM.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK YAW RATE & LATERAL G SENSOR. 1) Turn the ignition switch to OFF. 2) Remove the yaw rate & lateral G sensors from vehicle. 3) Connect the connector to the yaw rate & lateral G sensor. 4) Connect the connector to the VDCCM. 5) Turn the ignition switch to ON. 6) Measure the voltage between yaw rate & lateral G sensor connector terminals. Connector & terminal (B230) No. 5 (+) — No. 6 (-):	Is the voltage 2.3 — 2.7 V when yaw rate & lateral G sensor is on a level?	Go to step 10.	Replace the yaw rate & lateral G sensor. <Ref. to VDC-22, Yaw Rate & Lateral G Sensor.>
10 CHECK YAW RATE & LATERAL G SENSOR. Measure the voltage between yaw rate & lateral G sensor connector terminals. Connector & terminal (B230) No. 5 (+) — No. 6 (-):	Is the voltage 3.3 — 3.7 V when yaw rate & lateral G sensor is inclined 90° to the left?	Go to step 11.	Replace the yaw rate & lateral G sensor. <Ref. to VDC-22, Yaw Rate & Lateral G Sensor.>
11 CHECK YAW RATE & LATERAL G SENSOR. Measure the voltage between yaw rate & lateral G sensor connector terminals. Connector & terminal (B230) No. 5 (+) — No. 6 (-):	Is the voltage 1.3 — 1.7 V when yaw rate & lateral G sensor is inclined 90° to the right?	Go to step 12.	Replace the yaw rate & lateral G sensor. <Ref. to VDC-22, Yaw Rate & Lateral G Sensor.>
12 CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact in connector between VDCCM and yaw rate & lateral G sensor?	Repair the connector.	Go to step 13.
13 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 14.
14 CHECK ANY OTHER DTC ON DISPLAY.	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

AZ:DTC 74 PRIMARY PRESSURE SENSOR POWER/OUTPUT

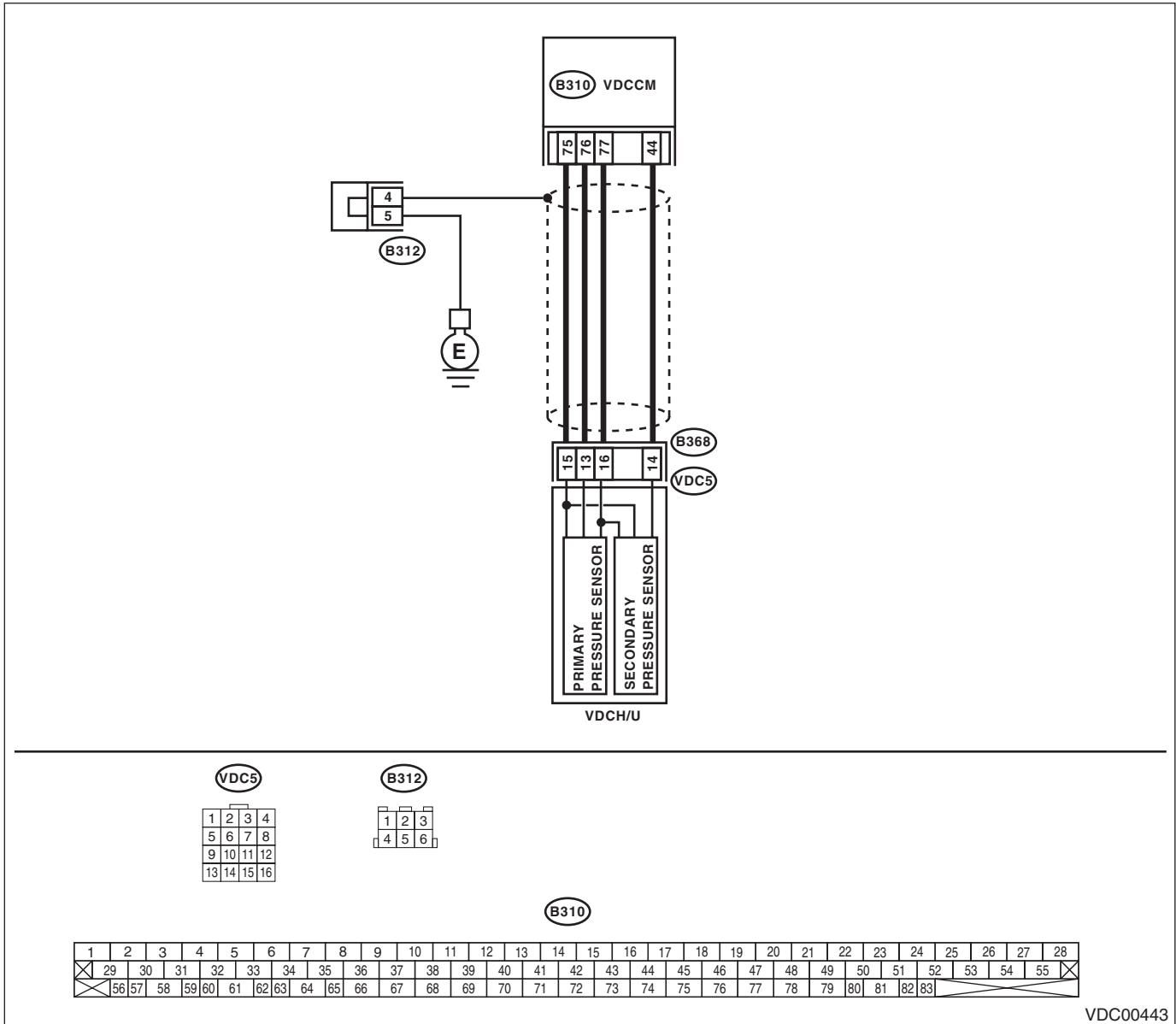
DTC DETECTING CONDITION:

Primary pressure sensor malfunction

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00443

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK GROUND CIRCUIT OF PRESSURE SENSOR.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connectors (B368) from VDCH/U.</p> <p>3) Measure the resistance between VDCH/U connector and chassis ground.</p> <p>Connector & terminal (B368) No. 15 — Chassis ground:</p>	Is the resistance less than 0.5 Ω ?	Go to step 4.	Go to step 2.
2	<p>CHECK GROUND CIRCUIT OF VDCCM.</p> <p>1) Disconnect the connectors from VDCCM.</p> <p>2) Remove the cover from VDCCM. <Ref. to VDC(diag)-18, REMOVAL, VDCCM Connector Cover.></p> <p>3) Connect the connector to the VDCCM.</p> <p>4) Measure the resistance between VDCCM and chassis ground.</p> <p>Connector & terminal (B310) No. 75 — Chassis ground:</p>	Is the resistance less than 0.5 Ω ?	Replace the harness between VDCH/U and VDCCM.	Go to step 3.
3	<p>CHECK POOR CONTACT OF CONNECTOR.</p>	Is there poor contact in the VDCCM connector?	Repair or replace the VDCCM connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
4	<p>CHECK POWER SUPPLY FOR PRESSURE SENSOR.</p> <p>NOTE: When performing this inspection, DTC 51 VALVE RELAY MALFUNCTION is stored. However, this does not indicate a malfunction of valve relay.</p> <p>1) Turn the ignition switch to ON.</p> <p>2) Measure the voltage between VDCH/U connector terminals.</p> <p>Connector & terminal (B368) No. 16 (+) — No. 15 (-):</p>	Is the voltage 4.75 — 5.25 V?	Go to step 7.	Go to step 5.
5	<p>CHECK VDCCM POWER SUPPLY.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connectors from VDCCM.</p> <p>3) Remove the cover from VDCCM. <Ref. to VDC(diag)-18, REMOVAL, VDCCM Connector Cover.></p> <p>4) Connect the connector to the VDCCM.</p> <p>5) Turn the ignition switch to ON.</p> <p>6) Measure the voltage between VDCCM connector terminals.</p> <p>Connector & terminal (B310) No. 77 (+) — No. 75 (-):</p>	Is the voltage 4.75 — 5.25 V?	Repair the harness between VDCH/U and VDCCM.	Go to step 6.
6	<p>CHECK POOR CONTACT OF CONNECTOR.</p>	Is there poor contact in the VDCCM connector?	Repair or replace the VDCCM connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK GROUND SHORT CIRCUIT OF HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Measure the resistance between VDCH/U connector and chassis ground. <i>Connector & terminal</i> <i>(B368) No. 13 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 8.	Repair the harness between VDCH/U and VDCCM.
8 CHECK BATTERY SHORT OF HARNESS. Measure the voltage between VDCH/U connector and chassis ground. <i>Connector & terminal</i> <i>(B368) No. 13 (+) — Chassis ground (-):</i>	Is the voltage less than 0.5 V?	Go to step 9.	Repair the harness between VDCH/U and VDCCM.
9 CHECK BATTERY SHORT OF HARNESS. 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCH/U connector and chassis ground. <i>Connector & terminal</i> <i>(B368) No. 13 (+) — Chassis ground (-):</i>	Is the voltage less than 0.5 V?	Go to step 10.	Repair the harness between VDCH/U and VDCCM.
10 CHECK INPUT VOLTAGE OF PRESSURE SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Remove the cover from VDCCM. <Ref. to VDC(diag)-18, REMOVAL, VDCCM Connector Cover.> 4) Connect the connector to the VDCCM. 5) Connect all connectors. 6) Turn the ignition switch to ON. 7) Do not depress the brake pedal. 8) Measure the voltage between VDCCM connector terminals. <i>Connector & terminal</i> <i>(B310) No. 76 (+) — No. 75 (-):</i>	Is the voltage 0.48 — 0.72 V?	Go to step 11.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>
11 CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact in connectors between VDCCM and pressure sensor?	Repair the connector.	Go to step 12.
12 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 13.
13 CHECK ANY OTHER DTC ON DISPLAY.	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

BA:DTC 74 SECONDARY PRESSURE SENSOR POWER/OUTPUT

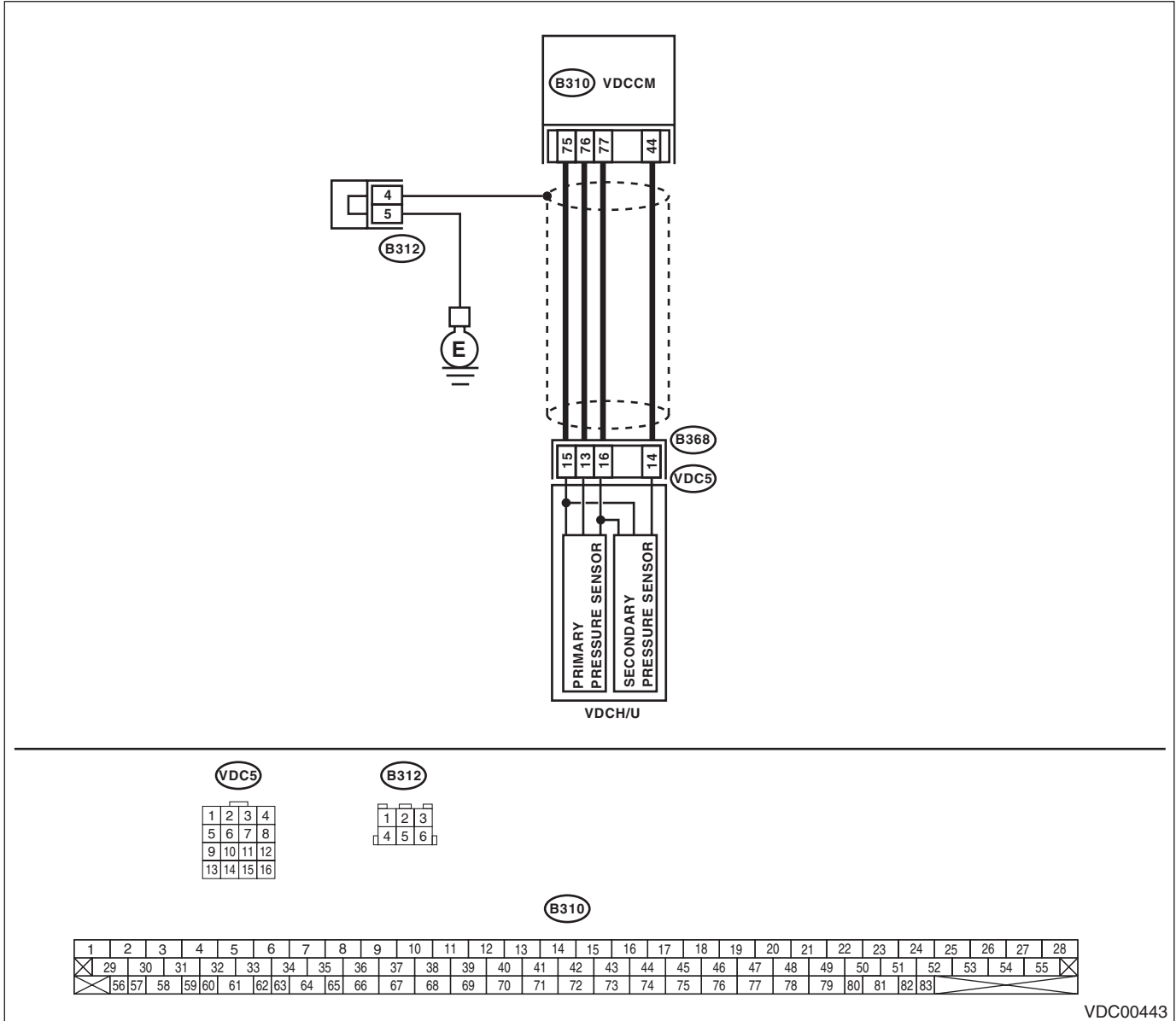
DTC DETECTING CONDITION:

Secondary pressure sensor malfunction

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00443

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK GROUND CIRCUIT OF PRESSURE SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors (B368) from VDCH/U. 3) Measure the resistance between VDCH/U connector and chassis ground. Connector & terminal (B368) No. 15 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Go to step 4.	Go to step 2.
2 CHECK GROUND CIRCUIT OF VDCCM. 1) Disconnect the connectors from VDCCM. 2) Remove the cover from VDCCM. <Ref. to VDC(diag)-18, REMOVAL, VDCCM Connector Cover.> 3) Connect the connector to the VDCCM. 4) Measure the resistance between VDCCM and chassis ground. Connector & terminal (B310) No. 75 — Chassis ground:	Is the resistance less than 0.5 Ω ?	Replace the harness between VDCH/U and VDCCM.	Go to step 3.
3 CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact in the VDCCM connector?	Repair or replace the VDCCM connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>
4 CHECK POWER SUPPLY FOR PRESSURE SENSOR. NOTE: When performing this inspection, DTC 51 VALVE RELAY MALFUNCTION is stored. However, this does not indicate a malfunction of valve relay. 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCH/U connector terminals. Connector & terminal (B368) No. 16 (+) — No. 15 (-):	Is the voltage 4.75 — 5.25 V?	Go to step 7.	Go to step 5.
5 CHECK VDCCM POWER SUPPLY. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Remove the cover from VDCCM. <Ref. to VDC(diag)-18, VDCCM Connector Cover.> 4) Connect the connector to the VDCCM. 5) Turn the ignition switch to ON. 6) Measure the voltage between VDCCM connector terminals. Connector & terminal (B310) No. 77 (+) — No. 75 (-):	Is the voltage 4.75 — 5.25 V?	Repair the harness between VDCH/U and VDCCM.	Go to step 6.
6 CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact in the VDCCM connector?	Repair or replace the VDCCM connector.	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
7 CHECK GROUND SHORT CIRCUIT OF HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Measure the resistance between VDCH/U connector and chassis ground. Connector & terminal (B368) No. 14 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 8.	Repair the harness between VDCH/U and VDCCM.
8 CHECK BATTERY SHORT OF HARNESS. Measure the voltage between VDCH/U connector and chassis ground. Connector & terminal (B368) No. 14 (+) — Chassis ground (-):	Is the voltage less than 0.5 V?	Go to step 9.	Repair the harness between VDCH/U and VDCCM.
9 CHECK BATTERY SHORT OF HARNESS. 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCH/U connector and chassis ground. Connector & terminal (B368) No. 13 (+) — Chassis ground (-): (B368) No. 14 (+) — Chassis ground (-):	Is the voltage less than 0.5 V?	Go to step 10.	Repair the harness between VDCH/U and VDCCM.
10 CHECK INPUT VOLTAGE OF PRESSURE SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Remove the cover from VDCCM. <Ref. to VDC(diag)-18, REMOVAL, VDCCM Connector Cover.> 4) Connect the connector to the VDCCM. 5) Connect all connectors. 6) Turn the ignition switch to ON. 7) Do not depress the brake pedal. 8) Measure the voltage between VDCCM connector terminals. Connector & terminal (B310) No. 44 (+) — No. 75 (-):	Is the voltage 0.48 — 0.72 V?	Go to step 11.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>
11 CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact in connectors between VDCCM and pressure sensor?	Repair the connector.	Go to step 12.
12 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 13.
13 CHECK ANY OTHER DTC ON DISPLAY.	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

BB:DTC 74 PRIMARY PRESSURE SENSOR OFFSET IS TOO BIG

NOTE:

Refer to DTC 74 for the diagnostic procedure. <Ref. to VDC(diag)-134, DTC 74 SECONDARY PRESSURE SENSOR OFFSET IS TOO BIG, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

BC:DTC 74 SECONDARY PRESSURE SENSOR OFFSET IS TOO BIG

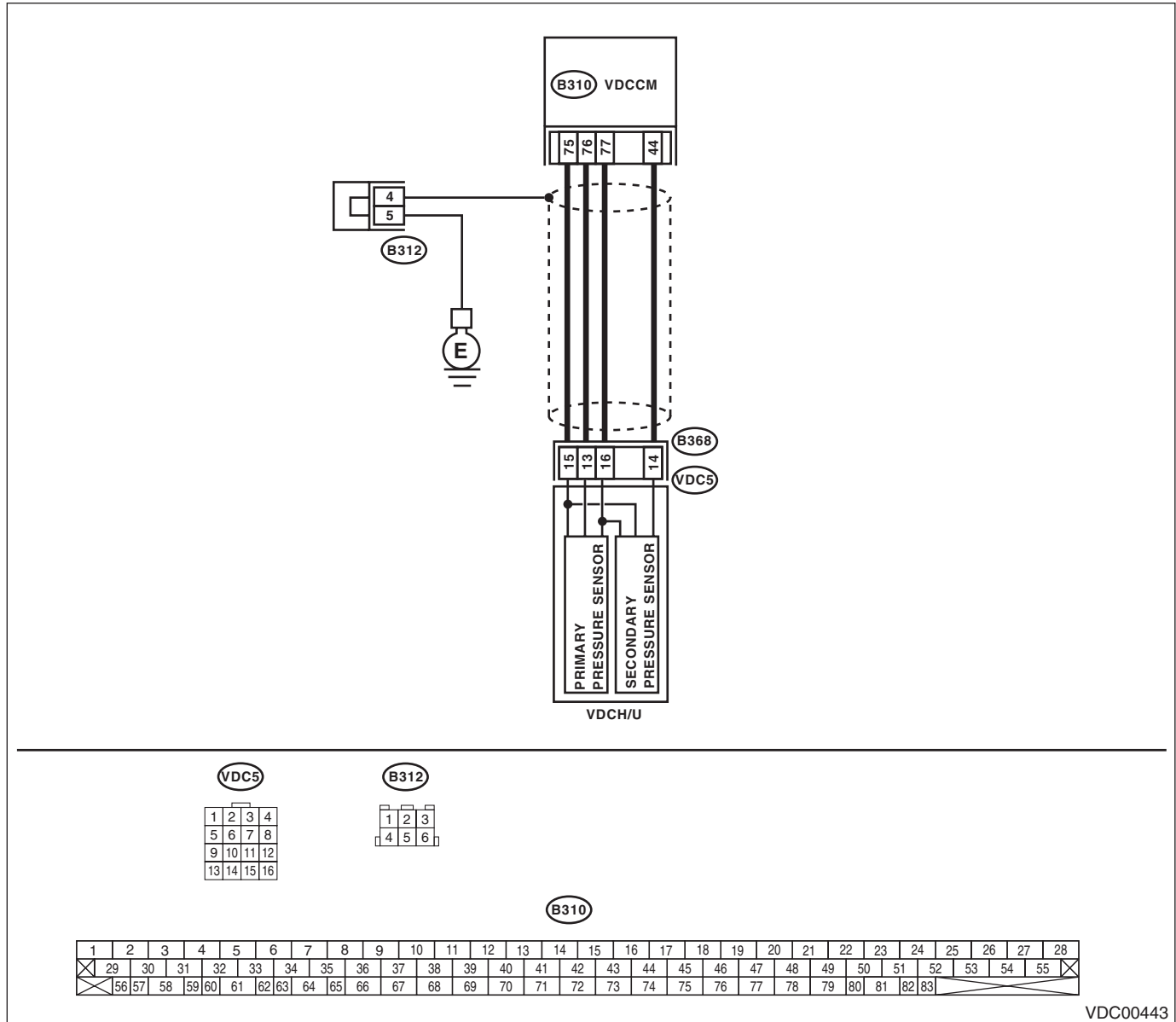
DTC DETECTING CONDITION:

Pressure sensor malfunction

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00443

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK USER DRIVING METHOD. Interview the user about their driving habits.	Are the acceleration pedal and brake pedal depressed simultaneously while driving?	Erase the normal DTC for the VDC. NOTE: If the vehicle is driven while both the accelerator pedal and brake pedal are used, the DTC is sometimes stored in memory.	Go to step 2.
2	CHECK OUTPUT OF THE PRESSURE SENSOR USING SUBARU SELECT MONITOR. 1) Select {Current Data Display & Save} in Subaru Select Monitor. 2) Read the pressure sensor output on the Subaru Select Monitor display.	Is the output value 0.6 ± 0.12 V when the brake pedal is not depressed?	Go to step 3.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>
3	CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 4.
4	CHECK ANY OTHER DTC ON DISPLAY.	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

BD:DTC 74 DIFFERENTIAL PRESSURE OF PRESSURE SENSOR IS TOO BIG

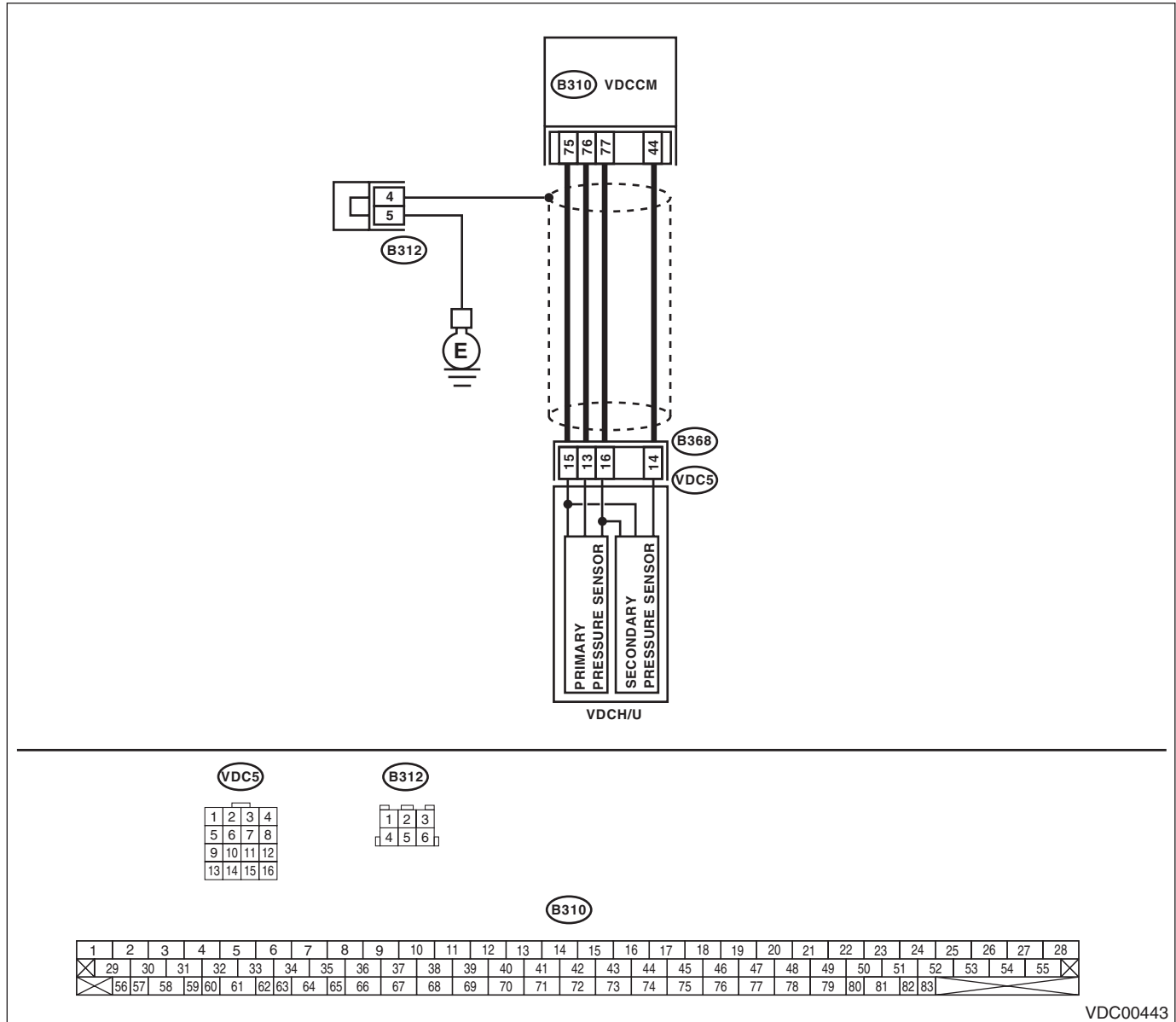
DTC DETECTING CONDITION:

Pressure sensor malfunction

TROUBLE SYMPTOM:

- ABS does not operate.
- VDC does not operate.

WIRING DIAGRAM:



VDC00443

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

	Step	Check	Yes	No
1	CHECK GROUND SHORT CIRCUIT OF HARNESS. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Disconnect the connectors (B368) from VDCH/U. 4) Measure the resistance between VDCH/U connector and chassis ground. Connector & terminal (B368) No. 13 — Chassis ground: (B368) No. 14 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 2.	Repair the harness between VDCH/U and VDCCM.
2	CHECK BATTERY SHORT OF HARNESS. Measure the voltage between VDCH/U connector and chassis ground. Connector & terminal (B368) No. 13 (+) — Chassis ground (-): (B368) No. 14 (+) — Chassis ground (-):	Is the voltage less than 0.5 V?	Go to step 3.	Repair the harness between VDCH/U and VDCCM.
3	CHECK BATTERY SHORT OF HARNESS. 1) Turn the ignition switch to ON. 2) Measure the voltage between VDCH/U connector and chassis ground. Connector & terminal (B368) No. 13 (+) — Chassis ground (-): (B368) No. 14 (+) — Chassis ground (-):	Is the voltage less than 0.5 V?	Go to step 4.	Repair the harness between VDCH/U and VDCCM.
4	CHECK INPUT VOLTAGE OF PRESSURE SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connectors from VDCCM. 3) Remove the cover from VDCCM. <Ref. to VDC(diag)-18, REMOVAL, VDCCM Connector Cover.> 4) Connect the connector to the VDCCM. 5) Connect all connectors. 6) Turn the ignition switch to ON. 7) Do not depress the brake pedal. 8) Measure the voltage between VDCCM connector terminals. Connector & terminal (B310) No. 76 (+) — No. 75 (-): (B310) No. 44 (+) — No. 75 (-):	Is the voltage 0.48 — 0.72 V?	Go to step 5.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>
5	CHECK FOR BRAKE FLUID LEAKS. Check for fluid leaks between brake master cylinder and VDCH/U.	Is brake fluid leaking?	Retighten or replace.	Go to step 6.
6	CHECK BRAKE MASTER CYLINDER. Check the brake master cylinder oil pressure. <Ref. to BR-39, OPERATION CHECK (WITH GAUGE), INSPECTION, Brake Booster.>	Is oil pressure normal?	Go to step 7.	Replace the master cylinder.
7	CHECK BRAKE PEDAL STROKE. Measure the stroke of the brake pedal at 50 kg (110 lb).	Is the stroke less than 105 mm (4.13 in)?	Go to step 8.	Bleed the air of brake system.
8	CHECK INPUT VOLTAGE OF PRESSURE SENSOR. 1) Depress the brake pedal with the force of 50 kg (110 lb). 2) Measure the voltage between VDCCM connector terminals. Connector & terminal (B310) No. 76 (+) — No. 75 (-): (B310) No. 44 (+) — No. 75 (-):	Is the voltage less than 0.2 V?	Go to step 9.	Replace the VDCH/U. <Ref. to VDC-10, VDC Hydraulic Control Module (VDCH/M).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact in connectors between VDCCM and pressure sensor?	Repair the connector.	Go to step 10 .
10 CHECK VDCCM. 1) Connect all connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	In the current diagnosis, is the same DTC displayed again?	Replace the VDCCM. <Ref. to VDC-8, VDC Control Module (VDCCM).>	Go to step 11 .
11 CHECK ANY OTHER DTC ON DISPLAY.	Are other DTCs displayed?	Go to the diagnosis corresponding to the DTC.	Temporary poor contact occurs.

General Diagnostic Table

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

14. General Diagnostic Table

A: INSPECTION

Symptom		Main probable cause	Other probable cause
Poor brake performance	Long braking/stopping distance	<ul style="list-style-type: none"> • VDCH/U • VDCCM • Brake pad • Air in brake line • Tire specifications, tire wear and air pressure • Incorrect wiring or piping 	<ul style="list-style-type: none"> • ABS wheel speed sensor or clearance of sensor malfunction • Defective steering angle sensor or improper neutral position • Yaw rate & lateral G sensor installation malfunction • Master cylinder • Brake caliper • Disc rotor • Brake pipe • Brake booster
	Wheels lock-up.	<ul style="list-style-type: none"> • VDCH/U • VDCCM • ABS wheel speed sensor or clearance of sensor malfunction • Incorrect wiring or piping 	<ul style="list-style-type: none"> • Defective steering angle sensor or improper neutral position • Yaw rate & lateral G sensor installation malfunction • Brake caliper • Brake pipe
	Brake drag	<ul style="list-style-type: none"> • VDCH/U • VDCCM • ABS wheel speed sensor or clearance of sensor malfunction • Master cylinder • Brake caliper • Parking brake • Axle & wheels • Brake pedal play 	<ul style="list-style-type: none"> • Defective steering angle sensor or improper neutral position • Yaw rate & lateral G sensor installation malfunction • Brake pad • Brake pipe
	Brake pedal stroke is large.	<ul style="list-style-type: none"> • Air in brake line • Brake pedal play 	<ul style="list-style-type: none"> • VDCH/U • Master cylinder • Brake caliper • Brake pad • Brake pipe • Brake booster
	Vehicle pitching	<ul style="list-style-type: none"> • VDCH/U • VDCCM • Uneven road surface • Suspension play or fatigue (Decreased damping force) • Incorrect wiring or piping 	<ul style="list-style-type: none"> • ABS wheel speed sensor or clearance of sensor malfunction • Defective steering angle sensor or improper neutral position • Yaw rate & lateral G sensor installation malfunction
Poor brake performance	Unbalance braking or unbalanced braking effect	<ul style="list-style-type: none"> • VDCH/U • VDCCM • ABS wheel speed sensor or clearance of sensor malfunction • Brake caliper • Brake pad • Uneven road surface • Tire specifications, tire wear and air pressure • Incorrect wiring or piping 	<ul style="list-style-type: none"> • ABS wheel speed sensor or clearance of sensor malfunction • Defective steering angle sensor or improper neutral position • Yaw rate & lateral G sensor installation malfunction • Master cylinder • Disc rotor • Brake pipe • Axle & wheels • Crown shaped road/road with banks • Suspension play or fatigue (Decreased damping force)

General Diagnostic Table

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Symptom		Main probable cause	Other probable cause
Vibration and noise • When braking suddenly • When accelerating suddenly • When driving on slippery road surfaces	Excessive brake pedal vibration	<ul style="list-style-type: none"> • Uneven road surface • Incorrect wiring or piping 	<ul style="list-style-type: none"> • VDCH/U • Brake booster • Suspension play or fatigue (Decreased damping force)
	Noise from VDCH/U	<ul style="list-style-type: none"> • VDCH/U (mount bushing) • ABS wheel speed sensor or clearance of sensor malfunction • Brake pipe 	<ul style="list-style-type: none"> • VDCCM • Defective steering angle sensor or improper neutral position • Yaw rate & lateral G sensor installation malfunction
	Noise from the front side of vehicle	<ul style="list-style-type: none"> • VDCH/U (mount bushing) • ABS wheel speed sensor or clearance of sensor malfunction • Master cylinder • Brake caliper • Brake pad • Disc rotor • Brake pipe • Brake booster • Suspension play or fatigue (Decreased damping force) 	<ul style="list-style-type: none"> • Axle & wheels • Tire specifications, tire wear and air pressure
	In-vehicle noise	—	<ul style="list-style-type: none"> • VDCCM • Defective steering angle sensor or improper neutral position • Yaw rate & lateral G sensor installation malfunction
	Noise from the rear side of vehicle	<ul style="list-style-type: none"> • ABS wheel speed sensor or clearance of sensor malfunction • Brake caliper • Brake pad • Disc rotor • Parking brake • Brake pipe • Suspension play or fatigue (Decreased damping force) 	<ul style="list-style-type: none"> • Axle & wheels • Tire specifications, tire wear and air pressure
Engine speed does not increase, or engine stalls when suddenly accelerated or driving on slippery road surface.		<ul style="list-style-type: none"> • VDCH/U • VDCCM • ABS wheel speed sensor or clearance of sensor malfunction • Master cylinder • Brake caliper • Parking brake • Incorrect wiring or piping 	<ul style="list-style-type: none"> • Defective steering angle sensor or improper neutral position • Yaw rate & lateral G sensor installation malfunction • Brake pad • Brake pipe

General Diagnostic Table

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Symptom		Main probable cause	Other probable cause
Poor straight directional stability of TCS	Wanders to left or right from straight forward direction.	<ul style="list-style-type: none"> • VDCH/U • VDCCM • ABS wheel speed sensor or clearance of sensor malfunction • Defective steering angle sensor or improper neutral position • Yaw rate & lateral G sensor installation malfunction • Brake caliper • Brake pad • Wheel alignment • Uneven road surface • Crown shaped road/road with banks • Tire specifications, tire wear and air pressure • Incorrect wiring or piping 	<ul style="list-style-type: none"> • Disc rotor • Brake pipe • Axle & wheels • Suspension play or fatigue (Decreased damping force)
	Vehicle spins.	<ul style="list-style-type: none"> • VDCH/U • VDCCM • ABS wheel speed sensor or clearance of sensor malfunction • Defective steering angle sensor or improper neutral position • Yaw rate & lateral G sensor installation malfunction • Brake pad • Tire specifications, tire wear and air pressure • Incorrect wiring or piping 	<ul style="list-style-type: none"> • Brake caliper • Brake pipe
Steering wheel drags when driving.	<ul style="list-style-type: none"> • VDCH/U • VDCCM • ABS wheel speed sensor or clearance of sensor malfunction • Defective steering angle sensor or improper neutral position • Yaw rate & lateral G sensor installation malfunction • Incorrect wiring or hose connections • Power steering system 	<ul style="list-style-type: none"> • Brake caliper • Brake pad • Disc rotor • Wheel alignment • Uneven road surface • Crown shaped road/road with banks • Suspension play or fatigue (Decreased damping force) • Tire specifications, tire wear and air pressure 	
VDC operates while driving normally.	<ul style="list-style-type: none"> • VDCH/U • VDCCM • ABS wheel speed sensor or clearance of sensor malfunction • Defective steering angle sensor or improper neutral position • Yaw rate & lateral G sensor installation malfunction • Wheel alignment • Uneven road surface • Crown shaped road/road with banks • Suspension play or fatigue (Decreased damping force) • Tire specifications, tire wear and air pressure • Incorrect wiring or piping • Power steering system 	—	

General Diagnostic Table

VEHICLE DYNAMICS CONTROL (VDC) (DIAGNOSTICS)

Symptom	Main probable cause	Other probable cause
VDC warning light/VDC OFF indicator light does not come on when the VDC OFF switch is depressed. NOTE: When pressing the VDC OFF switch for 10 seconds or more while the engine is running, the VDC OFF indicator lights go off and the switch cannot be operated any more. To recover VDC operation, turn the ignition switch from OFF to ON again.	<ul style="list-style-type: none">• Harness• VDC warning light/VDC OFF indicator light bulb• VDC OFF switch	—

General Description

BRAKE

1. General Description

A: SPECIFICATION

Model		2.5 X	2.5 XS, 2.5 XT, L.L.Bean
Front disc brake	Type	Disc (Floating type, ventilated)	
	Effective disc diameter	244 mm (9.61 in)	
	Disc thickness × Diameter	24 × 294 mm (0.94 × 11.57 in)	
	Effective cylinder diameter	42.8 mm (1.685 in) × 2	
	Pad dimensions (Length × Width × Thickness)	117.8 × 50.5 × 11.0 mm (4.638 × 1.988 × 0.433 in)	
	Clearance adjustment	Automatic adjustment	
Rear disc brake	Type	—	Disc (Floating type)
	Effective disc diameter	—	230 mm (9.06 in)
	Disc thickness × Diameter	—	10 × 266 mm (0.39 × 10.47 in)
	Effective cylinder diameter	—	38.1 mm (1.500 in)
	Pad dimensions (Length × Width × Thickness)	—	89.4 × 33.7 × 9.0 mm (3.520 × 1.327 × 0.354 in)
	Clearance adjustment	—	Automatic adjustment
Rear drum brake	Type	Drum (Leading-Trailing type)	—
	Effective drum diameter	228.6 mm (9 in)	—
	Effective cylinder diameter	19 mm (0.75 in)	—
	Lining dimensions (Length × Width × Thickness)	219.4 × 35.0 × 4.1 mm (8.64 × 1.378 × 0.161 in)	—
	Clearance adjustment	Automatic adjustment	—
Master cylinder	Type	Tandem	
	Effective diameter	25.4 mm (1 in)	
	Reservoir type	Sealed type	
	Brake fluid reservoir capacity	205 cm ³ (12.51 cu in)	
Brake booster	Type	Vacuum suspended	
	Effective diameter	"8 + 9" tandem type	
Brake line	Dual circuit system		
Brake fluid	CAUTION: <ul style="list-style-type: none"> • Avoid mixing brake fluid of different brands to prevent fluid performance from degrading. • When filling brake fluid, be careful not to allow any dust into the reservoir. • Use new DOT3 or 4 brake fluid when replacing or refilling fluid. 		
	FMVSS No. 116, DOT3 or DOT4		

General Description

BRAKE

NOTE:

Refer to the "PB section" for parking brake specifications. <Ref. to PB-2, SPECIFICATION, General Description.>

Item		Standard	Limit
Front brake	Pad thickness	11 mm (0.43 in)	1.5 mm (0.059 in)
	Disc thickness	24 mm (0.94 in)	22 mm (0.87 in)
	Disc runout	—	0.075 mm (0.0030 in)
Rear brake (Disc type)	Pad thickness	9 mm (0.35 in)	1.5 mm (0.059 in)
	Disc thickness	10 mm (0.39 in)	8.5 mm (0.335 in)
	Disc runout	—	0.07 mm (0.0028 in)
Rear brake (Drum type)	Inside diameter	228.6 mm (9 in)	230.6 mm (9.08 in)
	Lining thickness	4.1 mm (0.161 in)	1.5 mm (0.059 in)
Rear brake (Disc type parking)	Inside diameter	170 mm (6.69 in)	171 mm (6.73 in)
	Lining thickness	3.2 mm (0.126 in)	1.5 mm (0.059 in)
Parking brake	Lever stroke	7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lb)	

		Brake pedal operation force	Fluid pressure
Brake booster	Brake fluid pressure with engine stopped	147 N (15 kgf, 33 lb)	686 kPa (7 kg/cm ² , 100 psi)
		294 N (30 kgf, 66 lb)	1,765 kPa (18 kg/cm ² , 256 psi)
	Brake fluid pressure and vacuum pressure with engine running at 66.7 kPa (500 mmHg, 19.69 inHg)	147 N (15 kgf, 33 lb)	6,468 kPa (65 kg/cm ² , 938 psi)
		294 N (30 kgf, 66 lb)	10,297 kPa (105 kg/cm ² , 1,493 psi)

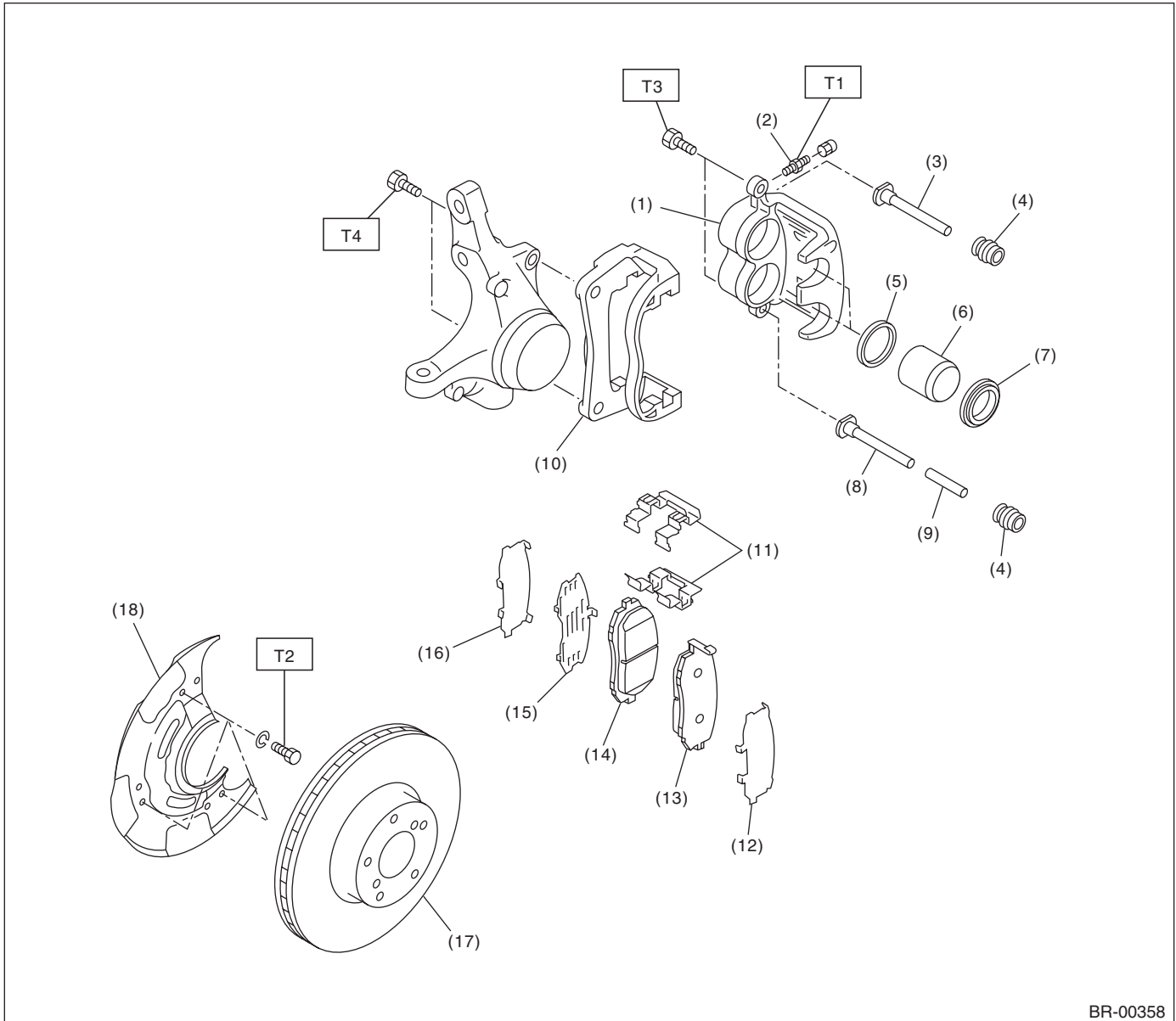
Brake pedal	Free play	0.5 — 2.0 mm (0.02 — 0.08 in) [Depress brake pedal with a force of less than 10 N (1 kgf, 2 lb).]
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General Description

BRAKE

B: COMPONENT

1. FRONT DISK BRAKE



BR-00358

- | | |
|-----------------------|-----------------------|
| (1) Caliper body | (9) Bushing |
| (2) Air bleeder screw | (10) Support |
| (3) Guide pin (Green) | (11) Pad clip |
| (4) Pin boot | (12) Outer shim |
| (5) Piston seal | (13) Outer pad |
| (6) Piston | (14) Inner pad |
| (7) Piston boot | (15) Rubber coat shim |
| (8) Lock pin (Yellow) | (16) Inner shim |

- (17) Disc rotor
(18) Disc cover

Tightening torque: N-m (kgf-m, ft-lb)

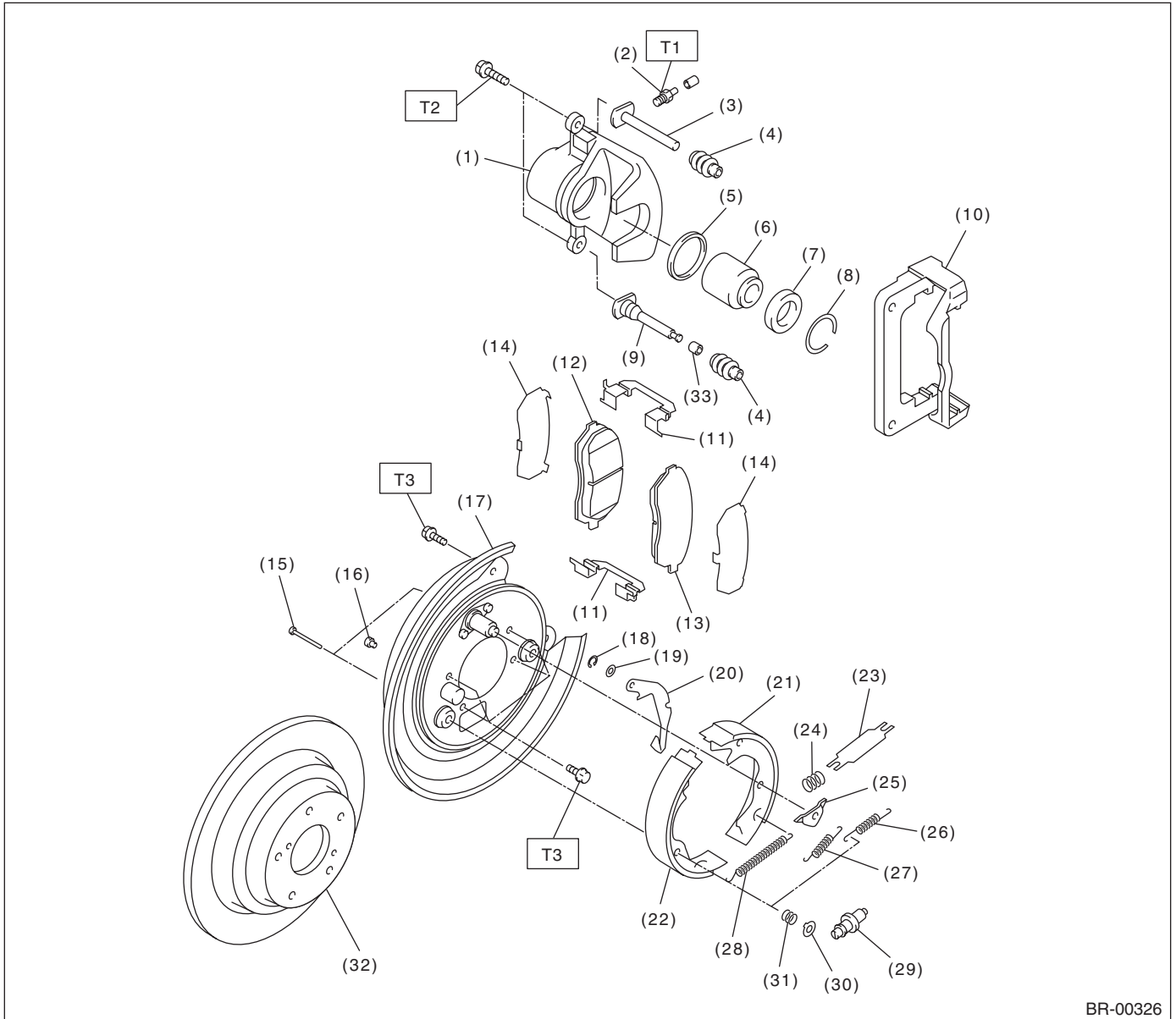
T1: 8 (0.8, 5.8)

T2: 18 (1.8, 13.0)

T3: 26 (2.7, 19.2)

T4: 80 (8.2, 59)

2. REAR DISC BRAKE



BR-00326

- | | | |
|-----------------------|-------------------------------------|---------------------------------|
| (1) Caliper body | (14) Shim | (27) Primary shoe return spring |
| (2) Air bleeder screw | (15) Shoe hold-down pin | (28) Adjusting spring |
| (3) Guide pin (Green) | (16) Cover | (29) Adjuster |
| (4) Pin boot | (17) Back plate | (30) Shoe hold-down cup |
| (5) Piston seal | (18) Retainer | (31) Shoe hold-down spring |
| (6) Piston | (19) Spring washer | (32) Disc rotor |
| (7) Piston boot | (20) Parking brake lever | (33) Bushing |
| (8) Boot ring | (21) Parking brake shoe (Secondary) | |
| (9) Lock pin (Yellow) | (22) Parking brake shoe (Primary) | |
| (10) Support | (23) Strut | |
| (11) Pad clip | (24) Strut shoe spring | |
| (12) Inner pad | (25) Shoe guide plate | |
| (13) Outer pad | (26) Secondary shoe return spring | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 8 (0.8, 5.8)

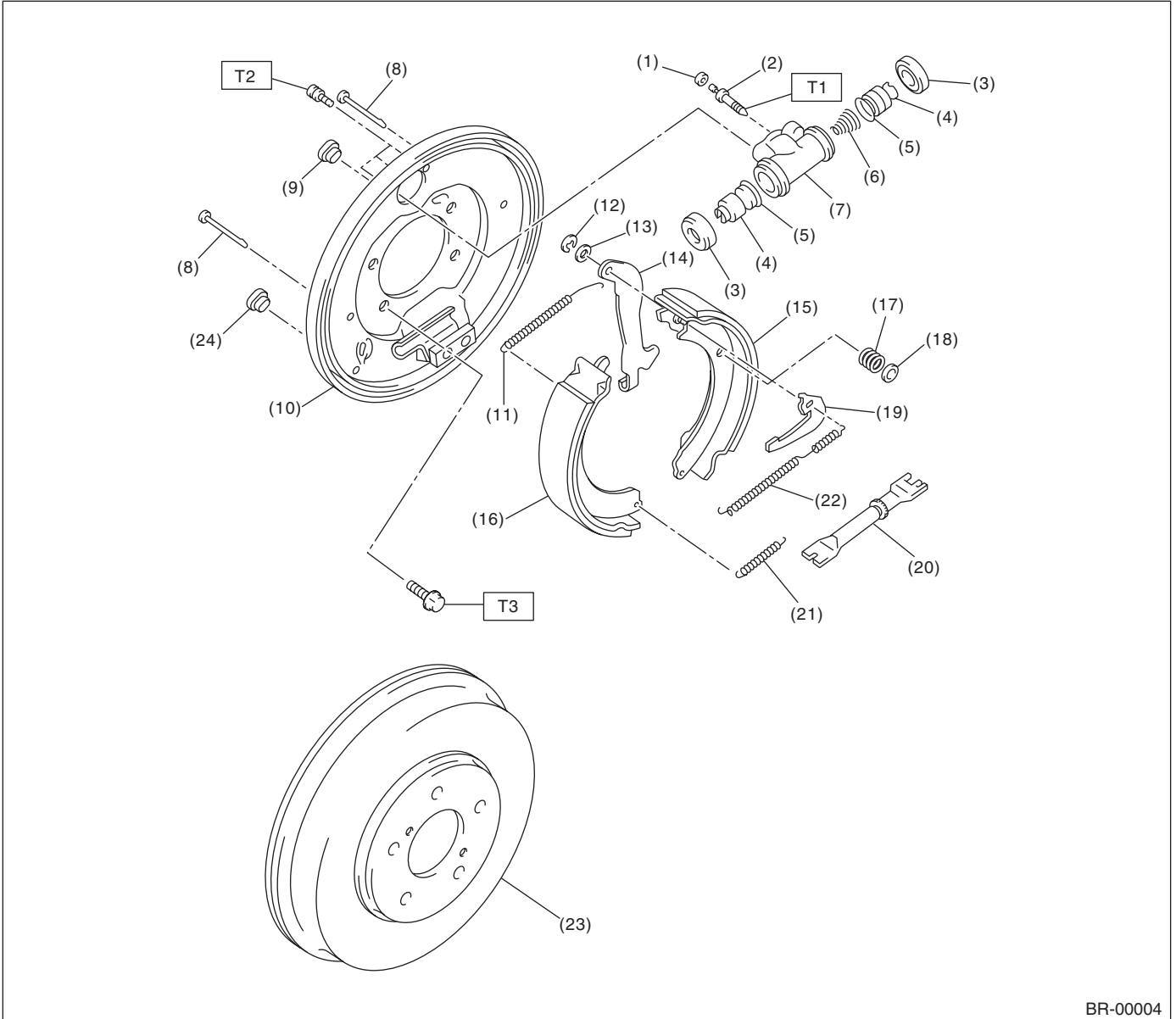
T2: 37 (3.8, 27.5)

T3: 52 (5.3, 38.3)

General Description

BRAKE

3. REAR DRUM BRAKE



BR-00004

- | | | |
|-------------------------|-------------------------------|-------------------------------|
| (1) Air bleeder cap | (11) Upper shoe return spring | (21) Lower shoe return spring |
| (2) Air bleeder screw | (12) Retainer | (22) Adjusting spring |
| (3) Dust boots | (13) Washer | (23) Brake drum |
| (4) Piston | (14) Parking brake lever | (24) Plug |
| (5) Cup | (15) Brake shoe (Trailing) | |
| (6) Spring | (16) Brake shoe (Leading) | |
| (7) Wheel cylinder body | (17) Shoe hold-down spring | |
| (8) Hold-down pin | (18) Hold-down cup | |
| (9) Plug | (19) Adjusting lever | |
| (10) Back plate | (20) Adjuster ASSY | |

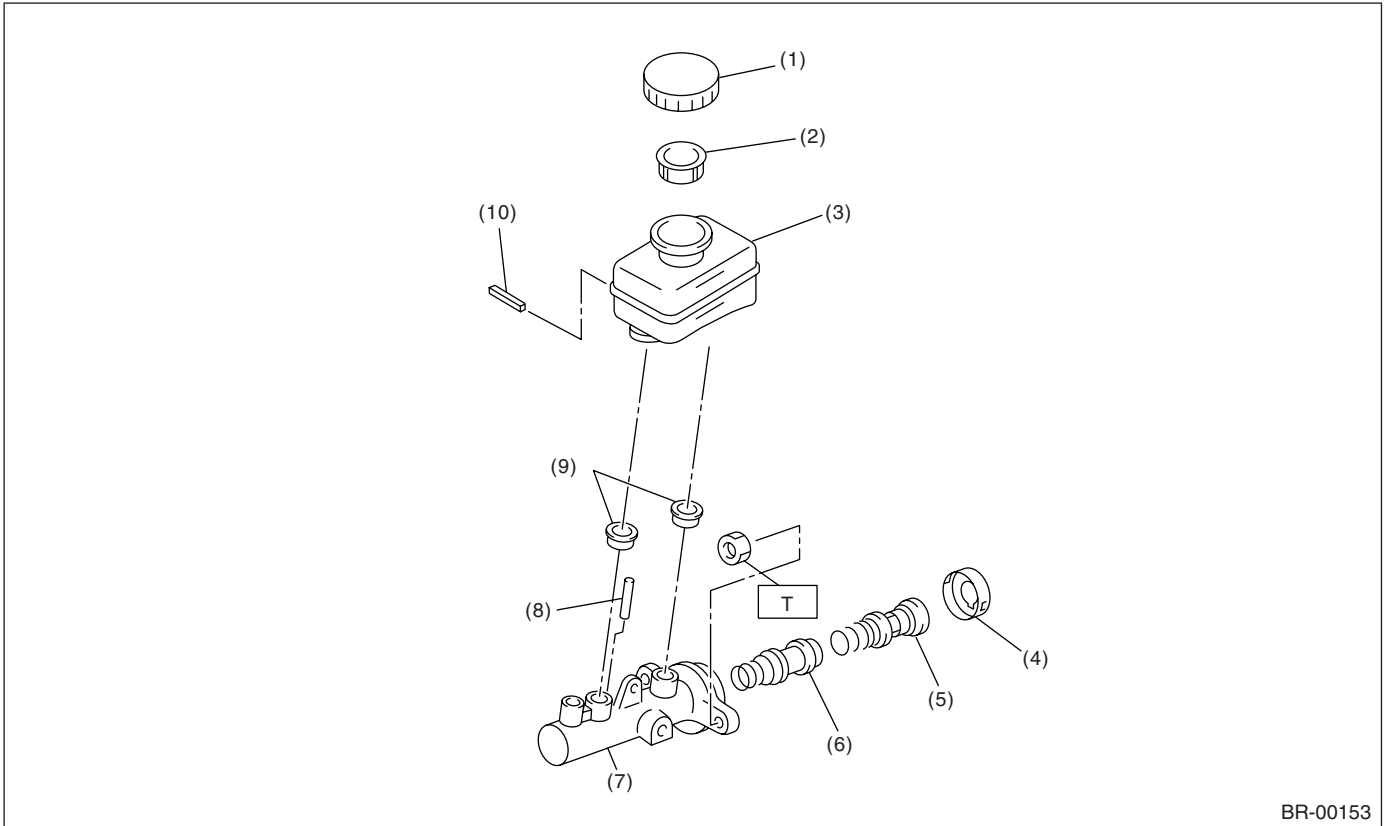
Tightening torque: N·m (kgf·m, ft·lb)

T1: 8 (0.8, 5.8)

T2: 10 (1.0, 7.2)

T3: 52 (5.3, 38.3)

4. MASTER CYLINDER



BR-00153

- (1) Cap
- (2) Filter
- (3) Reservoir tank
- (4) Piston retainer
- (5) Primary piston

- (6) Secondary piston
- (7) Cylinder body
- (8) Cylinder pin
- (9) Seal

- (10) Pin

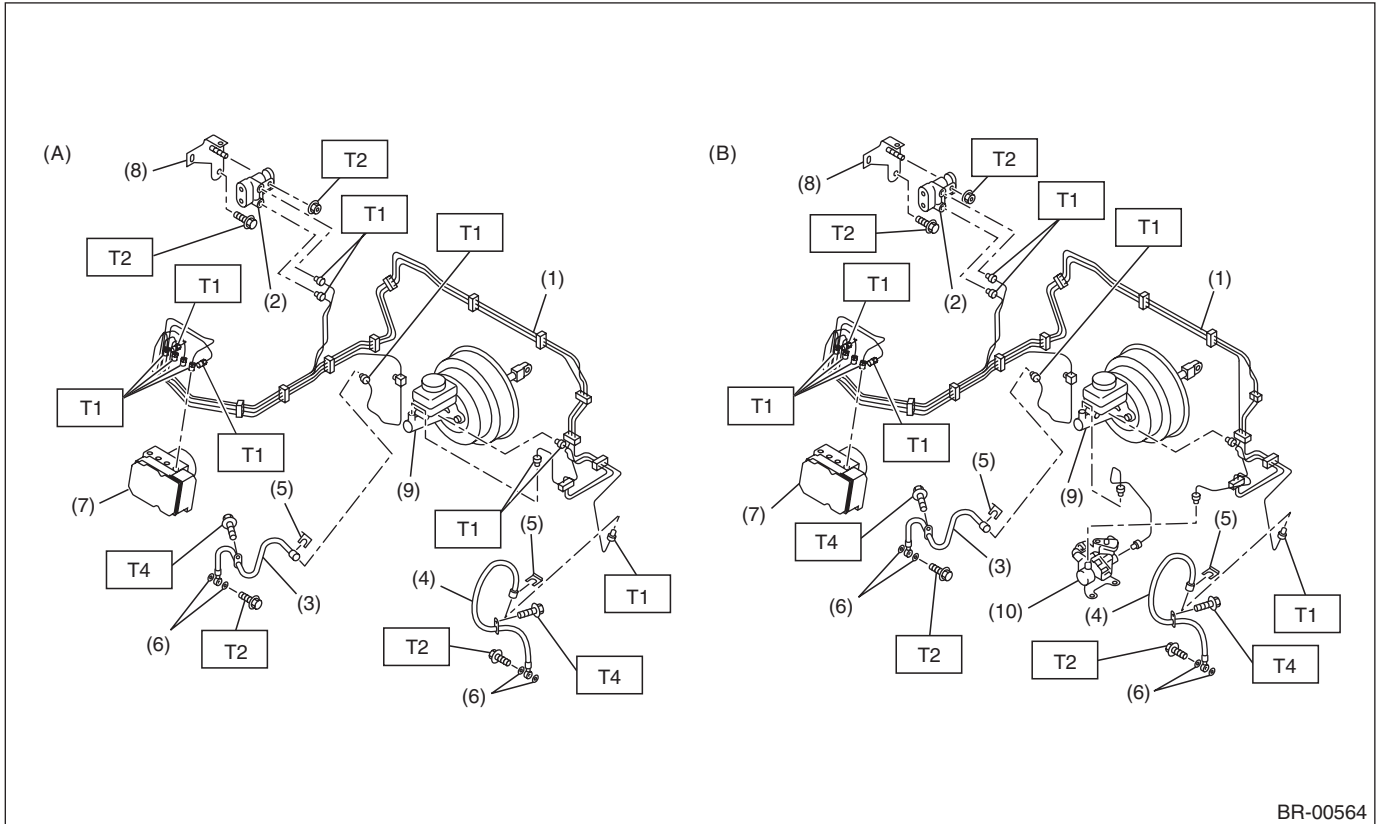
Tightening torque: N·m (kgf·m, ft·lb)

T: 14 (1.4, 10.1)

General Description

BRAKE

5. FRONT BRAKE PIPES AND HOSES



BR-00564

(A) AT model

(B) MT model

- | | |
|---------------------------|---|
| (1) Front brake pipe ASSY | (7) ABS control module and hydraulic control unit (ABSCM&H/U) |
| (2) Two-way connector | (8) Bracket |
| (3) Front brake hose RH | (9) Master cylinder |
| (4) Front brake hose LH | (10) Hill holder |
| (5) Clamp | (11) Hill holder |
| (6) Gasket | |

Tightening torque: N·m (kgf·m, ft·lb)

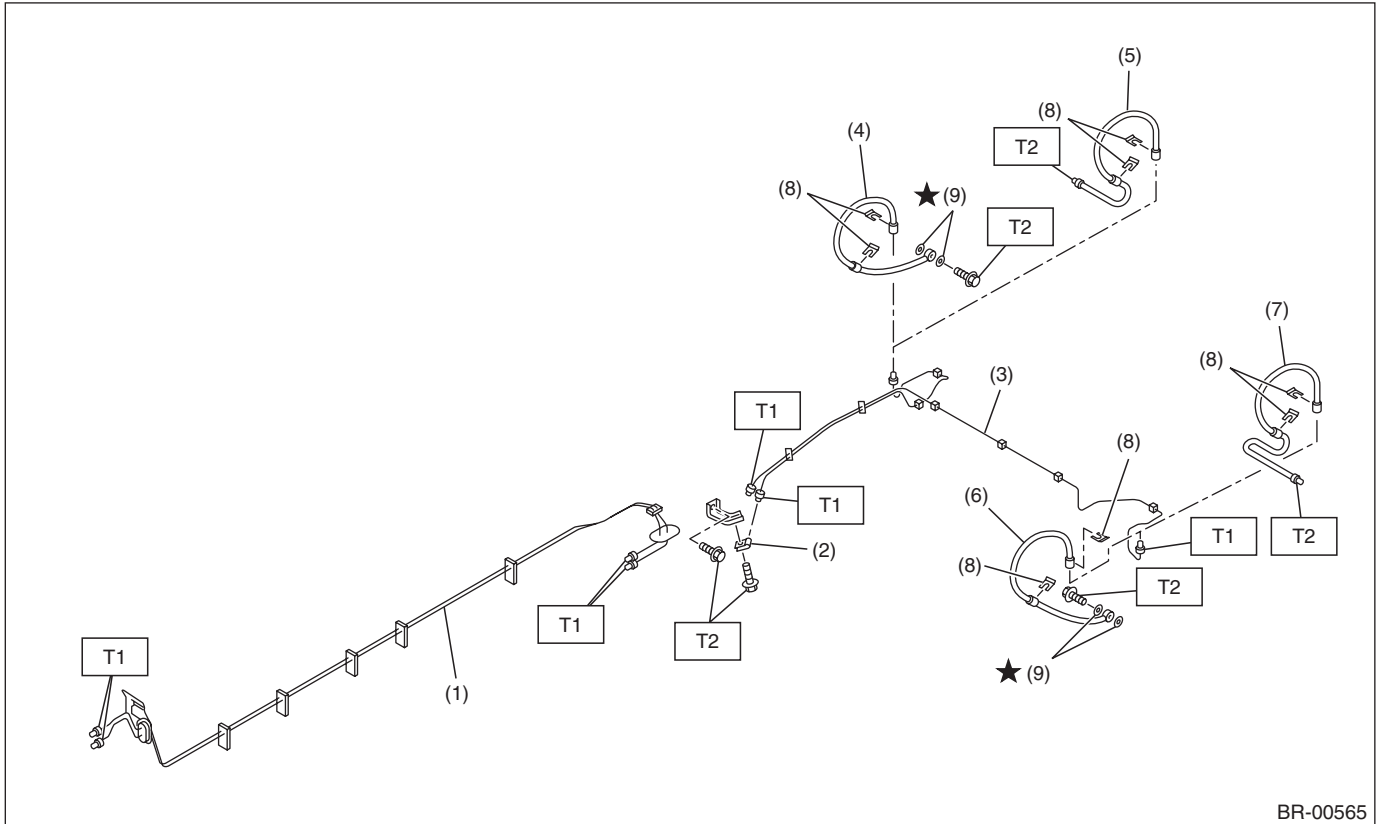
T1: 15 (1.5, 10.8)

T2: 18 (1.8, 13.0)

T3: 19 (1.9, 13.7)

T4: 32 (3.3, 23.6)

6. CENTER AND REAR BRAKE PIPES AND HOSES



BR-00565

- | | | |
|--|---|-------------------|
| <p>(1) Center brake pipe ASSY</p> <p>(2) Two-way connector</p> <p>(3) Rear brake pipe ASSY</p> <p>(4) Rear brake hose RH (Disc brake model)</p> <p>(5) Rear brake hose RH (Drum brake model)</p> | <p>(6) Rear brake hose LH (Disc brake model)</p> <p>(7) Rear brake hose LH (Drum brake model)</p> <p>(8) Brake hose clamp</p> | <p>(9) Gasket</p> |
|--|---|-------------------|

Tightening torque: N·m (kgf·m, ft·lb)

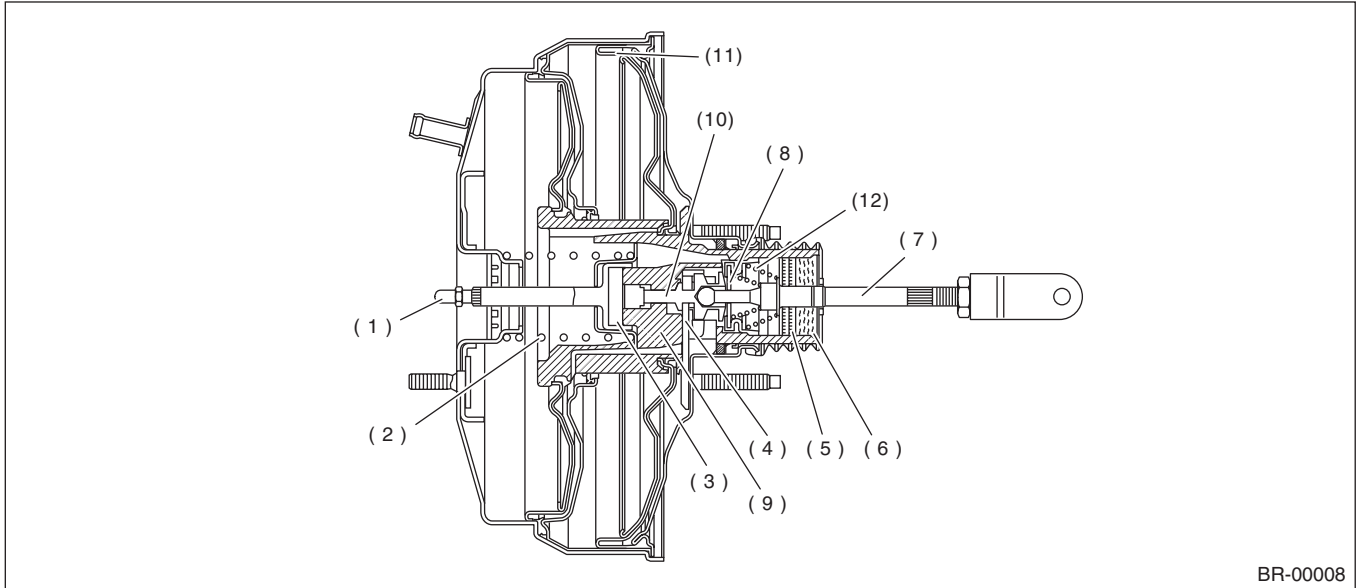
T1: 15 (1.5, 10.8)

T2: 18 (1.8, 13.0)

General Description

BRAKE

7. BRAKE BOOSTER

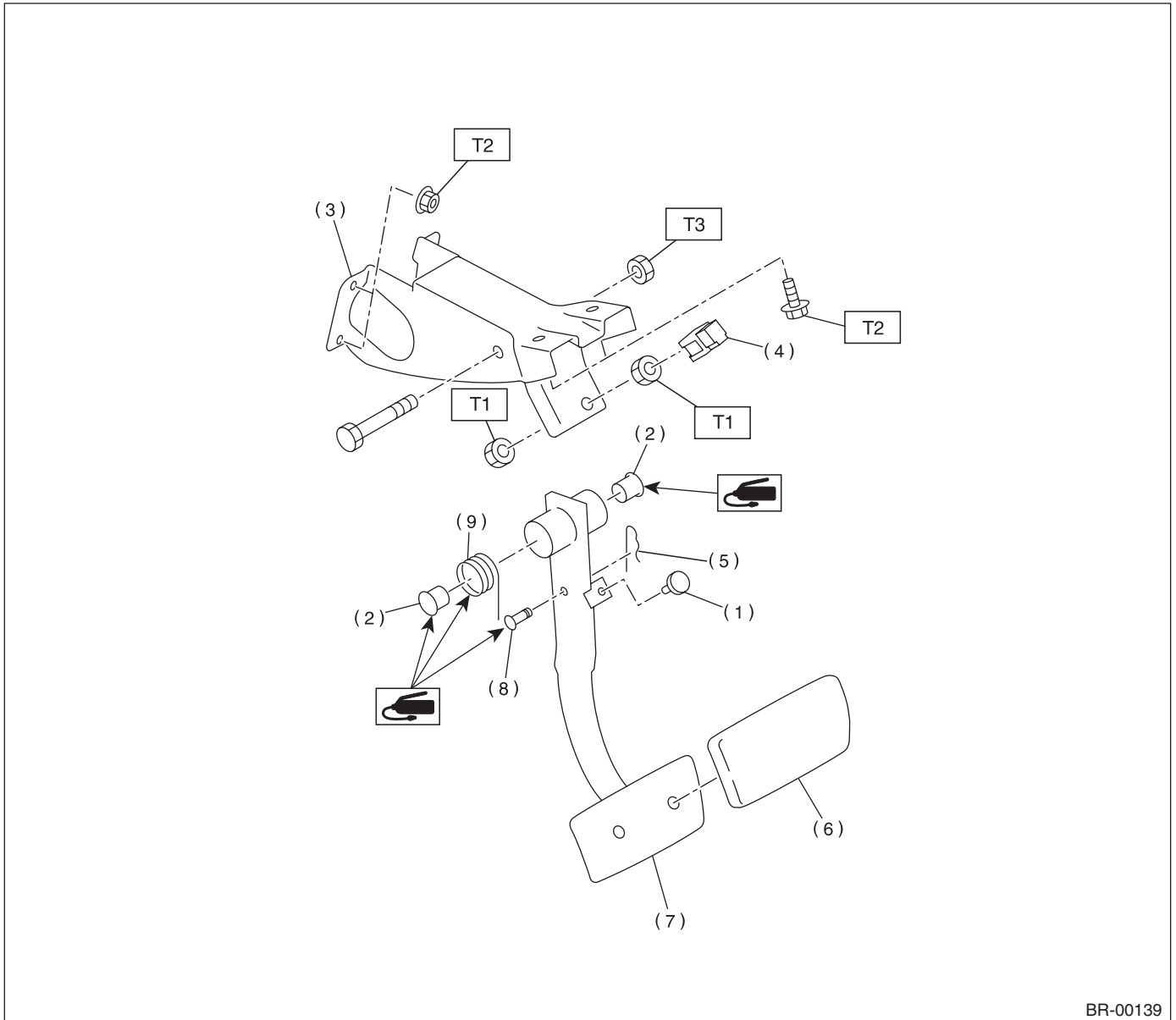


BR-00008

- | | | |
|-------------------|-----------------------|--------------------------|
| (1) Push rod | (5) Filter | (9) Valve body |
| (2) Return spring | (6) Silencer | (10) Plunger valve |
| (3) Reaction disc | (7) Operating rod | (11) Diaphragm plate |
| (4) Key | (8) Poppet valve ASSY | (12) Valve return spring |

8. BRAKE PEDAL

- AT model



BR-00139

- | | |
|-----------------------|------------------------|
| (1) Stopper | (6) Brake pedal pad |
| (2) Bushing | (7) Brake pedal |
| (3) Pedal bracket | (8) Clevis pin |
| (4) Stop light switch | (9) Brake pedal spring |
| (5) Snap pin | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 8 (0.8, 5.8)

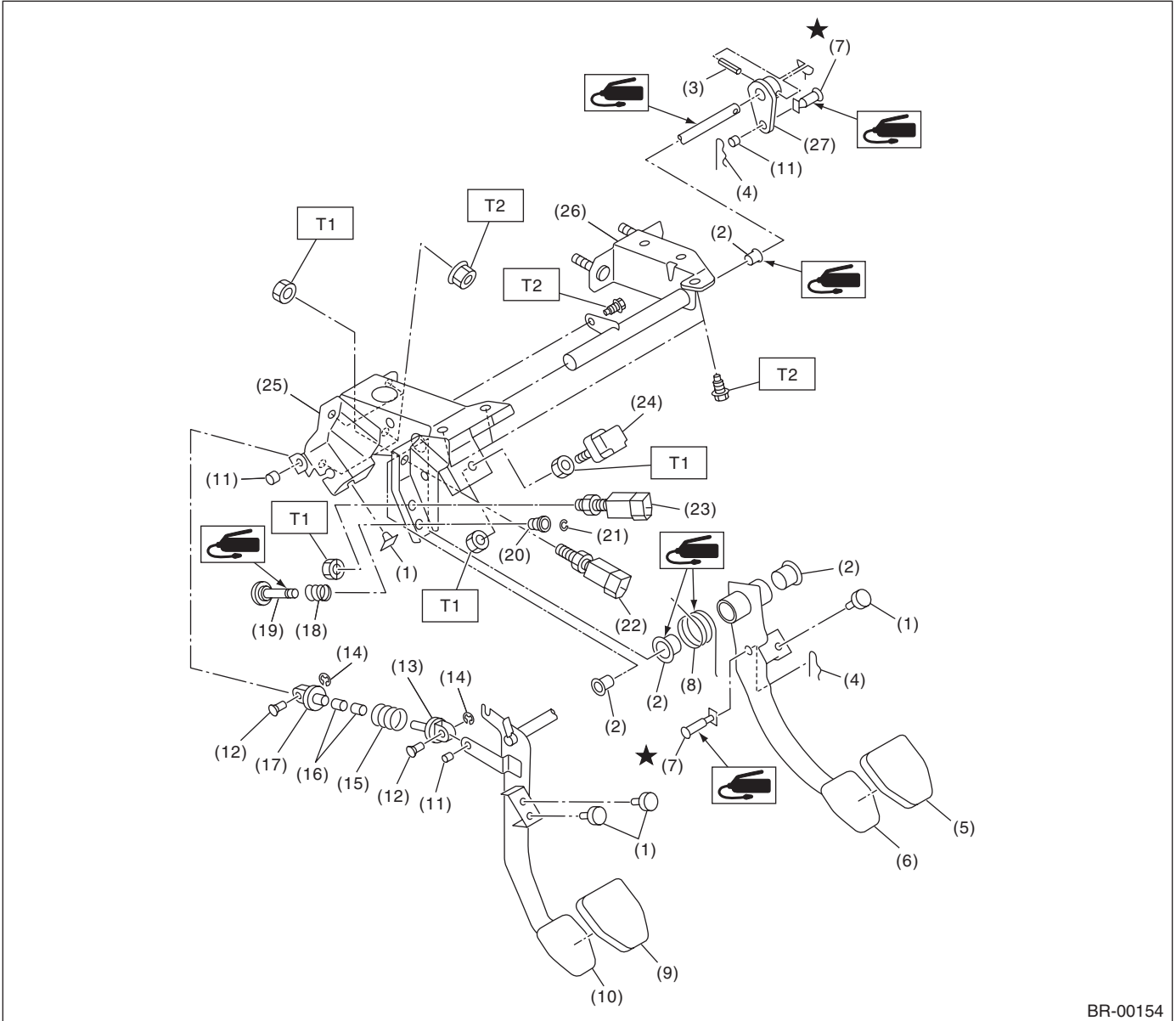
T2: 18 (1.8, 13.0)

T3: 29 (3.0, 21.7)

General Description

BRAKE

- MT model



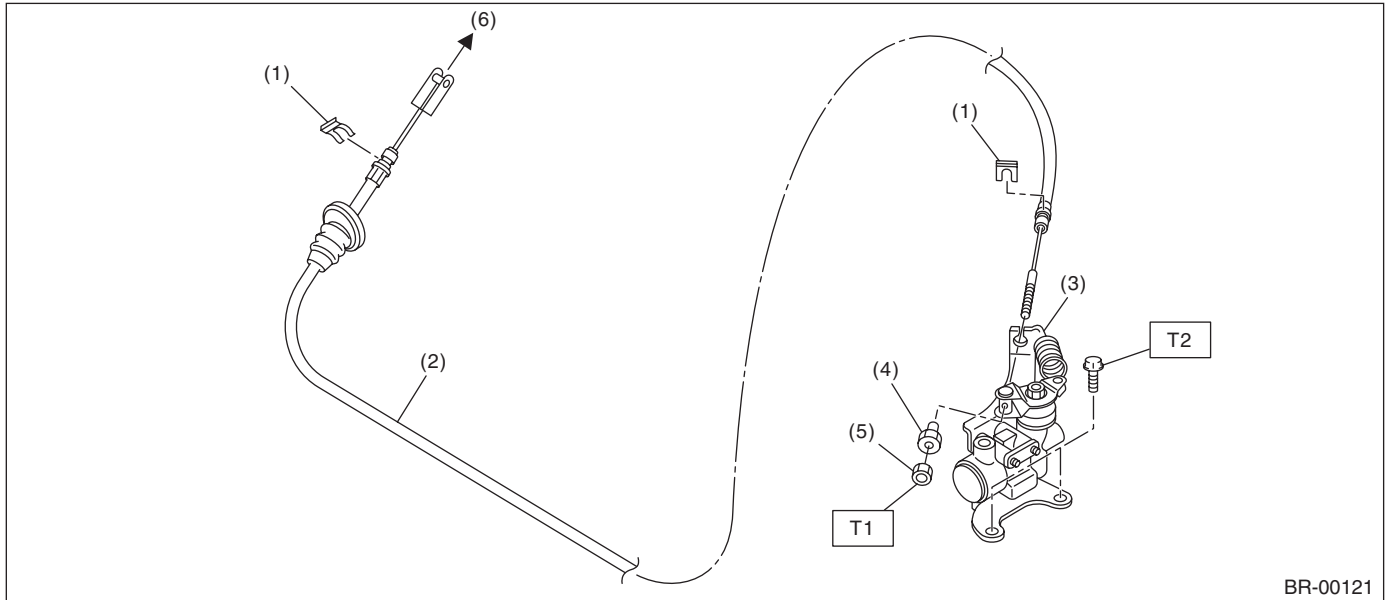
- | | | |
|------------------------|--|--|
| (1) Stopper | (12) Clutch clevis pin | (23) Clutch switch (Model with cruise control) |
| (2) Bushing | (13) Assist rod A | (24) Stop light switch |
| (3) Spring pin | (14) Clip | (25) Pedal bracket |
| (4) Snap pin | (15) Assist spring | (26) Clutch master cylinder bracket |
| (5) Brake pedal pad | (16) Assist bushing | (27) Lever |
| (6) Brake pedal | (17) Assist rod B | |
| (7) Clevis pin | (18) Spring S | |
| (8) Brake pedal spring | (19) Rod S | |
| (9) Clutch pedal pad | (20) Bushing S | |
| (10) Clutch pedal | (21) Clip | |
| (11) Bushing C | (22) Clutch switch (Starter interlock) | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 8 (0.8, 5.8)

T2: 18 (1.8, 13.0)

9. HILL HOLDER



- | | |
|-------------------------------|---------------------|
| (1) Clamp | (4) Adjusting nut |
| (2) PHV cable | (5) Lock nut |
| (3) PHV (Pressure hold valve) | (6) To clutch pedal |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 3.5 (0.36, 2.6)

T2: 18 (1.8, 13.0)

C: CAUTION

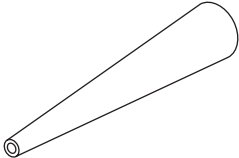
- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Use SUBARU genuine fluid, grease etc. or equivalent. Do not mix fluid, grease, etc. of different grades or manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Apply grease onto sliding or revolving surfaces before installation.
- Before installing O-rings or snap rings, apply sufficient amount of fluid to avoid damage and deformation.
- Before securing a part on a vise, set cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.
- Keep fluids away from the vehicle body. If any fluid contacts the vehicle body, immediately flush the area with water.

General Description

BRAKE

D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST-926460000</p>	926460000	WHEEL CYLINDER 3/4"ADAPTER	Used for installing the cup to the wheel cylinder piston. (Size 3/4 in)

2. GENERAL TOOL

TOOL NAME	REMARKS
Snap ring pliers	Used for removing and installing snap rings.
Brake pipe wrench	Used for removing and installing brake pipes.

2. Front Brake Pad

A: REMOVAL

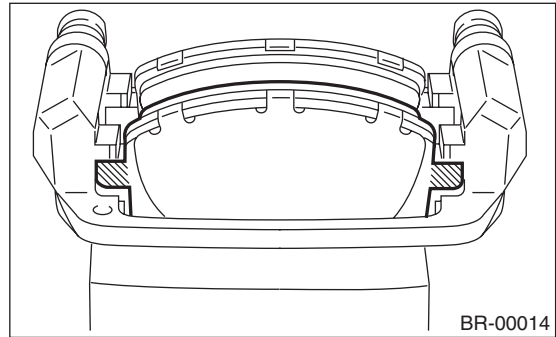
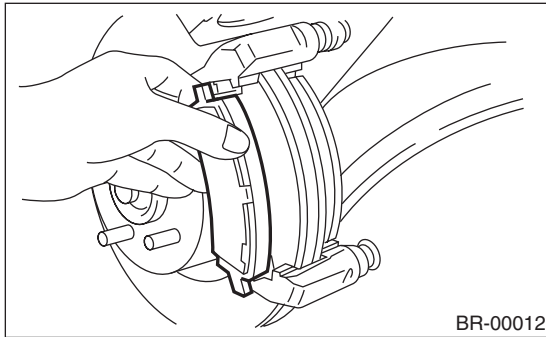
- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and remove the front wheels.
- 4) Remove the lower caliper bolts.
- 5) Raise the caliper body and support it.

NOTE:

The brake hose must not be disconnected from the caliper body.

- 6) Remove the pad.

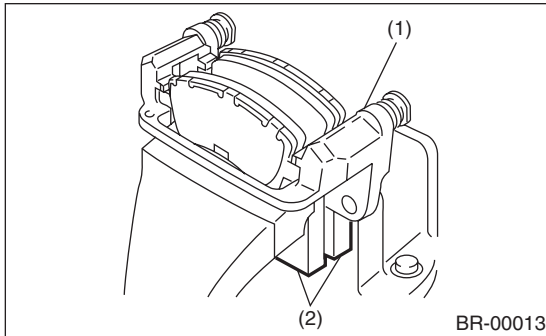
- (4) Apply a rod with less than 12 mm (0.47 in) diameter to the shaded area of brake pad, and strike the rod with a hammer to remove brake pad.



NOTE:

If the brake pad is difficult to remove, proceed as follows:

- (1) Remove the caliper body from support.
- (2) Remove the support.
- (3) Place the support between wooden blocks in the vise.



- (1) Support
- (2) Wooden block

Front Brake Pad

BRAKE

B: INSTALLATION

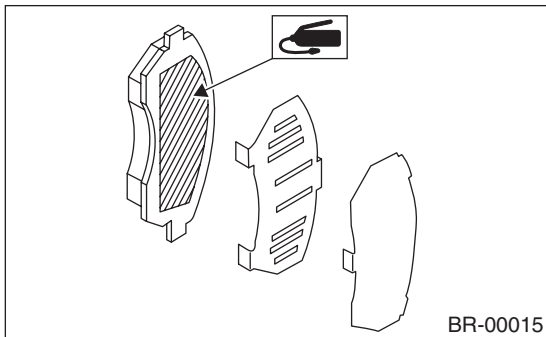
- 1) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) to the contact surface between pad and pad clip.
- 2) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) to the contact surface between inner pad and the rubber coat shim.

NOTE:

- Do not apply grease between the outer pad and the outer shim.
- Do not install the inner shim and outer shim incorrectly.

CAUTION:

Replace the pad if there is oil or grease adhering to the pad surface.



- 3) Install the pad to support.
- 4) Install the caliper body to the support.

Tightening torque:

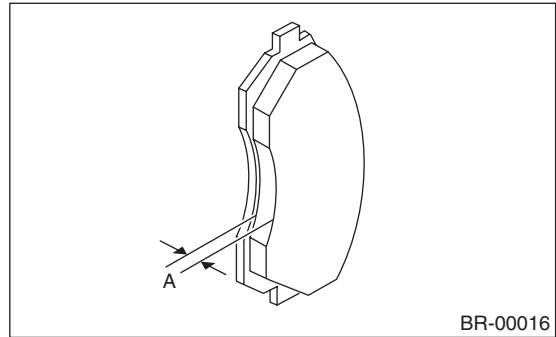
26 N·m (2.7 kgf·m, 19.2 ft·lb)

NOTE:

If it is difficult to push the piston during pad replacement, loosen the air bleeder to facilitate work.

C: INSPECTION

Check the thickness A of pad.



Pad thickness	Standard	11 mm (0.43 in)
	Wear limit	1.5 mm (0.06 in)

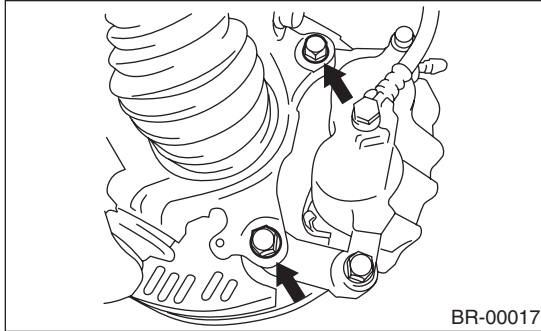
NOTE:

- Always replace the pads of both sides as a set.
- Replace pad clips if they are twisted or worn.
- A wear indicator is installed on inner pad. If the pad is worn to the limit, the end of wear indicator contacts disc rotor, and a squeaking sound is heard as the wheel rotates. If the sound is heard, replace the pad.
- Replace the pad if there is oil or grease on it.

3. Front Disc Rotor

A: REMOVAL

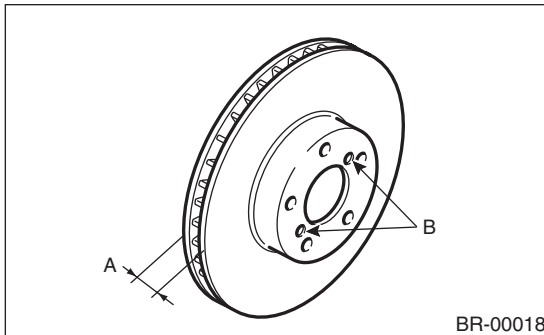
- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and remove the front wheels.
- 4) Remove caliper body and support from the housing, and suspend it from the strut using a wire.



- 5) Remove the disc rotor.

NOTE:

If it is difficult to remove the disc rotor from hub, drive an 8 mm bolt into the threads B of the rotor, then remove the rotor.



- 6) Remove mud and foreign matter from caliper body assembly and support.

B: INSTALLATION

- 1) Install the disc rotor.
- 2) Install the caliper body and the support to housing.

Tightening torque:

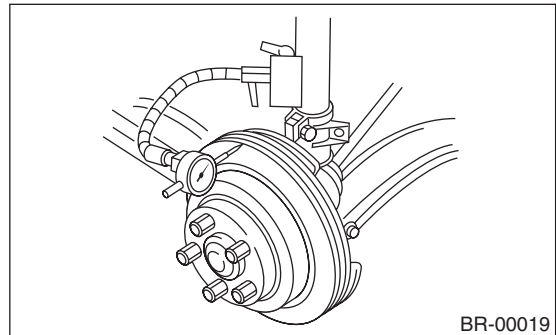
80 N·m (8.2 kgf·m, 59 ft·lb)

- 3) Install the wheel.

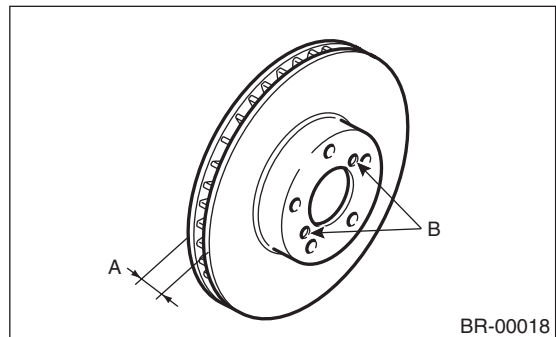
C: INSPECTION

- 1) Check the front wheel bearing play and axle hub runout before the inspection of disc rotor runout limit. <Ref. to DS-20, INSPECTION, Front Axle.>
- 2) Secure the disc rotor by tightening the five wheel nuts.
- 3) Set a dial gauge 10 mm (0.39 in) inward from the disc rotor outer circumference. Rotate the disc rotor to check runout. If the disc rotor runout exceeds the limit, resurface the disc rotor. After resurfacing, check disc rotor thickness as in step 4).

Disc rotor runout limit:
0.075 mm (0.0030 in)



- 4) Set a micrometer in 10 mm (0.39 in) inward from disc rotor outer perimeter, and then measure the disc rotor thickness. If the thickness of disc rotor exceeds the service limit, replace with a new disc rotor.



	Standard	Limit	Disc rotor outer dia.
Disc rotor thickness A	24 mm (0.94 in)	22 mm (0.87 in)	294 mm (11.57 in)

Front Disc Brake Assembly

BRAKE

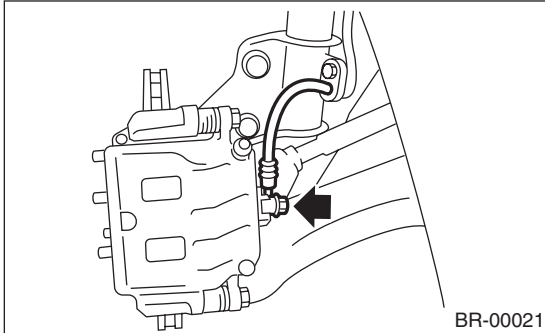
4. Front Disc Brake Assembly

A: REMOVAL

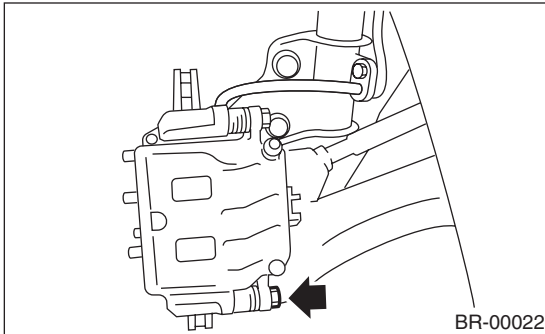
CAUTION:

Do not let brake fluid come into contact with the painted surface of the vehicle body. Completely wash away with water immediately and wipe off if it was accidental.

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and remove the front wheels.
- 4) Remove the union bolt, and disconnect the brake hose from the caliper body assembly.



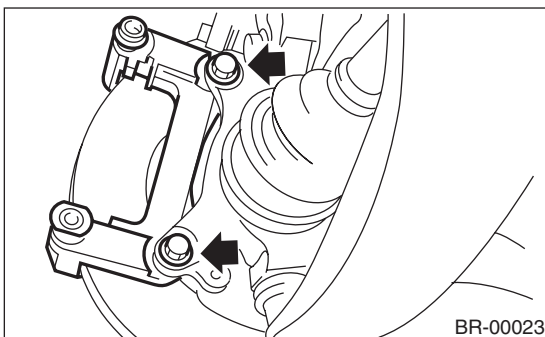
- 5) Remove the bolt securing lock pin (Yellow) to caliper body assembly.



- 6) Raise the caliper body assembly, and then move it toward vehicle center to separate it from the support.
- 7) Remove the support from housing.

NOTE:

Remove the support only when replacing the rotor or support. It need not be removed when servicing the caliper body assembly.



- 8) Remove mud and foreign matter from caliper body assembly and support.

B: INSTALLATION

1) Install the support to the housing.

Tightening torque:

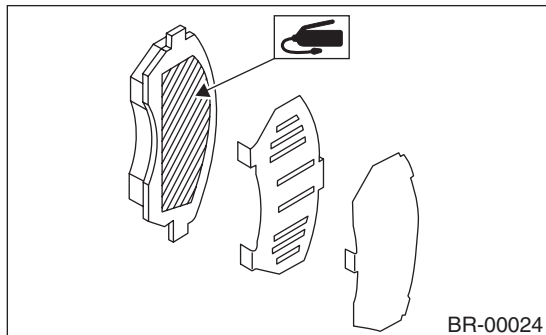
80 N·m (8.2 kgf·m, 59 ft·lb)

2) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) to the contact surface between pad and pad clip.

3) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) to the contact surface between inner pad and the rubber coat shim.

NOTE:

- Do not apply grease between the outer pad and the outer shim.
- Do not install the inner shim and outer shim incorrectly.



4) Install the pad to support.
5) Install the caliper body to the support.

Tightening torque:

26 N·m (2.7 kgf·m, 19.2 ft·lb)

6) Connect the brake hose using the new gaskets.

Tightening torque:

18 N·m (1.8 kgf·m, 13.0 ft·lb)

CAUTION:

When connecting the brake hose, do not twist it.

7) Bleed air from the brake system. <Ref. to BR-42, Air Bleeding.>

C: DISASSEMBLY

1) Remove mud and foreign matter from caliper body assembly and support.

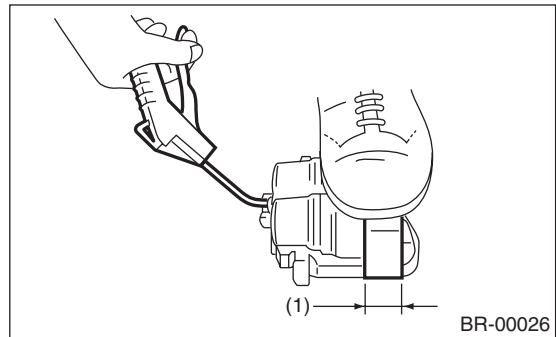
CAUTION:

Be careful not to allow foreign matter to enter the brake hose connector.

2) Using a standard screwdriver, remove the boot ring from piston.

3) Remove the piston boot from piston end.

4) Place a wooden block in caliper body as shown in the figure to prevent the piston from jumping out and being damaged, then gradually apply compressed air via installation hole of brake hose to push piston out.

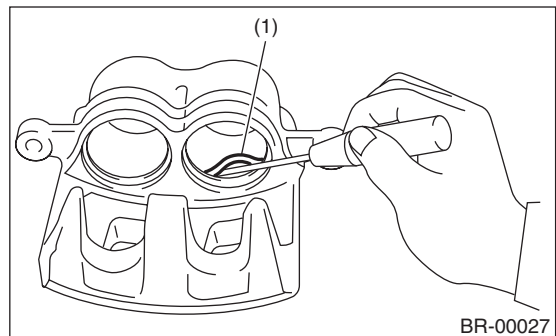


(1) Place a wood block with 30 mm (1.18 in) wide.

5) Remove the piston seal from caliper body cylinder.

CAUTION:

Do not damage the caliper body cylinder and piston seal groove.



(1) Piston seal

6) Remove the pin boot, then remove the lock pin (yellow) and the guide pin (green).

Front Disc Brake Assembly

BRAKE

D: ASSEMBLY

- 1) Clean the inside of the caliper body using brake fluid.
- 2) Apply a coat of brake fluid to piston seal and install piston seal in the groove on caliper body.
- 3) Apply a coat of brake fluid to the inner surface of the caliper body cylinder and entire outer surface of the piston.
- 4) Apply a coat of specified grease to the piston boot and install it into the groove on tip of caliper body cylinder.

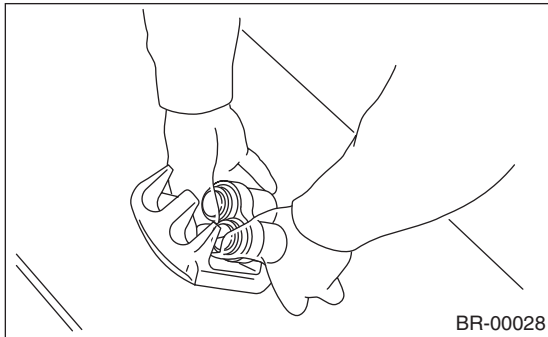
Grease:

NIGLUBE RX-2 (Part No. K0779GA102)

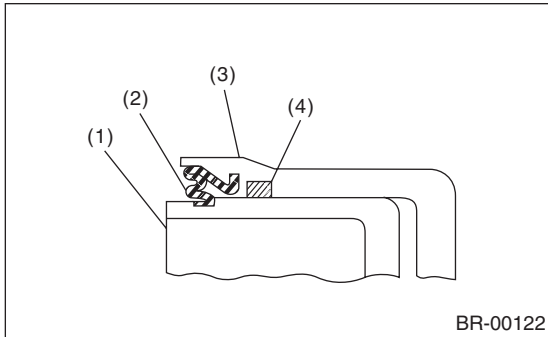
- 5) Insert the piston into caliper body cylinder.

CAUTION:

Do not force the piston into caliper body cylinder.



- 6) Position the piston boot in the grooves on caliper body cylinder and piston.

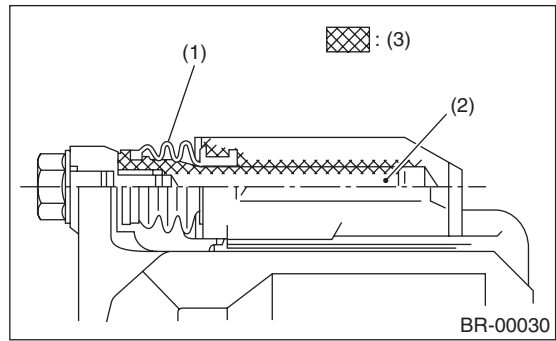


- (1) Piston
- (2) Piston boot
- (3) Caliper body
- (4) Piston seal

- 7) Apply a coat of the specified grease to the outer surface of lock pin (yellow) and guide pin (green), cylinder inner surface, and pin boot grooves.

Grease:

NIGLUBE RX-2 (Part No. K0779GA102)



- (1) Pin boot
- (2) Lock pin (yellow) or guide pin (green)
- (3) Grease applied area

- 8) Insert the lock pin (yellow) and guide pin (green) and each pin boots into the support.

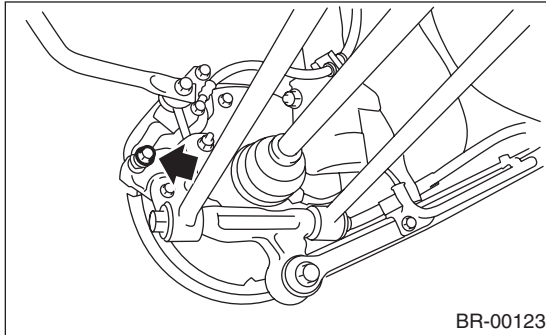
E: INSPECTION

- 1) Repair or replace the faulty parts.
- 2) Check the caliper body and piston for uneven wear, damage or rust.
- 3) Check rubber parts for damage or deterioration.

5. Rear Brake Pad

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and then remove the rear wheels.
- 4) Remove the lower caliper bolts.



- 5) Raise the caliper body and support it.

NOTE:

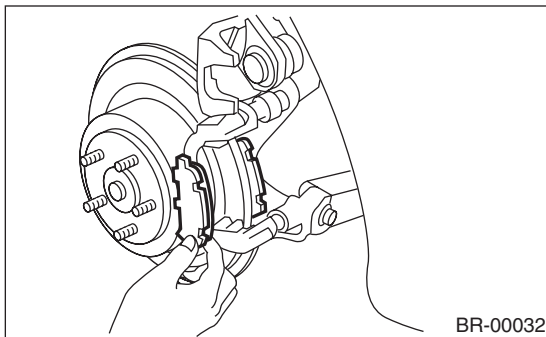
The brake hose must not be disconnected from the caliper body.

- 6) Remove the pad.

NOTE:

If it is difficult to remove the brake pad, use the same procedure as front disc brake pad.

<Ref. to BR-15, REMOVAL, Front Brake Pad.>



B: INSTALLATION

- 1) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) to the contact surface between pad and pad clip.

CAUTION:

Replace the pad if there is oil or grease adhering to the pad surface.

- 2) Install the pad to support.
- 3) Install the caliper body to the support.

Tightening torque:

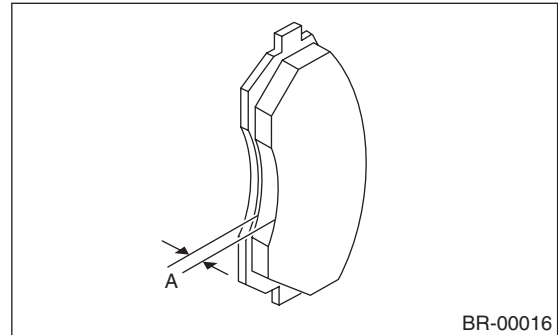
37 N·m (3.8 kgf·m, 27.5 ft·lb)

NOTE:

If it is difficult to push the piston during pad replacement, loosen the air bleeder to facilitate work.

C: INSPECTION

Check the thickness A of pad.



Pad thickness	Standard	9 mm (0.354 in)
	Wear limit	1.5 mm (0.059 in)

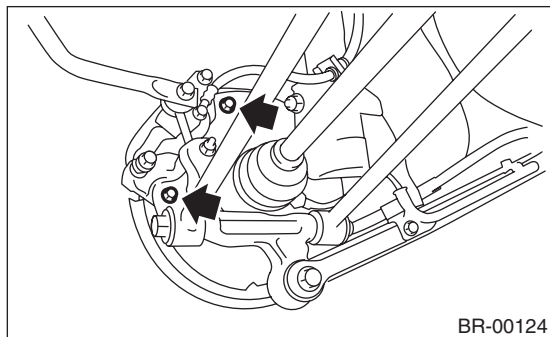
NOTE:

- Always replace the pads of both sides as a set.
- Replace pad clips if they are twisted or worn.
- A wear indicator is installed on inner pad. If the pad is worn to the limit, the end of wear indicator contacts disc rotor, and a squeaking sound is heard as the wheel rotates. If the sound is heard, replace the pad.
- Replace the pad if there is oil or grease on it.

6. Rear Disc Rotor

A: REMOVAL

- 1) Lift-up the vehicle, and then remove the rear wheels.
- 2) Pull down and release the parking brake.
- 3) Remove the two mounting bolts and remove the disc brake assembly.

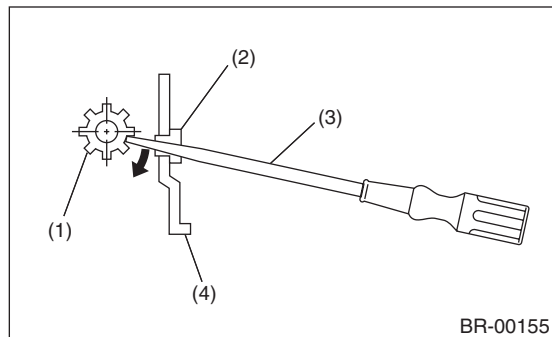


- 4) Suspend the disc brake assembly so that the hose is not stretched.
- 5) Remove the disc rotor.

NOTE:

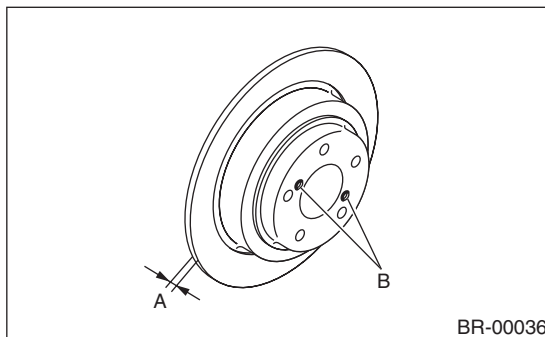
If it is difficult to remove the disc rotor, perform the following two methods in order.

- (1) Using a flat tip screwdriver, turn the adjuster until the parking brake shoe is apart enough from disc rotor.



- (1) Adjuster
- (2) Cover
- (3) Flat tip screwdriver
- (4) Back plate

- (2) If it is difficult to remove the disc rotor from hub, drive an 8 mm bolt into the threads B of the rotor, then remove the rotor.



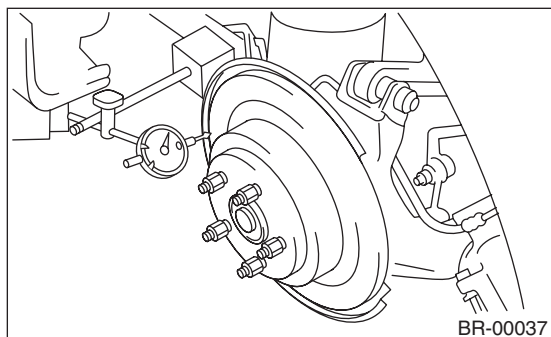
B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Adjust the parking brake. <Ref. to PB-9, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

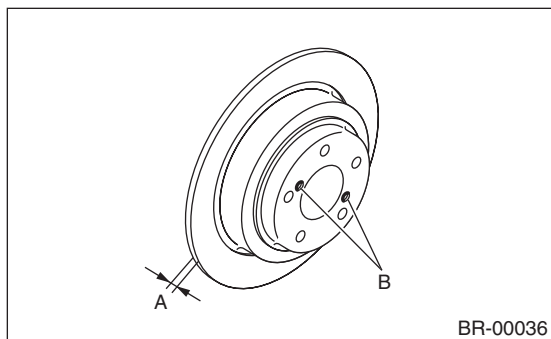
C: INSPECTION

- 1) Check the rear wheel bearing play and axle hub runout before the inspection of disc rotor runout. <Ref. to DS-28, INSPECTION, Rear Axle.>
- 2) Secure the disc rotor by tightening the five wheel nuts.
- 3) Set a dial gauge 10 mm (0.39 in) inward from the disc rotor outer circumference. Rotate the disc rotor to check runout. If the disc rotor runout exceeds the limit, resurface the disc rotor. After resurfacing, check disc rotor thickness as in step 4).

**Disc rotor runout limit:
0.070 mm (0.0027 in)**



- 4) Set a micrometer in 10 mm (0.39 in) inward from disc rotor outer perimeter, and then measure the disc rotor thickness. If the thickness of disc rotor exceeds the service limit, replace with a new disc rotor.



	Standard	Limit	Disc rotor outer dia.
Disc rotor thickness A	10 mm (0.39 in)	8.5 mm (0.335 in)	266 mm (10.47 in)

Rear Disc Brake Assembly

BRAKE

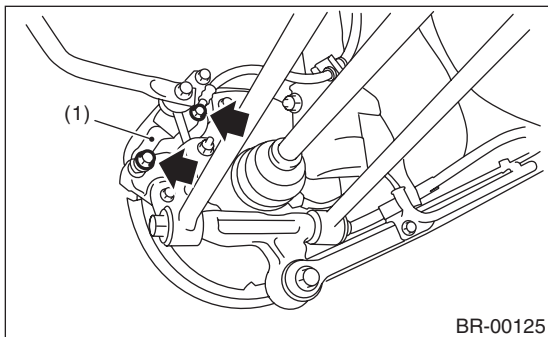
7. Rear Disc Brake Assembly

A: REMOVAL

CAUTION:

Do not let brake fluid come into contact with the painted surface of the vehicle body. Completely wash away with water immediately and wipe off if it was accidental.

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and then remove the rear wheels.
- 4) Disconnect the brake hose from caliper body assembly.
- 5) Remove the bolt securing lock pin (Yellow) to caliper body assembly.



(1) Caliper body

- 6) Raise the caliper body, and then move it toward vehicle center to separate it from the support.
- 7) Remove the support from housing.

NOTE:

Remove the support only when replacing the rotor or support. It need not be removed when servicing the caliper body assembly.

- 8) Remove mud and foreign matter from caliper body assembly and support.

CAUTION:

Be careful not to allow foreign matter to enter the brake hose connector.

B: INSTALLATION

- 1) Install the disc rotor to hub.
- 2) Install the support to the housing.

Tightening torque:

52 N·m (5.3 kgf-m, 38.3 ft-lb)

- 3) Apply a thin coat of Molykote AS880N (Part No. K0777YA010) to the contact surface between pad and pad clip.
- 4) Install the pad to support.
- 5) Install the caliper body to the support.

Tightening torque:

37 N·m (3.8 kgf-m, 27.5 ft-lb)

- 6) Connect the brake hose using the new gaskets.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

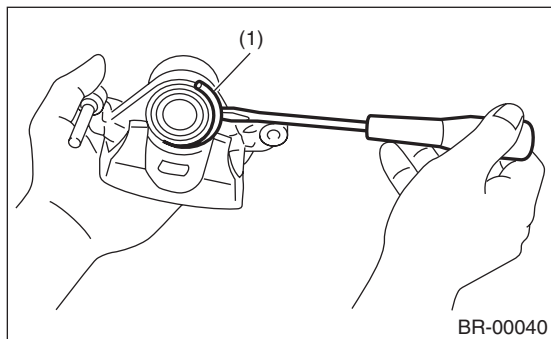
CAUTION:

When connecting the brake hose, do not twist it.

- 7) Bleed air from the brake system. <Ref. to BR-42, Air Bleeding.>

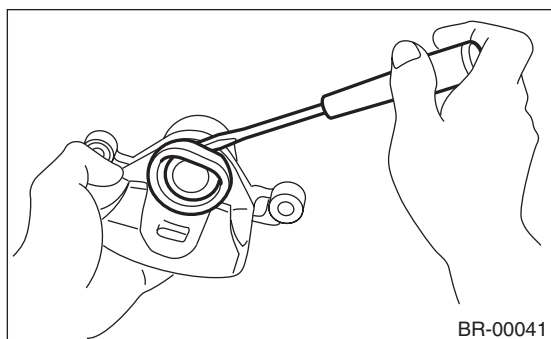
C: DISASSEMBLY

1) Remove the boot ring.

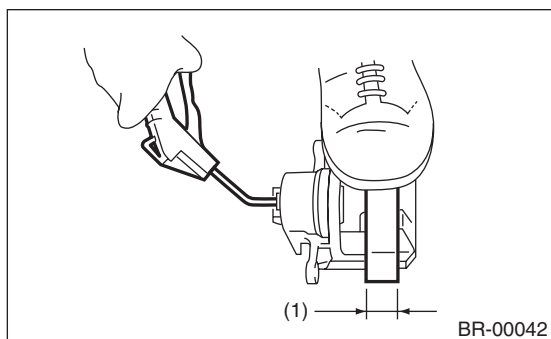


(1) Boot ring

2) Remove the piston boot.



3) Place a wooden block in caliper body as shown in the figure to prevent the piston from jumping out and being damaged, then gradually apply compressed air via installation hole of brake hose to push piston out.

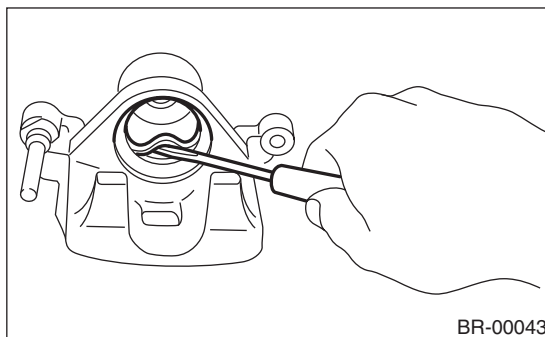


(1) Place a wood block with 30 mm (1.18 in) wide.

4) Remove the piston seal from caliper body cylinder.

CAUTION:

Do not damage the caliper body cylinder and piston seal groove.



5) Remove the lock pin sleeve and pin boot from caliper body.

6) Remove the guide pin (green) and pin boot.

Rear Disc Brake Assembly

BRAKE

D: ASSEMBLY

- 1) Clean the inside of the caliper body using brake fluid.
- 2) Apply a coat of brake fluid to piston seal and install piston seal in the groove on caliper body.
- 3) Apply a coat of brake fluid to the inner surface of caliper body cylinder and entire outer surface of piston.
- 4) Apply a coat of specified grease to the piston boot and install it into the groove on tip of caliper body cylinder.

Grease:

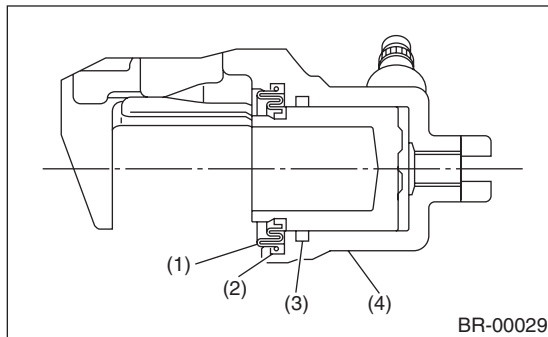
NIGLUBE RX-2 (Part No. K0779GA102)

- 5) Insert the piston into caliper body cylinder.

CAUTION:

Do not force the piston into caliper body cylinder.

- 6) Position the piston boot in the grooves on caliper body cylinder and piston, then install the boot ring.

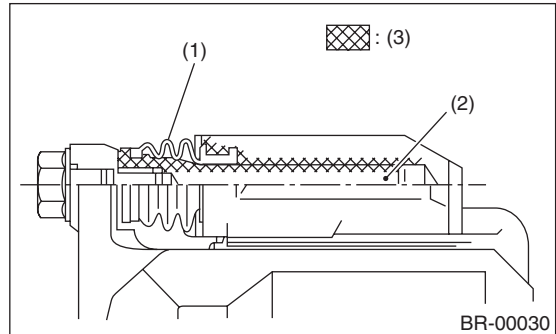


- (1) Piston boot
- (2) Boot ring
- (3) Piston seal
- (4) Caliper body

- 7) Apply a coat of the specified grease to the outer surface of lock pin (yellow) and guide pin (green), outer surface of the lock pin sleeve, cylinder inner surface, and pin boot grooves.

Grease:

NIGLUBE RX-2 (Part No. K0779GA102)



- (1) Pin boot
- (2) Lock pin (yellow) or guide pin (green)
- (3) Grease applied area

- 8) Insert the guide pin boot to the support.
- 9) Install the lock pin boot to the support, and then insert the lock pin sleeve into the specified position.

E: INSPECTION

- 1) Repair or replace the faulty parts.
- 2) Check the caliper body and piston for uneven wear, damage or rust.
- 3) Check rubber parts for damage or deterioration.

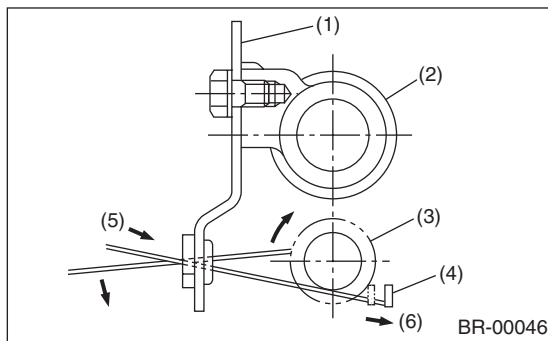
8. Rear Drum Brake Shoe

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and then remove the rear wheels.
- 4) Release the parking brake.
- 5) Remove the brake drum from brake assembly.

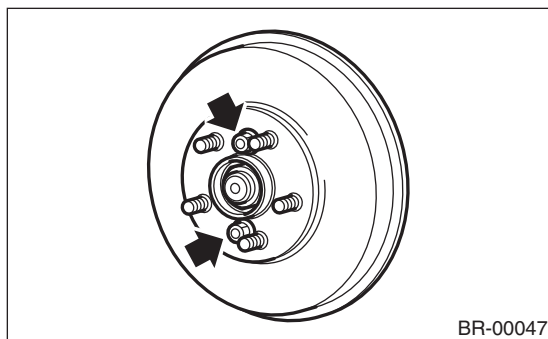
NOTE:

- If it is difficult to remove the brake drum, remove the adjusting hole cover from back plate, then turn the adjuster assembly claws using a flat tip screwdriver until the brake shoe separates from the drum.

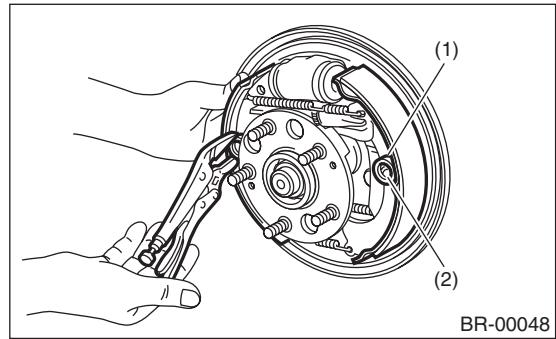


- (1) Back plate
- (2) Wheel cylinder ASSY
- (3) Adjuster ASSY claws
- (4) Adjusting lever
- (5) Tightening direction
- (6) Push direction

- If the brake drum is difficult to remove, drive it out by installing an 8-mm bolt into bolt hole in brake drum.

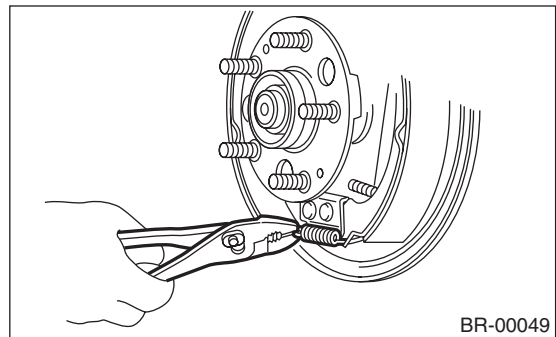


- 6) Hold the hold-down pin by securing rear of back plate with your hand.



- (1) Hold-down cup
- (2) Hold-down pin

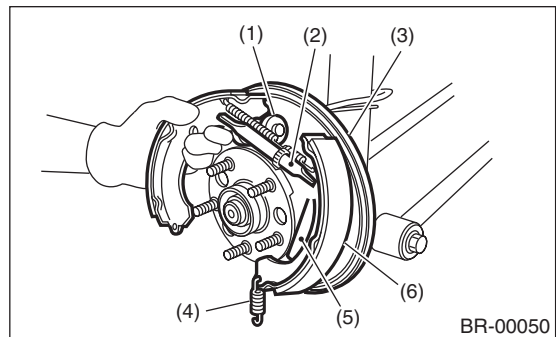
- 7) Rotate the hold down cup and remove from the hold down pin.
- 8) Disconnect the lower shoe return spring from the brake shoe.



- 9) Remove each brake shoe along with the adjuster from the back plate.

CAUTION:

Be careful not to excessively bend the parking brake cable when removing the brake shoes.

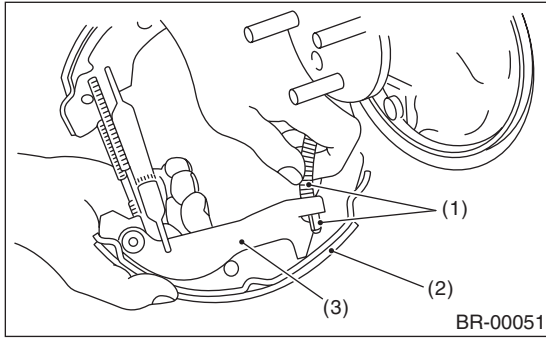


- (1) Wheel cylinder ASSY
- (2) Adjuster ASSY
- (3) Back plate
- (4) Lower shoe return spring
- (5) Parking lever
- (6) Brake shoe (Trailing)

Rear Drum Brake Shoe

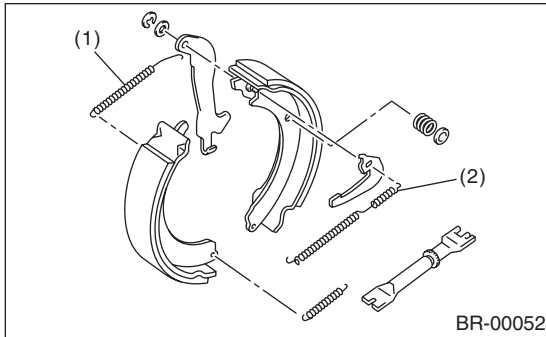
BRAKE

10) Disconnect the parking brake cable from the parking brake lever.



- (1) Parking brake cable
- (2) Brake shoe (Trailing)
- (3) Parking brake lever

11) Remove the upper shoe return spring and adjusting spring from the brake shoe.



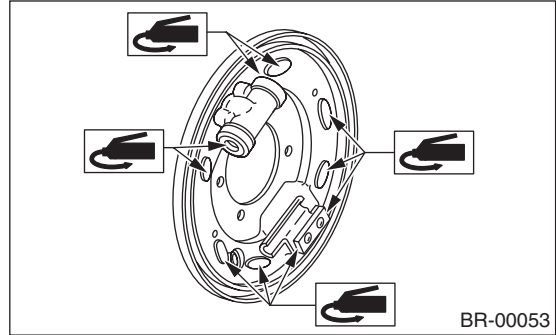
- (1) Upper shoe return spring
- (2) Adjusting spring

B: INSTALLATION

- 1) Clean the back plate and wheel cylinder assembly.
- 2) Apply grease to the portions indicated by arrows in the figure.

Brake grease:

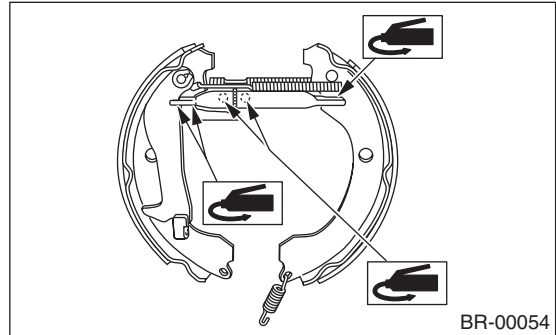
Dow Corning Molykote M 7439 (Part No. 003602001)



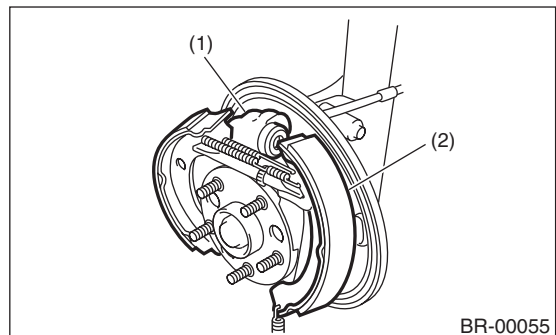
- 3) Apply grease to the adjusting screw and both ends of adjuster.

Brake grease:

Dow Corning Molykote M 7439 (Part No. 003602001)



- 4) Attach the upper shoe return spring to the brake shoe.
- 5) Connect the parking brake cable to the parking lever.
- 6) While positioning the brake shoe (one at a time) in the groove of the wheel cylinder, secure the brake shoe in place.



- (1) Wheel cylinder ASSY
- (2) Brake shoe (Trailing)

- 7) Fix the shoes in place by connecting the hold-down cup to the hold-down pin.
- 8) Install the lower shoe return spring.
- 9) Set the outside diameter of brake shoes 0.5 to 0.8 mm (0.020 to 0.031 in) smaller in comparison with the inside diameter of the brake drum.

C: INSPECTION

- 1) Measure the lining thickness. If it exceeds the service limit, replace the brake shoe with a new part.

Lining thickness

Standard:

4.1 mm (0.161 in)

Service limit:

1.5 mm (0.059 in)

- 2) If the deformation or wear of back plate, shoe, etc. are severe, replace them.
- 3) If the tension of the shoe return spring is very low, replace it. Be careful not to confuse the upper and lower shoe return springs.

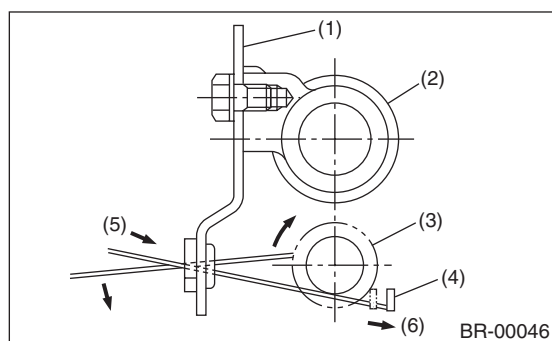
9. Rear Drum Brake Drum

A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and then remove the rear wheels.
- 4) Release the parking brake.
- 5) Remove the brake drum from brake assembly.

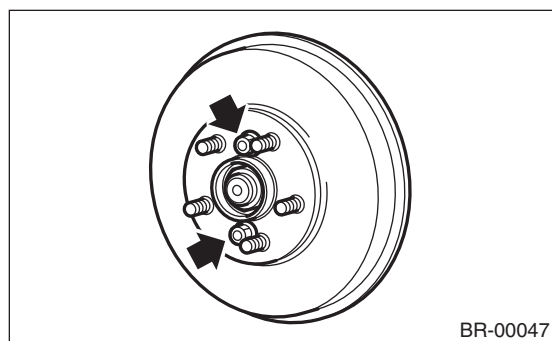
NOTE:

- If it is difficult to remove the brake drum, remove the adjusting hole cover from the back plate, then turn the adjuster assembly claws using a flat tip screwdriver until the brake shoe separates from the drum.



- (1) Back plate
- (2) Wheel cylinder ASSY
- (3) Adjuster ASSY claws
- (4) Adjusting lever
- (5) Tightening direction
- (6) Push direction

- If the brake drum is difficult to remove, drive it out by installing an 8-mm bolt into bolt hole in brake drum.



B: INSTALLATION

Set the outside diameter of brake shoes 0.5 to 0.8 mm (0.020 to 0.031 in) smaller in comparison with the inside diameter of the brake drum.

C: INSPECTION

- 1) If the inside surface of the brake drum has scratches, perform inspection. And, if it is unevenly worn, has narrow streaks on the surface, or the outside surface of brake drum is damaged, correct or replace it.
- 2) Measure the brake drum inside diameter. If it exceeds service limits, replace with a new brake drum.

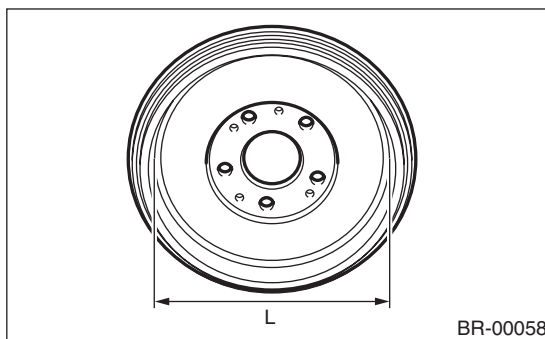
Drum inner diameter: "L"

Standard:

228.6 mm (9 in)

Service limit:

230.6 mm (9.08 in)



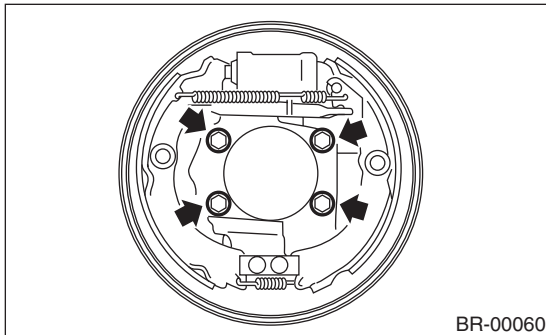
10. Rear Drum Brake Assembly

A: REMOVAL

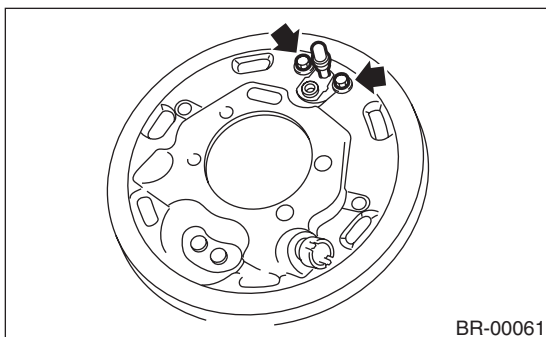
CAUTION:

Do not let brake fluid come into contact with the painted surface of the vehicle body. Completely wash away with water immediately and wipe off if it was accidental.

- 1) Set the vehicle on a lift.
- 2) Loosen the wheel nuts.
- 3) Lift-up the vehicle, and then remove the rear wheels.
- 4) Release the parking brake.
- 5) Remove the brake drum from the brake assembly. <Ref. to BR-30, REMOVAL, Rear Drum Brake Drum.>
- 6) Remove the brake shoe. <Ref. to BR-27, REMOVAL, Rear Drum Brake Shoe.>
- 7) Disconnect the brake hose. <Ref. to BR-44, REAR BRAKE HOSE (DRUM BRAKE), REMOVAL, Brake Hose.>
- 8) Remove the hub. <Ref. to DS-21, REMOVAL, Rear Axle.>
- 9) Disconnect the ABS wheel speed sensor from the back plate.
- 10) Remove the rear drum brake assembly.



- 11) Remove the bolts holding the wheel cylinder assembly on the back plate, and remove the wheel cylinder assembly.

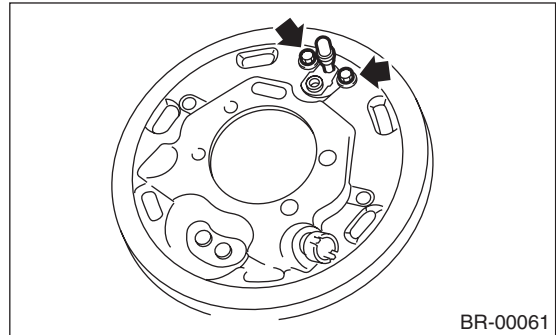


B: INSTALLATION

- 1) Clean the back plate and wheel cylinder assembly.
- 2) Install the wheel cylinder assembly on the back plate, and tighten bolts.

Tightening torque:

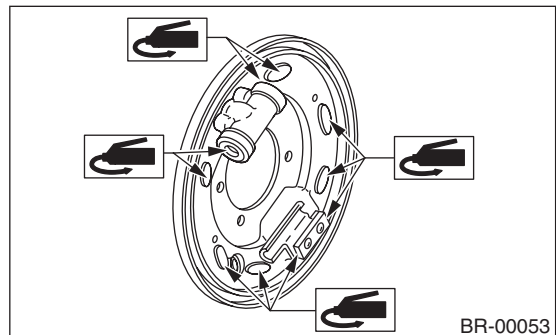
10 N·m (1.0 kgf-m, 7.2 ft-lb)



- 3) Apply grease to the portions indicated by arrows in the figure.

Brake grease:

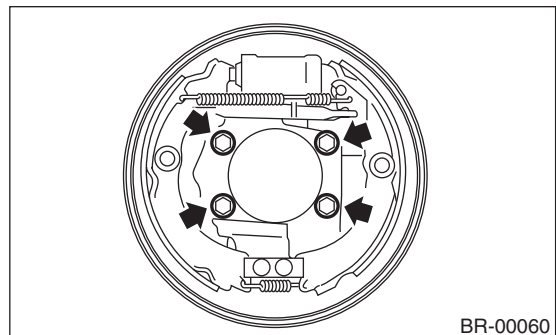
Dow Corning Molykote M 7439 (Part No. 003602001)



- 4) Install the brake assembly on housing, and tighten the bolts to install back plate.

Tightening torque:

52 N·m (5.3 kgf-m, 38.3 ft-lb)



- 5) Install the hub. <Ref. to DS-24, INSTALLATION, Rear Axle.>

Rear Drum Brake Assembly

BRAKE

6) Connect the brake hose, and tighten the brake hose flange nut.

Tightening torque:

18 N·m (1.8 kgf-m, 13.0 ft-lb)

CAUTION:

When connecting the brake hose, do not twist it.

7) Install the ABS wheel speed sensor on the back plate.

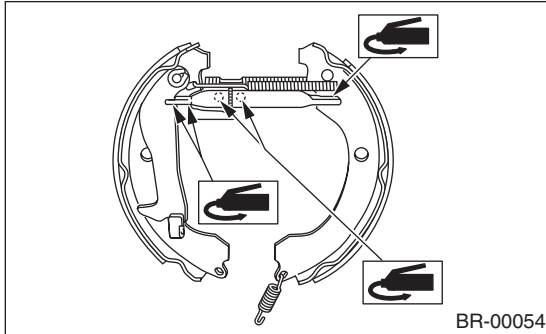
Tightening torque:

32 N·m (3.3 kgf-m, 23.6 ft-lb)

8) Apply grease to the adjusting screw and both ends of adjuster.

Brake grease:

Dow Corning Molykote M 7439 (Part No. 003602001)



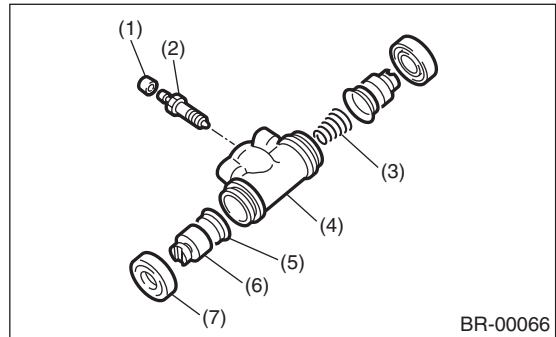
9) Install the brake shoe. <Ref. to BR-28, INSTALLATION, Rear Drum Brake Shoe.>

10) Install the brake drum. <Ref. to BR-30, INSTALLATION, Rear Drum Brake Drum.>

11) After installing the rear drum brake assembly, bleed air from the brake line. <Ref. to BR-42, Air Bleeding.>

C: DISASSEMBLY

1) Remove the right and left dust boots from the wheel cylinder.



- (1) Air bleeder cap
- (2) Air bleeder screw
- (3) Spring
- (4) Wheel cylinder body
- (5) Cup
- (6) Piston
- (7) Dust boots

2) Remove the piston, cup, spring and air bleeder screw and cap.

D: ASSEMBLY

1) Clean all parts with brake fluid. Check and replace faulty parts.

- Cup and boot damage or fatigue
- Wheel cylinder body, piston and spring damage or rust

2) Assemble in the reverse order of disassembly.

(1) When attaching the cup, use the ST and apply brake fluid to the sliding surfaces to make installation smoother. Be careful of the direction of the cup at this time.

(2) The ST is available in different sizes.

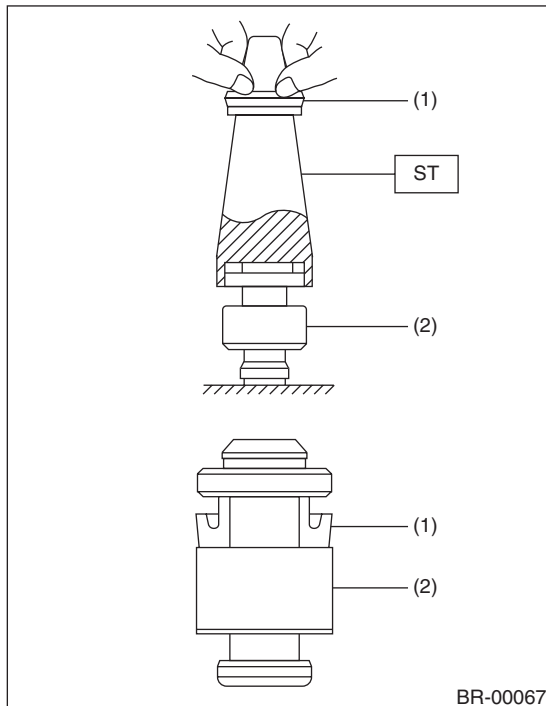
CAUTION:

When replacing with the repair kit, make sure that the sizes of wheel cylinder body and cup are the same as those being replaced.

ST: ADAPTER	
Size	Part No.
19 mm (3/4 in)	926460000

CAUTION:

When assembling, be careful that the wheel cylinder does not become scratched, and that no dust enters.



- (1) Cup
- (2) Piston

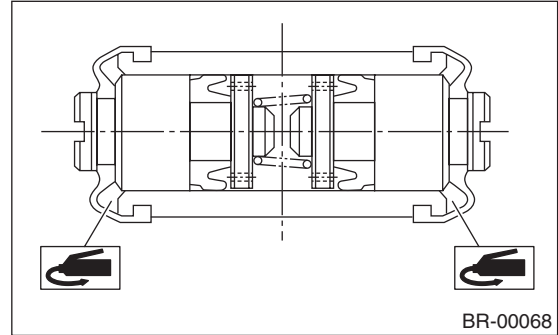
3) Apply rubber grease to the boot inside as shown in figure.

CAUTION:

Never use brake grease.

Grease:

NIGLUBE RX-2 (Part No. K0779GA102)



E: INSPECTION

If the deformation or wear of back plate, shoe, etc. are severe, replace them.

11. Master Cylinder

A: REMOVAL

CAUTION:

Do not let brake fluid come into contact with the painted surface of the vehicle body. Completely wash away with water immediately and wipe off if it was accidental.

- 1) Drain brake fluid from reservoir tank completely.
- 2) Disconnect the harness connector of the fluid level gauge.
- 3) Remove the brake pipes from master cylinder.
- 4) Remove the master cylinder mounting nuts, and remove the master cylinder from the brake booster.

B: INSTALLATION

- 1) Install in the reverse order of removal.

Tightening torque:

Master cylinder mounting nut

14 N·m (1.4 kgf-m, 10.1 ft-lb)

Piping flare nut

15 N·m (1.5 kgf-m, 10.8 ft-lb)

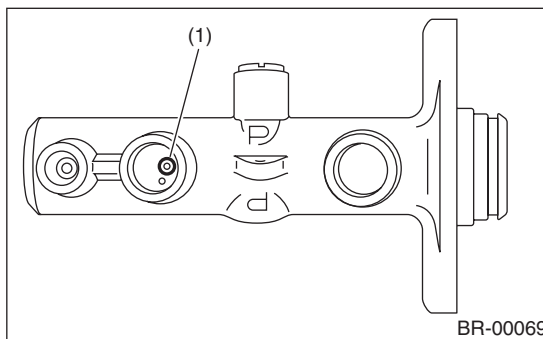
CAUTION:

Be sure to use recommended brake fluid.

- 2) Bleed air from the brake system. <Ref. to BR-42, PROCEDURE, Air Bleeding.>

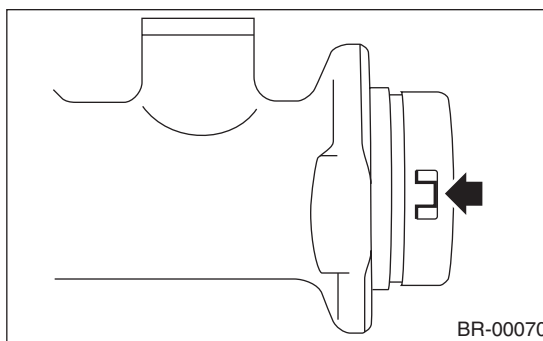
C: REPLACEMENT

- 1) Remove mud and dirt from the surface of brake master cylinder.
- 2) Secure the master cylinder in a vise.
- 3) Remove the pin which secures the reservoir tank to master cylinder, and then remove the reservoir tank and grommet.
- 4) Remove the cylinder pin with magnetic pick-up tool while pushing in the primary piston by screwdriver which is wrapped with tape.



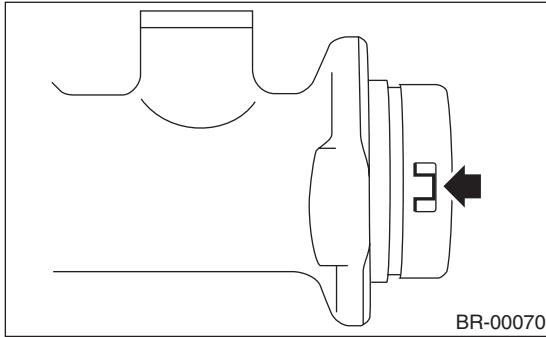
(1) Cylinder pin (straight pin)

- 5) Raise the claw and remove the piston retainer. Hold the piston retainer while working, because the piston may fly out with force.



- 6) Extract the primary piston assembly and secondary piston assembly straight out while taking care not to scratch the inner surface of the cylinder.
- 7) Use brake fluid to wash the inside wall of master cylinder and the piston assembly. Check for any damage, deformation, wear or rust. Replace the master cylinder assembly as a unit if faulty.
- 8) Apply brake fluid to the inner surface of master cylinder and piston assembly.
- 9) Make sure that the inner surface of master cylinder and the piston assembly are free of foreign matter. Install the primary piston assembly and the secondary piston assembly to master cylinder, while taking care not to scratch the master cylinder inner surface.
- 10) Install the cylinder pin while pushing in the primary piston by the screwdriver which is wrapped with tape.

11) Install the piston retainer and secure it with the claw.



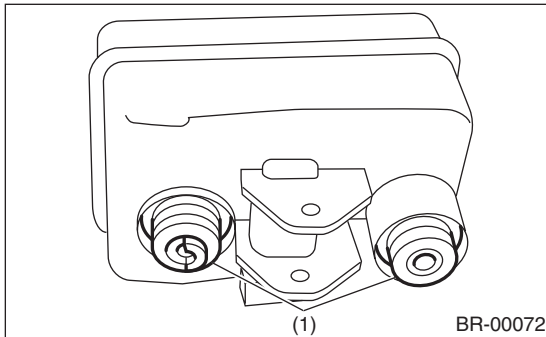
D: INSPECTION

Check the master cylinder for oil leakage.

NOTE:

After replacing the piston kit, if an oil leakage is found even though there is no damage or scratches on the inside of the cylinder, the master cylinder inner wall may be worn. In this case, replace the master cylinder as an assembly.

12) Install the seal to reservoir tank.



(1) Seal

13) Install the reservoir tank to the master cylinder, and secure with pin.

12. Brake Booster

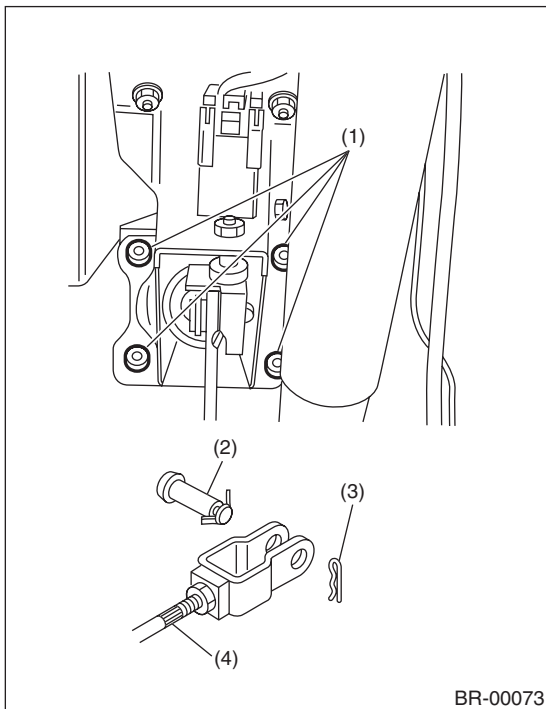
A: REMOVAL

1) Remove or disconnect the following parts of engine compartment.

- (1) Disconnect the connector of brake fluid level gauge.
- (2) Remove the brake pipes from master cylinder.
- (3) Remove the master cylinder installation nut.
- (4) Disconnect the vacuum hose from brake booster.

2) Remove the following parts from the pedal bracket.

- (1) Snap pin and clevis pin
- (2) Four brake booster installation nuts



- (1) Nut
- (2) Clevis pin
- (3) Snap pin
- (4) Operating rod

3) Remove the brake booster while avoiding the brake pipe.

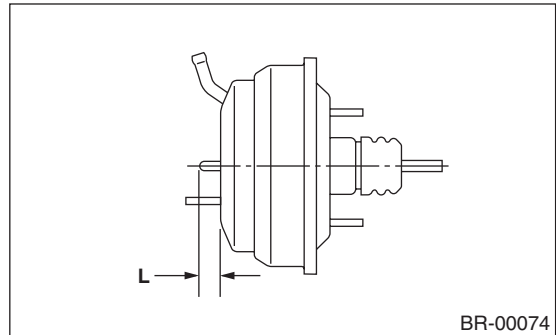
NOTE:

- Be careful not to drop the brake booster. If the booster is dropped, replace it.
- Use special care when handling the operating rod.
- If excessive force is applied to operating rod, angle may cause change in excess of $\pm 3^\circ$, and it may result in damage to the master cylinder.
- Be careful when placing the brake booster on floor.
- Do not change the push rod length. If it has been changed, reset the projected length "L" to the standard length.

Standard:

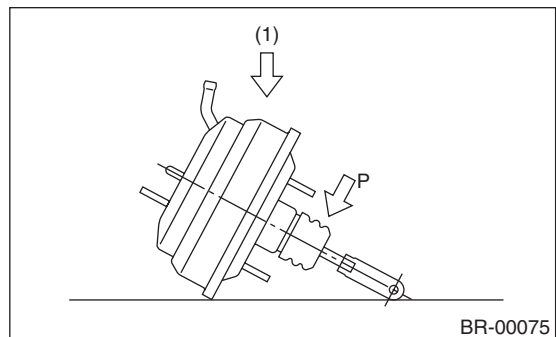
Model with ABS

L = 10.05 mm (0.396 in)



CAUTION:

- Do not disassemble the brake booster.
- If external force is applied from above when brake booster is placed in this position, the resin portion as indicated by "P" may be damaged, so be careful how it is placed.



(1) Force

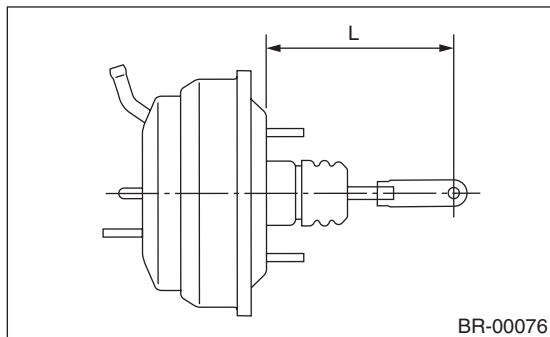
B: INSTALLATION

1) Check and adjust the operating rod of the brake booster.

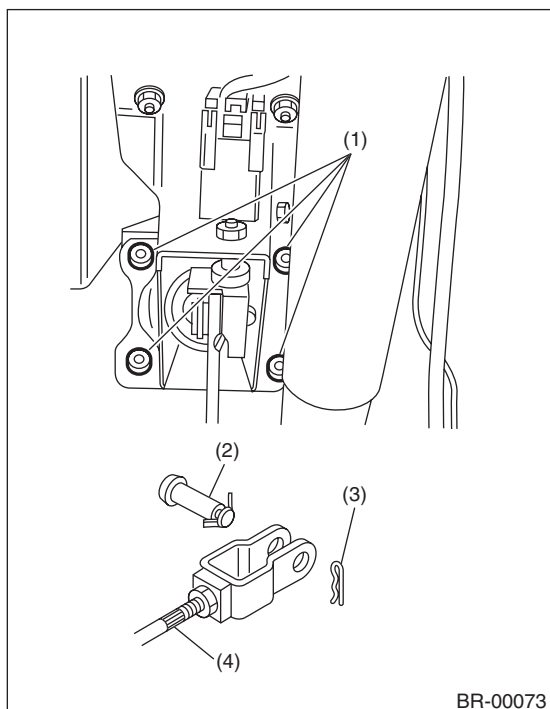
Standard: L

144.6 mm (5.69 in)

If it is out of specification, adjust it with the brake booster operating rod.

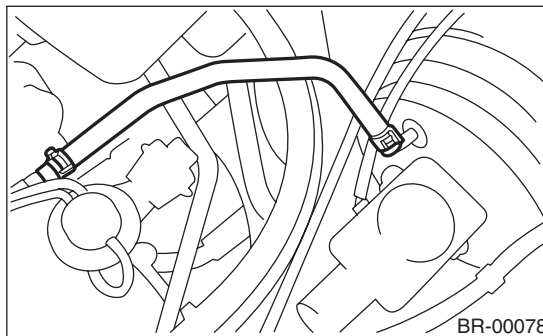


- 2) Mount the brake booster in position.
- 3) Connect the operating rod to brake pedal with a clevis pin and snap pin.



- (1) Nut
- (2) Clevis pin
- (3) Snap pin
- (4) Operating rod

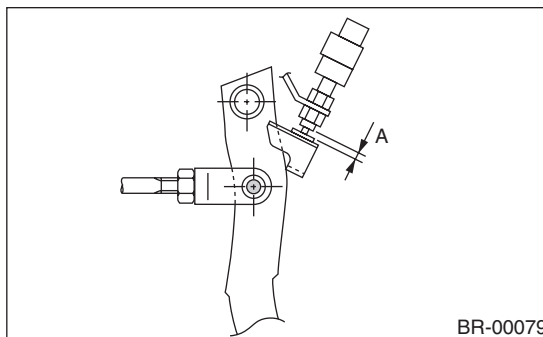
4) Connect the vacuum hose to brake booster.



- 5) Mount the master cylinder onto the brake booster.
- 6) Connect the brake pipes to the master cylinder.
- 7) Connect the connector of the brake fluid level gauge.
- 8) Measure the clearance between the threaded end of stop light switch and the stopper. If it is not within the specification, adjust it by adjusting the position of the stop light switch. <Ref. to BR-50, ADJUSTMENT, Stop Light Switch.>

CAUTION:
Do not rotate the stop light switch.

Stop light switch clearance: A
0.3 mm (0.012 in)



- 9) Apply grease to the operating rod connecting pin to prevent it from wear.
- 10) Bleed air from the brake system. <Ref. to BR-42, Air Bleeding.>

Tightening torque (air bleeder screw):
8 N·m (0.8 kgf-m, 5.8 ft-lb)

11) Perform a road test to make sure the brakes do not drag.

Brake Booster

BRAKE

C: INSPECTION

1. OPERATION CHECK (WITHOUT GAUGES)

CAUTION:

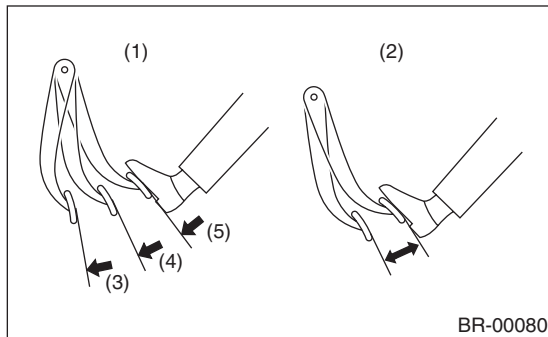
When checking operation, be sure to apply the parking brake securely.

CHECK WITHOUT GAUGES

This method can not determine which portion is defective exactly. But it is possible to identify the outline of the defect by performing the check according to the following procedures.

AIR TIGHTNESS CHECK

Start the engine, and idle it for 1 to 2 minutes, then turn it OFF. Depress the brake pedal several times applying the normal pedal force. The pedal stroke should be the longest at the 1st depression, and it should become shorter at each successive depression. If the depressed pedal height is not changed, the brake booster is faulty.



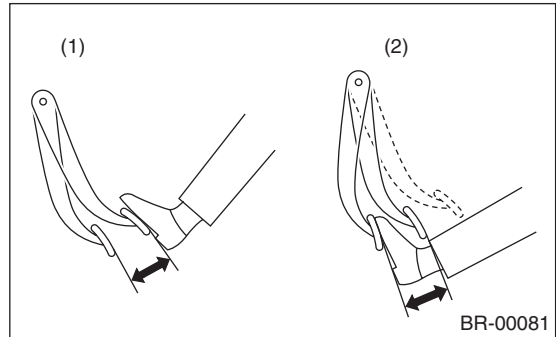
- (1) Normal
- (2) Not OK
- (3) 1st
- (4) 2nd
- (5) 3rd

NOTE:

- In case of defective operation, inspect the condition of the check valve and vacuum hose as well.
- Replace them if faulty, and perform the test again.
- If a defect is not improved, check correctly using a gauge.

OPERATION CHECK

1) While the engine is OFF, depress the brake pedal several times applying the same pedal force, to check for a change in pedal height.



- (1) When engine is stopped
- (2) When engine is started

2) With brake pedal depressed, start the engine.
3) As the engine starts, the brake pedal should move slowly toward floor. If the pedal height is not changed, the brake booster is faulty.

NOTE:

If faulty, check correctly with gauge.

LOADED AIR TIGHTNESS CHECK

Depress the brake pedal while the engine is running, and turn the engine OFF with the pedal depressed. Keep the pedal depressed for 30 seconds. If the pedal height does not change, the function of brake booster is normal. If the pedal height increases, it is faulty.

NOTE:

If faulty, check correctly with gauge.

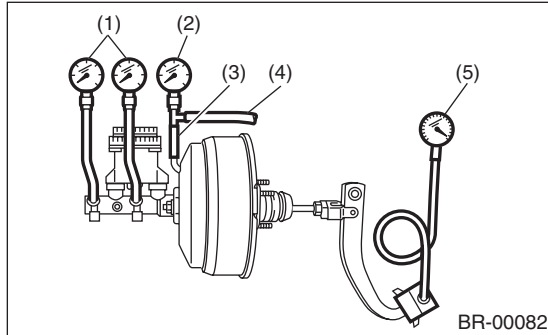
2. OPERATION CHECK (WITH GAUGE)

CAUTION:

When checking operation, be sure to apply the parking brake securely.

CHECK WITH GAUGE

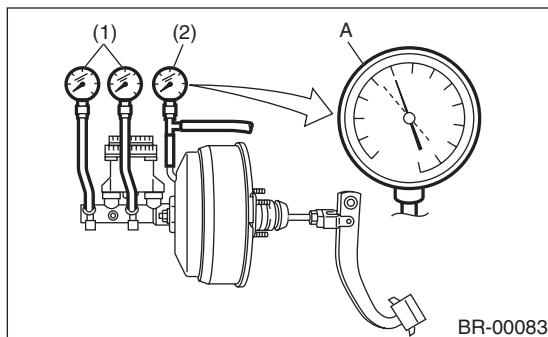
Connect the gauge as shown in the figure. After bleeding air from pressure gauge, perform each check.



- (1) Pressure gauge
- (2) Vacuum gauge
- (3) Adapter hose
- (4) Vacuum hose
- (5) Pedal force gauge

AIR TIGHTNESS CHECK

1) Start the engine and keep it running until vacuum pressure indicates A point of vacuum gauge = 66.7 kPa (500 mmHg, 19.69 inHg). Do not depress the brake pedal at this time.



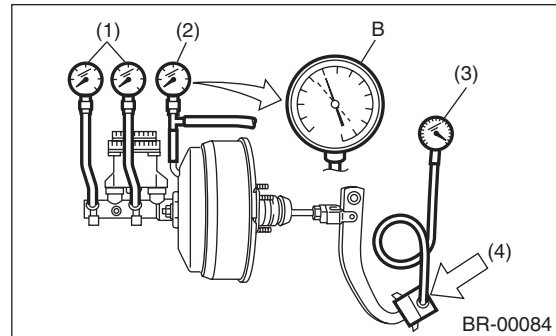
- (1) Pressure gauge
- (2) Vacuum gauge

2) Stop the engine and check the gauge. If the vacuum pressure drop within 15 seconds after stopping the engine is less than 3.3 kPa (25 mmHg, 0.98 inHg), the function of brake booster is normal. If faulty, the cause may be one of the following.

- Check valve malfunction
- Leak from vacuum hose
- Leak from shell joint section or stud bolt welded section
- Damaged diaphragm plate
- Leak from valve body seal and bearing section
- Leak from plate and seal assembly section
- Leak from poppet valve assembly section

LOADED AIR TIGHTNESS CHECK

1) Start the engine and depress the brake pedal with a pedal force of 196 N (20 kgf, 44 lb). Keep the engine idling until vacuum pressure indicates B point of gauge = 66.7 kPa (500 mmHg, 19.69 inHg) with the pedal depressed.



- (1) Pressure gauge
- (2) Vacuum gauge
- (3) Pedal force gauge
- (4) Depressed

2) Stop the engine and check the vacuum gauge. If the vacuum pressure drop within 15 seconds after stopping the engine is less than 3.3 kPa (25 mmHg, 0.98 inHg), the function of brake booster is normal.

If defective, refer to "AIR TIGHTNESS CHECK".

<Ref. to BR-38, INSPECTION, Brake Booster.>

3) If the brake booster is faulty, replace it with a new part.

LACK OF BOOSTING ACTION CHECK

Turn the engine OFF, and set the value of the vacuum gauge to "0". Then, check the fluid pressure when the brake pedal is depressed. The pressure must be greater than the specification listed.

Brake pedal operation force	147 N (15 kgf, 33 lb)	294 N (30 kgf, 66 lb)
Fluid pressure	686 kPa (7 kg/cm ² , 100 psi)	17.65 kPa (18 kg/cm ² , 256 psi)

Brake Booster

BRAKE

BOOSTING ACTION CHECK

Set the vacuum gauge reading to 66.7 kPa (500 mmHg, 19.69 inHg) with the engine running. Then, check the fluid pressure when the brake pedal is depressed. The pressure must be greater than the specification listed.

Brake pedal operation force	147 N (15 kgf, 33 lb)	294 N (30 kgf, 66 lb)
Fluid pressure	6,468 kPa (66 kg/cm ² , 938 psi)	10,297 kPa (105 kg/cm ² , 1,493 psi)

13.Brake Fluid

A: INSPECTION

- 1) Check that the brake fluid level remains between MIN and MAX. If out of the specified range, refill or drain fluid. If the fluid level becomes close to MIN, check the brake pad for wear and refill fluid.
- 2) Check the fluid for discoloration. If the fluid color has excessively changed, drain the fluid and refill with new fluid.

B: REPLACEMENT

CAUTION:

- Do not let brake fluid come into contact with the painted surface of the vehicle body. Wash away with water immediately and wipe off if it is spilled by accident.
- Avoid mixing brake fluid of different brands to prevent fluid performance from degrading.
- Be careful not to allow dirt or dust to enter into reservoir tank.

NOTE:

- While working, keep the reservoir tank filled with brake fluid to eliminate entry of air.
 - Operate the brake pedal slowly.
 - For convenience and safety, perform work with 2 people.
 - The required amount of brake fluid is approximately 500 m^l (16.9 US fl oz, 17.6 Imp fl oz) for entire brake system.
- 1) Lift-up the vehicle and set rigid racks at the specified locations, or keep the vehicle lifted.
 - 2) Remove both the front and rear wheels.
 - 3) Drain the brake fluid from the reservoir tank.
 - 4) Refill the reservoir tank with recommended brake fluid.

Recommended brake fluid:

Refer to SPECIFICATION of General Description. <Ref. to BR-2, SPECIFICATION, General Description.>

Repeat the same procedure as for bleeding air from the brake line, until new brake fluid comes out from vinyl tube. <Ref. to BR-42, PROCEDURE, Air Bleeding.>

NOTE:

Perform the brake fluid replacement starting from the wheel cylinder farthest from the master cylinder.

14. Air Bleeding

A: PROCEDURE

CAUTION:

- Do not let brake fluid come into contact with the painted surface of the vehicle body. Wash away with water immediately and wipe off if it is spilled by accident.
- Avoid mixing brake fluid of different brands to prevent fluid performance from degrading.
- Be careful not to allow dirt or dust to enter into reservoir tank.

1. MASTER CYLINDER

NOTE:

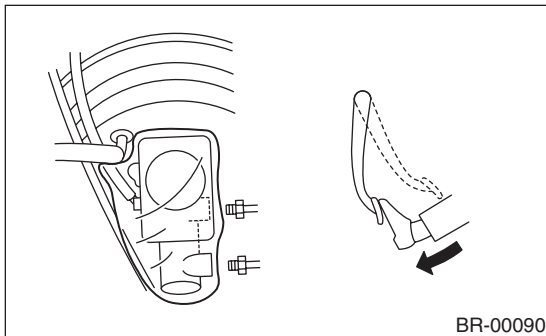
- When the master cylinder is disassembled or when the reservoir tank is empty, bleed the master cylinder.
- If bleeding of the master cylinder is not necessary, omit the following procedures, and perform bleeding of the brake line. <Ref. to BR-42, BRAKE LINE, PROCEDURE, Air Bleeding.>

1) Fill the master cylinder reservoir tank with brake fluid.

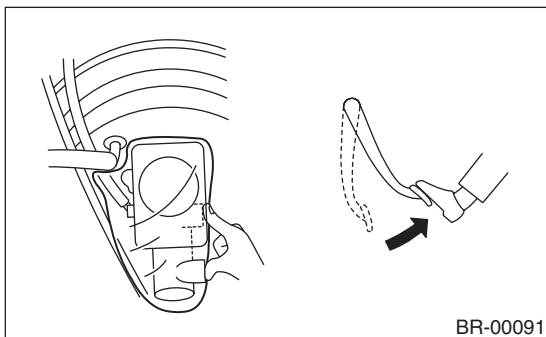
NOTE:

During air bleeding, keep the reservoir tank filled with brake fluid to prevent entry of air.

- 2) Disconnect the brake line at primary and secondary sides.
- 3) Wrap the master cylinder with a plastic bag.
- 4) Slowly depress the brake pedal and keep it depressed.



5) Close the outlet plug with your finger, and release the brake pedal.



- 6) Repeat steps 4) and 5) several times.
- 7) Remove the plastic bag.
- 8) Install the brake pipe to the master cylinder.

Tightening torque:

Model with ABS

15 N·m (1.5 kgf-m, 10.8 ft-lb)

9) Bleed air from the brake line. <Ref. to BR-42, BRAKE LINE, PROCEDURE, Air Bleeding.>

2. BRAKE LINE

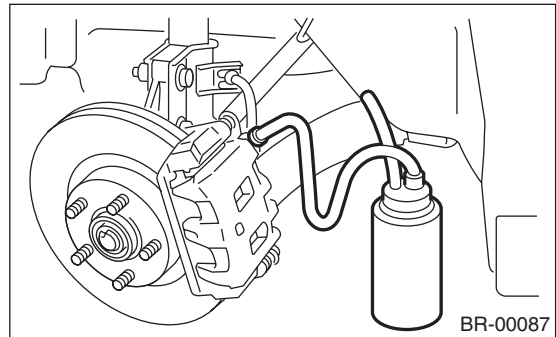
1) When the master cylinder is disassembled or when the reservoir tank is empty, bleed the master cylinder before bleeding the brake line. <Ref. to BR-42, MASTER CYLINDER, PROCEDURE, Air Bleeding.>

2) Fill the master cylinder reservoir tank with brake fluid.

NOTE:

While bleeding air, keep the reservoir tank filled with brake fluid to prevent entry of air.

3) Attach one end of the vinyl tube to the air bleeder and the other end to the brake fluid container.



4) Depress the brake pedal several times and keep it depressed.

5) Loosen the air bleeder screw to drain brake fluid. Tighten the air bleeder quickly, and release the brake pedal.

6) Repeat the steps 4) to 5) until there are no more air bubbles in the vinyl tube.

7) Repeat the steps from 2) to 6) above to bleed air from each wheel.

NOTE:

Perform the air bleeding operation starting from the wheel cylinder closest to the master cylinder.

8) Securely tighten the air bleeder screws.

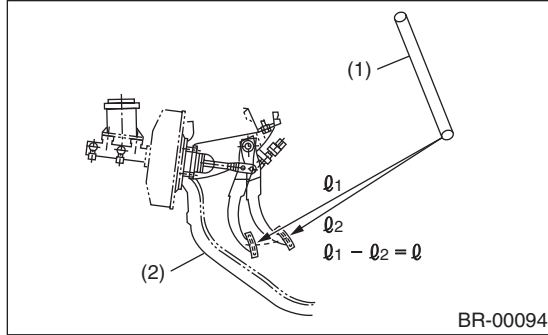
Tightening torque:

8 N·m (0.8 kgf-m, 5.8 ft-lb)

9) Check the entire system for brake fluid leaks.

10) Check the pedal stroke.

Idle the engine after warm-up, depress the brake pedal with a force of 500 N (51 kgf, 112 lbf), and measure the distance between the brake pedal and steering wheel. Release the pedal, and measure the distance between pedal and steering wheel again.



- (1) Steering wheel
- (2) Toe board

Specification of pedal stroke:

When depressing the pedal with a force of 500 N (51 kgf, 112 lbf)

105 mm (4.13 in) or less

11) If the distance is more than specified, there is a possibility that air is in the brake line. Bleed the brake line of all air until the pedal stroke meets the specification.

12) Operate the hydraulic control unit in the sequence control mode. <Ref. to ABS-11, ABS Sequence Control.>

13) Check the pedal stroke again.

14) If the distance is more than specified, there is a possibility that air is in the hydraulic unit. Repeat above steps 2) to 9) until pedal stroke meets the specification.

15) Fill brake fluid up to the "MAX" level of reservoir tank.

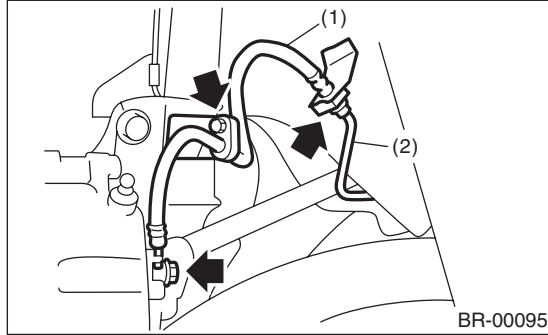
16) Test run the vehicle and ensure that the brakes operate normally.

15. Brake Hose

A: REMOVAL

1. FRONT BRAKE HOSE

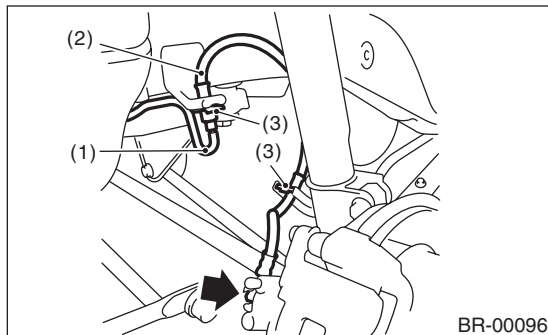
- 1) Separate the brake pipe from the brake hose using a flare nut wrench.
- 2) Remove the clamp, strut mount bolts and union bolt.



- (1) Brake hose
- (2) Brake pipe

2. REAR BRAKE HOSE (DISC BRAKE)

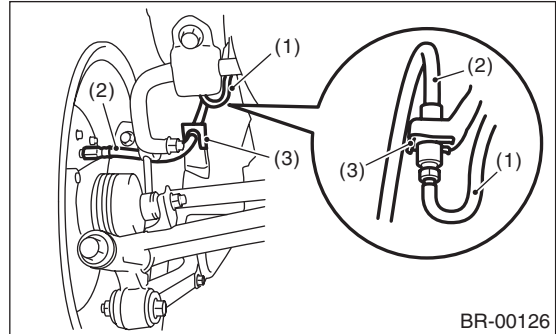
- 1) Separate the brake pipe from the brake hose using a flare nut wrench.
- 2) Remove the clamp and union bolt.



- (1) Brake pipe
- (2) Brake hose
- (3) Brake hose clamp

3. REAR BRAKE HOSE (DRUM BRAKE)

- 1) Separate the brake pipe from the brake hose using a flare nut wrench.
- 2) Remove the two clamps.
- 3) Disconnect the brake hose from the wheel cylinder.



- (1) Brake pipe
- (2) Brake hose
- (3) Brake hose clamp

B: INSTALLATION

1. FRONT BRAKE HOSE

1) Secure the brake hose to strut mount.

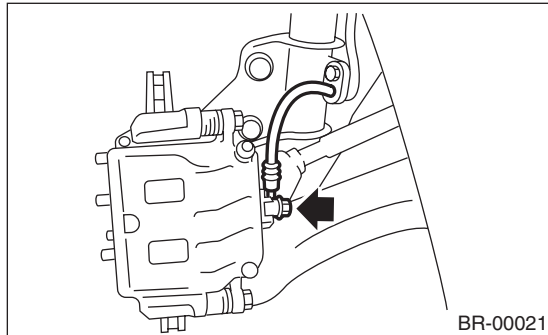
Tightening torque:

32 N·m (3.3 kgf-m, 23.6 ft-lb)

2) Install the brake hose to the caliper using new gasket.

Tightening torque (union bolt):

18 N·m (1.8 kgf-m, 13.0 ft-lb)



3) Position the disc in straight position and route the brake hose through the hole in the bracket on the wheel apron side.

CAUTION:

Do not twist the brake hose.

4) Temporarily tighten the flare nut which connects brake pipe and hose.

5) Secure the brake hose to wheel apron bracket with clamp.

6) While holding the hexagonal part of brake hose fitting with a wrench, tighten the flare nut to the specified torque.

Tightening torque (brake pipe flare nut):

15 N·m (1.5 kgf-m, 10.8 ft-lb)

7) Bleed air from brake system.

2. REAR BRAKE HOSE (DISC BRAKE)

1) Route the brake hose through the hole of bracket, and lightly tighten the flare nut to connect brake pipe.

2) Insert the clamp to secure brake hose.

3) Install the brake hose to caliper using new gasket.

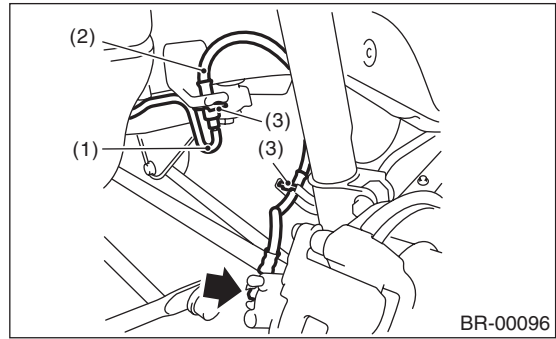
Tightening torque (union bolt):

18 N·m (1.8 kgf-m, 13.0 ft-lb)

4) While holding the hexagonal part of brake hose fitting with a wrench, tighten the flare nut to the specified torque.

Tightening torque (brake pipe flare nut):

15 N·m (1.5 kgf-m, 10.8 ft-lb)



- (1) Brake pipe
- (2) Brake hose
- (3) Brake hose clamp

5) Bleed air from the brake system.

3. REAR BRAKE HOSE (DRUM BRAKE)

1) Attach the brake hose to the wheel cylinder.

Tightening torque:

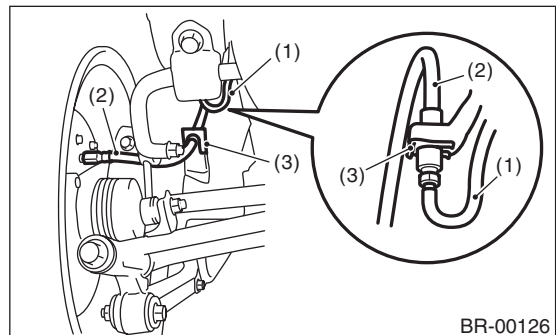
18 N·m (1.8 kgf-m, 13.0 ft-lb)

2) Attach the brake hose to the bracket of the strut using the clamp.

3) Route the brake hose through the bracket hole in the vehicle body, and connect to the brake pipe.

Tightening torque:

15 N·m (1.5 kgf-m, 10.8 ft-lb)



- (1) Brake pipe
- (2) Brake hose
- (3) Brake hose clamp

4) Bleed air from the brake system.

C: INSPECTION

Ensure there are no cracks, breakage, or damage on hoses. Check the joint for fluid leakage. If any cracks, breakage, damage or leakage is found, repair or replace the hose.

NOTE:

Check locations that are hard to see and reverse side of parts using a mirror.

16.Brake Pipe

A: REMOVAL

NOTE:

Airbag system wiring harness is routed near the center brake pipe.

CAUTION:

- All airbag system wiring harness and connectors are colored yellow. Do not use the electrical test equipment on these circuits.
- Be careful not to damage the airbag system wiring harness when servicing the center brake pipe.
- When removing brake pipes, use a brake pipe wrench.
- When removing the brake pipe, do not bend.

B: INSTALLATION

NOTE:

Airbag system wiring harness is routed near the center brake pipe.

CAUTION:

- All airbag system wiring harness and connectors are colored yellow. Do not use the electrical test equipment on these circuits.
- Be careful not to damage the airbag system wiring harness when servicing the center brake pipe.
- When installing brake pipes, use a brake pipe wrench.
- When installing the brake pipe, do not bend.
- After installing the brake pipe and hose, bleed air.
- After installing the brake hoses, make sure that they do not contact the tires or suspension assembly, etc.

Brake pipe tightening torque:
15 N·m (1.5 kgf-m, 10.8 ft-lb)

C: INSPECTION

Ensure there are no cracks, breakage, or damage on pipes. Check the joint for fluid leakage. If any cracks, breakage, damage or leakage is found, repair or replace the pipe.

NOTE:

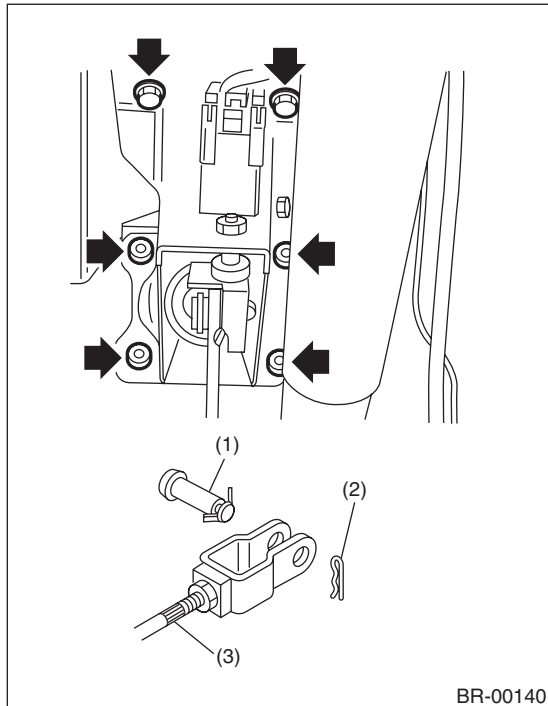
Check the part, which is difficult to see such as the backside using a mirror.

17.Brake Pedal

A: REMOVAL

1. AT MODEL

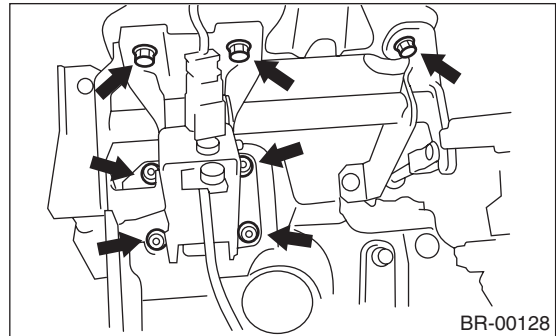
- 1) Disconnect the ground cable from the battery.
- 2) Remove the instrument panel lower cover from instrument panel.
- 3) Remove the clevis pins which secure the brake pedal to the brake booster operating rod. Also disconnect the stop light switch connector.
- 4) Remove the two bolts and four nuts which secure brake pedal to pedal.



- (1) Clevis pin
- (2) Snap pin
- (3) Operating rod

2. MT MODEL

- 1) Remove the steering bolt.
- 2) Raise the vehicle on a lift and remove the two bolts which secure the steering unit to the underside of the body.
- 3) Lower the vehicle.
- 4) Remove the instrument panel lower cover from instrument panel.
- 5) Disconnect the following parts from pedal bracket.
 - Operating rod of brake booster
 - Connector (stop light switch, etc.)
- 6) Remove the clevis pin which secures the lever and push rod.
- 7) Remove the nut which secures the clutch master cylinder.
- 8) Remove the steering assembly.
- 9) Remove the accelerator pedal.
- 10) Remove the bolts and nuts which secure the pedal bracket.



B: INSTALLATION

- 1) Install in the reverse order of removal.

CAUTION:

- If the cable clamp is damaged, replace it with a new part.
 - Never fail to cover outer cable end with boot.
 - Be careful not to twist the accelerator cable.
 - Always use a new clevis pin.
- 2) Adjust the clutch pedal. <Ref. to CL-26, ADJUSTMENT, Clutch Pedal.>
 - 3) Check the brake pedal after installation. <Ref. to BR-49, INSPECTION, Brake Pedal.>

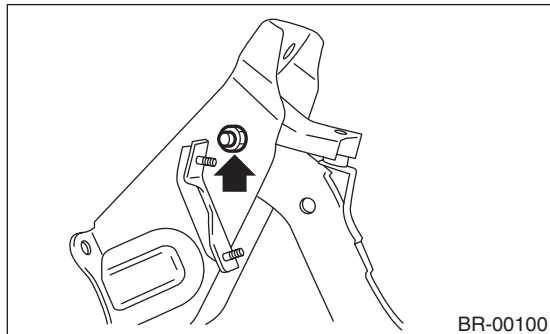
Brake Pedal

BRAKE

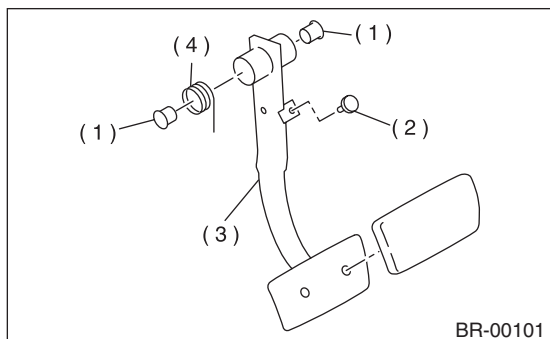
C: DISASSEMBLY

1. AT MODEL

- 1) Remove the brake switch. <Ref. to BR-50, REMOVAL, Stop Light Switch.>
- 2) Unbolt, and then remove the brake pedal.



- 3) Remove the bushing, stopper and spring.

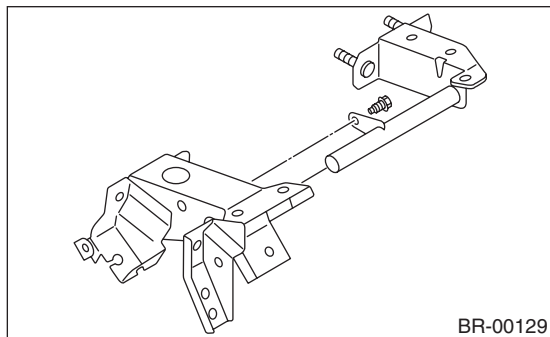


- (1) Bushing
- (2) Stopper
- (3) Brake pedal
- (4) Brake pedal spring

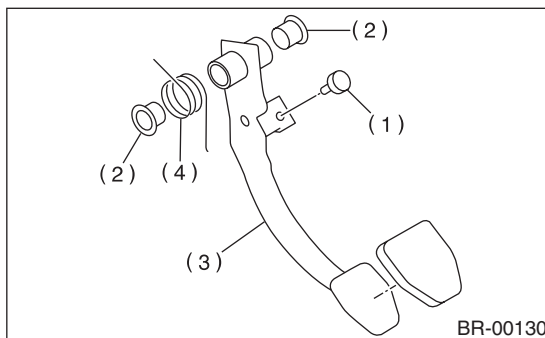
- 4) Remove the brake pedal pad.

2. MT MODEL

- 1) Remove the brake switch. <Ref. to BR-50, REMOVAL, Stop Light Switch.>
- 2) Remove the clutch pedal. <Ref. to CL-25, DISASSEMBLY, Clutch Pedal.>
- 3) Remove the clutch master cylinder bracket.



- 4) Remove the bushing, spring and stopper.



- (1) Stopper
- (2) Bushing
- (3) Brake pedal
- (4) Brake pedal spring

- 5) Remove the brake pedal pad.

D: ASSEMBLY

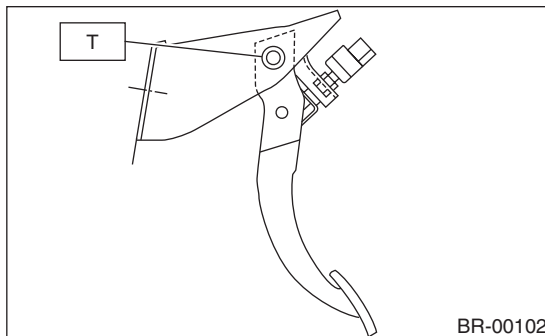
- 1) Position the stop light switch, etc. to the brake pedal.
- 2) Clean the inside of bores of the clutch pedal and brake pedal, apply grease, and set bushings into the bores.
- 3) Align bores of the pedal bracket, clutch pedal and brake pedal, attach brake pedal return spring and clutch pedal effort reduction spring (vehicles equipped with hill holder), then install the pedal bolt.

NOTE:

Clean up the inside of bushings and apply a thin coat of grease before installing the spacer.

Tightening torque:

T: 29 N·m (3.0 kgf·m, 21.7 ft·lb)



- 4) After attaching the brake pedal to the vehicle, adjust the position of the stop light switch. <Ref. to BR-50, ADJUSTMENT, Stop Light Switch.>

E: INSPECTION

1) Move the brake and clutch pedal pads in the lateral direction with a force of approx. 10 N (1 kgf, 2 lb), and check the pedal deflection is in the range of specifications.

CAUTION:

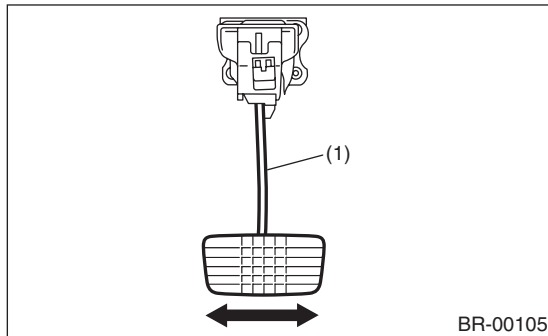
If excessive deflection is found, replace the bushing with new part.

Deflection of the brake and clutch pedal:

Service limit:

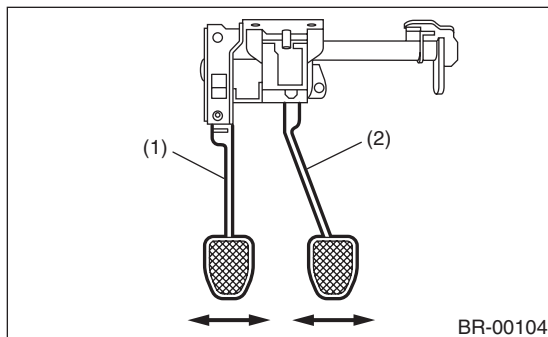
5.0 mm (0.197 in) or less

- AT model



(1) Brake pedal

- MT model



(1) Clutch pedal

(2) Brake pedal

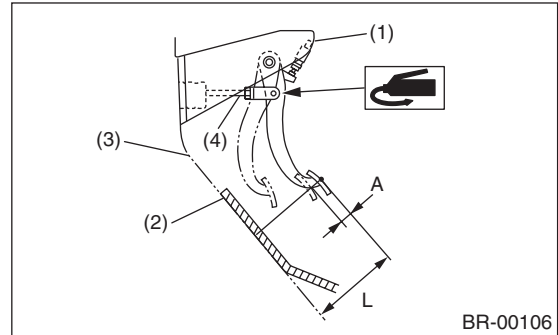
- 2) Check the position of pedal pad.

Pedal height: L

148 mm (5.83 in)

Brake pedal free play: A

1 — 3 mm (0.04 — 0.12 in) [Depress brake pedal with a force of less than 10 N (1 kgf, 2 lb).]



(1) Stop light switch

(2) Mat

(3) Toe board

(4) Operating rod

- 3) If it is not within the specification, adjust it by adjusting the brake booster operating rod length.

Stop Light Switch

BRAKE

18. Stop Light Switch

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Disconnect the stop light switch connector.
- 3) Loosen the nuts, unscrew the stop light switch, and remove stop light switch.

B: INSTALLATION

- 1) Install the stop light switch onto the bracket with screws and position it with the nut.
 - 2) Adjust the stop light switch position, and then tighten the nut.
- <Ref. to BR-50, ADJUSTMENT, Stop Light Switch.>

Tightening torque:

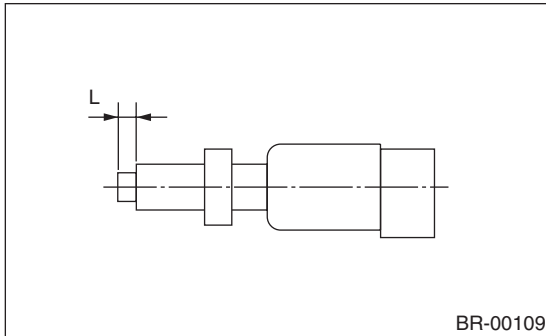
8 N·m (0.8 kgf·m, 5.8 ft·lb)

C: INSPECTION

- 1) If the stop light switch does not operate properly (or if it is not secured at the specified position), replace with a new part.

Specified position: L

2 mm (0.079 in)

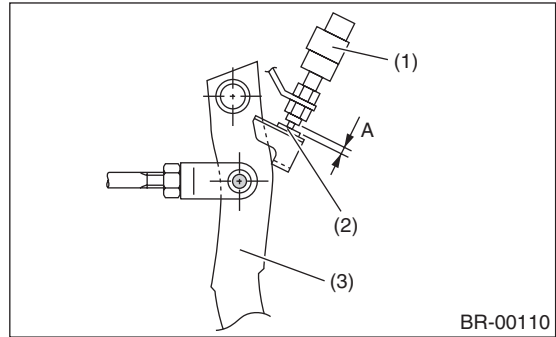


- 2) Measure the clearance between the threaded end of stop light switch and the stopper.

CAUTION:

Do not rotate the stop light switch.

Stop light switch clearance: A
0.3 mm (0.012 in)



- (1) Stop light switch
- (2) Stopper
- (3) Brake pedal

- 3) If it is not within the specification, adjust it by adjusting the position of the stop light switch.

CAUTION:

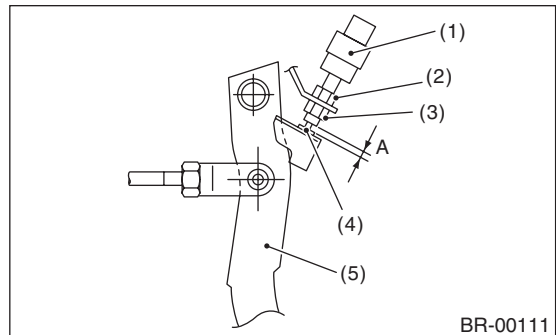
Do not rotate the stop light switch.

D: ADJUSTMENT

Loosen the lock nut, and adjust the stop light switch position until the clearance A between the threaded end of the stop light switch and stopper becomes 0.3 mm (0.012 in). Then, tighten the lock nut.

Tightening torque:

8 N·m (0.8 kgf·m, 5.8 ft·lb)



- (1) Stop light switch
- (2) Lock nut A
- (3) Lock nut B
- (4) Stopper
- (5) Brake pedal

NOTE:

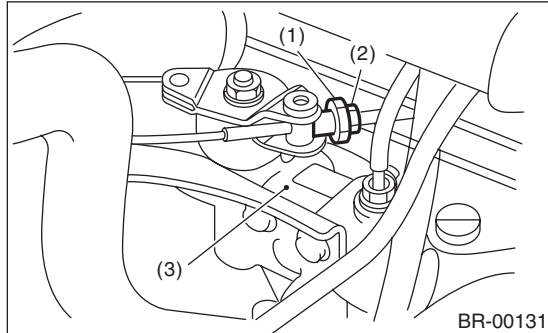
Tighten lock nut B until the threaded end of switch contacts with stopper. Hold the switch so that it does not rotate, then loosen the lock nut B approx. 60°. The clearance will become approximately 0.3 mm (0.012 in).

19. Hill Holder

A: REMOVAL

1. PHV (PRESSURE HOLD VALVE)

- 1) Drain brake fluid from the master cylinder reservoir tank.
- 2) Remove the adjusting nut and lock nut.

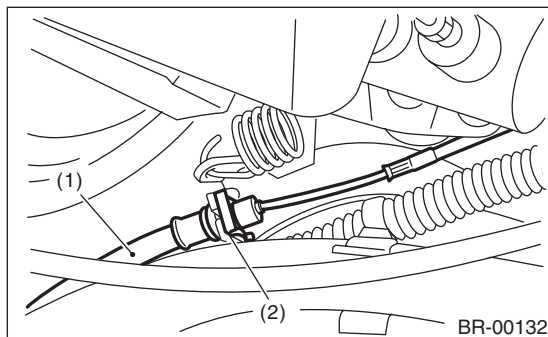


- (1) Adjusting nut
- (2) Lock nut
- (3) PHV

- 3) Remove the cable clamp, and disconnect the PHV cable from the PHV.

CAUTION:

When disconnecting the PHV cable, protect it carefully so as not to damage the boot and inner cable.



- (1) PHV cable
- (2) Clamp

- 4) Disconnect the brake pipes from the PHV.

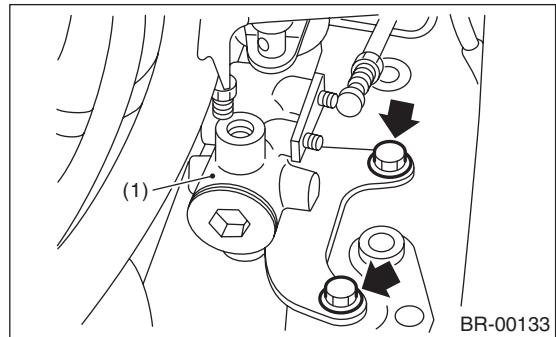
CAUTION:

- Do not let brake fluid come into contact with the painted surface of the vehicle body. Completely wash away with water immediately and wipe off if it was accidental.
- Use a pipe wrench so that the hex head of the flare nut is not damaged.

- 5) Separate the PHV from the side frame, along with the support.

CAUTION:

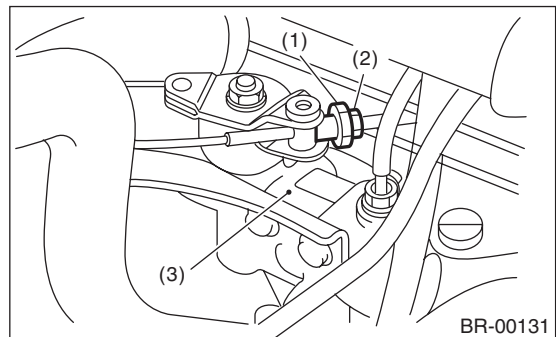
When removing the PHV, take great care that no foreign objects enter inside.



- (1) PHV

2. PHV CABLE

- 1) Remove the adjusting nut and lock nut.

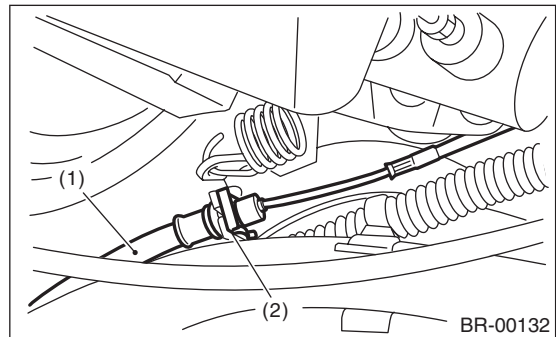


- (1) Adjusting nut
- (2) Lock nut
- (3) PHV

- 2) Remove the cable clamp, and disconnect the PHV cable from the PHV.

CAUTION:

When disconnecting the PHV cable, protect it carefully so as not to damage the boot and inner cable.



- (1) PHV cable
- (2) Clamp

- 3) Remove the cable clamp from the clutch pedal bracket.

- 4) Remove the PHV cable.

B: INSPECTION

Inspect the following items for the removed parts, and replace those that apply.

- 1) If the PHV cable boot is damaged or deteriorated, or if the inner cable is damaged or rusted.
- 2) Check for weak return springs, damage, and rust.
- 3) Check that the rotation of the ball can be heard when the PHV is tilted and the lever is moved smoothly.

CAUTION:

The PHV cannot be disassembled. If it requires replacement, replace the entire PHV assembly.

C: INSTALLATION

1. PHV (PRESSURE HOLD VALVE)

- 1) Attach the PHV to the side frame.

Tightening torque:

18 N·m (1.8 kgf·m, 13.0 ft·lb)

- 2) Connect the brake pipe to the PHV.

Tightening torque:

15 N·m (1.5 kgf·m, 10.8 ft·lb)

CAUTION:

Check that there is no deformation or damage on the brake pipe. If necessary, replace with a new part.

- 3) Attach the PHV cable to the PHV.

CAUTION:

- If the cable clamp (and clip) is damaged, replace it with a new part.
- Do not bend the PHV cable sharply to avoid damage.

- 4) Connect the PHV cable with a clip.
- 5) Apply grease to the following points.
 - Return spring hook position
 - Lever cable end portion.

Grease:

KOPR-KOTE (Part No. 003603001)

- 6) Bleed air from the brake system. <Ref. to BR-42, Air Bleeding.>
- 7) Adjust the PHV cable. <Ref. to BR-52, PHV CABLE, INSTALLATION, Hill Holder.>

CAUTION:

After replacing with a new PHV cable, operate the clutch pedal approximately 30 times to break it in, then perform adjustment.

2. PHV CABLE

- 1) The installation of the PHV cable is performed in the reverse order of removal.

CAUTION:

- If the cable clamp is damaged, replace it with a new part.
 - Do not bend the PHV cable sharply to avoid damage.
- 2) Apply grease to the following points.
 - Return spring hook position
 - Lever cable end portion.

Grease:

KOPR-KOTE (Part No. 003603001)

- 3) Adjust the PHV cable. <Ref. to BR-52, ADJUSTMENT, Hill Holder.>

CAUTION:

After replacing with a new PHV cable, operate the clutch pedal approximately 30 times to break it in, then perform adjustment.

D: ADJUSTMENT

Perform inspection of stop, start performance on a hill with an incline of 3° or more.

- 1) If the vehicle will not stop:

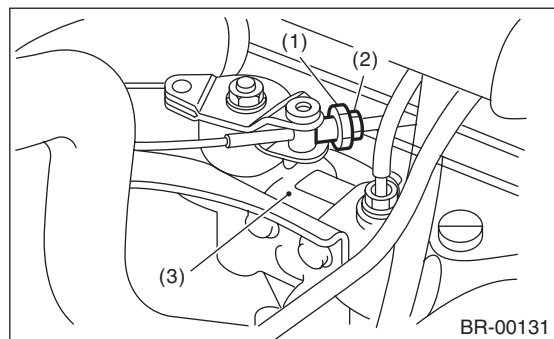
Tighten the adjusting nut of the PHV cable.
- 2) If the vehicle does not advance properly:
 - Case A — If the hill holder is released after the clutch is connected (engine stalls easily):

Loosen the adjusting nut gradually until a smooth start is possible.
 - Case B — If the hill holder is released before the clutch is connected (vehicle moves backward):

Tighten the adjusting nut so that the hill holder releases after connecting the clutch pedal. (Case A) then perform the same adjustment as for Case A.

CAUTION:

When turning the adjusting nut, always make sure that the PHV cable does not turn.



- (1) Adjusting nut
- (2) Lock nut
- (3) PHV

- 3) Tighten the lock nut.

Tightening torque:

3.5 N·m (0.36 kgf·m, 2.6 ft·lb)

20. General Diagnostic Table

A: INSPECTION

	Trouble and possible cause	Corrective action
1. Insufficient braking	(1) Fluid leakage from the hydraulic mechanism	Correct or replace. (cup, piston seal, piston boot, master cylinder piston kit, pipe or hose)
	(2) Entry of air into the hydraulic mechanism	Bleed air.
	(3) Excessively wide shoe clearance	Adjust the clearance.
	(4) Wear, deteriorated surface material, water or fluid on lining	Replace, grind or clean.
	(5) Improper operation of master cylinder, disc caliper, brake booster or check valve	Correct or replace.
2. Unstable or uneven braking	(1) Fluid on the lining, drum or rotor	Correct the cause of fluid leakage, and clean or replace.
	(2) Drum or rotor problem	Repair or replace the drum or rotor.
	(3) Worn brake drum, or damage to the drum caused by entry of sand	Repair by grinding, or replace.
	(4) Improper lining contact, deteriorated surface, deteriorated or wear lining material	Repair by grinding, or replace.
	(5) Deformed back plate	Correct or replace.
	(6) Overinflation of tires	Adjust air pressure.
	(7) Defective wheel alignment	Adjust alignment.
	(8) Loose back plate or the support installation bolt	Tighten to the specified torque.
	(9) Loose wheel bearing	Replace.
	(10) Defective hydraulic system	Replace the cylinder, brake pipe or hose.
	(11) Unstable effect of parking brake	Check, adjust or replace the rear brake and cable system.
3. Excessive pedal stroke	(1) Entry of air into the hydraulic mechanism	Bleed air.
	(2) Excessive play in the master cylinder push rod	Adjust.
	(3) Fluid leakage from the hydraulic mechanism	Correct or replace. (cup, piston seal, piston boot, master cylinder piston kit, pipe or hose)
	(4) Improperly adjusted shoe clearance	Adjust.
	(5) Improper lining contact or worn lining	Correct or replace.
4. Brake dragging or improper brake return	(1) Insufficient pedal play	Adjust play.
	(2) Improper master cylinder return	Clean or replace the cylinder.
	(3) Clogged hydraulic mechanism	Replace.
	(4) Improper return or adjustment of parking brake	Repair or adjust.
	(5) Weakened spring tension or breakage of shoe return spring	Replace the spring.
	(6) Excessively narrow shoe clearance	Adjust the clearance.
	(7) Improper disc caliper operation	Correct or replace.
	(8) Faulty wheel bearing	Replace.
5. Brake noise (1) (creaking sound)	(1) Hardened or deteriorated lining	Replace the shoe assembly or pad.
	(2) Worn lining	Replace the shoe assembly or pad.
	(3) Loose back plate or the support installation bolt	Tighten to the specified torque.
	(4) Loose wheel bearing	Tighten to the specified torque.
	(5) Dirty drum or rotor	Clean the drum or rotor, or clean/replace the brake assembly.
6. Brake noise (2) (hissing sound)	(1) Worn lining	Replace the shoe assembly or pad.
	(2) Improperly installed brake shoe or pad	Repair or replace the shoe assembly or pad.
	(3) Loose or bent drum or rotor	Retighten or replace.

General Diagnostic Table

BRAKE

	Trouble and possible cause	Corrective action
7.Brake noise (3) (click sound)	In the case of the disc brake:	
	(1) Excessively worn pad or the support	Replace the pad or the support.
	In the case of the drum brake:	
	(1) Excessively worn shoe ridge	Replace the back plate.
	(2) Lack of oil on the shoe ridge surface and anchor	Supply grease.

General Description

PARKING BRAKE

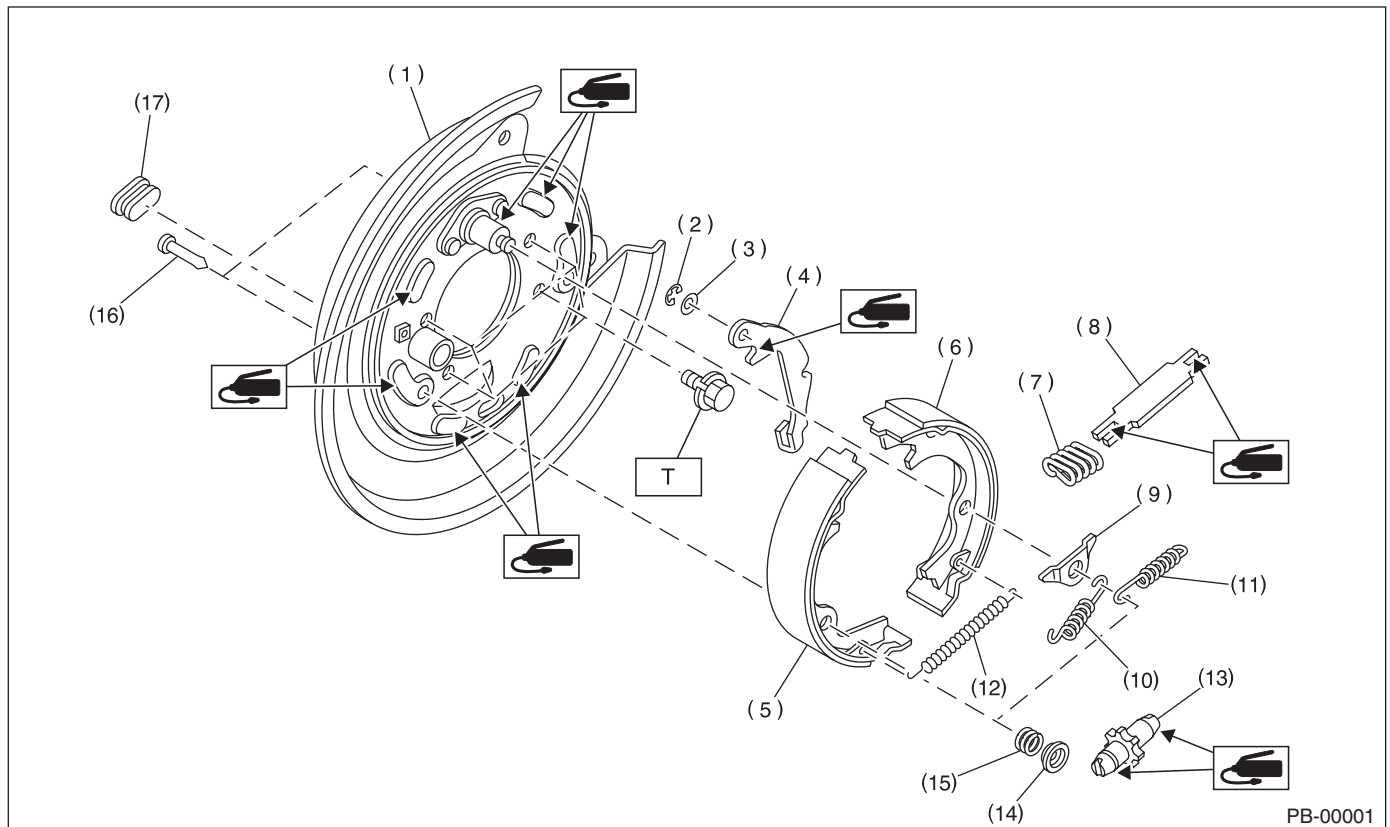
1. General Description

A: SPECIFICATION

Model		Rear drum brake	Rear disc brake
Type		Rear brake mechanical	Mechanical, drum in disc rear brakes
Effective drum diameter	mm (in)	228.6 (9)	170 (6.69)
Lining dimensions (Length x Width x Thickness)	mm (in)	219.4 x 35.0 x 4.1 (8.64 x 1.378 x 0.161)	163.1 x 30.0 x 3.2 (6.42 x 1.181 x 0.126)
Clearance adjustment		Automatic adjusting	Manual adjustment
Lever stroke	notches/N (kgf, lb)	7 — 8/196 (20, 44)	

B: COMPONENT

1. PARKING BRAKE (REAR DISC BRAKE)

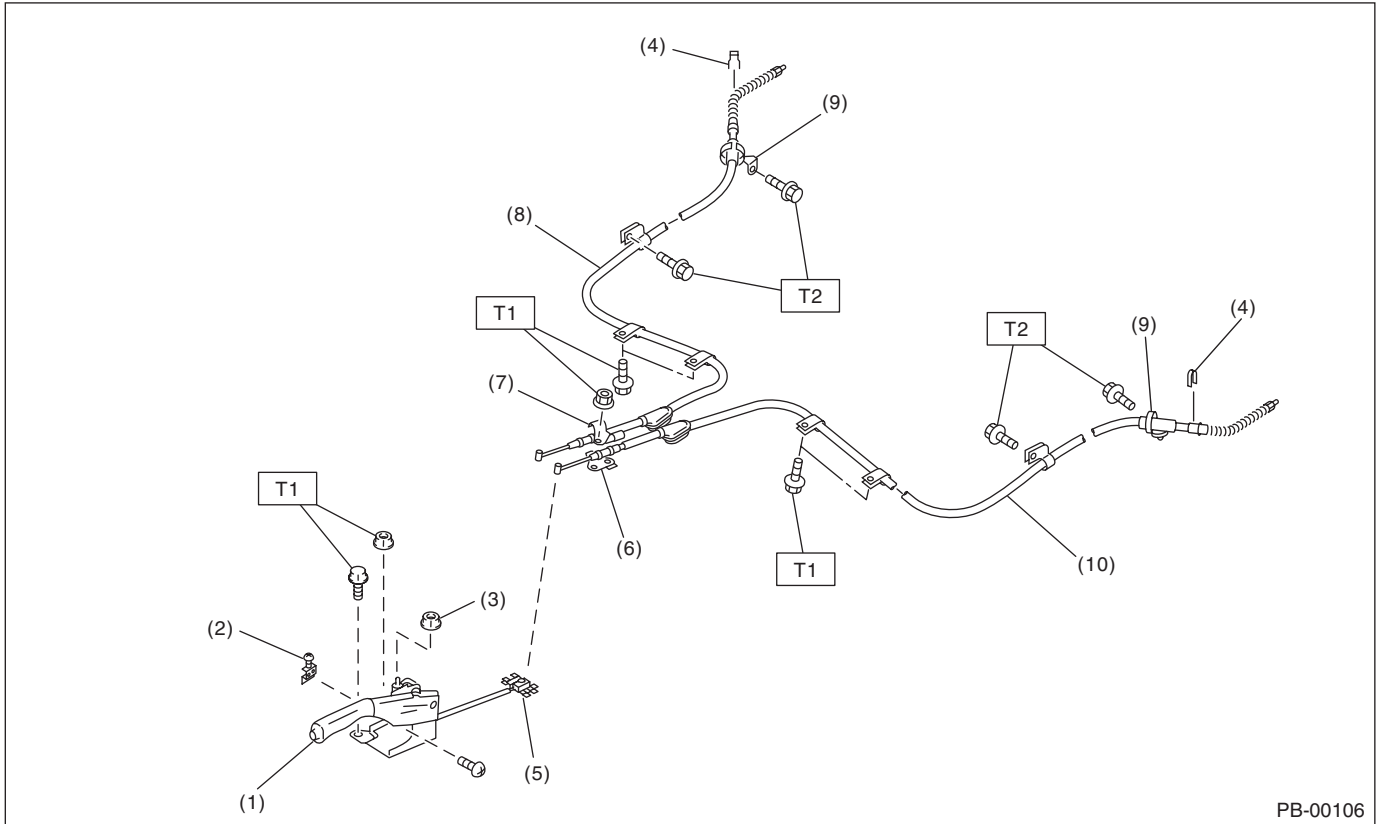


- | | | |
|------------------------------------|------------------------------|----------------------------|
| (1) Back plate | (8) Strut | (15) Shoe hold-down spring |
| (2) Retainer | (9) Shoe guide plate | (16) Shoe hold-down pin |
| (3) Spring washer | (10) Primary return spring | (17) Adjusting hole cover |
| (4) Lever | (11) Secondary return spring | |
| (5) Parking brake shoe (Primary) | (12) Adjusting spring | |
| (6) Parking brake shoe (Secondary) | (13) Adjuster | |
| (7) Strut spring | (14) Shoe hold-down cup | |

Tightening torque: N-m (kgf-m, ft-lb)

T: 53 (5.4, 39.1)

2. PARKING BRAKE CABLE



PB-00106

- | | | |
|--|----------------------------|-----------------------------|
| (1) Parking brake lever | (5) Equalizer | (10) Parking brake cable LH |
| (2) Parking brake switch | (6) Bracket | |
| (3) Self-locking nut | (7) Clamp | |
| (4) Clamp (Rear disc brake model only) | (8) Parking brake cable RH | |
| | (9) Cable guide | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 18 (1.8, 13.0)

T2: 32 (3.3, 23.6)

General Description

PARKING BRAKE

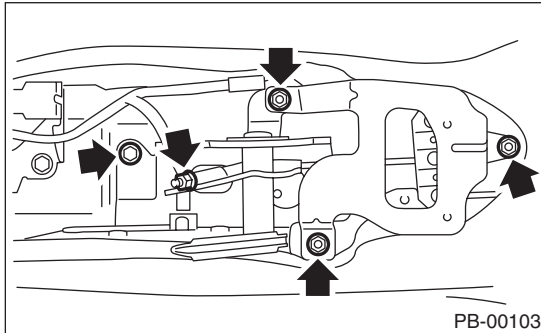
C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Vehicle components are extremely hot after driving. Be wary of receiving burns from heated parts.
- Use SUBARU genuine grease etc. or equivalent. Do not mix grease etc. of different grades or manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Before securing a part in a vise, place cushioning material such as wood blocks, aluminum plate or cloth between the part and the vise.
- Make sure grease does not come into contact with the parking shoes.

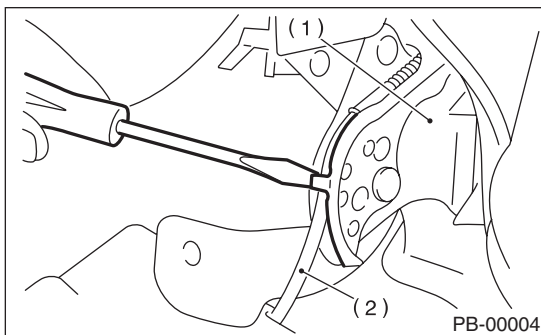
2. Parking Brake Lever

A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Remove the rear wheels.
- 3) Remove the rear seat cushion.
- 4) Remove the console box.
- 5) Loosen the parking cable self-locking nut and console bracket.
- 6) Disconnect the parking brake switch connector.
- 7) Remove the parking brake lever.



- 8) Straighten the tab on the parking brake lever and remove the cable.



- (1) Parking brake lever
- (2) Cable

B: INSTALLATION

- 1) Install in the reverse order of removal.

Tightening torque:

Parking brake lever

18 N·m (1.8 kgf·m, 13.0 ft·lb)

- 2) Be sure to adjust the lever stroke. <Ref. to PB-5, ADJUSTMENT, Parking Brake Lever.>

C: INSPECTION

While pulling the parking brake lever upward, count the notches.

Lever stroke:

7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lb)

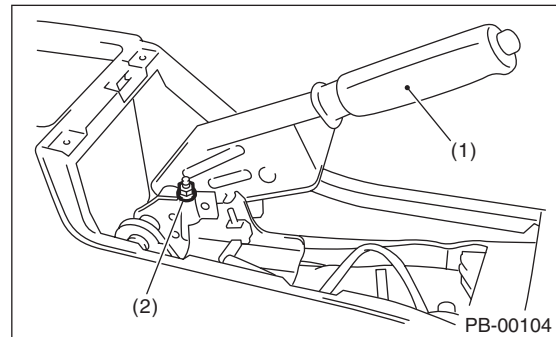
If it is not within the specified value, adjust the parking brake. <Ref. to PB-9, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

D: ADJUSTMENT

- 1) Remove the console cover. <Ref. to EI-38, REMOVAL, Console Box.>
- 2) Forcefully pull the parking brake lever 3 to 5 times.
- 3) Rotate to adjust the selflocking nut so that the lever stroke of the parking brake lever is 7 to 8 notches when applying the parking brake with force of 196 N (20 kgf, 44 lb).

Lever stroke:

7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lb)



- (1) Parking brake lever
- (2) Self-locking nut

- 4) Install the console cover. <Ref. to EI-38, INSTALLATION, Console Box.>

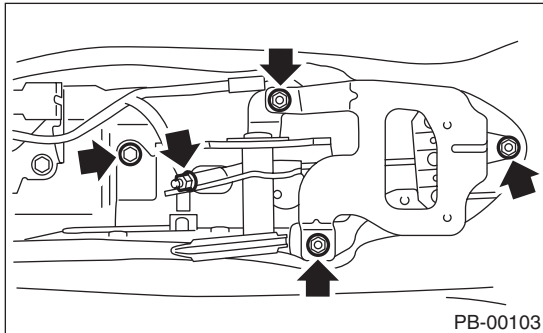
Parking Brake Cable

PARKING BRAKE

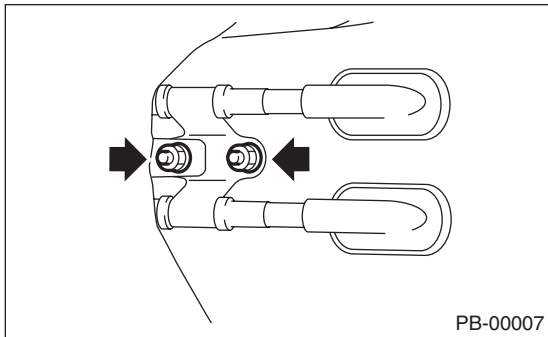
3. Parking Brake Cable

A: REMOVAL

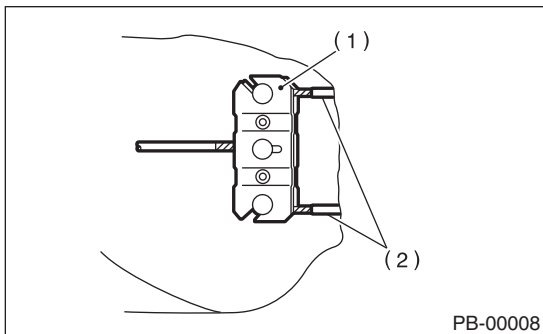
- 1) Lift-up the vehicle.
- 2) Remove the rear wheels.
- 3) Remove the rear seat cushion.
- 4) Remove the console box. <Ref. to EI-38, REMOVAL, Console Box.>
- 5) Loosen the parking cable self-locking nut and console bracket.
- 6) Remove the parking brake lever.



- 7) Roll up the floor mat and remove the clamps.



- 8) Remove the equalizer cover.
- 9) Remove the inner cable end from equalizer.



- (1) Equalizer
- (2) Inner cable end

- 10) Remove the parking brake cable from rear brake.

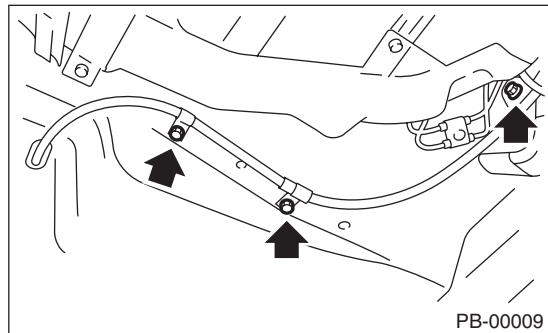
Disc brake

<Ref. to PB-7, REMOVAL, Parking Brake Assembly (Rear Disc Brake).>

Drum brake

<Ref. to BR-31, Rear Drum Brake Assembly.>

- 11) Remove the clamp from the rear brake.
- 12) Remove the bolt and bracket from trailing link bracket.
- 13) Remove the bolt and clamp from rear floor.



- 14) Remove the grommet from the rear floor.
- 15) Remove the cable assembly from the cabin by pulling it forcefully rearward.
- 16) Detach the parking brake cable from cable guide at rear trailing link.

B: INSTALLATION

- 1) Install in the reverse order of removal.

NOTE:

Be sure to pass the cable through the tunnel in the cable guide.

2) Be sure to adjust the lever stroke. <Ref. to PB-5, ADJUSTMENT, Parking Brake Lever.>

C: INSPECTION

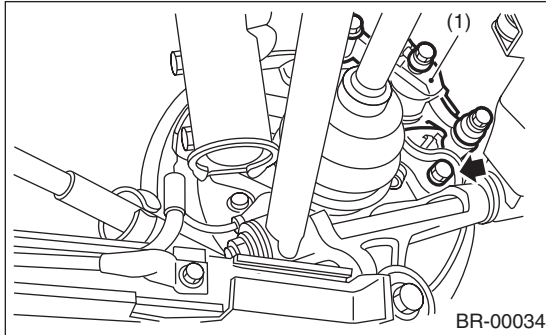
Check the removed cable and replace if damaged, rusty or having problems.

- 1) Check the cable for smooth operation.
- 2) Check the inner cable for damage and rust.
- 3) Check the outer cable for damage, bends and cracks.
- 4) Check the boot for damage, cracks, and corrosion.

4. Parking Brake Assembly (Rear Disc Brake)

A: REMOVAL

- 1) Release the parking brake.
- 2) Remove the two mounting bolts and remove the brake caliper assembly.



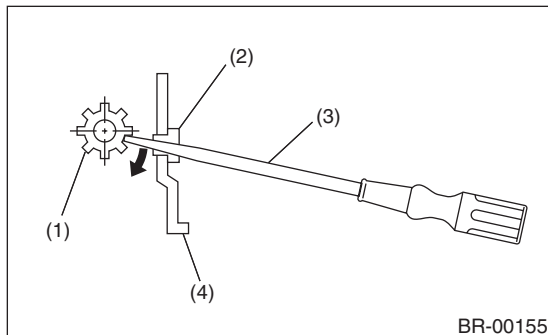
(1) Brake caliper ASSY

- 3) Suspend the brake caliper assembly so that the hose is not stretched.
- 4) Remove the disc rotor.

NOTE:

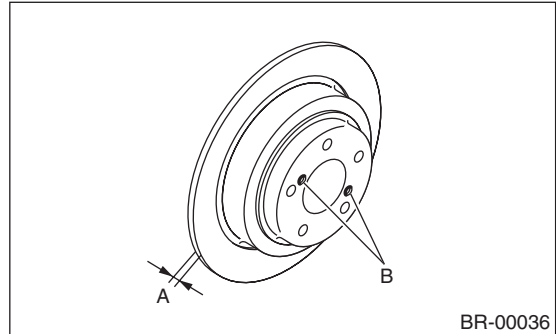
If the disc rotor is difficult to remove, try the following two methods in order.

- (1) Turn the adjusting screw using a flat tip screwdriver until the brake shoe moves adequately away from the disc rotor.

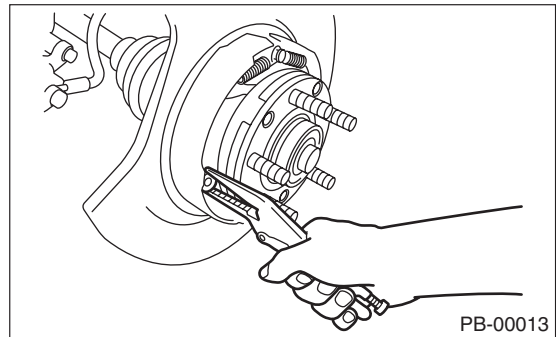


- (1) Adjusting screw
- (2) Adjusting hole cover (rubber)
- (3) Flat tip screwdriver
- (4) Back plate

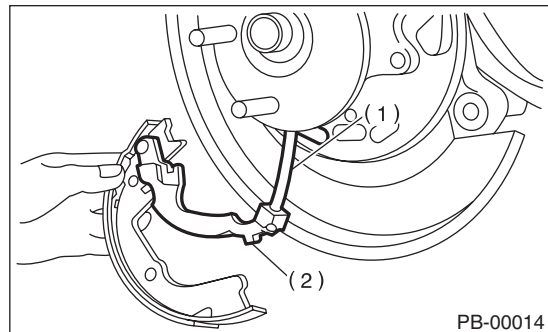
- (2) If disc rotor is seized up on the hub, drive the disc rotor out by pushing two 8 mm bolts in holes B on the rotor.



- 5) Remove the shoe return spring from the parking brake assembly.
- 6) Remove the front shoe hold down spring and pin with pliers.



- 7) Remove the strut and strut spring.
- 8) Remove the adjuster assembly from the parking brake assembly.
- 9) Remove the brake shoe.
- 10) Remove the rear shoe hold down spring and pin with pliers.
- 11) Remove the parking brake cable from the parking brake lever.



- (1) Parking brake cable
- (2) Parking brake lever

- 12) Using a flat tip screwdriver, raise the retainer. Remove the parking lever and washer from brake shoe.

Parking Brake Assembly (Rear Disc Brake)

PARKING BRAKE

B: INSTALLATION

CAUTION:

Be sure the lining surface is free from oil and grease.

1) Apply brake grease to the following locations.

Brake grease:

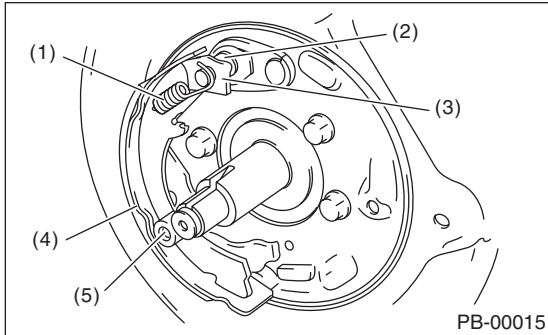
Brake Grease (Part No. 003602002)

- Six contact surfaces of the shoe rim and the back plate packing
- Contact surface of the shoe wave and the anchor pin
- Contact surface of the lever and strut
- Contact surface of the shoe wave and the adjuster assembly
- Contact surface of the shoe wave and the strut
- Contact surface of the lever and the shoe wave

2) Insert the primary side brake shoe into the anchor pin groove.

3) Secure the brake shoe with the shoe hold-down pin and the cup.

4) Install the plate to the anchor pin, and then assemble the primary return spring to the anchor pin.



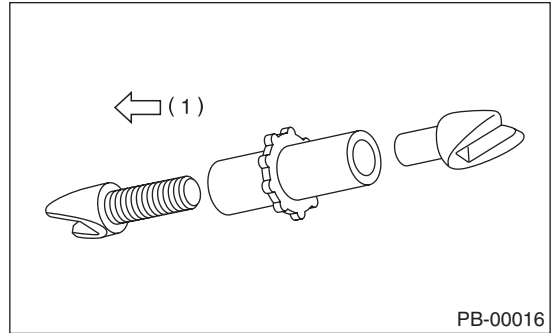
- (1) Primary return spring
- (2) Anchor pin
- (3) Plate
- (4) Primary shoe
- (5) Shoe hold-down pin and cup

5) Install the parking brake cable to the parking brake lever.

6) Assemble the strut and adjuster, and then secure the secondary side brake shoe with the shoe hold-down pin and cup.

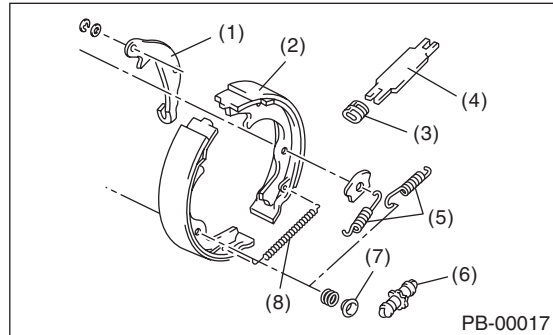
NOTE:

- Install the strut spring of both right and left wheels facing the front of the vehicle.
- Install the adjuster assembly with screw section on the left side.



(1) LH

7) Install the secondary return spring and the adjusting spring.



- (1) Lever
- (2) Secondary brake shoe
- (3) Strut spring
- (4) Strut
- (5) Secondary return spring
- (6) Adjuster
- (7) Hold-down cup
- (8) Adjusting spring

8) Adjust the parking brake. <Ref. to PB-9, ADJUSTMENT, Parking Brake Assembly (Rear Disc Brake).>

9) Drive the vehicle to break-in the parking brake lining.

- (1) Drive the vehicle at about 35 km/h (22 MPH).
- (2) With the parking brake release button pushed in, pull the parking brake lever gently.
- (3) Drive the vehicle for about 200 m (0.12 mile) in this condition.
- (4) Wait 5 to 10 minutes for the parking brake to cool down. Repeat this procedure once more.
- (5) After breaking-in, re-adjust the parking brakes.

C: INSPECTION

1) Measure the brake disc rotor inside diameter. If the disc is scored or worn, replace the brake disc rotor.

Disc rotor inside diameter:

Standard:

170 mm (6.69 in)

Service limit:

171 mm (6.73 in)

2) Measure the lining thickness. If it exceeds the limit, replace shoe assembly.

Lining thickness:

Standard:

3.2 mm (0.126 in)

Service limit:

1.5 mm (0.059 in)

NOTE:

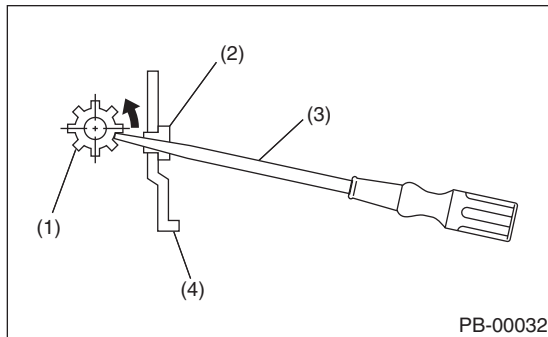
Replace the right and left brake shoe as a set.

D: ADJUSTMENT

1. SHOE CLEARANCE

1) Remove the adjusting hole cover from the back plate.

2) Turn the adjusting screw using a flat tip screwdriver until the brake shoe is in close contact with the disc rotor.



- (1) Adjusting screw
- (2) Adjusting hole cover (rubber)
- (3) Flat tip screwdriver
- (4) Back plate

3) Turn back (downward) the adjusting screw 3 to 4 notches.

4) Install the adjusting hole cover to the back plate.

2. LEVER STROKE

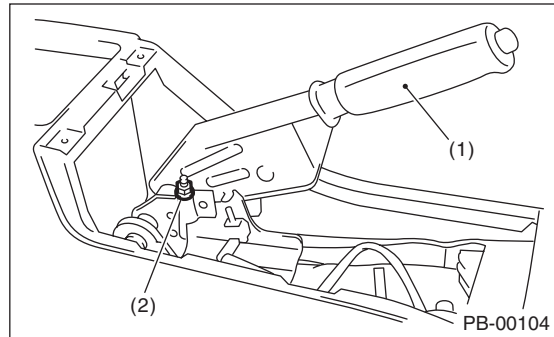
1) Remove the console box lid. <Ref. to EI-38, REMOVAL, Console Box.>

2) Forcefully pull the parking brake lever 3 to 5 times.

3) Rotate to adjust the selflocking nut so that the lever stroke of the parking brake lever is 7 to 8 notches when applying the parking brake with force of 196 N (20 kgf, 44 lb).

Lever stroke:

7 to 8 notches when pulled with a force of 196 N (20 kgf, 44 lb)



- (1) Parking brake lever
- (2) Self-locking nut

4) Install the console box lid. <Ref. to EI-38, INSTALLATION, Console Box.>

General Diagnostic Table

PARKING BRAKE

5. General Diagnostic Table

A: INSPECTION

Symptoms	Possible cause	Corrective action
Brake drag	Parking brake lever misadjustment.	Adjust.
	Parking brake cable does not move.	Correct or replace.
	Parking brake shoe clearance is misadjusted.	Adjust.
	Return spring is faulty.	Replace.
Noise from brake	Return spring is faulty.	Replace.
	Shoe hold-down spring is faulty.	Replace.

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

1. General Description

A: SPECIFICATION

Model		Non-turbo model	Turbo model	
Whole system	Minimum turning radius	m (ft) 5.4 (17.7)		
	Steering angle (Inside — Outside)	36° 25' — 32° 00'	35° 00' — 30° 54'	
	Steering wheel diameter	mm (in) 375 (14.8)		
	Maximum number of rotations	3.1	3.0	
Gearbox	Type	Integral Rack and Pinion		
	Backlash	0 (Automatic adjusting)		
	Valve (Power steering system)	Rotary valve		
Pump (Power steering system)	Type	Vane pump		
	Reservoir tank	Installed on body		
	Specific output	cm ³ (cu in)/rev. 7.2 (0.439)		
	Relief pressure	6,700 — 7,400 (68 — 75, 970 — 1,070)	7,650 — 8,340 (78 — 85, 1,110 — 1,210)	
	Hydraulic fluid control	Engine speed sensitive		
	Adjusted flow	∅ (US qt, Imp qt)/min. 1,000 rpm: 6.6 (7.0, 5.8) 3,000 rpm: 5.3 (5.6, 4.7)	1,000 rpm: 7 (7.4, 6.2) 3,000 rpm: 5 (5.3, 4.4)	
	RPM range	670 — 9,869	595 — 8,925	
	Direction of rotation	Clockwise (when observed from pulley side)		
Hydraulic oil (Power steering system)	Description	ATF DEXRON III or equivalent		
	Capacity ∅ (US qt, Imp qt)	Reservoir tank	0.3 (0.3, 0.3)	
		Whole system	0.7 (0.7, 0.6)	
Steering wheel	Free play	mm (in) 17 (0.67)		
Steering angle	Inner wheel	36°25'±1°30'	35°00'±1°30'	
	Outer wheel	32°00'±1°30'	30°54'±1°30'	
Steering shaft	Clearance between the steering wheel and column cover	mm (in) 3.0 (0.118)		
Steering gearbox (Power steering system)	Sliding resistance	N (kgf, lb) 400 (40.8, 89.9) or less		
	Rack shaft play in the radial direction	Right-turn steering	mm (in) 0.19 (0.0075) or less	
		Left-turn steering	mm (in) Horizontal free play: 0.15 (0.0059) or less Vertical free play: 0.3 (0.012) or less	
	Input shaft play	In radial direction	mm (in) 0.18 (0.0071) or less	
		In axial direction	mm (in) 0.5 (0.020) or less	
	Rotation resistance	N (kgf, lb)	Maximum allowance: 9.33 (0.95, 2.10) or less Left and right Difference between right and left sliding resistance: 20% or less	

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

Model			Non-turbo model	Turbo model
Oil pump (Power steering system)	Pulley shaft	Free play in the radial direction	mm (in)	0.4 (0.016) or less
		Free play in the axial direction	mm (in)	0.9 (0.035) or less
	Pulley	Ditch deflection	mm (in)	1.0 (0.039) or less
		Rotation resistance	N (kgf, lb)	9.22 (0.94, 2.07) or less
	Regular pressure	kPa (kg/cm ² , psi)	981 (10, 142) or less	
Steering wheel effort (Power steering system)	At standstill with engine idling on paved road	N (kgf, lb)	31.4 (3.2, 7.1) or less	
	At standstill with engine stalled on paved road	N (kgf, lb)	294.2 (30, 66.2) or less	

Recommended power steering fluid	Manufacturer
ATF DEXRON III or equivalent	B.P.
	CALTEX
	CASTROL
	MOBIL
	SHELL
	TEXACO

NOTE:

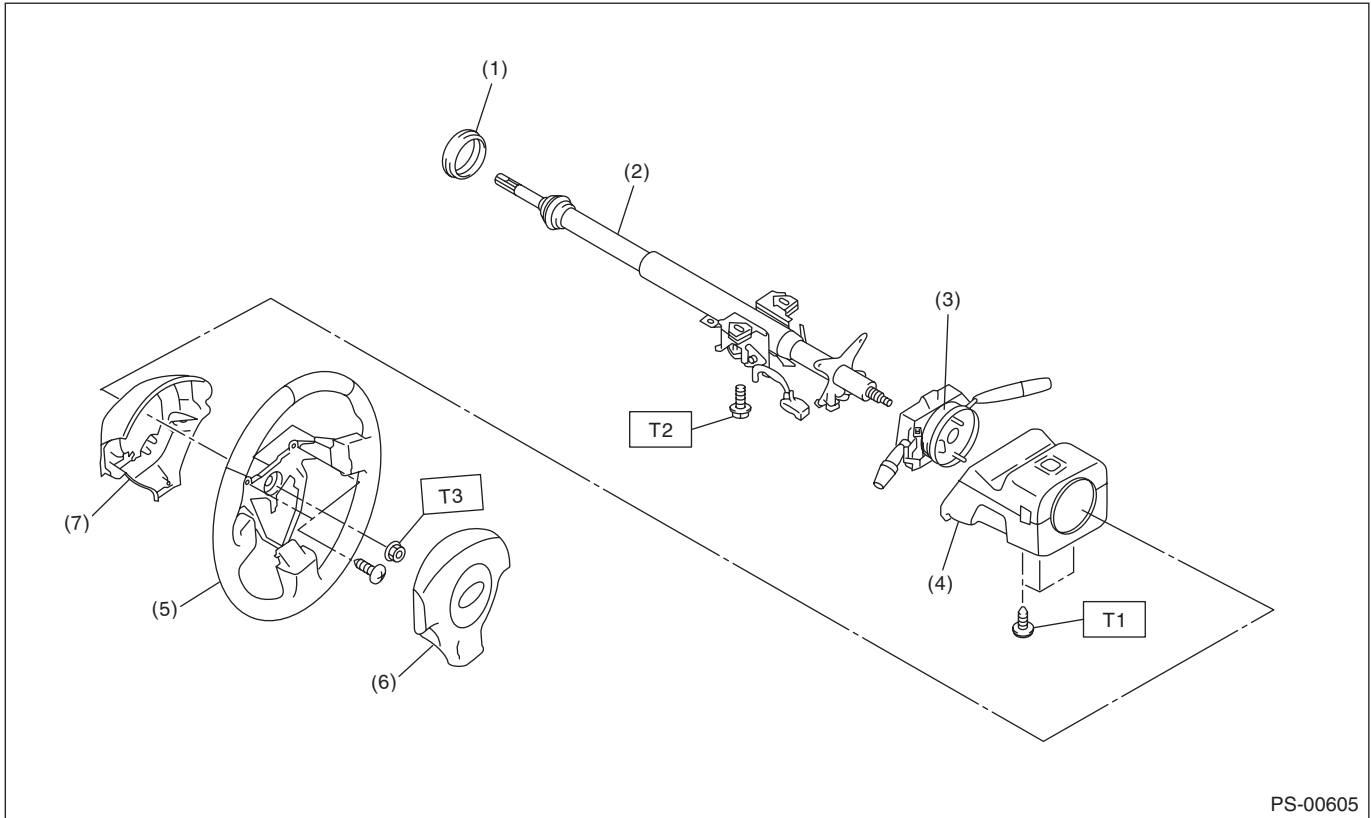
The table below lists various clearances that must be correctly adjusted to ensure the normal vehicle operation without interference noise, or any other faults. <Ref. to PS-54, INSPECTION OF CLEARANCE, INSPECTION, General Diagnostic Table.>

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

B: COMPONENT

1. STEERING WHEEL AND COLUMN



- | | |
|-----------------------------|--------------------------------|
| (1) Bushing | (5) Steering wheel |
| (2) Steering shaft | (6) Airbag module |
| (3) Steering roll connector | (7) Steering wheel lower cover |
| (4) Column cover | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 1.2 (0.12, 0.9)

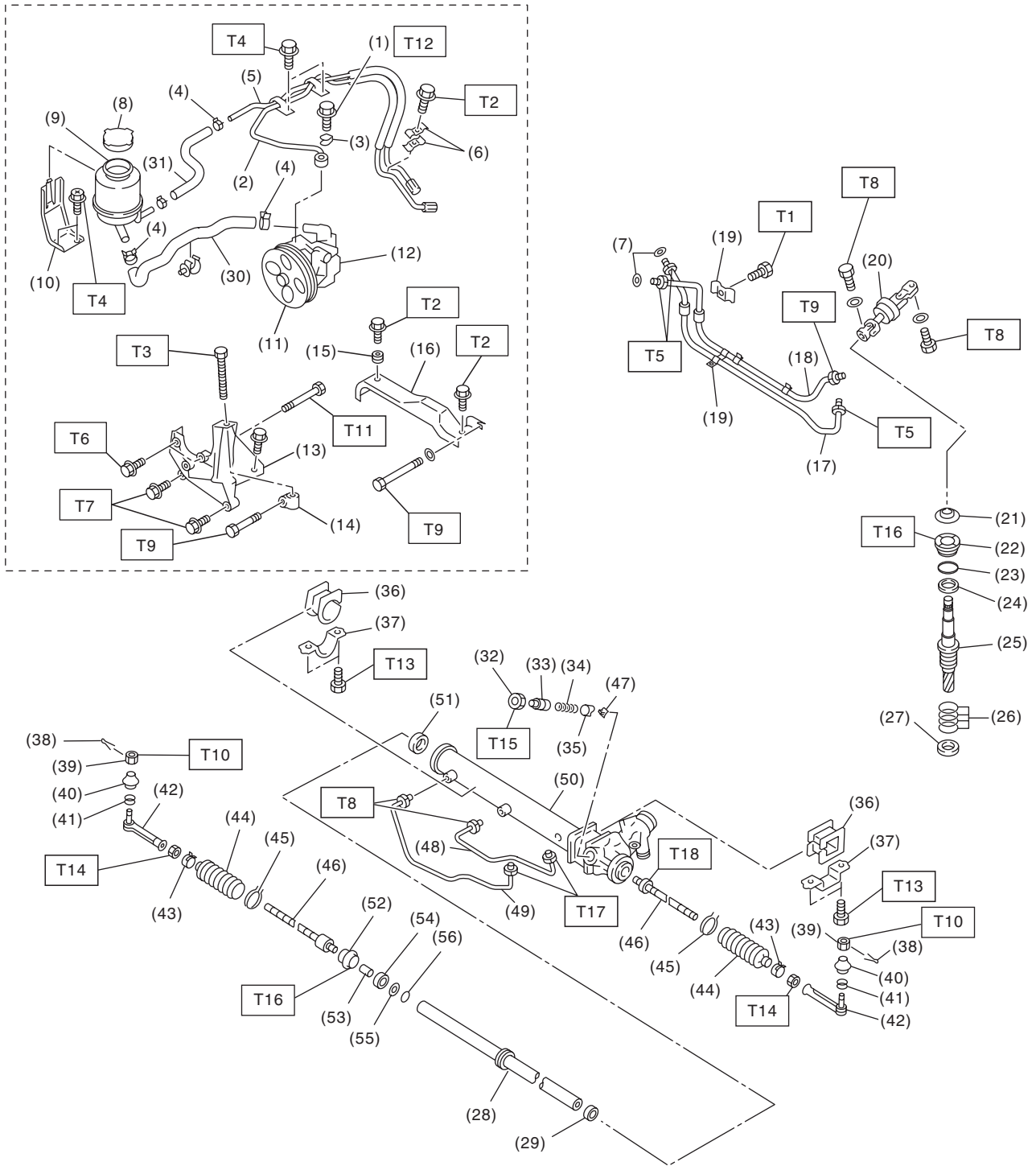
T2: 25 (2.5, 18.1)

T3: 45 (4.6, 33.2)

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

2. POWER ASSISTED SYSTEM



PS-00689

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

(1) Eye bolt	(27) Oil seal	(52) Holder
(2) Pipe C	(28) Rack	(53) Bushing
(3) Gasket	(29) Back-up washer	(54) Oil seal
(4) Clip	(30) Suction hose	(55) Oil seal
(5) Pipe D	(31) Return hose	(56) O-ring
(6) Clamp E	(32) Lock nut	
(7) O-ring	(33) Adjusting screw	
(8) Cap	(34) Spring	
(9) Reservoir tank	(35) Sleeve	
(10) Reservoir tank bracket	(36) Adapter	
(11) Pulley	(37) Clamp	
(12) Oil pump	(38) Cotter pin	
(13) Bracket	(39) Castle nut	
(14) Belt tension nut	(40) Dust cover	
(15) Bushing	(41) Clip	
(16) Belt cover	(42) Tie-rod end	
(17) Pipe E	(43) Clip	
(18) Pipe F	(44) Boot	
(19) Clamp plate	(45) Boot band	
(20) Universal joint	(46) Tie-rod	
(21) Dust cover	(47) Sheet pad	
(22) Plug	(48) Pipe B	
(23) O-ring	(49) Pipe A	
(24) Oil seal	(50) Steering body	
(25) Pinion and valve ASSY	(51) Oil seal	
(26) Seal ring		

Tightening torque: N·m (kgf·m, ft·lb)

T1: 6 (0.6, 4.3)

T2: 7.4 (0.75, 5.4)

T3: 8 (0.8, 5.8)

T4: 13 (1.3, 9.4)

T5: 15 (1.5, 10.8)

T6: 15.7 (1.6, 11.6)

T7: 22 (2.2, 15.9)

T8: 24 (2.4, 17.4)

T9: 25 (2.5, 18.1)

T10: 27 (2.75, 19.9)

T11: 37.3 (3.8, 27.5)

T12: 39 (4.0, 28.9)

T13: 60 (6.1, 44.1)

T14: 83 (8.5, 61.5)

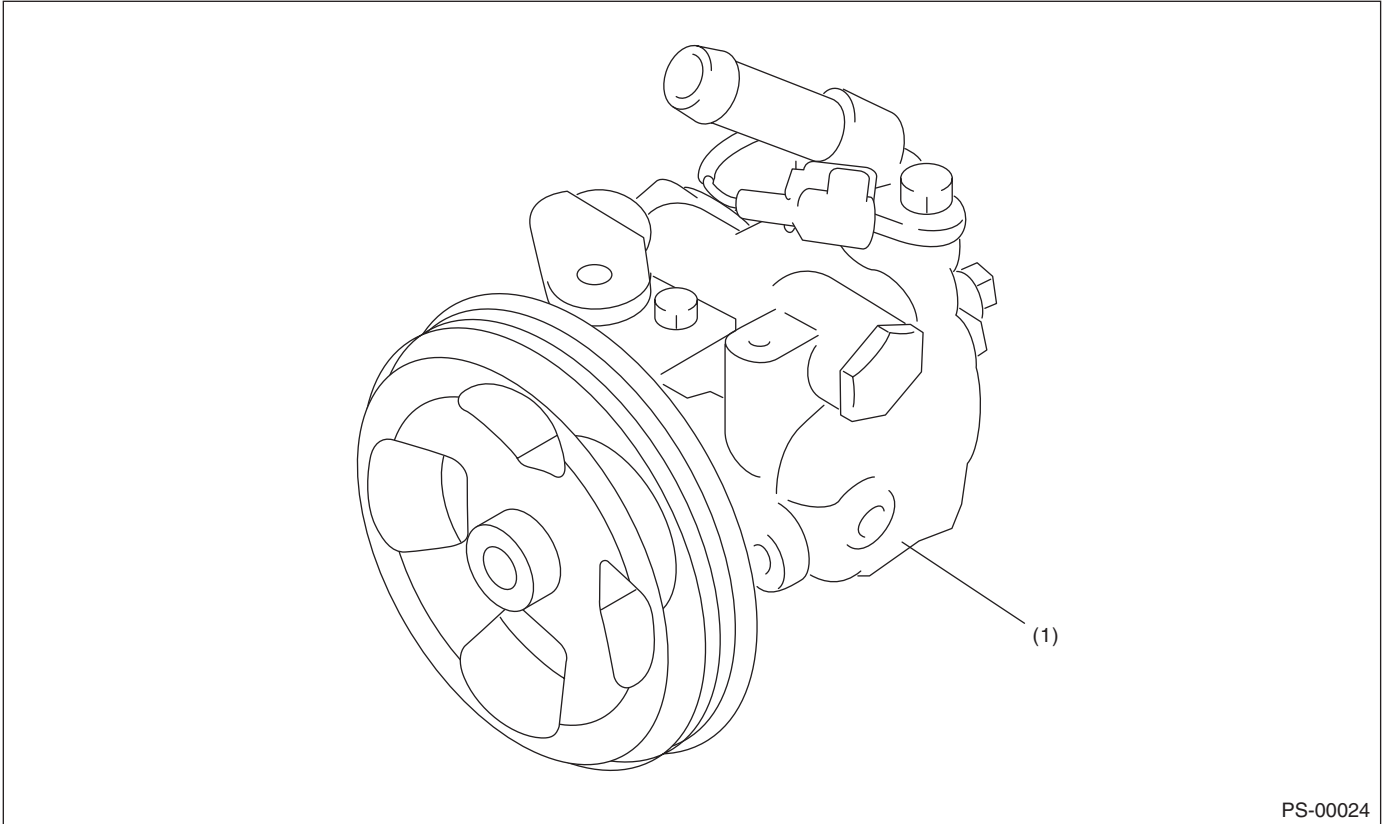
T15: 39 (4.0, 28.9)

T16: 64 (6.5, 47.0)

T17: 20 (2.0, 14.5)

T18: 90 (9.0, 65.1)

3. OIL PUMP



PS-00024

(1) Power steering oil pump ASSY

C: CAUTION

- Wear appropriate work clothing, including a cap, protective goggles and protective shoes when performing any work.
- Remove contamination including dirt and corrosion before removal, installation or disassembly.
- Keep the disassembled parts in order and protect them from dust and dirt.
- Before removal, installation or disassembly, be sure to clarify the failure. Avoid unnecessary removal, installation, disassembly and replacement.
- Be careful not to burn your hands, because each part on the vehicle is hot after running.
- Use SUBARU genuine power steering fluid, grease etc. or the equivalent. Do not mix fluid, grease etc. of different grades or manufacturers.
- Be sure to tighten fasteners including bolts and nuts to the specified torque.
- Place shop jacks or rigid racks at the specified points.
- Apply power steering fluid onto sliding or revolving surfaces before installation.
- Before installing the O-ring or snap ring, apply a sufficient amount of gear oil to avoid damage and deformation.

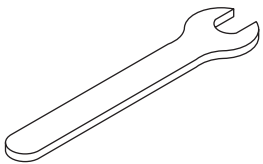
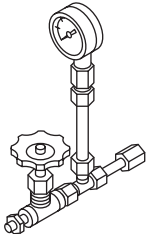
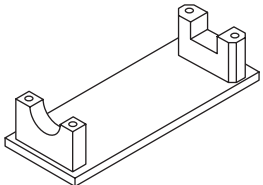
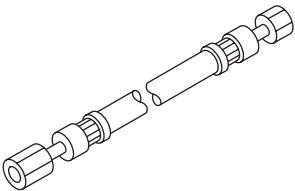
- Before securing a part on a vise, place cushioning material such as wood blocks, aluminum plate, or shop cloth between the part and the vise.

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

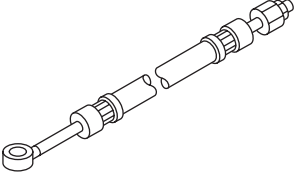
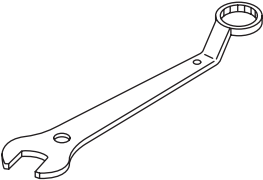
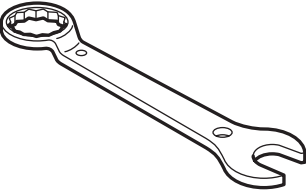
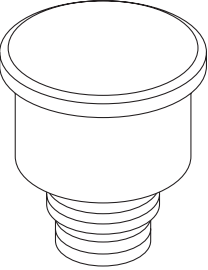
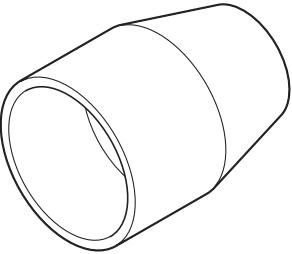
D: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-925700000</p>	925700000	WRENCH	<ul style="list-style-type: none"> • Used for removing and installing Tie-rod. • Apply this tool to rack.
 <p style="text-align: center;">ST-925711000</p>	925711000	PRESSURE GAUGE	Used for measuring oil pressure.
 <p style="text-align: center;">ST-926200000</p>	926200000	STAND	Used when inspecting characteristics of the gearbox assembly and disassembly.
 <p style="text-align: center;">ST34099AC010</p>	34099AC010	ADAPTER HOSE A	Used together with PRESSURE GAUGE (925711000).

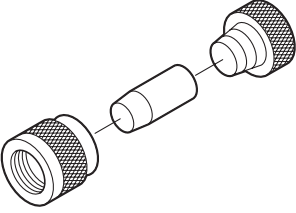
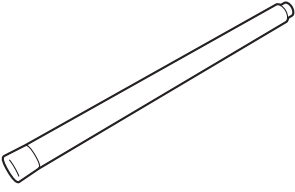
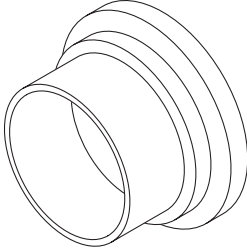
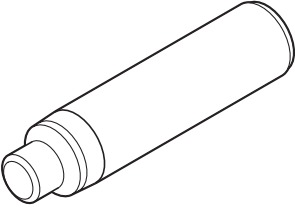
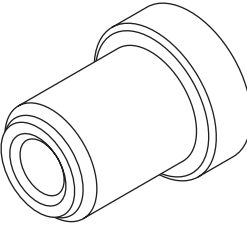
General Description

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST34099AC020</p>	34099AC020	ADAPTER HOSE B	Used together with PRESSURE GAUGE (925711000).
 <p style="text-align: center;">ST-926230000</p>	926230000	WRENCH	For the lock nut when adjusting backlash of gear-box.
 <p style="text-align: center;">ST34099PA100</p>	34099PA100	WRENCH	Used when measuring the rotating resistance of gearbox assembly.
 <p style="text-align: center;">ST34199AE040</p>	34199AE040	OIL CHARGE GUIDE	Used for charging power steering fluid.
 <p style="text-align: center;">ST-926250000</p>	926250000	GUIDE	Used for installing the holder assembly into the rack housing.

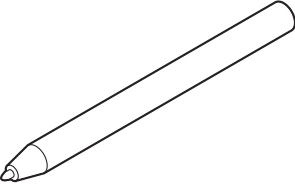
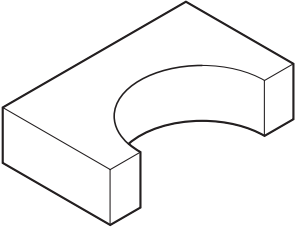
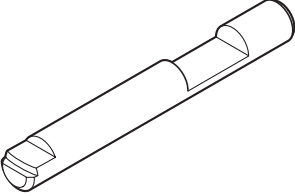
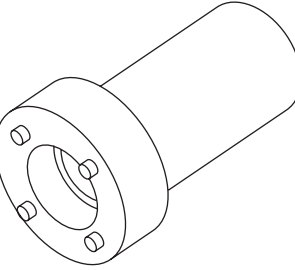
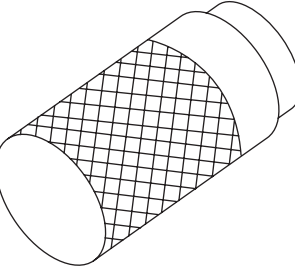
General Description

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST-927490000</p>	927490000	INSTALLER A, B, C	Used for installing the oil seal to the rack assembly.
 <p style="text-align: center;">ST-927580000</p>	927580000	REMOVER	Used for removing the back-up ring and oil seal.
 <p style="text-align: center;">ST34199AE000</p>	34199AE000	GUIDE	Used for installing the rack and seal into housing assembly.
 <p style="text-align: center;">ST34199FE000</p>	34199FE000	INSTALLER & REMOVER	Used for removing and installing the rack oil seal (outer & inner).
 <p style="text-align: center;">ST34199AE010</p>	34199AE010	INSTALLER	Used for installing the rack oil seal (outer).

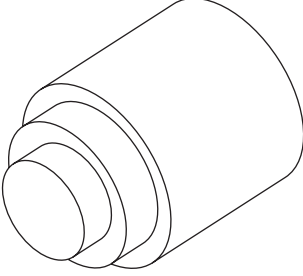
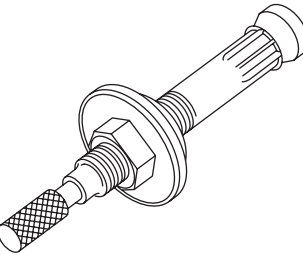
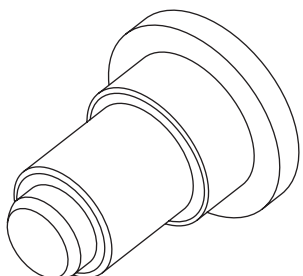
General Description

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST34099FA060</p>	34099FA060	PUNCH HOLDER	Used for crimping.
 <p>ST34099FA070</p>	34099FA070	BASE	Used for the support housing assembly.
 <p>ST34099FA080</p>	34099FA080	PUNCH	Used for removing crimps.
 <p>ST34199AE090</p>	34199AE090	PLUG WRENCH	Used for removing the plug.
 <p>ST34199AE100</p>	34199AE100	OIL SEAL PLUG REMOVER	Used for removing the oil seal plug.

General Description

POWER ASSISTED SYSTEM (POWER STEERING)

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST34199AE110</p>	34199AE110	OIL SEAL PLUG INSTALLER	Used for installing the oil seal plug.
 <p style="text-align: center;">ST34199AE120</p>	34199AE120	GEARBOX OIL SEAL REMOVER	Used for removing the gearbox oil seal.
 <p style="text-align: center;">ST34199AE130</p>	34199AE130	GEARBOX OIL SEAL INSTALLER	Used for installing the gearbox oil seal.

2. GENERAL TOOL

TOOL NAME	REMARKS
Spring scale	Used for measuring tightening torque.
Snap ring pliers	Used for removing and installing snap ring.
Dial gauge	Used for measuring the steering gearbox.
Hand clamp pliers	Used for crimping the boot band.
Steering wheel puller	Used for removing the steering wheel.

Steering Wheel

POWER ASSISTED SYSTEM (POWER STEERING)

2. Steering Wheel

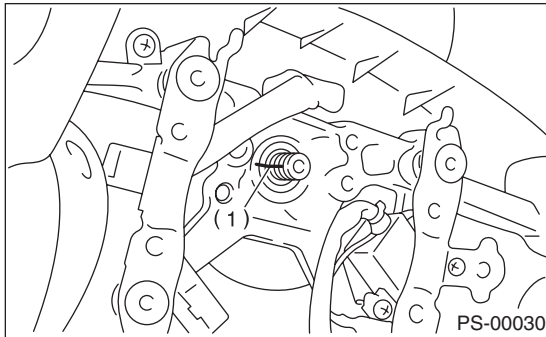
A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Set the tire to the straight-ahead position.
- 3) Remove the airbag module. <Ref. to AB-14, REMOVAL, Driver's Airbag Module.>

WARNING:

Always refer to "Airbag System" before performing service on the airbag modules. <Ref. to AB-4, CAUTION, General Description.>

- 4) Place alignment marks on the steering wheel and steering shaft.



(1) Alignment mark

- 5) Remove the steering wheel nut, and then draw out the steering wheel from the shaft using a steering puller.

B: INSTALLATION

WARNING:

Always refer to "Airbag System" before performing service on the airbag modules. <Ref. to AB-4, CAUTION, General Description.>

- 1) Align the center position of the roll connector. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>
- 2) Install in the reverse order of removal.

NOTE:

Align the alignment marks on the steering wheel and steering shaft.

Tightening torque:

45 N·m (4.6 kgf·m, 33.2 ft·lb)

Column cover to steering wheel clearance

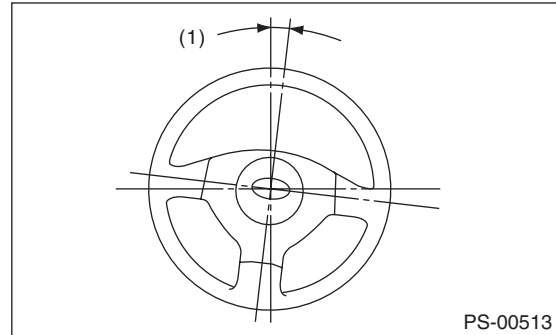
2 — 4 mm (0.08 — 0.16 in)

CAUTION:

Insert the roll connector guide pin into the guide hole on the lower end of the steering wheel surface. Avoid damaging the pin.

C: INSPECTION

- 1) Check the steering wheel for deformation. If the deformation is excessive, replace the steering wheel.
- 2) Check the splines on the steering wheel for damage. If the damage is excessive, replace the steering wheel.
- 3) If the steering wheel spokes are not horizontal when wheels are set in the straight ahead position, or error is more than 5° on the periphery of the steering wheel, correctly re-install the steering wheel.



(1) Within 5°

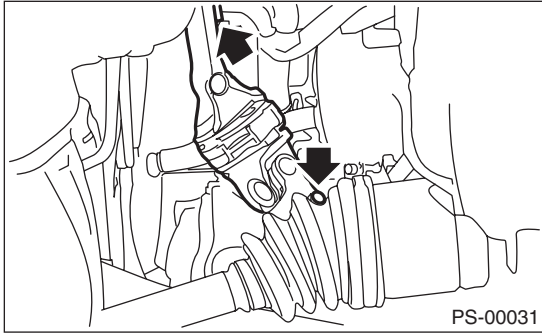
Universal Joint

POWER ASSISTED SYSTEM (POWER STEERING)

3. Universal Joint

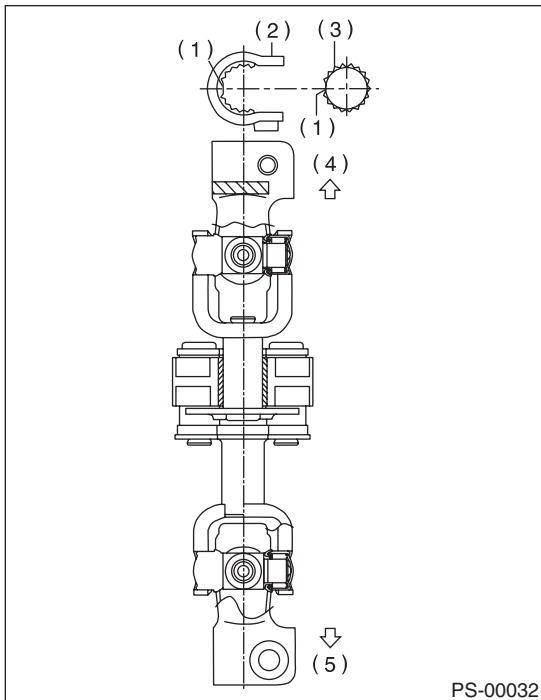
A: REMOVAL

- 1) Remove the steering wheel. <Ref. to PS-13, REMOVAL, Steering Wheel.>
- 2) Place alignment marks on universal joint.
- 3) Remove the universal joint bolt, and then remove the universal joint.



B: INSTALLATION

- 1) Align the cutout portion at the serrated section of the steering shaft and yoke, then insert the universal joint into the steering shaft.



- (1) Cutout portion
- (2) Yoke
- (3) Steering shaft
- (4) Steering shaft side
- (5) Gearbox side

- 2) Match the alignment marks, and insert the universal joint into the serrations of gearbox assembly.
- 3) Tighten the bolt.

Tightening torque:

24 N·m (2.4 kgf-m, 17.4 ft-lb)

CAUTION:

Do not excessively tighten the torque on the universal joint bolts. Overtightening will make the steering wheel heavy.

Standard clearance between gearbox to DOJ:

14 mm (0.55 in) or more

- 4) Align the center position of the roll connector. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>
- 5) Install the steering wheel and airbag module. <Ref. to PS-13, INSTALLATION, Steering Wheel.>

WARNING:

Always refer to “Airbag System” before performing service on the airbag modules. <Ref. to AB-4, CAUTION, General Description.>

C: INSPECTION

Check for wear, damage or any other faults. Replace as necessary.

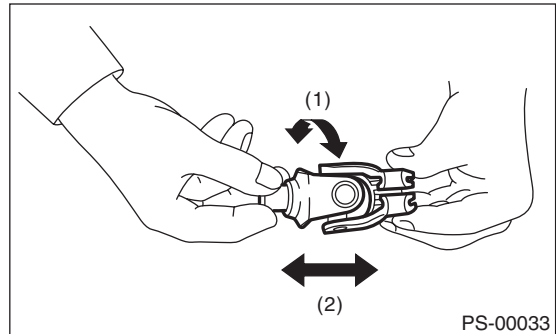
Service limit:

Free play of the universal joint:

0 mm (0 in)

Maximum value of swing torque:

0.3 N (0.03 kgf, 0.07 lb)



- (1) Swing torque
- (2) Play

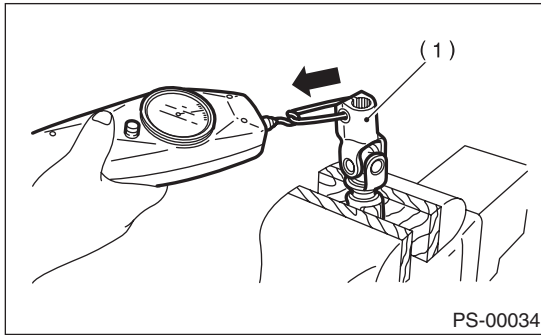
Universal Joint

POWER ASSISTED SYSTEM (POWER STEERING)

Measure the swing torque of universal joint.

Service limit:

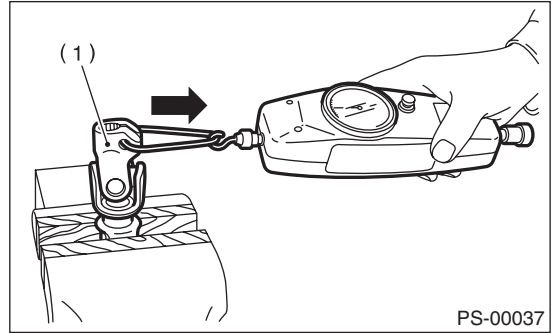
Maximum load:
3.8 N (0.39 kgf, 0.86 lb) or less



(1) Yoke (Gearbox side)

Service limit:

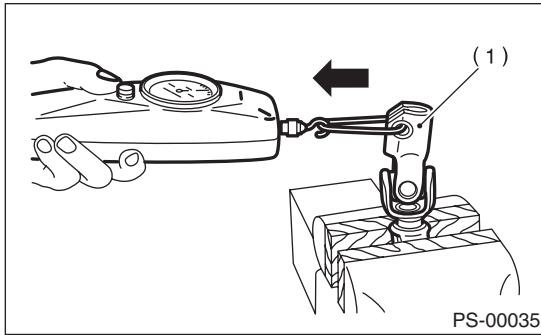
Maximum load:
7.3 N (0.74 kgf, 1.64 lb) or less



(1) Yoke (Steering column side)

Service limit:

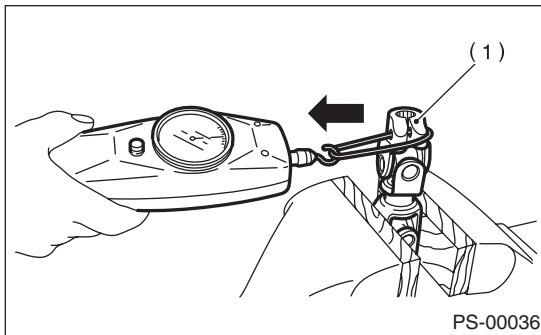
Maximum load:
3.8 N (0.39 kgf, 0.86 lb) or less



(1) Yoke (Gearbox side)

Service limit:

Maximum load:
7.3 N (0.74 kgf, 1.64 lb) or less



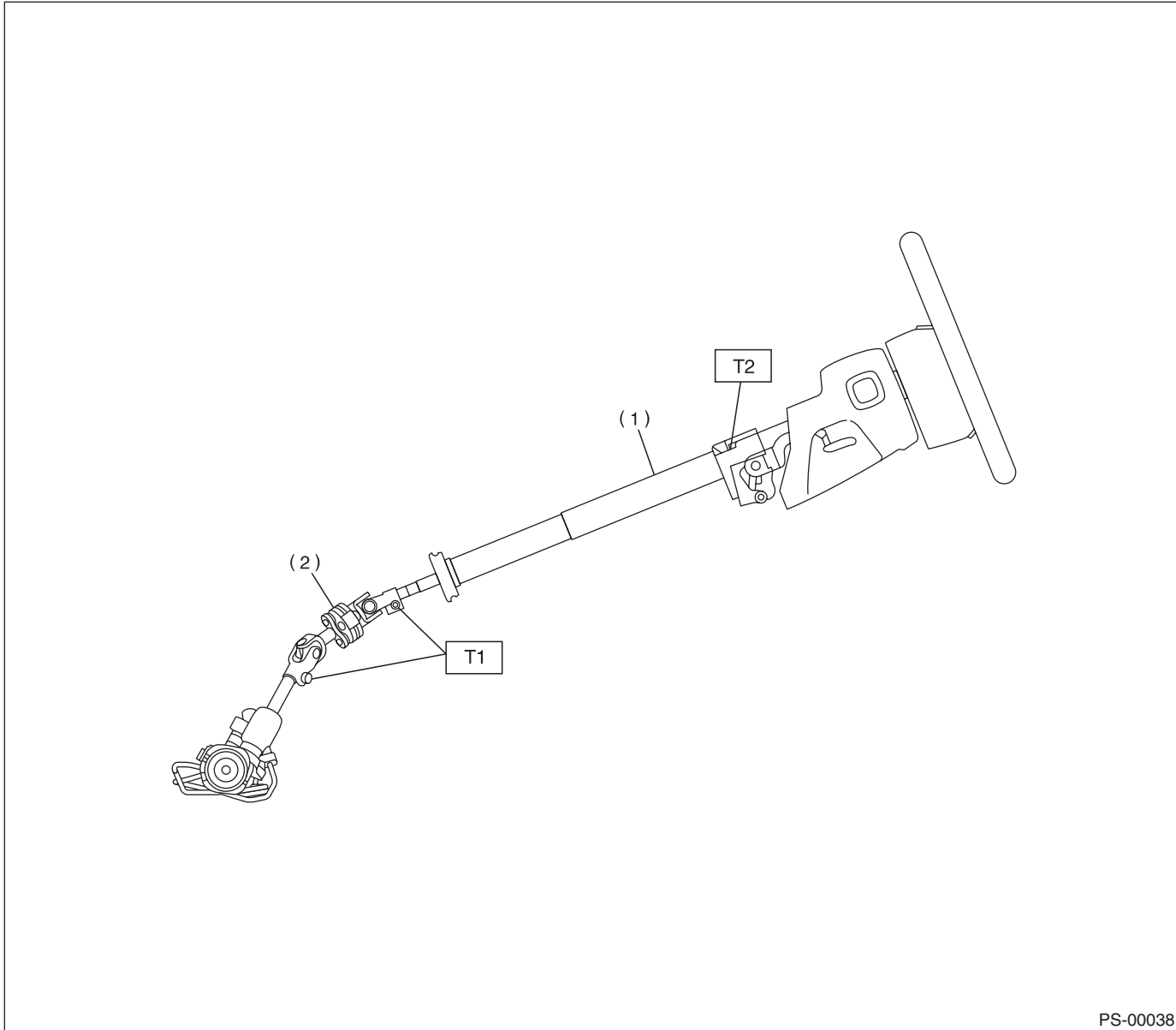
(1) Yoke (Steering column side)

Tilt Steering Column

POWER ASSISTED SYSTEM (POWER STEERING)

4. Tilt Steering Column

A: REMOVAL



PS-00038

(1) Tilt steering column

(2) Universal joint

Tightening torque: N·m (kgf·m, ft·lb)

T1: 24 (2.4, 17.4)

T2: 25 (2.5, 18.1)

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.
- 3) Remove the airbag module. <Ref. to AB-14, REMOVAL, Driver's Airbag Module.>

WARNING:

Always refer to "Airbag System" before performing service on the airbag modules. <Ref. to AB-4, CAUTION, General Description.>

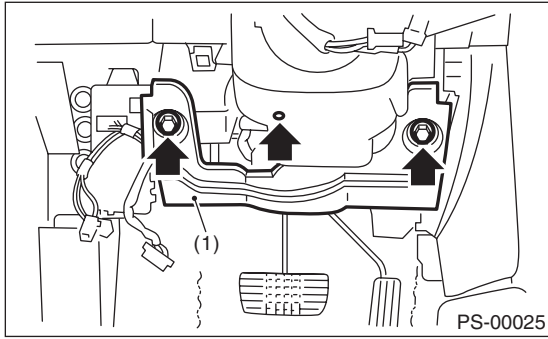
- 4) Remove the steering wheel. <Ref. to PS-13, REMOVAL, Steering Wheel.>

- 5) Remove the universal joint. <Ref. to PS-14, REMOVAL, Universal Joint.>
- 6) Remove the trim panel under instrument panel.

Tilt Steering Column

POWER ASSISTED SYSTEM (POWER STEERING)

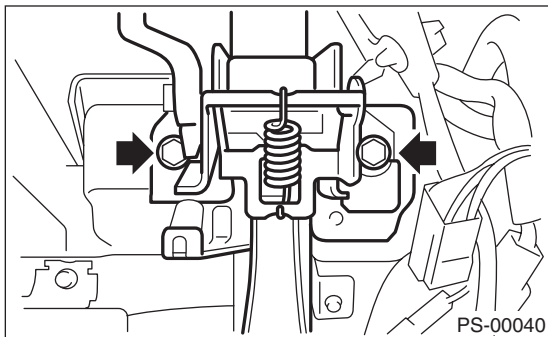
7) Knee guard panel and steering column lower cover.



(1) Knee guard panel

8) Remove all connectors from the steering column.

9) Remove the two bolts under instrument panel securing the steering column.



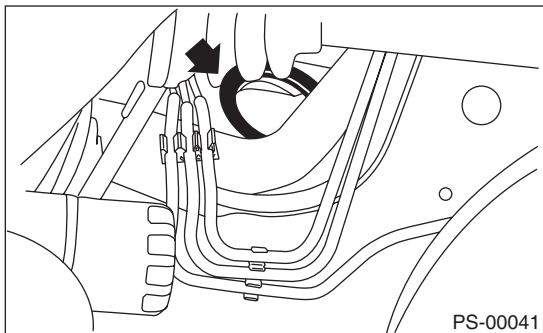
10) Pull out the steering shaft assembly from the hole on toe board.

CAUTION:

- Be sure to remove the universal joint before removing steering shaft assembly installing bolt, when removing the steering shaft assembly or when lowering it to service other parts.
- Do not loosen the tilt lever when the steering column is not secured to the vehicle.

B: INSTALLATION

1) Set the grommet to the toe board.



2) Insert the end of the steering shaft into the toe board grommet.

3) Tighten the steering shaft mounting bolts under instrument panel.

Tightening torque:

25 N·m (2.5 kgf-m, 18.1 ft-lb)

4) Connect all the connectors under the instrument panel.

5) Connect the airbag system connector at the harness spool.

NOTE:

Make sure to apply double lock.

6) Install the lower column cover with tilt lever held in the lowered position.

7) Install the universal joint. <Ref. to PS-14, INSTALLATION, Universal Joint.>

8) Align the center position of the roll connector. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>

9) Install the steering wheel. <Ref. to PS-13, INSTALLATION, Steering Wheel.>

CAUTION:

Insert the roll connector guide pin into the guide hole on lower end of steering wheel surface to prevent damage.

10) Install the airbag module to the steering wheel.

WARNING:

Always refer to “Airbag System” before performing the service operation. <Ref. to AB-4, CAUTION, General Description.>

C: DISASSEMBLY

Remove the two screws securing the upper steering column covers, and the two screws securing the combination switch, and then remove related parts.

D: ASSEMBLY

Insert the combination switch to the upper column shaft, and install the upper column cover. Then route the ignition key harness and combination switch harness between the column cover mounting bosses.

Tightening torque:

1.2 N·m (0.12 kgf-m, 0.9 ft-lb)

CAUTION:

Do not overtorque the screw.

Tilt Steering Column

POWER ASSISTED SYSTEM (POWER STEERING)

E: INSPECTION

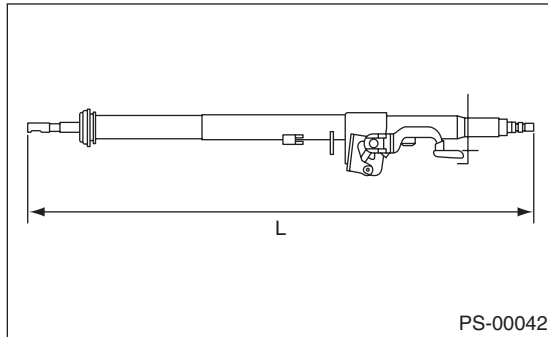
1. BASIC INSPECTION

Measure the overall length of steering column. If not within specification, replace it.

Specification:

Overall length L

808.6 ± 1.5 mm (31.83 ± 0.059 in)



2. AIRBAG MODEL INSPECTION

WARNING:

Refer to “Airbag System” for airbag model inspection procedure. <Ref. to AB-4, CAUTION, General Description.>

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

5. Steering Gearbox

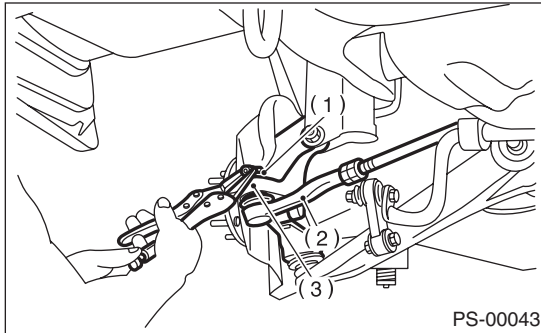
A: REMOVAL

- 1) Set the vehicle on a lift.
- 2) Disconnect the ground cable from the battery.
- 3) Loosen the front wheel nuts.
- 4) Lift-up the vehicle, and remove the front wheels.
- 5) Remove the under cover.
- 6) Remove the sub frame. <Ref. to FS-23, REMOVAL, Sub Frame.>
- 7) Remove the front exhaust pipe assembly. (Non-turbo model)
<Ref. to EX (H4SO)-4, REMOVAL, Front Exhaust Pipe.>

WARNING:

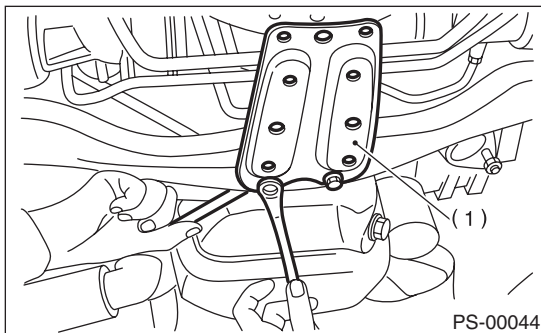
The exhaust pipe is extremely hot. Be careful not to burn your hand.

- 8) After pulling off the cotter pin and removing the castle nut, use a puller to remove the tie-rod end from the knuckle arm.



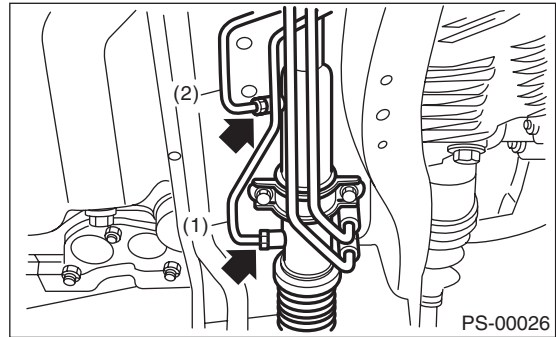
- (1) Castle nut
- (2) Tie-rod end
- (3) Knuckle arm

- 9) Remove the jack-up plate and front stabilizer.



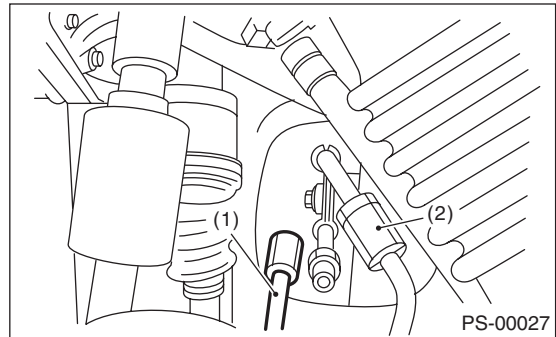
- (1) Jack-up plate

- 10) Remove the one pipe joint at the center of gearbox assembly, and connect a vinyl hose to the pipe and the joint. Discharge the fluid by turning the steering wheel fully clockwise and counterclockwise. Discharge the fluid similarly from other pipes.



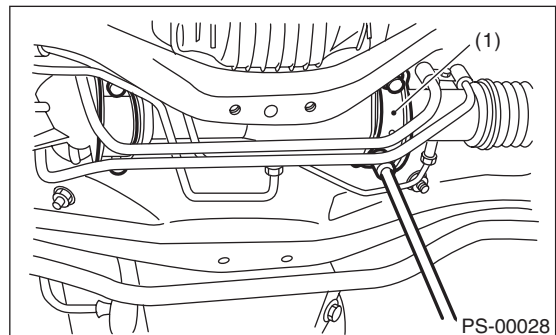
- (1) Pipe A
- (2) Pipe B

- 11) Remove the universal joint. <Ref. to PS-14, REMOVAL, Universal Joint.>
- 12) Disconnect the lower pipe C from gearbox assembly first, and upper pipe D second.



- (1) Pipe C
- (2) Pipe D

- 13) Remove the clamp bolts securing the gearbox assembly to the crossmember, and remove the gearbox.



- (1) Clamp

Steering Gearbox

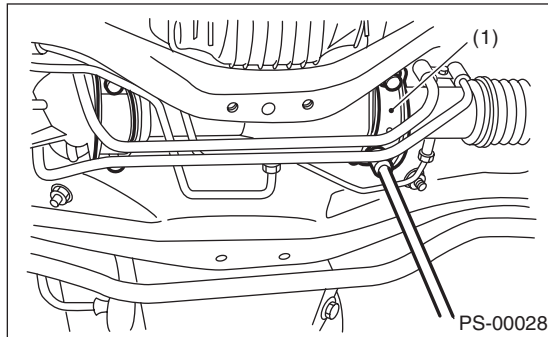
POWER ASSISTED SYSTEM (POWER STEERING)

B: INSTALLATION

- 1) Insert the gearbox assembly into the crossmember, being careful not to damage the gearbox assembly boot.
- 2) Tighten the gearbox assembly to the crossmember bracket via clamp with bolt, and tighten to the specified torque.

Tightening torque:

60 N·m (6.1 kgf-m, 44.1 ft-lb)

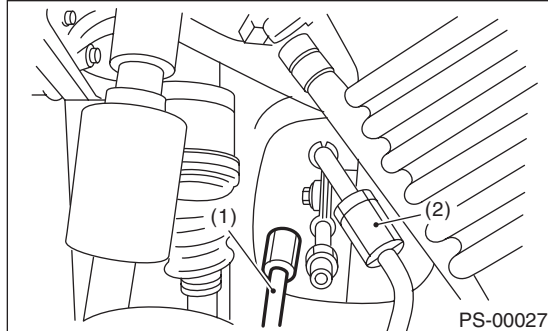


(1) Clamp

- 3) Connect the pipe D first to gearbox, then lower pipe C.

Tightening torque:

15 N·m (1.5 kgf-m, 10.8 ft-lb)



(1) Pipe C

(2) Pipe D

- 4) Install the universal joint. <Ref. to PS-14, INSTALLATION, Universal Joint.>
- 5) Connect the tie-rod end and knuckle arm, and tighten with castle nut.

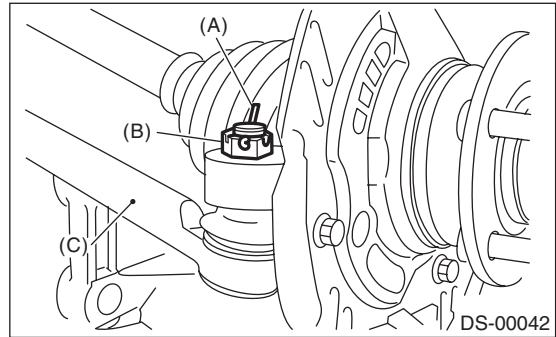
Tightening torque:

27 N·m (2.75 kgf-m, 19.9 ft-lb)

CAUTION:

When connecting, do not hit the cap at the bottom of tie-rod end with hammer.

- 6) After tightening the castle nut to the specified tightening torque, tighten it further within 60° until the cotter pin hole is aligned with slot in the nut. Fit the cotter pin into nut, and then bend the pin to lock.



(A) Cotter pin

(B) Castle nut

(C) Tie-rod end

- 7) Install the front stabilizer to vehicle. <Ref. to FS-21, INSTALLATION, Front Stabilizer.>
- 8) Install the front exhaust pipe assembly. (Non-turbo model) <Ref. to EX (H4SO)-5, INSTALLATION, Front Exhaust Pipe.>
- 9) Install the sub frame. <Ref. to FS-23, INSTALLATION, Sub Frame.>
- 10) Install the under cover. <Ref. to EI-20, INSTALLATION, Front Under Cover.>
- 11) Align the center position of the roll connector. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>
- 12) Install the steering wheel. <Ref. to PS-13, INSTALLATION, Steering Wheel.>
- 13) Install the front wheels.
- 14) Tighten the wheel nuts to the specified torque.

Tightening torque:

90 N·m (9.1 kgf-m, 65.8 ft-lb)

- 15) Connect the ground cable to the battery.
- 16) Pour fluid into the reservoir, and bleed the air. <Ref. to PS-49, Power Steering Fluid.>
- 17) Check for fluid leaks.
- 18) Install the jack-up plate.
- 19) Lower the vehicle.
- 20) Check the fluid level in the reservoir tank.

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

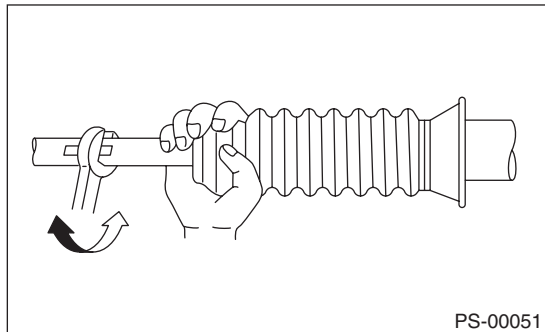
21) After adjusting toe-in and steering angle, tighten the lock nut on the tie-rod end.

Tightening torque:

83 N·m (8.5 kgf-m, 61.5 ft-lb)

NOTE:

When adjusting toe-in, hold the boot as shown to prevent it from being rotated or twisted. If it becomes twisted, straighten it.



C: DISASSEMBLY

1) Disconnect the four pipes from gearbox.

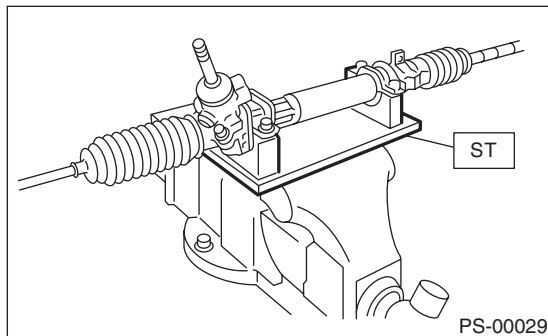
NOTE:

Remove the pipes E and F, which are fixed to the clamp plate, as a unit.

2) Secure the gearbox assembly removed from the vehicle in a vise using a ST.
ST 92620000 STAND

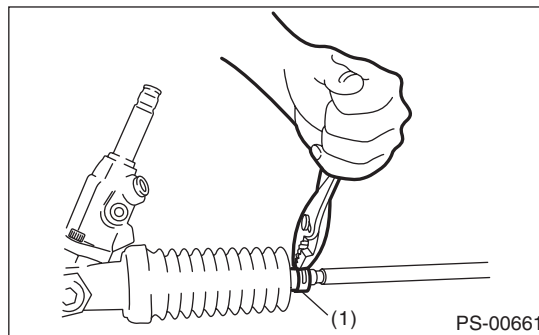
CAUTION:

Secure the gearbox assembly in a vise using ST as shown. Do not affix the gearbox to the vise without this ST.



3) Remove the tie-rod end and lock nut from gearbox assembly.

4) Move the clip of the boot using the pliers, and then slide the boot to the tie-rod end side.

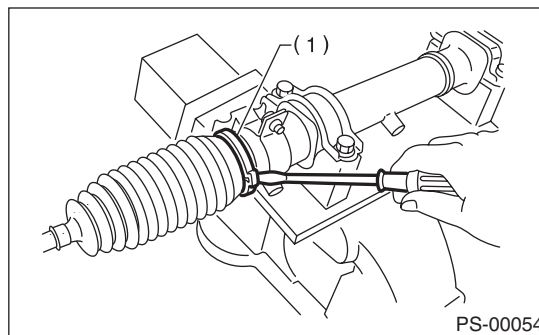


(1) Clip

5) Using a flat tip screwdriver, remove the band from boot.

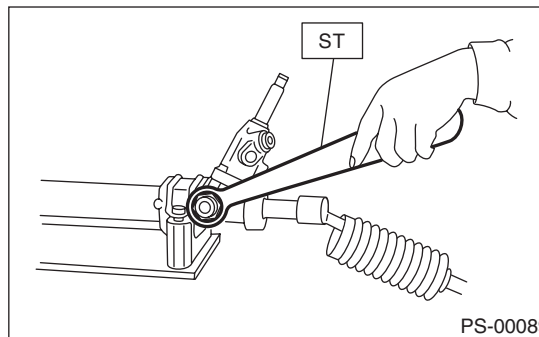
NOTE:

Replace the boot if there is damage, cracks or deterioration.



(1) Band

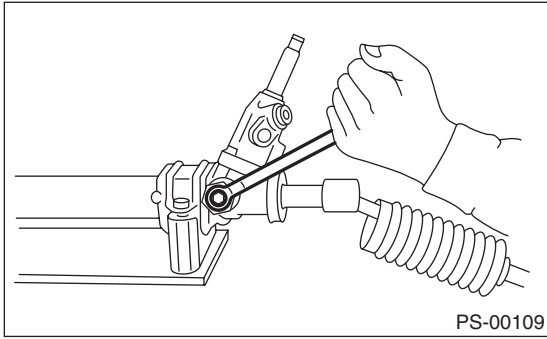
6) Using the ST, loosen the lock nut.
ST 926230000 WRENCH



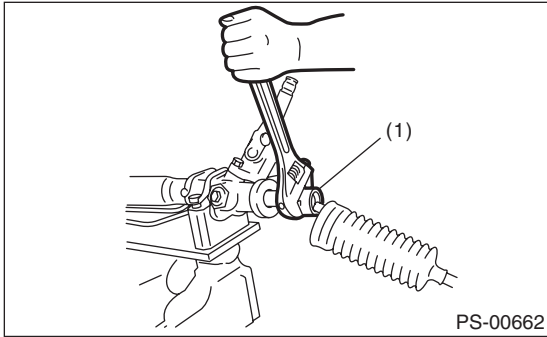
Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

7) Tighten the adjusting screw until it can no longer be tightened.



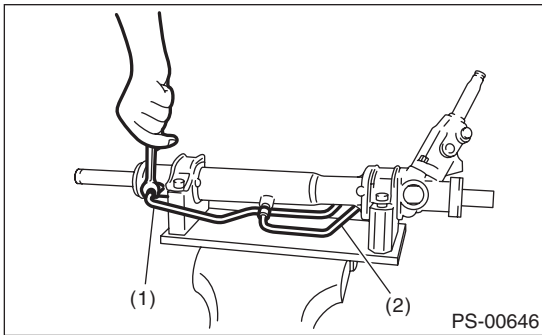
8) Remove the tie-rod using a 32 mm (1.26 in) wrench or adjustable wrench.



(1) Tie-rod

9) Loosen the adjusting screw, and remove the spring and sleeve.

10) Disconnect the pipes A and B from steering body and control valve housing.



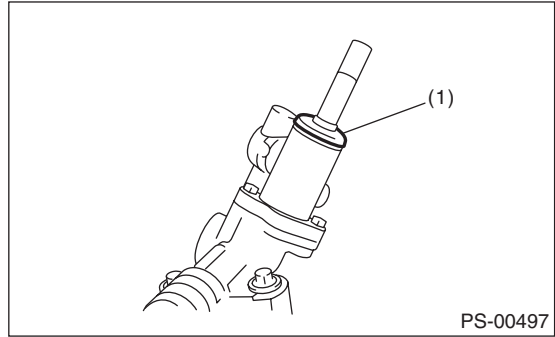
(1) Pipe A

(2) Pipe B

11) Clean any dirt adhered to the input shaft. Remove the dust cover, paying attention not to scratch the housing or input shaft and not to allow foreign matter to enter gear box interior.

CAUTION:

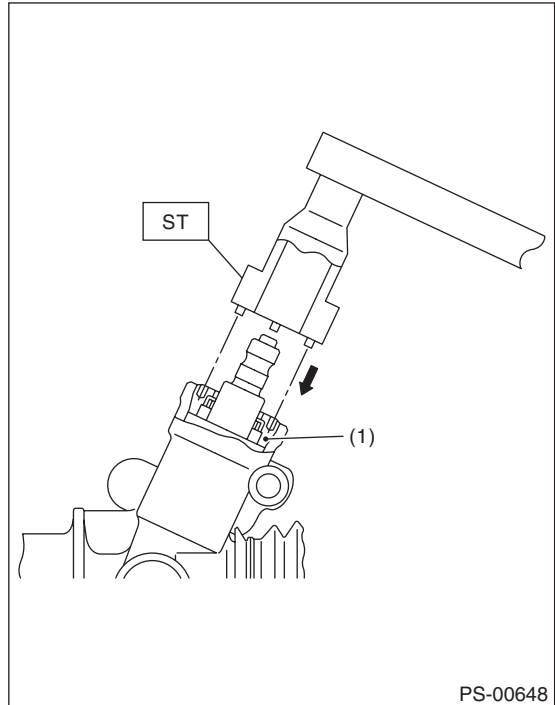
Wrap a tape around the input shaft spline in order not to damage the dust cover.



(1) Dust cover

12) Align the ST pin with plug hole to install. Rotate the ST counterclockwise to remove plug.

ST 34199AE090 PLUG WRENCH

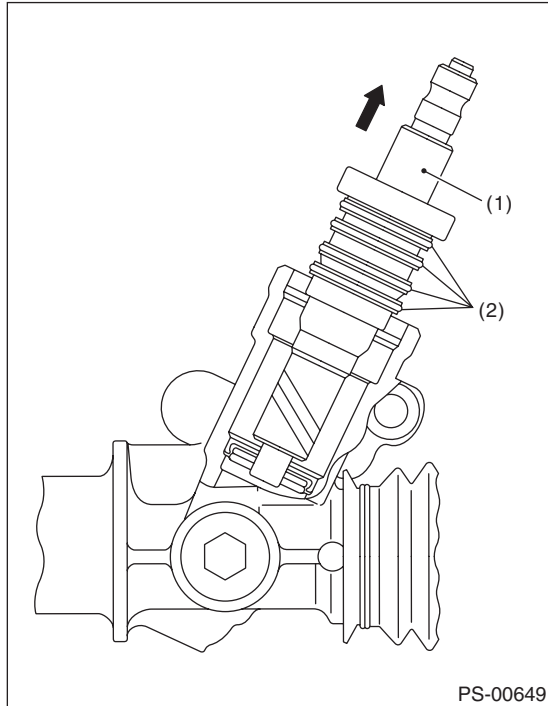


(1) Plug

Steering Gearbox

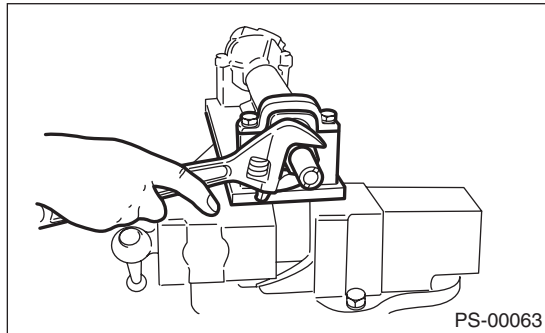
POWER ASSISTED SYSTEM (POWER STEERING)

13) Remove the valve assembly paying attention not to scratch the seal ring or valve housing inner surfaces.



- (1) Valve ASSY
- (2) Seal ring

14) Remove the holder using a 32 mm (1.26 in) wrench or adjustable wrench.

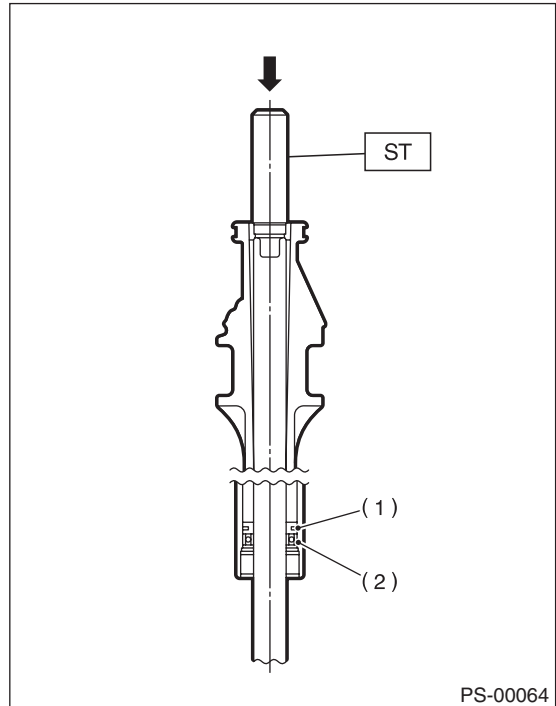


15) Attach the ST on the valve side of rack, and press out the outer side oil seal while taking care that the rack and the steering body inner surface do not come into contact with each other.

ST 34199FE000 INSTALLER & REMOVER

NOTE:

Block the pipe connection of steering body to prevent fluid from flowing out.



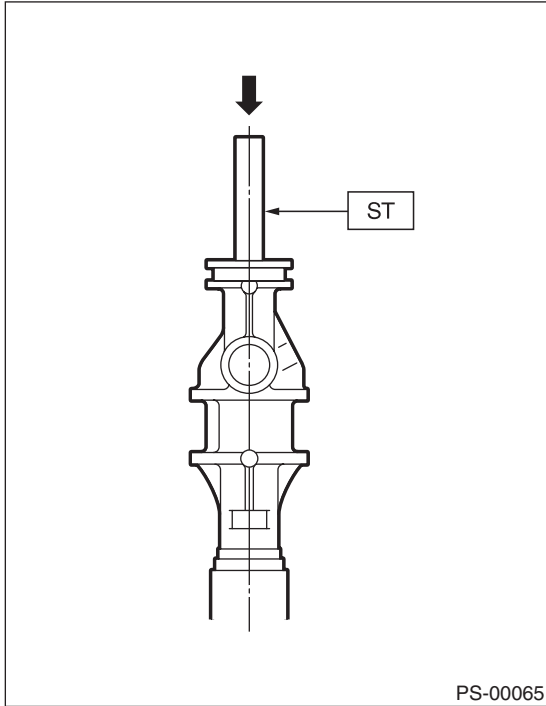
- (1) Rack piston
- (2) Outer side oil seal

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

16) Insert the ST from the valve side and press the back-up ring and oil seal out.

ST 927580000 REMOVER

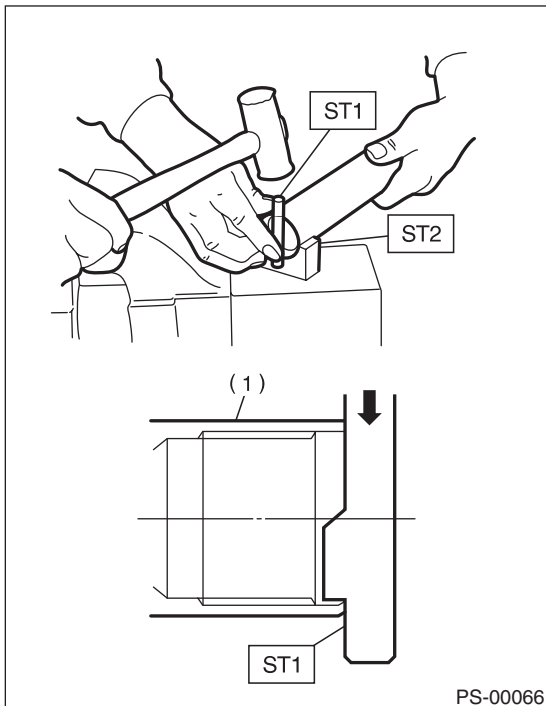


PS-00065

17) Using ST1 and ST2, repair the crimped portion of cylinder.

ST1 34099FA080 PUNCH

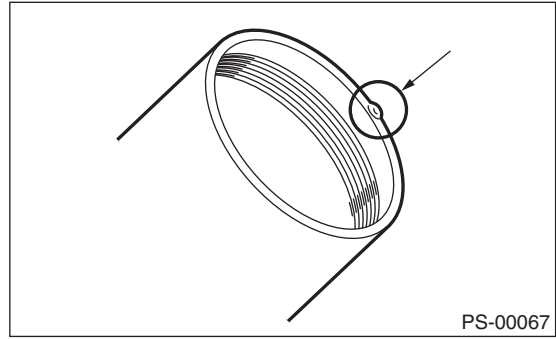
ST2 34099FA070 BASE



PS-00066

(1) Cylinder

18) If the cylinder edge is deformed in a convex shape, repair using an oil stone.



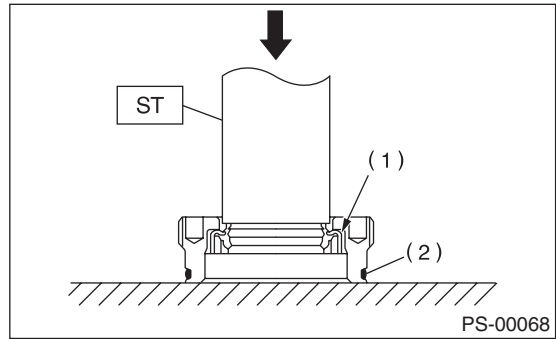
PS-00067

19) Remove the oil seal using ST and push out from the plug.

ST 34199AE100 OIL SEAL PLUG REMOVER

NOTE:

Do not apply force on the plug edge surface.



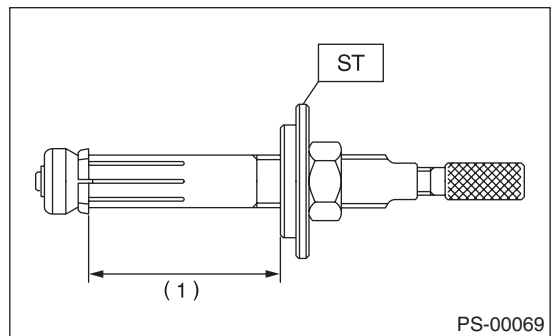
PS-00068

(1) Oil seal

(2) O-ring

20) Set the ST at a size shown in the figure.

ST 34199AE120 GEARBOX OIL SEAL RE-MOVER



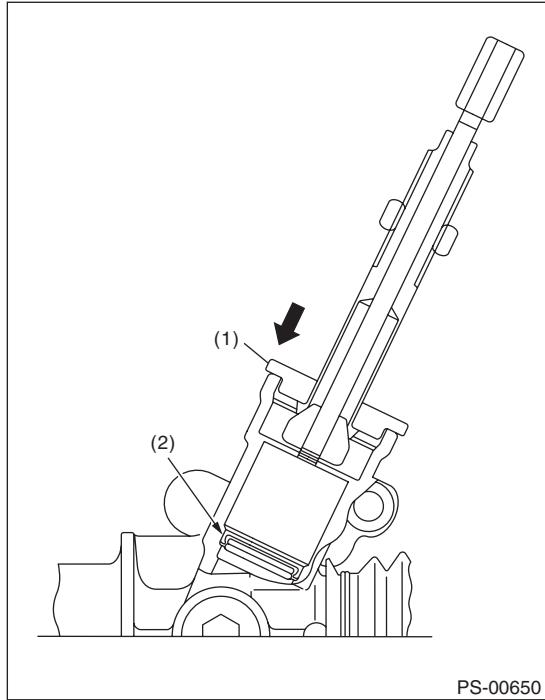
PS-00069

(1) 70 mm (2.76 in)

Steering Gearbox

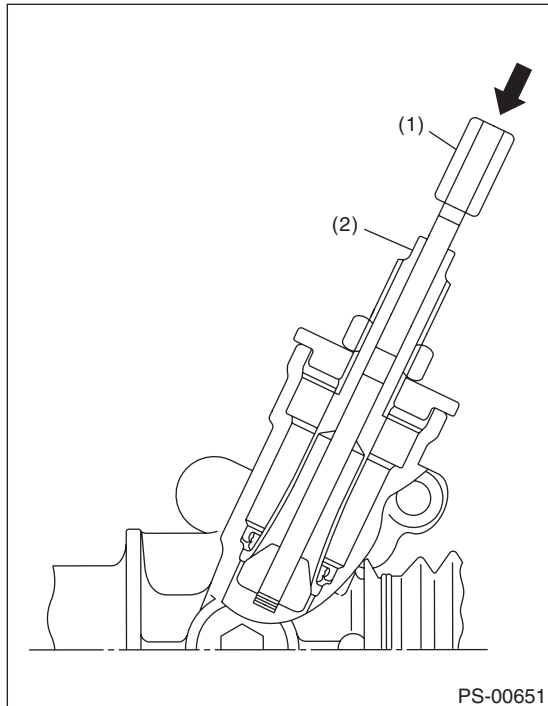
POWER ASSISTED SYSTEM (POWER STEERING)

21) Set the stopper to gearbox, then insert the tip of the ST to the gearbox.



- (1) Stopper
- (2) Oil seal

22) By fixing the 2-surface widths, press-in the rod while rotating it and catch the oil seal.

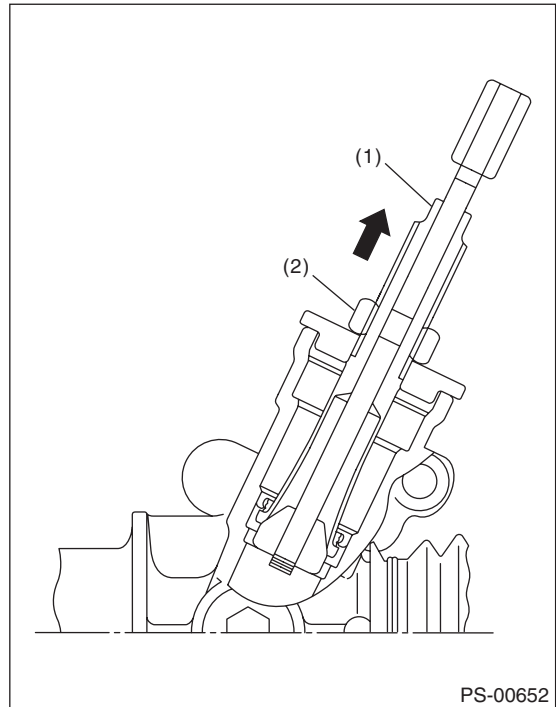


- (1) Rod
- (2) 2-surface widths

23) While fixing the 2-surface widths, pull out the oil seal by rotating nut.

CAUTION:

Take care not to scratch the gearbox inner surface.



- (1) 2-surface widths
- (2) Nut

D: ASSEMBLY

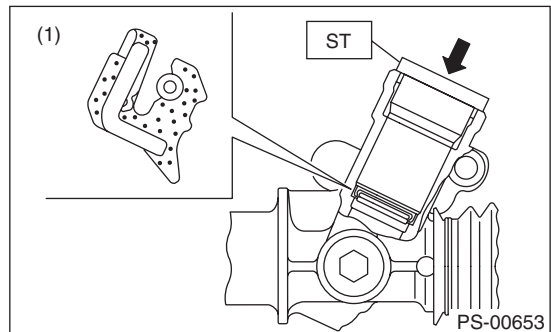
1) Apply a coat of grease to the inside and outside of the new oil seal.

Steering grease:

ONE LUBER MO (Part No. 003608001)

2) Verify the direction of the oil seal and installation position. Using the ST and a press, press-fit the oil seal into the gearbox.

ST 34199AE130 GEARBOX OIL SEAL INSTALLER



- (1) Oil seal

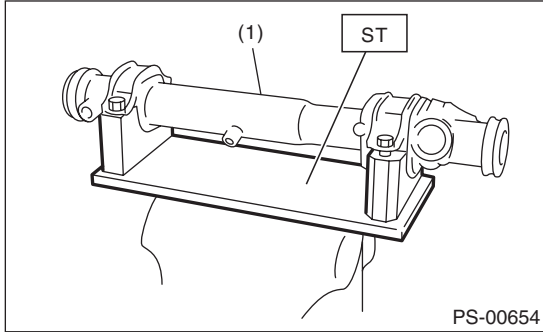
Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

3) Attach the steering body to ST as shown in the figure. Apply a coat of grease to needle bearing.
ST 926200000 STAND

CAUTION:

Make sure the needle bearing is free from defects. If it is faulty, replace the steering body with a new part.

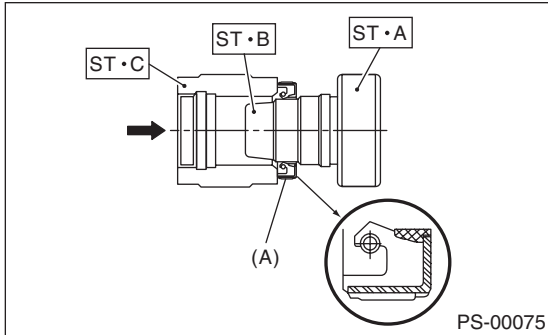


(1) Steering body

4) Using the ST B and ST C, attach the oil seal to ST A.
ST 927490000 INSTALLER A, B, C

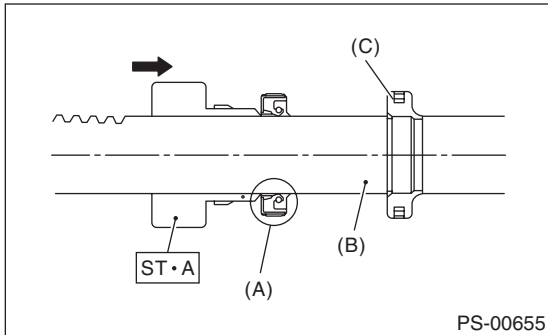
NOTE:

Face the oil seal in the direction as shown in the figure.



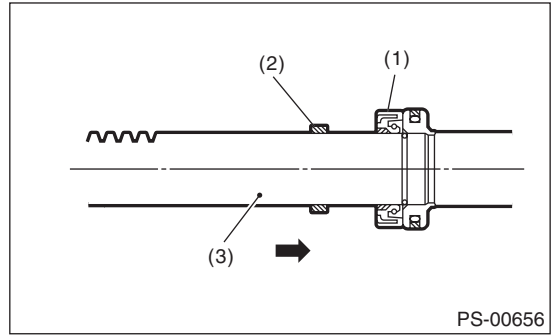
(A) Oil seal

5) Insert the ST A with oil seal assembled from the gear side of rack. Remove the oil seal from ST A near piston, and then remove the ST A from rack.



(A) Oil seal
(B) Rack
(C) Piston

6) Install the back-up washer from the gear side of rack.



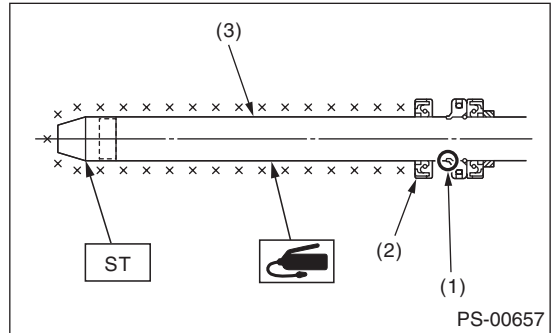
(1) Oil seal
(2) Back-up washer
(3) Rack

7) Attach the ST on rack, equally apply a thin coat of grease to the rack and ST, and then install the oil seal.

ST 926250000 GUIDE

CAUTION:

Be careful not to scratch the oil seal lips with the inner ring section of piston.



(1) Rack piston inner ring
(2) Outer side oil seal
(3) Rack

Steering Gearbox

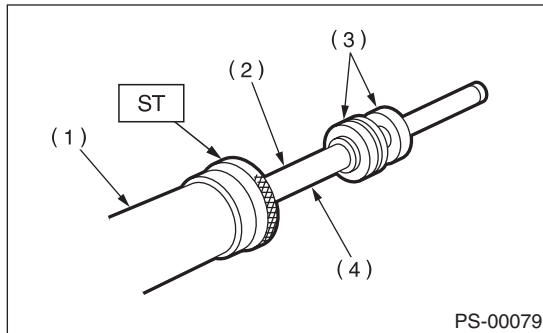
POWER ASSISTED SYSTEM (POWER STEERING)

8) Apply a coat of grease to the grooves in rack, sliding surface of sleeve and sealing surface of piston. Attach the ST on the end of steering body cylinder. Then insert the rack into steering body from cylinder side.

ST 34199AE000 GUIDE (OIL SEAL)

CAUTION:

Do not allow grease to block the air vent hole on rack.



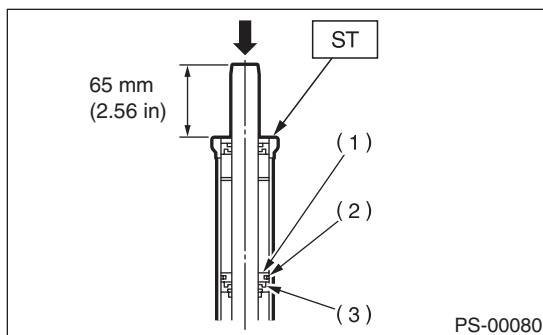
- (1) Cylinder side of steering body
- (2) Air vent hole
- (3) Oil seal
- (4) Rack

9) Slowly push the inner side oil seal using the press until the distance from the ST to the end of the rack is 65 mm (2.56 in).

ST 34199AE000 GUIDE (OIL SEAL)

CAUTION:

Make sure that there are no scratches on the inner wall of the ST. Otherwise there is a possibility of the oil seal being damaged when it is installed.

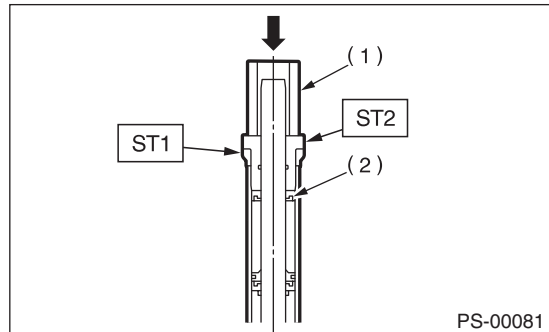


- (1) Rack piston
- (2) Inner side oil seal
- (3) Back-up ring

10) Make the ST2 and pipe pass through rack, and then press-in the ST1, ST 2 and the outer side oil seal 2 using a press.

ST1 34199AE000 GUIDE (OIL SEAL)

ST2 34199AE010 INSTALLER (OIL SEAL)

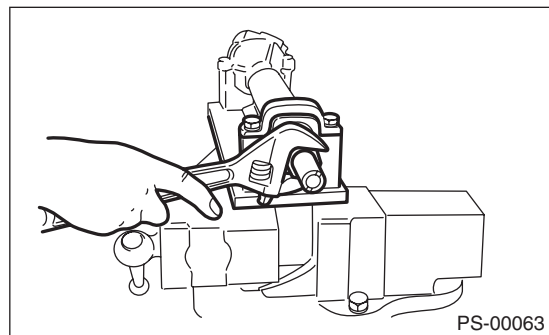


- (1) Pipe
- (2) Outer side oil seal

11) Install a new holder to the cylinder side of steering body.

Tightening torque:

64 N·m (6.5 kgf·m, 47.0 ft·lb)

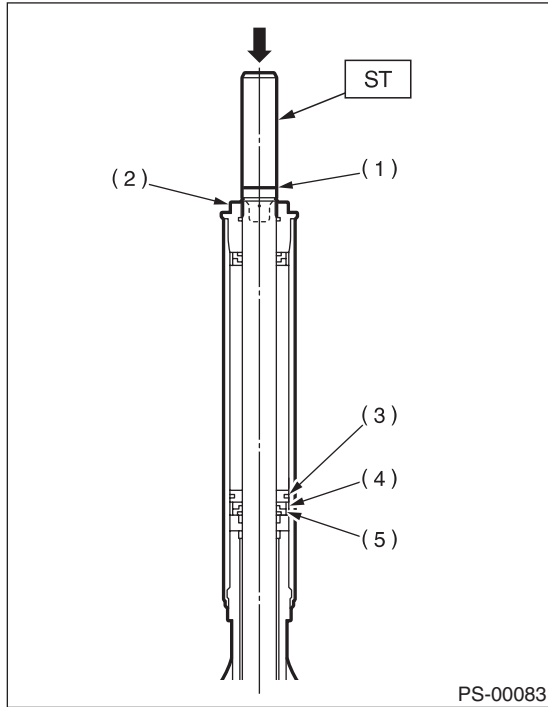


Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

12) Attach the ST on rack cylinder. Using the press, press in the ST until the groove on the ST aligns with the edge of the holder.

ST 34199FE000 INSTALLER & REMOVER



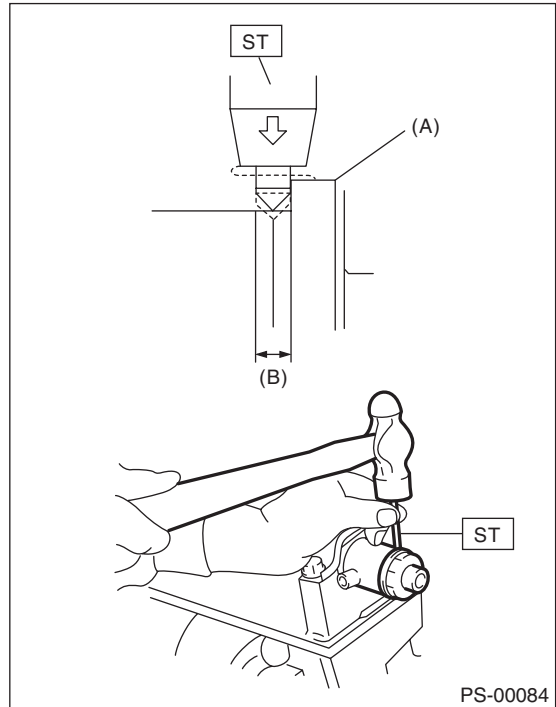
- (1) Groove
- (2) Holder
- (3) Rack piston
- (4) Oil seal
- (5) Back-up ring

13) Using the ST, crimp the steering body at one point less than 3 mm (0.12 in) from holder.

CAUTION:

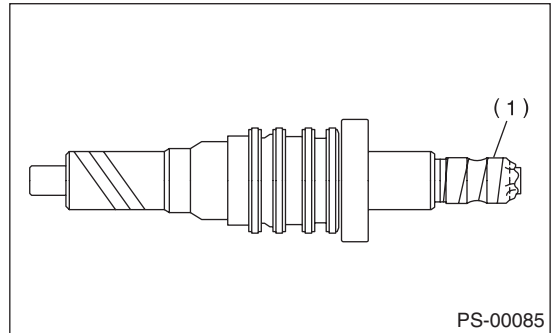
Be careful not to deform the holder.

ST 34099FA060 PUNCH HOLDER



- (A) Holder
- (B) 3 mm (0.12 in)

14) Roll a vinyl tape on the serration portion of valve assembly, and then apply grease on the tape surface.

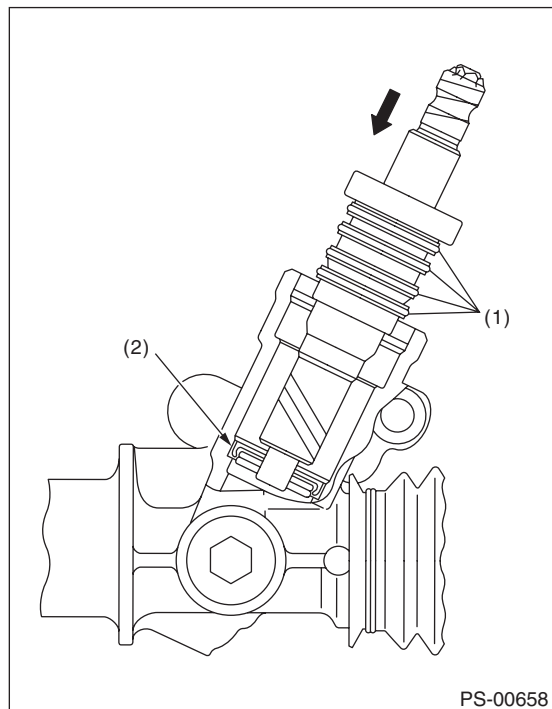


- (1) Vinyl tape

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

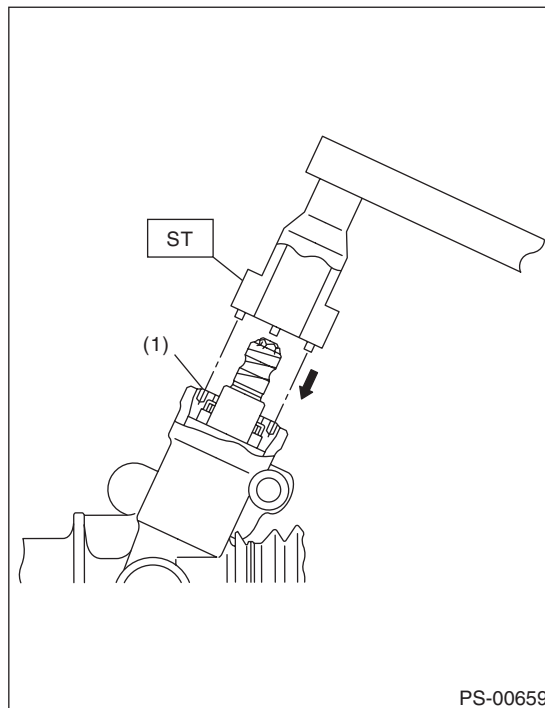
15) Apply a coat of grease on the gear teeth of the valve assembly, and then attach the valve assembly taking care not to scratch oil seal and seal ring.



- (1) Seal ring
- (2) Oil seal

17) Attach the plug using ST.
ST 34199AE090 PLUG WRENCH

Tightening torque:
64 N·m (6.5 kgf·m, 47.0 ft·lb)



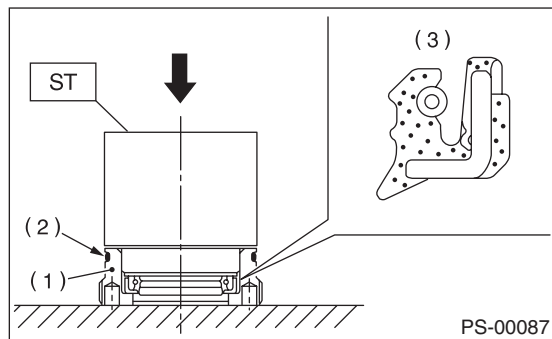
- (1) Plug

16) Apply grease on the oil seal circumference, and then press it into the plug using ST and a press. Replace the O-rings of plug circumference with new O-rings.

ST 34199AE110 OIL SEAL PLUG INSTALLER

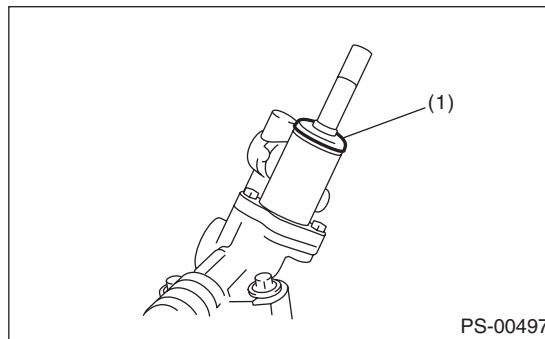
CAUTION:

Install the oil seal paying attention to correct direction.



- (1) Plug
- (2) O-ring
- (3) Oil seal

18) Install the dust cover and then remove the vinyl tape.



- (1) Dust cover

19) Temporarily tighten the tie-rod to the rack end, and then operate the rack from lock to lock for two or three times to make it fit in. Remove any grease blocking the air vent hole.

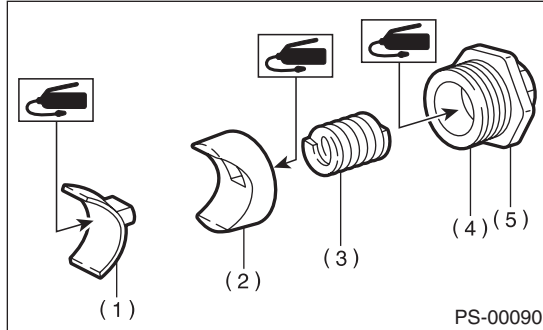
CAUTION:

If operating the rack from lock to lock without installing tie-rods, it may damage the oil seal. Always install the tie-rods LH and RH.

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

20) Apply a coat of grease to the sliding surface of seat pad, sleeve and seating surface of spring, and then insert sleeve into steering body. Charge the adjusting screw with grease, and then insert the spring into adjusting screw. Then install on the steering body.



- (1) Sheet pad
- (2) Sleeve
- (3) Spring
- (4) Adjusting screw
- (5) Lock nut

21) Tighten the adjusting screw to the specified torque.

Tightening torque:
7.4 N·m (0.75 kgf-m, 5.4 ft-lb)

NOTE:

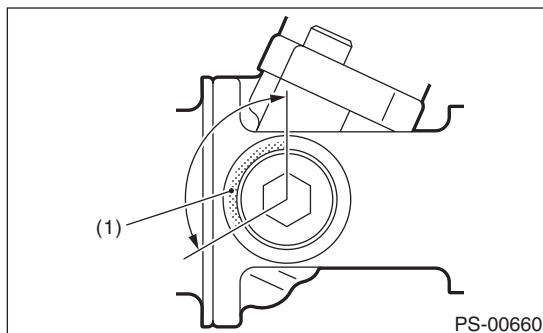
After tightening with the specified torque, loosen it by 25°.

22) Remove the tie-rod.

23) Check that the play, or looseness, is at the standard value. <Ref. to PS-33, SERVICE LIMIT, INSPECTION, Steering Gearbox.>

24) Loosen the adjusting screw, and then apply liquid gasket to at least 1/3 of the entire perimeter of adjusting screw thread.

Liquid gasket:
THREE BOND 1141



- (1) Apply liquid gasket to at least 1/3 of entire perimeter.

25) Tighten the adjusting screw.

(1) Tighten the adjusting screw to the specified torque, then loosen it.

Tightening torque:
9.8 N·m (1.0 kgf-m, 7.2 ft-lb)

(2) Tighten the adjusting screw to the specified torque, then loosen it.

Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

(3) Tighten the adjusting screw to the specified torque, then loosen it 26°.

Tightening torque:
4.9 N·m (0.50 kgf-m, 3.6 ft-lb)

26) Install the lock nut. While holding the adjusting screw with a wrench, tighten the lock nut using ST. ST 926230000 WRENCH

Tightening torque (lock nut):
39 N·m (4.0 kgf-m, 28.9 ft-lb)

NOTE:

Hold the adjusting screw with a wrench to prevent it from turning while tightening the lock nut.

27) Install the tie-rod into rack.

Tightening torque:
90 N·m (9.0 kgf-m, 65.1 ft-lb)

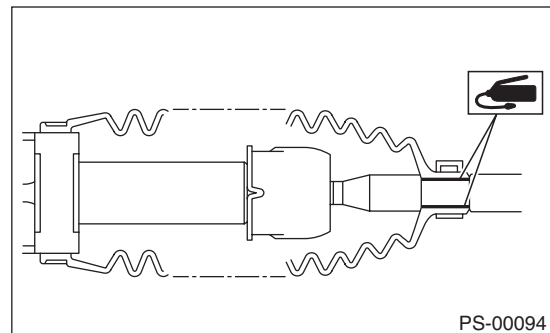
NOTE:

Check the mating face of rack and tie-rod for foreign matter such as dust etc.

28) Apply a coat of grease to the tie-rod groove, and then install the boot to the housing.

NOTE:

Make sure that the boot is installed without unusual inflation or deflation.



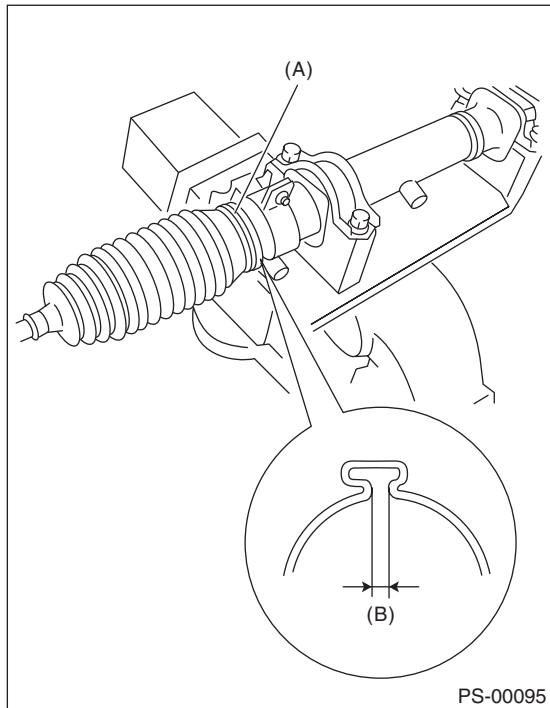
Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

29) Crimp the boot so that the clearance of the boot band crimp portion becomes 2 mm (0.08 in) or less.

NOTE:

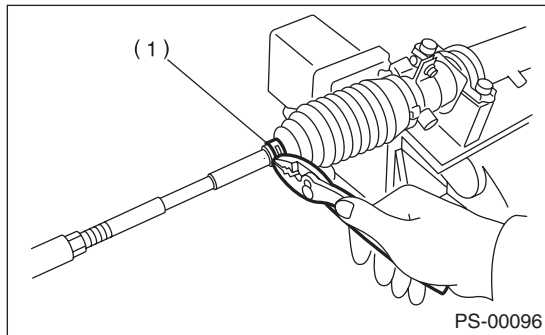
Use a new band.



(A) Boot band

(B) 2 mm (0.08 in) or less

30) Fix the boot end with small clip.



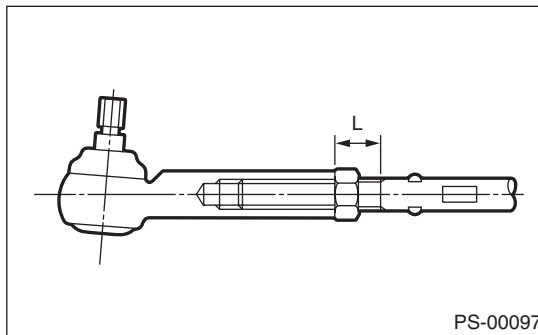
(1) Clip

31) After installing, check that the boot end is installed to the groove of the tie-rod.

32) If the tie-rod end has been removed, screw in lock nut and tie-rod end to the screwed portion of tie-rod, and tighten the lock nut temporarily in a position as shown in the figure.

Installed tie-rod length: L

31.2 mm (1.23 in)

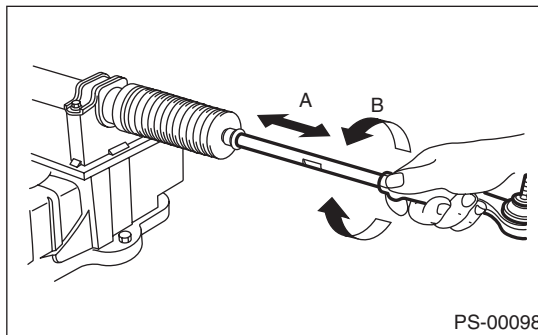


33) Inspect the gearbox as follows.

Holding the "A" tie-rod end, repeat movement from lock to lock two or three times as quickly as possible.

Holding the "B" tie-rod end, turn a few times as slowly as possible.

Finally, make sure that the boot is installed in the specified position without inflating.



34) Remove the gearbox from ST.

ST 926200000 STAND

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

E: INSPECTION

1. BASIC INSPECTION

1) Clean all the disassembled parts, and check for wear, damage or any other faults, then repair or replace as necessary.

2) When disassembling, check the inside of gearbox assembly for water. If any water is found, carefully check the boot for damage, and the input shaft dust seal, adjusting screw and boot clips for poor sealing. If faulty, replace with new parts.

No.	Parts	Inspection	Corrective action
1	Input shaft	(1) Bent input shaft (2) Damage on serration	If there is excessive bend or damage, replace the entire gearbox assembly.
2	Dust seal	(1) Crack or damage (2) Wear	If the outer wall slips, the lip is worn out or damage is found, replace it with a new dust seal.
3	Rack and pinion	Poor mating of rack with pinion	(1) Adjust the backlash properly. By measuring the turning torque of the gearbox and the sliding resistance of rack, check if the rack and pinion engages uniformly and smoothly with each other. (Refer to "SERVICE LIMIT") (2) Pull out the entire rack to allow viewing of the teeth, and check for damage. If a problem of either (1) or (2) is found, replace the entire gearbox assembly.
4	Gearbox unit	(1) Bending of the rack shaft (2) Bending of the cylinder portion (3) Crack or damage on cast iron portion	Replace the gearbox assembly with a new part.
		(4) Wear or damage on rack bushing	If the free play of the rack shaft in the radial direction is out of the specified range, replace the gearbox assembly with a new part. (Refer to "SERVICE LIMIT")
		(5) Wear on input shaft bearing	If the free play of the input shaft in the radial direction is out of the specified range, replace the gearbox assembly with a new part. (Refer to "SERVICE LIMIT")
5	Boot	Crack, damage or deterioration	Replace.
6	Tie-rod	(1) Looseness of ball joint (2) Bend of tie-rod	Replace.
7	Tie-rod end	Damage or deterioration of dust seal	Replace.
8	Adjusting screw spring	Deterioration	Replace.
9	Boot clip	Deterioration	Replace.
10	Sleeve	Damage	Replace.
11	Pipe	(1) Damage to flared surface (2) Damage to flare nut (3) Damage to pipe	Replace.

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

2. SERVICE LIMIT

Make a measurements as follows. If it exceeds the specified service limits, adjust or replace.

NOTE:

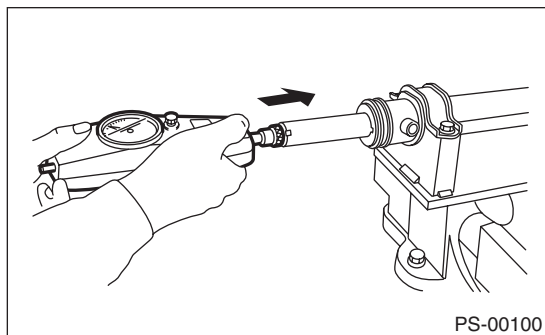
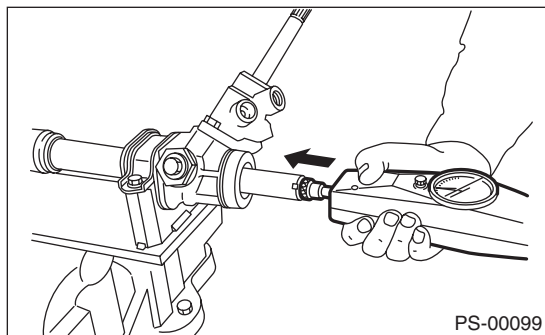
When making a measurement, hold the gearbox assembly in a vise using the ST. Do not hold the gearbox in a vice by inserting aluminum plates etc. between the vise and gearbox assembly.

ST 926200000 STAND

Rack shaft sliding resistance:

Service limit:

400 N (41 kgf, 90 lb) or less



3. RACK SHAFT FREE PLAY IN THE RADIAL DIRECTION

Right-turn steering

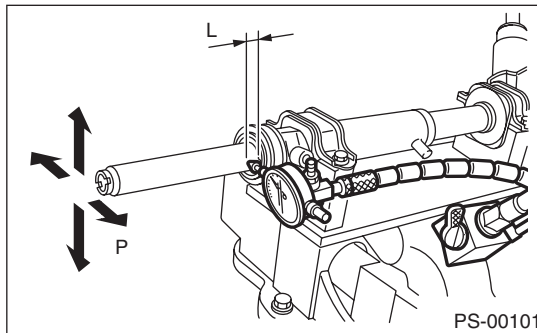
Service limit:

0.19 mm (0.0075 in) or less

Condition

L: 5 mm (0.20 in)

P: 122.6 N (12.5 kgf, 27.6 lb)



Left-turn steering

Service limit:

Direction ← →

0.3 mm (0.012 in) or less

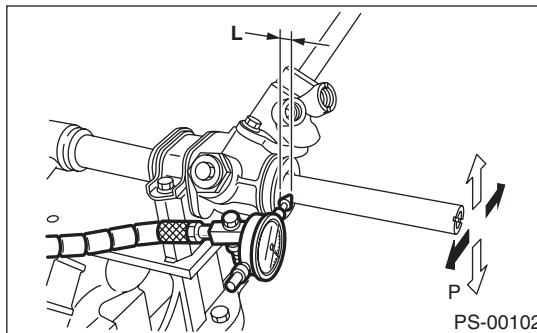
Direction ← →

0.15 mm (0.0059 in) or less

Condition

L: 5 mm (0.20 in)

P: 98 N (10 kgf, 22 lb)



Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

4. INPUT SHAFT PLAY

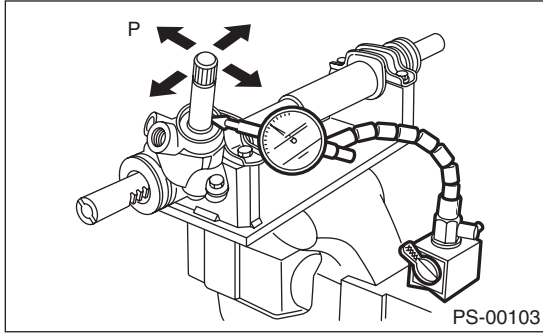
In radial direction

Service limit:

0.18 mm (0.0071 in) or less

Condition

P: 98 N (10 kgf, 22 lb)



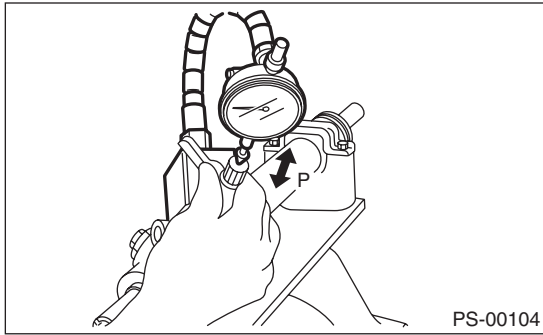
In axial direction

Service limit:

0.5 mm (0.020 in) or less

Condition

P: 20 — 49 N (2 — 5 kgf, 4 — 11 lb)



5. TURNING RESISTANCE OF GEARBOX

Using the ST, measure gearbox turning resistance.
ST 34099PA100 WRENCH

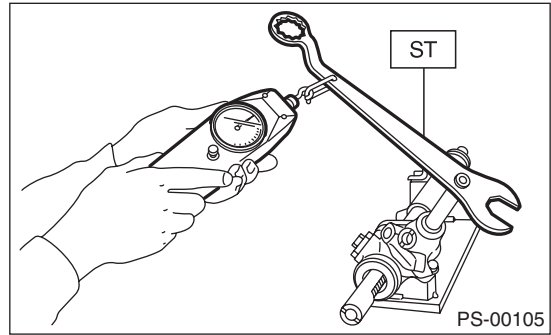
Service limit:

Maximum allowable resistance:

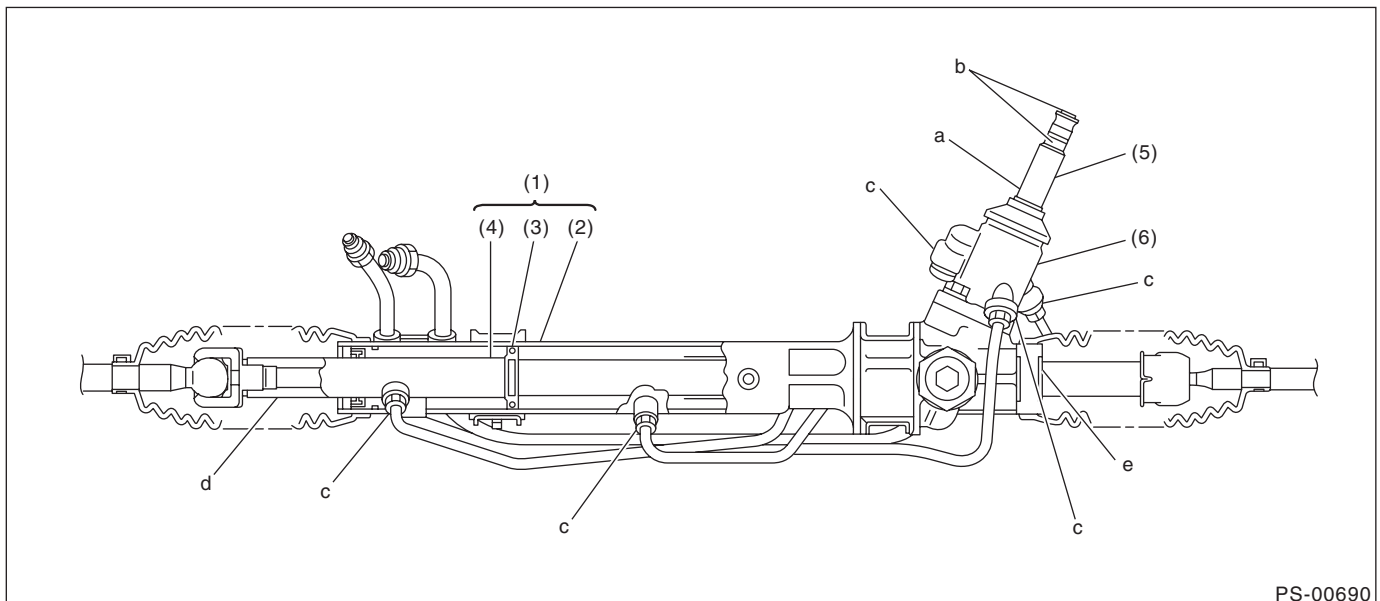
9.33 N (0.95 kgf, 2.10 lb) or less

Difference between right and left turning resistance:

Less than 20%



6. OIL LEAKAGE



PS-00690

- (1) Power cylinder
- (2) Cylinder

- (3) Rack piston
- (4) Rack

- (5) Input shaft
- (6) Valve housing

Steering Gearbox

POWER ASSISTED SYSTEM (POWER STEERING)

1) If a fluid leak is found, clean the fluid completely from the suspect area, and turn the steering wheel 30 to 40 times to the left and right from lock to lock, with the engine running, and check again for leaks immediately, and also after a few hours have passed

2) Cause and solution for oil leakage from “a”
The oil seal is damaged. Replace the valve assembly with a new part.

3) Cause and measure for oil leakage from “b”
The torsion bar O-ring is damaged. Replace the valve assembly with a new part.

4) Cause and measure for oil leakage from “c”
The pipe is damaged. Replace the faulty pipe or O-ring.

5) If the leak is other than a, b, c or if oil is leaking from the gearbox, move the right and left boots toward tie-rod end side, respectively, with the gearbox mounted to the vehicle, and remove fluid from surrounding areas. Then, turn the steering wheel from lock to lock 30 to 40 times with the engine running, then re-inspect the leaking area immediately after and several hours after this operation.

(1) Cause and solution for oil leakage from “d”
The cylinder seal is damaged. Replace the rack bushing with a new part.

(2) Cause and solution for oil leakage from “e”
There are two possible causes. Perform the following step first. Remove the pipe assembly B from the valve housing, and close the circuit using ST.

ST 926420000 PLUG

Turn the steering wheel from lock to lock 30 to 40 times with the engine running, then inspect the leaking section immediately after and several hours after this operation.

- If leakage from “e” is found again:
The oil seal of pinion and valve assembly is damaged. Replace the pinion and valve assembly with a new part. Or replace the oil seal and the parts that are damaged during disassembly with new parts.

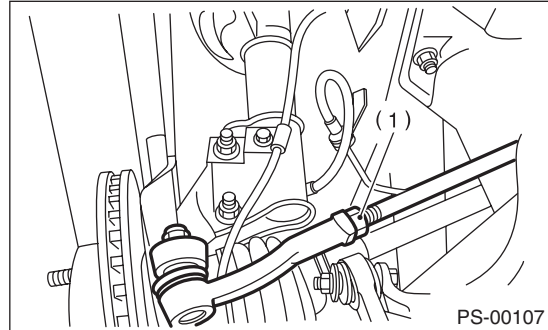
- If oil stops leaking from “e”:
The oil seal of rack housing is damaged. Replace the oil seal and parts that are damaged during disassembly with new parts.

F: ADJUSTMENT

1) Adjust the front toe. <Ref. to FS-10, FRONT WHEEL TOE-IN, INSPECTION, Wheel Alignment.>

Standard of front toe:

IN 3 — OUT 3 mm (IN 0.12 — OUT 0.12 in)



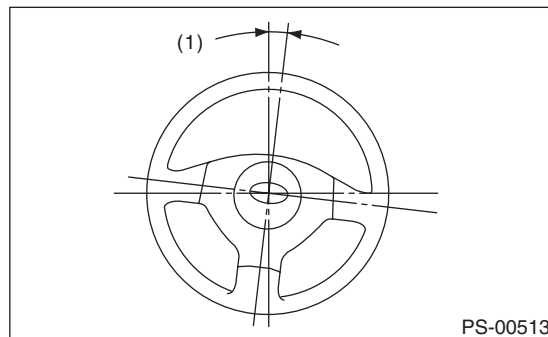
(1) Lock nut

2) Adjust the steering angle of the steering wheel.

Steering angle:

Model	Non-turbo	Turbo
Inner wheel	36°25'±1°30'	35°00'±1°30'
Outer wheel	32°00'±1°30'	30°54'±1°30'

3) If the steering wheel spokes are not horizontal when wheels are set in the straight ahead position, or error is more than 5° on the periphery of the steering wheel, correctly re-install the steering wheel.



(1) Within 5°

4) If the steering wheel spokes are not horizontal with vehicle set in the straight ahead position after this adjustment, correct it by turning the right and left tie-rods in the opposite direction from each other by the same angle.

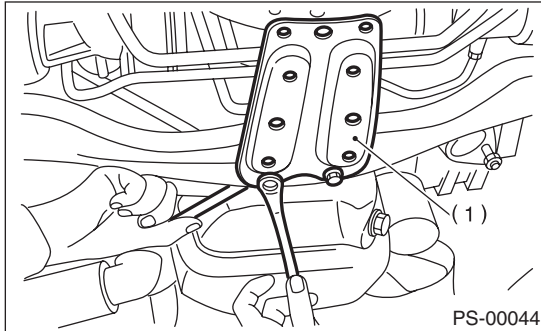
Pipe Assembly

POWER ASSISTED SYSTEM (POWER STEERING)

6. Pipe Assembly

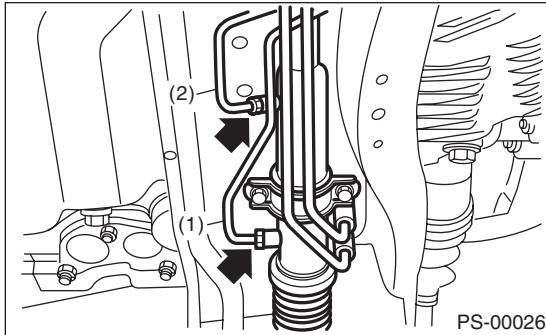
A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Lift-up the vehicle and remove the jack-up plate.



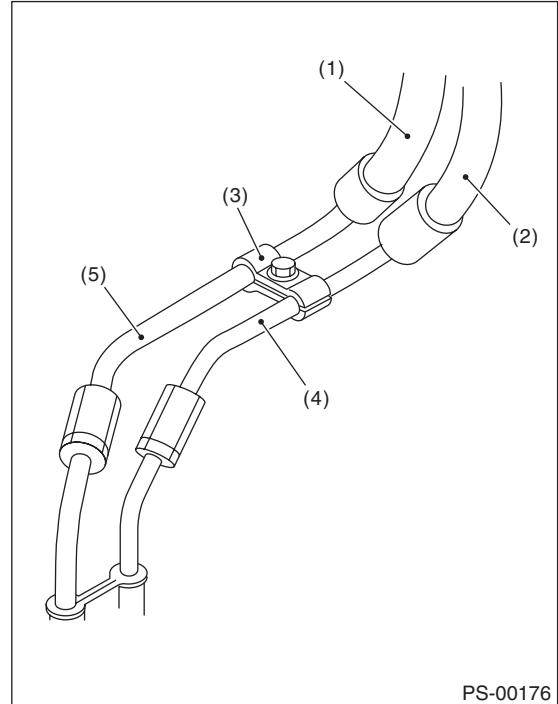
(1) Jack-up plate

- 3) Remove the one pipe joint at the center of gear-box assembly, and connect a vinyl hose to the pipe and the joint. Discharge the fluid by turning the steering wheel fully clockwise and counterclockwise. Discharge the fluid similarly from other pipes.



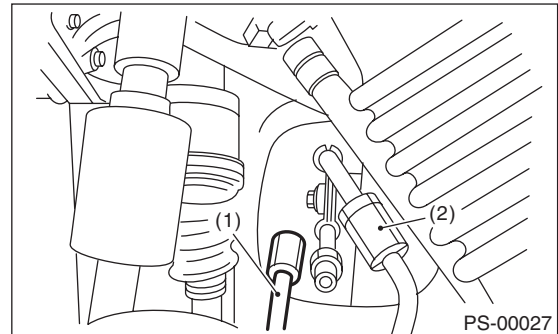
(1) Pipe A
(2) Pipe B

- 4) Remove the clamp E from pipe C and D.



(1) Return hose
(2) Pressure hose
(3) Clamp E
(4) Pipe C
(5) Pipe D

- 5) Disconnect the pipe C and D from the gearbox.



(1) Pipe C
(2) Pipe D

- 6) Remove the air intake duct. <Ref. to IN (H4SO)-7, REMOVAL, Air Intake Duct.>
- 7) Remove the bolt A.

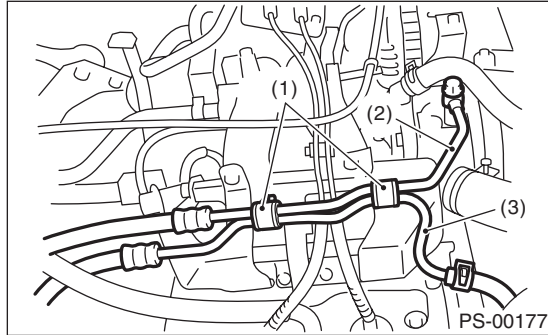
Pipe Assembly

POWER ASSISTED SYSTEM (POWER STEERING)

8) Disconnect the pipe C from oil pump. Disconnect the pipe D from the return hose.

CAUTION:

- Do not allow fluid from the hose end to come into contact with pulley belt.
- To prevent foreign matter from entering the hose and pipe, cover the open ends with clean cloth.



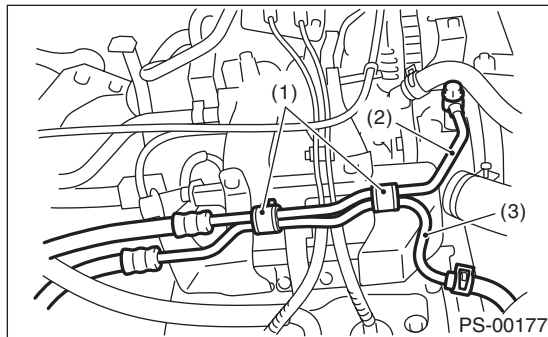
- (1) Bolt A
- (2) Pipe C
- (3) Pipe D

B: INSTALLATION

1) Temporarily tighten the two bolts (bolts A) fixing pipe C and D in place.

NOTE:

Visually check that the hose between tank and pipe D is not bent or twisted.



- (1) Bolt A
- (2) Pipe C
- (3) Pipe D

- (1) Connect pipe D to the reservoir tank.
- (2) Install the pipe C to the oil pump using a new gasket.

Tightening torque:

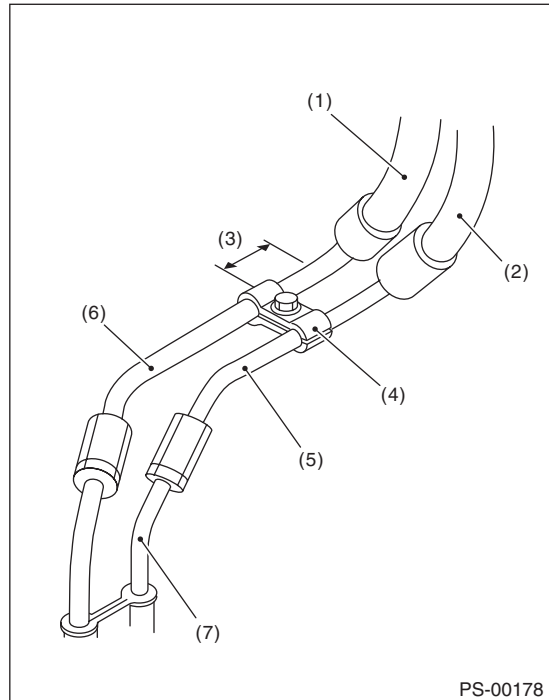
39 N·m (4.0 kgf·m, 28.9 ft·lb)

- (3) Tighten the two bolts (bolts A) fixing pipe C and D in place.

Tightening torque:

13 N·m (1.3 kgf·m, 9.4 ft·lb)

2) Temporarily connect the pipes C and D to the gearbox assembly.

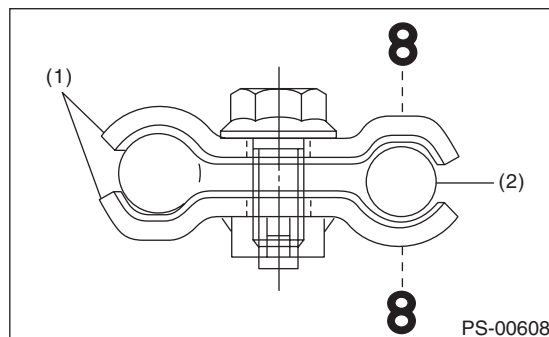


- (1) Return hose
- (2) Pressure hose
- (3) Approx. 30 mm (1.18 in)
- (4) Clamp E
- (5) Pipe C
- (6) Pipe D
- (7) Pipe (on gearbox assembly side)

3) Temporarily install clamp E on pipes C and D.

NOTE:

Make sure that the character “8” on each clamp is positioned on the same side, as shown in the figure.



- (1) Clamp E
- (2) Pipe C

4) Tighten the clamp E.

Tightening torque:

7.4 N·m (0.75 kgf·m, 5.4 ft·lb)

Pipe Assembly

POWER ASSISTED SYSTEM (POWER STEERING)

5) Tighten the joint nut.

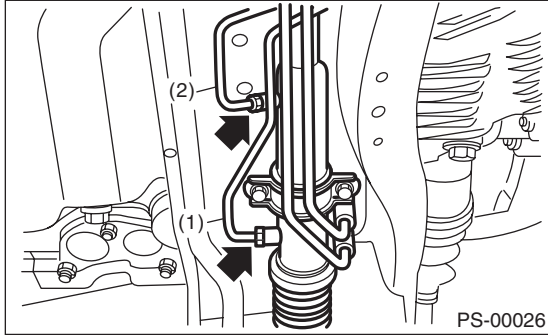
Tightening torque:

15 N·m (1.5 kgf-m, 10.8 ft-lb)

6) Connect pipe A and B to the four pipe joints of the gearbox assembly. Connect the upper pipe B first, and lower pipe A.

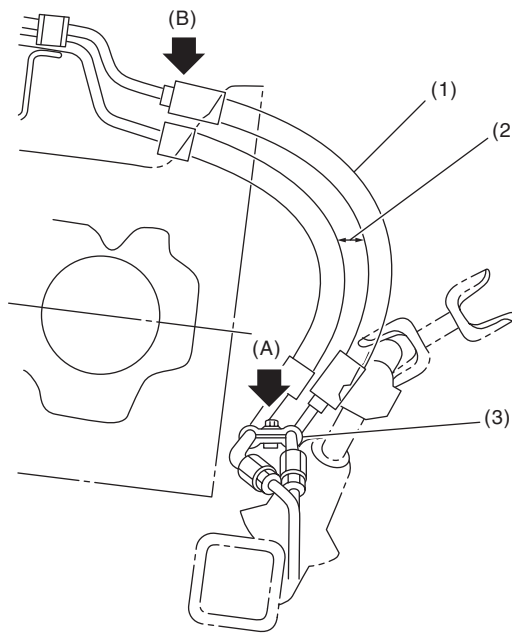
Tightening torque:

13 N·m (1.3 kgf-m, 9.4 ft-lb)



- (1) Pipe A
- (2) Pipe B

If the cruise control actuator and power steering hose clearance is less than 10 mm (0.39 in), move section (A) held in place by the clamp, or bend (B) to adjust.



PS-00179

- (1) High-pressure hose
- (2) No interference is allowed between hoses.
- (3) Clearance between crossmember and pipe: 3 — 8 mm (0.12 — 0.31 in)

7) Install the jack-up plate.

8) Install the air intake duct, the air cleaner upper cover and the air intake boot. <Ref. to IN (H4SO)-7, INSTALLATION, Air Intake Duct.>

9) Connect the ground cable to the battery.

10) Fill with the specified fluid.

CAUTION:

Never start the engine before feeding the fluid otherwise the vane pump might be seize.

11) Finally, check clearance between pipes or hoses as shown in the figure.

Clearance:

10 mm (0.39 in) or more

Pipe Assembly

POWER ASSISTED SYSTEM (POWER STEERING)

C: INSPECTION

Check all disassembled parts for wear, damage or other problems. Repair or replace the defective parts as necessary.

Part	Inspection	Corrective action
Pipe	<ul style="list-style-type: none"> • O-ring fitting surface damage • Nut damage • Pipe damage 	Replace with a new part.
Clamp	Loose clamps	Replace with a new part.
Hose	<ul style="list-style-type: none"> • Flare surface damage • Flare nut damage • Outer surface cracks • Outer surface wear • Clip damage • End coupling or adapter deformation 	Replace with a new part.

CAUTION:

Although the surface layer materials of rubber hoses have excellent weathering resistance, heat resistance and resistance for low temperature brittleness, they will be damaged chemically by brake fluid, battery electrolyte, engine oil and automatic transmission fluid and their service lives will be very shortened. Wipe off hoses immediately if any of these come into contact with the hoses.

Since resistances for heat and low temperature brittleness gradually declines according to long periods of exposure to hot or cold conditions, and their service lives are shortening accordingly. It is necessary to perform careful inspection frequently when the vehicle is used in hot weather areas, cold weather areas and in frequent driving conditions where a lot of steering work is required.

Particularly when there is continuous operation of the relief valve for over 5 seconds, the life of the hoses, oil pump, and fluid will be shortened due to overheating.

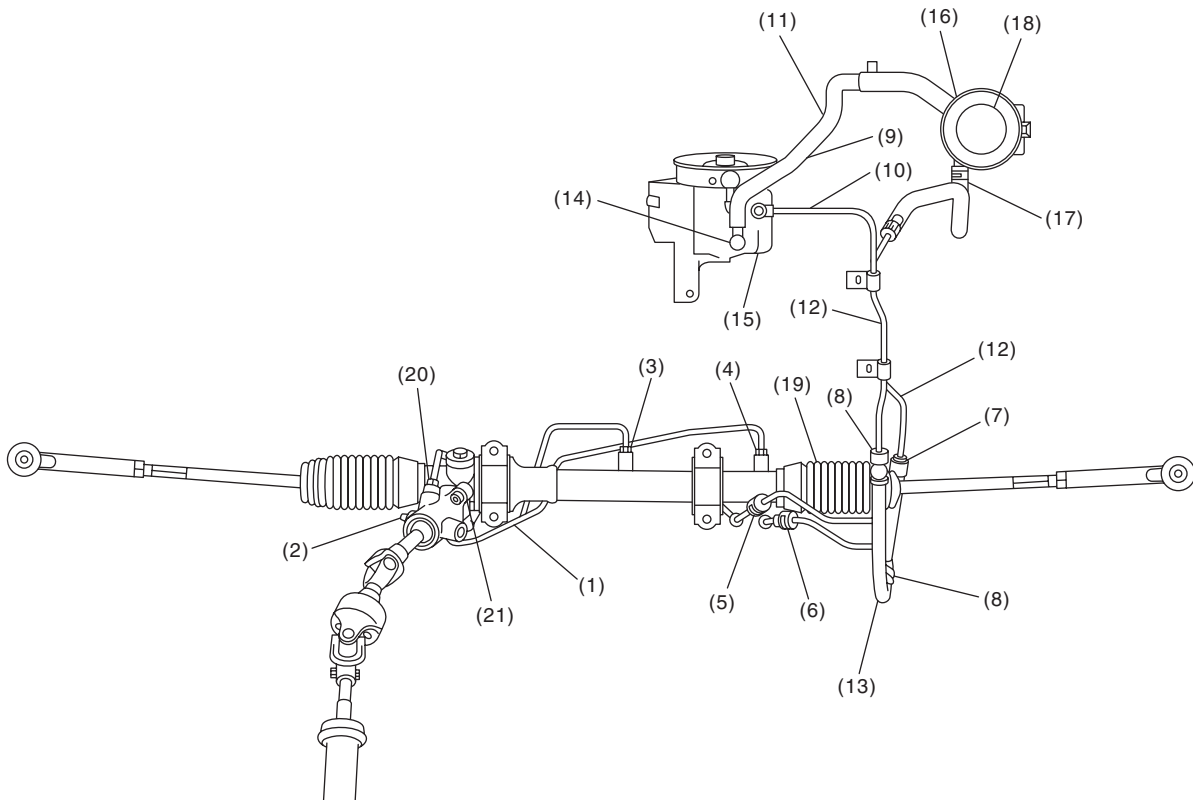
Trouble	Possible cause	Corrective action
Pressure hose burst	Excessive holding time of relief status	Replace. Instruct customers.
	Malfunction of the relief valve	Replace the oil pump.
	Poor cold characteristic of fluid	Replace fluid.
Disconnection of the return hose	Improper connection	Correct.
	Loosening of the clip	Retighten.
	Poor cold characteristic of fluid	Replace fluid.
Fluid slightly leaking out of hose	Wrong layout, tensioned	Replace the hose.
	Excessive play of engine due to deterioration of engine mounting rubber	Replace the parts if defective.
	Improper stop position of pitching stopper	Replace the parts if defective.
Crack on hose	Excessive holding time of relief status	Replace. Instruct customer.
	Excessive tightening torque for return hose clip	Replace. Tighten to the specified torque.
	Power steering fluid, brake fluid, engine oil, or electrolyte coming into contact with the hose surface	Replace. Be careful during service work.
	Hard steering work in a short period of time during extreme cold weather.	Replace. Instruct customers.

Pipe Assembly

POWER ASSISTED SYSTEM (POWER STEERING)

NOTE:

There are conditions in which a fluid leak is diagnosed, but is not actually leaking. This is because the fluid spilt during the last maintenance was not completely wiped off. Be sure to wipe off spilt fluid thoroughly after maintenance.



PS-00022

Pipe Assembly

POWER ASSISTED SYSTEM (POWER STEERING)

Fluid leaking area	Possible cause	Corrective action
Leakage from the connections of pipes and hoses, numbered with (1) through (10) in the figure	Insufficient tightening of flare nuts, dirt accumulation, damage to flare or flare nut or eye bolt	Loosen and retighten. Replace if ineffective.
	Improper installation of hoses or poor clamping	Retighten or replace the clamp.
	Damaged O-ring or gasket	Replace the O-ring, gasket pipe or hose with new parts. If there is still no improvement, replace the gearbox assembly.
Leakage from hose (11), (12) and (13) in the figure	Crack or damage in hose	Replace with a new part.
	Crack or damage in hose hardware	Replace with a new part.
Leakage from surrounding of cast iron portion of oil pump, (14) and (15) in the figure	Damaged O-ring	Replace the oil pump.
	Damaged gasket	Replace the oil pump.
Leakage from reservoir (16) and (17) in the figure	Crack in the reservoir tank	Replace the reservoir tank.
Leakage from filler neck of (18)	Damaged cap packing	Replace the cap.
	Crack in root of filler neck	Replace the reservoir tank.
	Fluid level too high	Adjust the fluid level.
Leakage from power cylinder of gearbox area (19) in the figure	Damaged oil seal	Replace the oil seal.
Leakage from (20), (21) in the figure and control valve of gearbox	Damaged packing or oil seal	Replace the problem parts.
	Damage in control valve	Replace the control valve.

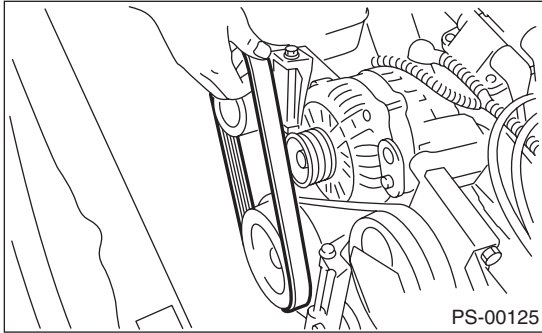
Oil Pump

POWER ASSISTED SYSTEM (POWER STEERING)

7. Oil Pump

A: REMOVAL

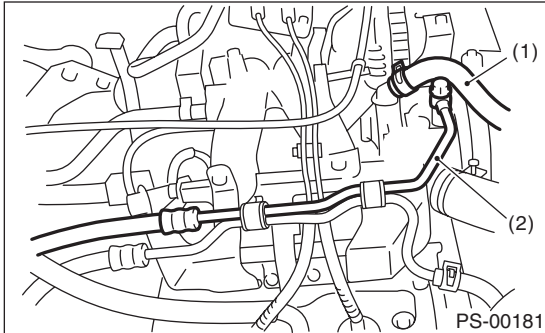
- 1) Disconnect the ground cable from the battery.
- 2) Remove the pulley belt cover.
- 3) Loosen the lock bolt and slider bolt and remove the power steering pump drive V-belt.



- 4) Disconnect the connector from power steering pump switch.
- 5) Disconnect pipe C and suction hose from oil pump.

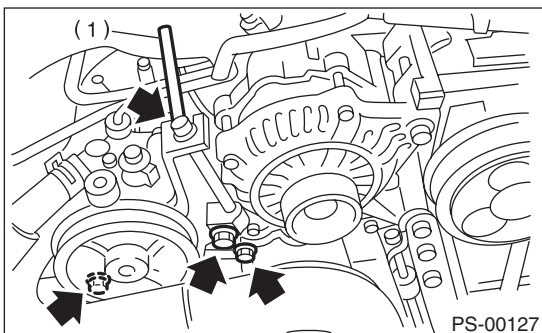
CAUTION:

- Do not allow fluid from the hose end to come into contact with pulley belt.
- To prevent foreign matter from entering the hose, cover the open ends with a clean cloth.



- (1) Suction hose
- (2) Pipe C

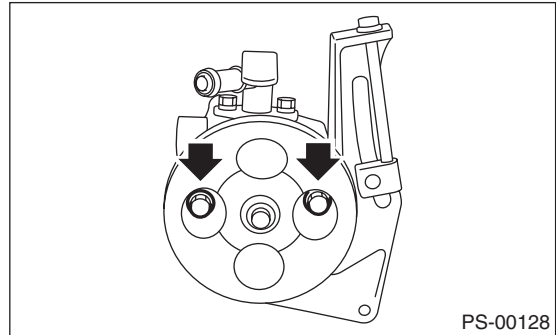
- 6) Remove the installation bolt of the power steering pump bracket.



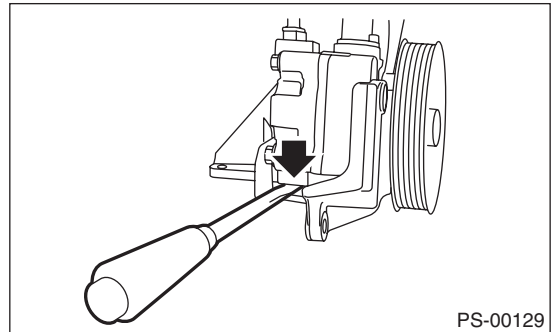
- 7) Place the oil pump bracket in a vise, and remove the two bolts from the front side of the oil pump.

CAUTION:

When securing the oil pump bracket in a vise, hold the oil pump bracket with the least possible force between two pieces of wood.



- 8) Remove the bolt from the rear side of oil pump.
- 9) Disassemble the oil pump and bracket by inserting a flat tip screwdriver as shown in the figure.

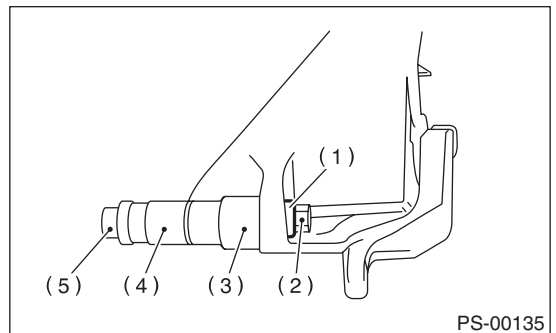


B: INSTALLATION

- 1) Install the oil pump to bracket.
 - (1) Place the oil pump bracket in a vise. Tighten the bushing using a 12.7 mm (1/2") type 14- and 21- mm box wrench until it is in contact with the oil pump mounting surface.

CAUTION:

When securing the oil pump bracket in a vise, hold the oil pump bracket with the least possible force between two pieces of wood.



- (1) Bushing
- (2) Nut
- (3) 21 mm
- (4) 14 mm
- (5) Bolt

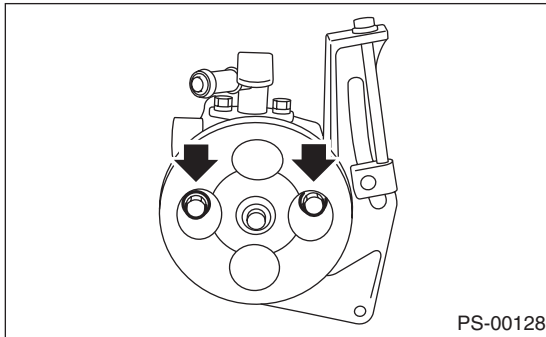
Oil Pump

POWER ASSISTED SYSTEM (POWER STEERING)

(2) Secure the oil pump to the bracket.

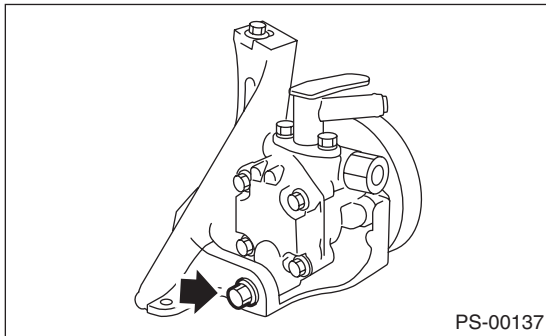
Tightening torque:

15.7 (1.6 kgf-m, 11.6 ft-lb)

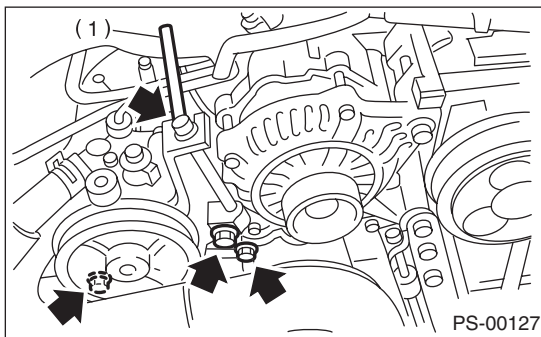


Tightening torque:

37.3 (3.8 kgf-m, 27.5 ft-lb)



2) Attach the installation bolts of the power steering pump bracket.



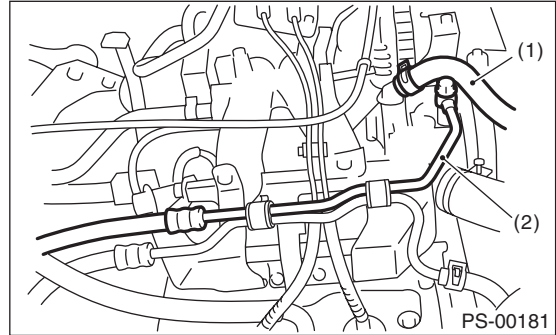
3) Install pipe C and the suction hose to the oil pump.

Tightening torque:

39 N-m (4.0 kgf-m, 28.9 ft-lb)

CAUTION:

If the hose is twisted, there is a danger that it may contact other parts.



(1) Suction hose

(2) Pipe C

4) Connect the connector to the power steering pump switch.

5) Install the V-belts to the oil pump.

6) Check the tension of the V-belt. <Ref. to ME(H4SO)-41, INSPECTION, V-belt.>

7) Tighten the belt tension bolt.

Tightening torque:

8 N-m (0.8 kgf-m, 5.8 ft-lb)

8) Install the belt cover.

9) Connect the ground cable to the battery.

10) Fill with the specified power steering fluid. <Ref. to PS-49, Power Steering Fluid.>

CAUTION:

Never start the engine before feeding the fluid otherwise the vane pump might be seize.

Oil Pump

POWER ASSISTED SYSTEM (POWER STEERING)

C: INSPECTION

1. BASIC INSPECTION

Perform the following inspection procedures and replace faulty parts.

No.	Part	Inspection	Corrective action
1	Oil pump (Exterior)	(1) Crack, damage or oil leakage	Replace the oil pump with a new part.
		(2) Play of pulley shaft	Measure the radial play and axial play. If any of these exceeds the service limit, replace the oil pump with a new part.
2	Pulley	(1) Damage	Replace with a new part.
		(2) Bend	Measure the V groove deflection. If it exceeds the service limit, replace the pulley with a new part.
3	Oil pump (Interior)	(1) Faulty or seized of vane pump	Check the rotating resistance of pulley. If it exceeds the service limit, replace the oil pump with new part.
		(2) Bend in the shaft or damage to bearing	If the a string is wrapped on the pulley and rotated, and the oil pump emits a noise that is markedly different in tone and loudness from a sound of a new oil pump, replace the oil pump with a new part.
4	O-ring	Cracking or deterioration	Replace with a new part.
5	Bracket	Cracking	Replace with a new part.

Oil Pump

POWER ASSISTED SYSTEM (POWER STEERING)

2. SERVICE LIMIT

Make a measurements as follows. If it exceeds the service limit, replace with a new part.

CAUTION:

- When securing the oil pump on a vise, hold the oil pump with the least possible force between two pieces of wood.
- Do not set the outside of the flow control valve or the pulley section on a vise; doing so may deform the exterior or the pulley. Select properly sized wood pieces.

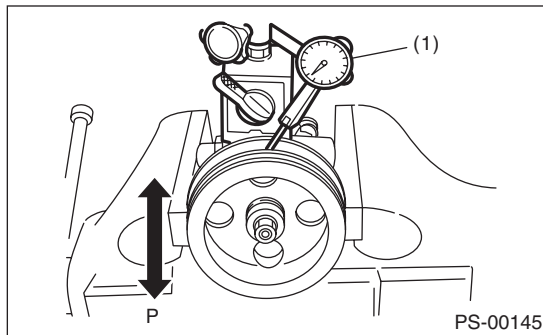
1) Play of the pulley shaft

Condition:

P: When applying a force of 9.8 N (1.0 kgf, 2.2 lb)

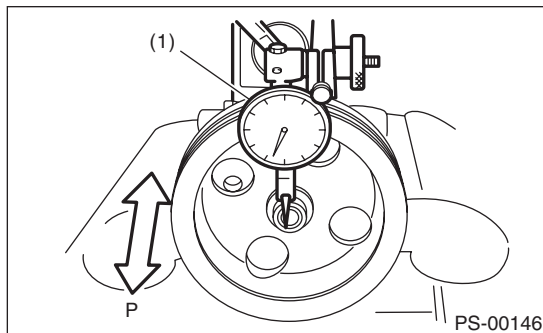
Service limit:

Play in the radial direction (Direction ◀ ▶)
0.4 mm (0.016 in) or less



(1) Dial gauge

Axial play (Direction ◀ ▶)
0.9 mm (0.035 in) or less



(1) Dial gauge

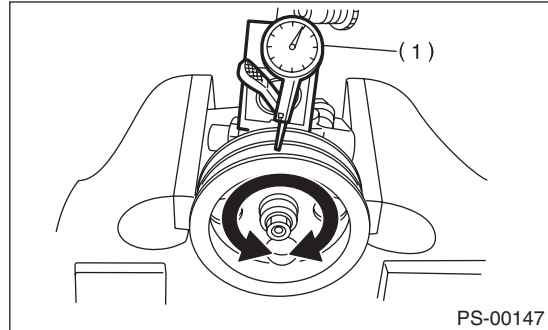
2) Deflection of the pulley groove

Service limit:

1.0 mm (0.039 in) or less

NOTE:

Read the value for one surface of V groove, and then set a dial on the other face and read the value.



(1) Dial gauge

3) Rotating resistance of pulley

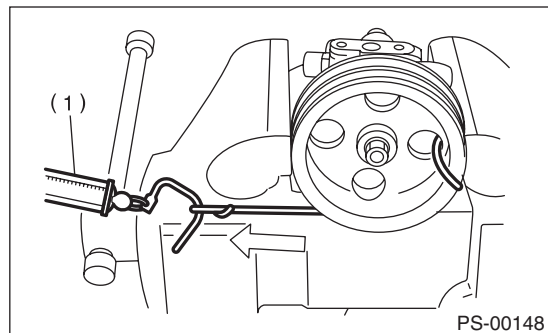
Service limit:

Maximum load:

9.22 N (0.94 kgf, 2.07 lb) or less

NOTE:

- A rather higher value may be indicated when pulley starts turning.
- Measure the load during rotation to make a judgment.



(1) Spring balance

3. HYDRAULIC PRESSURE

NOTE:

- Be sure to complete all items aforementioned in "INSPECTION," prior to measuring hydraulic pressure. Otherwise, pressure can not be measured correctly. <Ref. to PS-50, INSPECTION, General Diagnostic Table.>
- Do not leave the valve of pressure gauge closed or hold the steering wheel at lock for 5 seconds or more in any case, this can damage the oil pump.
- Before attaching a pressure gauge, place cloth at locations where fluid is expected to spill. Wipe off any spilt fluid completely after the measurement.

Oil Pump

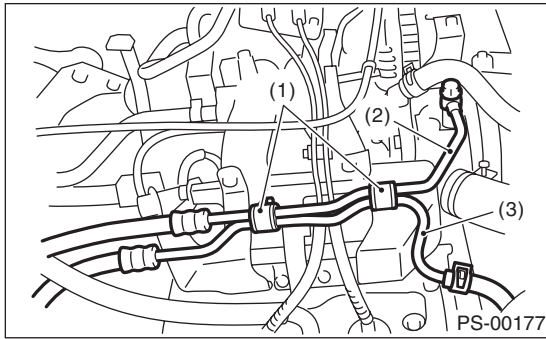
POWER ASSISTED SYSTEM (POWER STEERING)

1) Regular pressure measurement

- (1) Connect the ST1, ST2 and ST3.

ST1 925711000 PRESSURE GAUGE
 ST2 34099AC020 ADAPTER HOSE B
 ST3 34099AC010 ADAPTER HOSE A

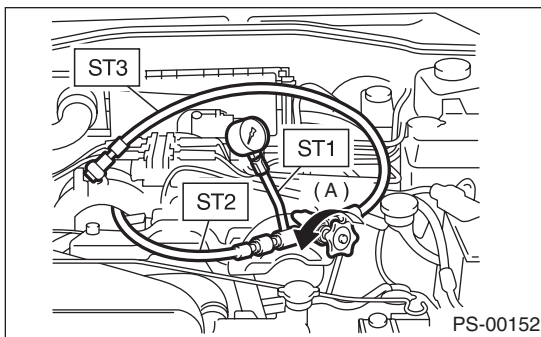
- (2) Remove the air intake duct.
 (3) Disconnect the pipe C from pump.
 (4) Using the gasket (Part No. 34621AC021) and bolt (Part No. 34620AC010), install the ST2 to pump instead of pipe C.



- (1) Bolt A
 (2) Pipe C
 (3) Pipe D

- (5) Attach the ST3 to the end of pipe C which is removed from pump.
 (6) Replenish power steering fluid up to the specified level.
 (7) Open the valve, and start the engine.
 (8) Measure the regular pressure.

ST1 925711000 PRESSURE GAUGE
 ST2 34099AC020 ADAPTER HOSE B
 ST3 34099AC010 ADAPTER HOSE A



(A) Open

Service limit:

981 kPa (10 kg/cm², 142 psi) or less

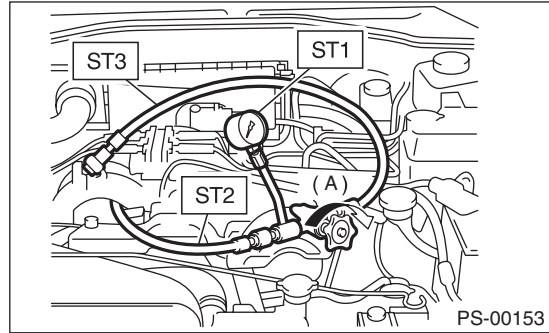
- (9) If it is not within the specification, replace the problem part for the following problems. (Pipe or hose clogged, leaks from fluid line, and mixture of foreign matter in fluid line)

2) Measure the relief pressure.

- (1) Using the STs, measure the relief pressure.
 (2) Close the valve.

- (3) Measure the relief pressure.

ST1 925711000 PRESSURE GAUGE
 ST2 34099AC020 ADAPTER HOSE B
 ST3 34099AC010 ADAPTER HOSE A



(A) Close

Service limit:

Turbo model

7,650 — 8,340 kPa (78 — 85 kg/cm², 1,110 — 1,210 psi)

Non-turbo model

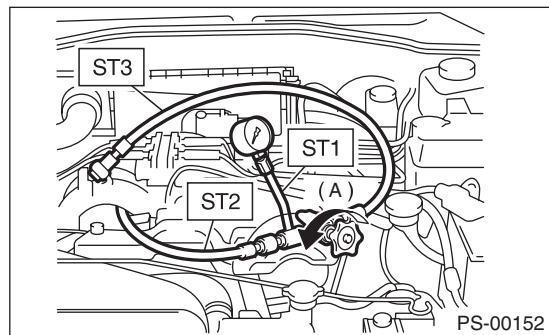
6,700 — 7,400 kPa (68 — 75 kg/cm², 971 — 1,073 psi)

- (4) If it is not within the specification, replace the oil pump.

3) Measure the working pressure.

- (1) Using the ST, measure the working pressure.
 (2) Open the valve.
 (3) Measure the working pressure of control valve by turning steering wheel from stop to stop.

ST1 925711000 PRESSURE GAUGE
 ST2 34099AC020 ADAPTER HOSE B
 ST3 34099AC010 ADAPTER HOSE A



(A) Open

Service limit:

Turbo model

7,650 — 8,340 kPa (78 — 85 kg/cm², 1,110 — 1,210 psi)

Non-turbo model

6,700 — 7,400 kPa (68 — 75 kg/cm², 971 — 1,073 psi)

Oil Pump

POWER ASSISTED SYSTEM (POWER STEERING)

(4) If it is out of specification, measure the steering effort. <Ref. to PS-53, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.> If it is not within specification, replace the control valve itself or control valve and pinion as a single unit, using new parts.

Reservoir Tank

POWER ASSISTED SYSTEM (POWER STEERING)

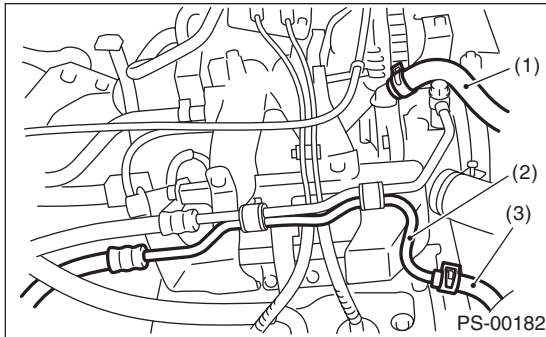
8. Reservoir Tank

A: REMOVAL

- 1) Remove the air intake duct. <Ref. to IN (H4SO)-7, REMOVAL, Air Intake Duct.>
- 2) Drain fluid from the reservoir tank.
- 3) Disconnect the pipe D from the return hose and suction hose from the oil pump.

CAUTION:

- Do not allow fluid from the hose end to come into contact with pulley belt.
- To prevent foreign matter from entering the hose and pipe, cover the open ends with clean cloth.

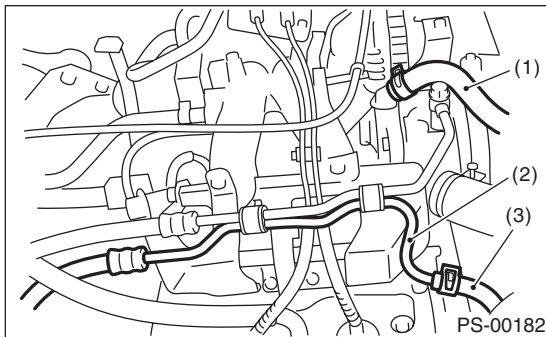


- (1) Suction hose
- (2) Pipe D
- (3) Return hose

- 4) Remove the reservoir tank from the bracket by pulling it upwards.

B: INSTALLATION

- 1) Install the reservoir tank to the bracket.
- 2) Connect the pipes D to the return hose and suction hose to the oil pump.



- (1) Suction hose
- (2) Pipe D
- (3) Return hose

- 3) Replenish the specified power steering fluid up to the specified level. <Ref. to PS-2, SPECIFICATION, General Description.>

C: INSPECTION

Check the reservoir tank for cracks, breakage or damage. If a failure is found, replace the reservoir tank.

9. Power Steering Fluid

A: SPECIFICATION

Recommended power steering fluid <Ref. to PS-2, SPECIFICATION, General Description.>

B: INSPECTION

1) Check the power steering fluid for deterioration or contamination. If the fluid is highly deteriorated or contaminated, drain it and refill with new fluid.

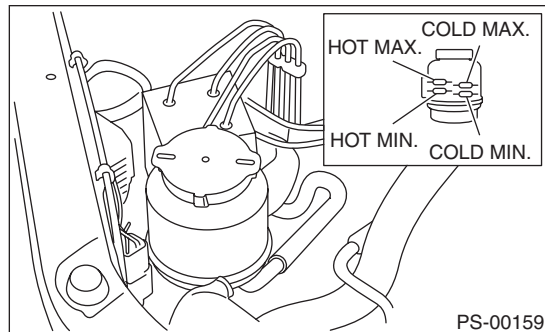
2) Check the joints and units for oil leakage. If any oil leaks are found, repair or replace the applicable part.

3) Inspect the fluid level of reservoir tank with vehicle on level surface and engine stopped.

If the level is at "MIN." point or below, add fluid to keep the level in the specified range of the indicator. If at "MAX." point or above, drain fluid by using a syringe or the like.

(1) If the power steering fluid temperature is 20°C (68°F) or less, read the fluid level on the "COLD" side.

(2) If the power steering fluid temperature is 80°C (176°F) or more, inspect the fluid level on the "HOT" side.



C: REPLACEMENT

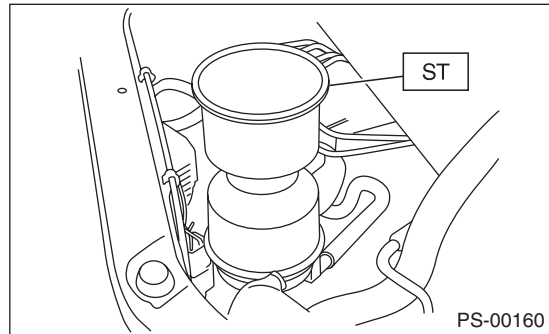
1) Lift-up the vehicle.

2) Remove the jack-up plate.

3) Remove the pipe joint in the center of gearbox assembly, and connect the vinyl hose to the pipe and joint. Turn the steering wheel to drain the fluid out.

4) Set ST on the top of reservoir tank and fill it about half way with the specified fluid.

ST 34199AE040 OIL CHARGE GUIDE



5) Maintaining the fluid level of Step 4), continue to turn the steering wheel slowly from lock to lock until the bubbles stop appearing on oil surface.

6) If the steering wheel is turned in a low fluid level condition, air will be sucked into the pipe. If air has entered, leave it for about half an hour and then repeat step 5) again.

7) Start the engine and let it idle.

8) Continue to turn the steering wheel slowly from lock to lock again until the bubbles stop appearing on oil surface, while keeping the fluid at the level in Step 4).

Normally bubbles will stop appearing after turning the steering wheel from lock to lock three times.

9) In case bubbles do not stop appearing in the tank, leave it for about half an hour and then repeat step 4) again.

10) Lower the vehicle, and then idle the engine.

11) Continue to turn the steering wheel from lock to lock until the bubbles stop appearing and change of the fluid level is within 3 mm (0.12 in).

12) In case the following happens, leave it about half an hour and then do step 8) to 11) again.

(1) The fluid level changes over 3 mm (0.12 in).

(2) Bubbles remain on the upper surface of the fluid.

(3) Screeching noise is generated from oil pump.

13) Check for fluid leakage after turning steering wheel from lock to lock with the engine running.

General Diagnostic Table

POWER ASSISTED SYSTEM (POWER STEERING)

10. General Diagnostic Table

A: INSPECTION

Trouble	Possible cause	Corrective action
<ul style="list-style-type: none"> Steering effort is heavy in all ranges. Steering effort is heavy at stand still. Steering wheel vibrates when turning. 	1. Pulley belt <ul style="list-style-type: none"> Unequal length of pulley belts Contact with oil or grease Looseness or damage of the pulley belt Poor uniformity of the pulley belt cross section Pulley belt is touching the pulley bottom. Poor revolution of pulleys (except oil pump pulley) Poor revolution of oil pump pulley 	Adjust or replace.
	2. Tire and wheel <ul style="list-style-type: none"> Improper tires out of specifications Improper wheels out of specification Tires not properly inflated*1 	Replace or reinflate.
	3. Fluid <ul style="list-style-type: none"> Low fluid level Air entry in fluid Dust entry in fluid Fluid deterioration Inadequate warm-up of fluid *2 	Refill, bleed air, replace or instruct customer.
	4. Idle speed <ul style="list-style-type: none"> Low idle speed Excessive drop of idle speed at start or when turning the steering wheel *3 	Adjust or instruct customer.
	5. Measure the hydraulic pressure. <Ref. to PS-45, HYDRAULIC PRESSURE, INSPECTION, Oil Pump.>	Replace the problem parts.
	6. Measure the steering wheel effort. <Ref. to PS-53, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.>	Adjust or replace.
<ul style="list-style-type: none"> Vehicle leads to one side or the other Returning force of steering wheel to center is poor. Steering wheel vibrates when turning. 	1. Fluid line <ul style="list-style-type: none"> Folded hose Flattened pipe 	Correct or replace.
	2. Tire and wheel <ul style="list-style-type: none"> Flat tire Mixed use of different tires Mixed use of different wheels Uneven tire wear Unequal tread remaining Unequal pressure of tire 	Correct or replace.
	3. Front alignment <ul style="list-style-type: none"> Improper or unequal caster Improper or unequal toe-in Loose suspension connections 	Adjust or retighten.
	4. Others <ul style="list-style-type: none"> Damaged joint assembly Unbalanced height Unbalanced weight 	Replace, adjust or instruct customer.
	5. Measure the steering wheel effort. <Ref. to PS-53, MEASUREMENT OF STEERING EFFORT, INSPECTION, General Diagnostic Table.>	Adjust or replace.

*1 If the tires or wheels are wider than standard, the load to power steering system is increased. Accordingly, in a condition where the fluid has not yet warmed up, the relief valve may work before reaching the maximum turning angle. In this case, steering effort may be heavy. When the measured hydraulic pressure is normal, there is no problem.

*2 In cold weather, steering effort may be heavy due to increased flow resistance of cold fluid. After warming-up engine, turn the steering wheel from stop to stop several times to warm-up the fluid. If steering effort reduces normally, the power steering is functioning normally.

*3 In cold weather or with insufficient warm-up of the engine, steering effort may be heavy due to excessive drop of idling when turning the steering wheel. In this case, it is recommended to start the vehicle by increasing engine speed a little higher than usual. If steering effort reduces normally, the power steering is functioning normally.

General Diagnostic Table

POWER ASSISTED SYSTEM (POWER STEERING)

1. ABNORMAL NOISE & VIBRATION

CAUTION:

Do not keep the relief valve operating for over 5 seconds at a time or the inner parts of the oil pump may be damaged due to rapid increase of fluid temperature.

NOTE:

- A screeching noise may be heard immediately after the engine start in extremely cold conditions. In this case, if the noise goes away when the vehicle warms up, the system is functioning normally. This is due to the fluid characteristics in extremely cold condition.
- The oil pump normally makes a small whining noise due to its mechanism. Even if a noise is heard when steering wheel is turned at stand still, there is no abnormal function in the system provided that the noise eliminates when the vehicle is driving.

- When turning the steering wheel with the brake applied when the vehicle is parked, a screeching noise may be generated by the brake disc and pads. This is not a fault in the steering system.

- There may be a small vibration around the steering devices when turning the steering wheel at standstill, even though the component parts are operating properly

Hydraulic systems are likely to generate this kind of vibration as well as working noise and fluid noise because of combined conditions, i.e., road surface and tire surface, engine speed and turning speed of the steering wheel, fluid temperature and braking conditions.

These conditions do not indicate a problem in the system.

Confirm vibration for an AT model, by applying the parking brake on a concrete surface, shifting into the "D" range, and turning the steering wheel repeatedly at from slow to rapid, step by step.

Trouble	Possible cause	Corrective action
Hiss noise (continuous) While engine is running.	The relief valve emits an operating sound when steering wheel is completely turned in either direction. (Do not keep this condition over 5 seconds.)	Normal
	Relief valve emits an operating sound when steering wheel is not turned. This means that the relief valve is defective.	Replace the oil pump.
Rattling noise (intermittent) when engine is running.	Interference with adjacent parts	Check the clearance. <Ref. to PS-54, INSPECTION OF CLEARANCE, INSPECTION, General Diagnostic Table.> Correct if necessary. <Ref. to PS-39, INSPECTION, Pipe Assembly.>
	Loosened attachment of the oil pump, reservoir tank, pump bracket, gearbox or crossmember	Retighten.
	Loose oil pump pulley or other pulley(s)	Retighten.
	Looseness of the linkage, play in the steering, improper tightening (looseness) of suspension joints or steering column	Retighten or replace.
	Sound generates from the inside of gearbox or oil pump.	Replace faulty parts in the gearbox or oil pump.
Knocking When turning steering wheel in both directions with small angle repeatedly at engine ON or OFF.	Excessive backlash Loosened lock nut for adjusting backlash	Adjust and retighten.
	Insufficient tightening or play in the tie-rod or tie-rod end	Retighten or replace.
Grinding noise (continuous) While engine is running.	Air in vane pump	Inspect and retighten the fluid line connection. Refill the fluid and vent air.
	Vane pump seizing	Replace the oil pump.
	Oil pump pulley bearing seized	Replace the oil pump.
	Folded hose, flattened pipe	Replace.
Squeal, squeak (intermittent or continuous) While engine is running.	Improper adjustment of pulley belt Damaged or over tensioned pulley belt Unequal length of pulley belts	Adjust or replace. (Replace two belts as a set.)
	Runout or dirty V-groove surface of oil pump pulley	Clean or replace.

General Diagnostic Table

POWER ASSISTED SYSTEM (POWER STEERING)

Trouble	Possible cause	Corrective action
Sizzling noise (continuous) While engine is running.	Fluid aeration	Fix the faulty part causing aeration. Replace the fluid and vent air.
	Damaged pipe of gearbox	Replace the pipe.
	Faulty inside of hose or pipe Flattened hose or pipe	Repair or replace.
	Problem inside the reservoir tank	Replace.
	Missing reservoir tank cap	Install cap.
Whistle (continuous) While engine is running.	Faulty pipe of gearbox or faulty hose	Replace the faulty parts of the gearbox or the hose.
Whine or growl (intermittent or continuous) While engine is running with/ without steering turned.	Looseness of oil pump, oil pump bracket attachment	Retighten.
	Fault inside of oil pump or hose	Replace the oil pump or hose, if the noise can be heard when vehicle is running as well as being stopped.
	Torque converter growl, air conditioner compression growl	Remove the power steering pulley belt and check.
Grinding noise (continuous) While engine is running with the steering turned.	Fault inside of gearbox	Replace the faulty parts of gearbox.
	Faulty steering shaft bearing	Apply grease or replace.
	Occurs when turning the steering wheel with brakes (service or parking) applied.	If the noise goes away when brake is released, it is normal.
Vibration While engine is running with/ without steering turned.	Engine speed is too low.	Adjust, and notify customer.
	Air in vane pump	Repair faulty part Vent air.
	Damaged valve in oil pump or gearbox	Replace the faulty parts in gearbox and oil pump.
	Excessive play in steering, looseness of suspension parts	Retighten.

General Diagnostic Table

POWER ASSISTED SYSTEM (POWER STEERING)

2. MEASUREMENT OF STEERING EFFORT

	Step	Check	Yes	No
1	CHECK STEERING EFFORT. 1) Stop the vehicle on paved road. 2) Start the engine. 3) Run the engine at idle. 4) Install a spring scale on the steering wheel. 5) Pull the spring scale at a right angle to the steering wheel, and measure both right and left steering wheel efforts. NOTE: When turning the steering more quickly than necessary from one direction to the other at an engine speed over 2,000 rpm, steering effort may be heavy. This is caused by flow characteristic of the fluid in the oil pump and is not a defect.	Is the steering effort less than 29.4 N (3.0 kgf, 6.6 lb)?	Go to step 2.	Adjust the backlash.
2	CHECK STEERING EFFORT. 1) Stop the engine. 2) Pull the spring scale at a right angle to the steering wheel, and measure both right and left steering wheel efforts.	Is the steering effort less than 314 N (35 kgf, 77 lb)?	Go to step 3.	Perform the adjustment.
3	CHECK STEERING WHEEL EFFORT. 1) Remove the universal joint. 2) Measure the steering wheel effort.	Is steering effort less than 2.26 N (0.23 kgf, 0.51 lb)?	Go to step 4.	Check, adjust and replace if necessary.
4	CHECK STEERING WHEEL EFFORT. Measure the steering wheel effort.	Is the steering effort difference in the left and right directions is less than 1.08 N (0.11 kgf, 0.24 lb)?	Go to step 5.	Check, adjust and replace if necessary.
5	CHECK UNIVERSAL JOINT. Measure the swing torque of the joint (yoke of steering column side). <Ref. to PS-14, INSPECTION, Universal Joint.>	Is the swing torque of the universal joint less than 7.3 N (0.74 kgf, 1.64 lb)?	Go to step 6.	Replace with a new part.
6	CHECK UNIVERSAL JOINT. Measure the swing torque of the joint (yoke of gearbox side). <Ref. to PS-14, INSPECTION, Universal Joint.>	Is the swing torque of the universal joint less than 7.3 N (0.74 kgf, 1.64 lb)?	Go to step 7.	Replace with a new part.
7	FRONT WHEEL CHECK. Check the front wheels.	Does the front wheels have unsteady revolution or rattling, or does the brakes drag?	Inspect, readjust and replace if necessary.	Go to step 8.
8	CHECK TIE-ROD ENDS. Remove the tie-rod ends.	Is there any unsteady revolution or rattling of suspension tie-rod ends?	Inspect and replace if necessary.	Go to step 9.
9	BALL JOINT CHECK. Remove the ball joint.	Is there any unsteady revolution or rattling of suspension ball joints?	Inspect and replace if necessary.	Go to step 10.
10	CHECK GEARBOX. Measure the rotating resistance of the gearbox. <Ref. to PS-34, TURNING RESISTANCE OF GEARBOX, INSPECTION, Steering Gearbox.>	Is the rotating resistance of steering gearbox less than 9.33 N (0.95 kgf, 2.09 lb)? Is the difference between right and left sides less than 20%?	Go to step 11.	Readjust the backlash, and if ineffective, replace the faulty parts.
11	CHECK GEARBOX. Measure the sliding resistance of the gearbox. <Ref. to PS-33, SERVICE LIMIT, INSPECTION, Steering Gearbox.>	Is the sliding resistance of steering gearbox less than 304 N (31 kgf, 68 lb)? Is the difference between the right and left sliding resistances less than 20%?	Steering effort is normal.	Readjust the backlash, and if ineffective, replace the faulty parts.

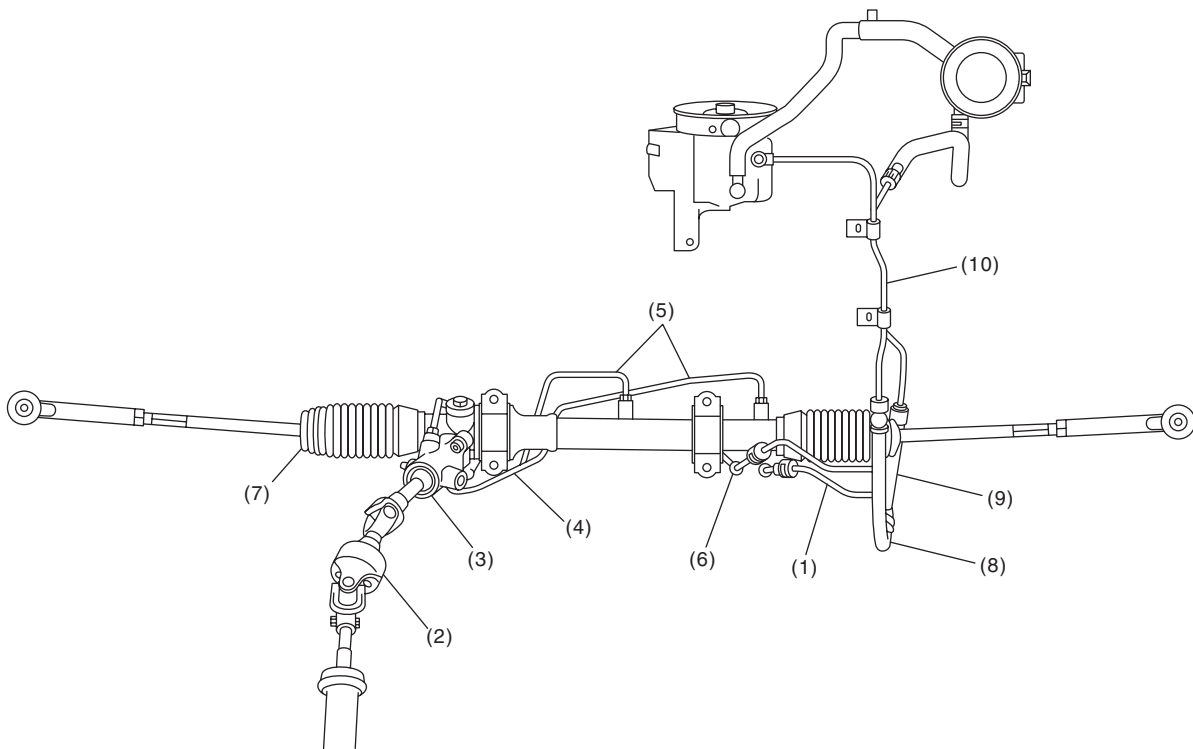
General Diagnostic Table

POWER ASSISTED SYSTEM (POWER STEERING)

3. INSPECTION OF CLEARANCE

This table lists various clearances that must be correctly adjusted to ensure the normal vehicle driving without interfering noise, or any other faults.

Install locations	Minimum allowance
(1) Crossmember to pipe	5 mm (0.20 in)
(2) DOJ to shaft or joint	14 mm (0.55 in)
(3) DOJ to valve housing	11 mm (0.43 in)
(4) Pipe to pipe	2 mm (0.08 in)
(5) Stabilizer to pipe	5 mm (0.20 in)
(6) Exhaust pipe to pipe	11 mm (0.43 in)
(7) Exhaust pipe to gear box bolt	15 mm (0.59 in)
(8) Side frame to hose A and B	10 mm (0.39 in)
(9) Cruise control pump — Hoses A and B	15 mm (0.59 in)
(10) Pipe portion of hose A to pipe portion of hose B	1.5 mm (0.059 in)



PS-00193

General Description

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

1. General Description

A: SPECIFICATION

1. HEATER SYSTEM

Item		Specifications	Condition
Heating capacity		5.0 kW (4,300 kcal/h, 17,062 BTU/h) or more	<ul style="list-style-type: none"> Mode selector switch: HEAT Temperature control switch: FULL HOT Temperature difference between hot water and inlet air: 65°C (149°F) Hot water flow rate: 360 ℓ (95.1 US gal, 79.2 Imp gal)/h
Air flow rate		280 m ³ (9,888 cu ft)/h	Heat mode (FRESH), FULL HOT at 12.5 V
Max air flow rate		480 m ³ (16,951 cu ft)/h	<ul style="list-style-type: none"> Temperature control switch: FULL COLD Blower fan speed: 4th position Mode selector lever: Recirculation
Heater core size (height × length × width)		134.1 × 224.3 × 32 mm (5.28 × 8.83 × 1.26 in)	—
Blower motor	Type	Auto A/C (Brushless motor) 230 W or less	12.5 V
		Manual A/C (Cylinder motor) 260 W or less	12.5 V
	Fan type and size (diameter × width)	Sirocco fan type 150 × 75 mm (5.91 × 2.95 in)	—

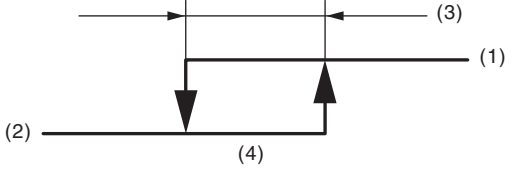
2. A/C SYSTEM

- Auto A/C model

Item		Specifications
Type of air conditioner		Reheat air-mix type
Cooling capacity		5.0 kW (4,300 kcal/h, 17,064 BTU/h)
Refrigerant		HFC-134a (CH ₂ FCF ₃) [600±50 g (1.32±0.11 lb)]
Compressor	Type	Vane rotary, fix volume (DKV-14G)
	Discharge	140 cm ³ (8.54 cu in)/rev
	Max. permissible speed	7,000 rpm
Magnet clutch	Type	Dry, single-disc type
	Power consumption	38 W (DC12 V-25°C)
	Type of belt	V-belt 4 PK
	Pulley dia. (effective dia.)	125 mm (4.92 in)
	Pulley ratio	1.064
Condenser	Type	Corrugated fin (Sub cool type)
	Core face area	0.247 m ² (2.69 sq ft)
	Core thickness	16 mm (0.63 in)
	Radiation area	5.9 m ² (63.51 sq ft)
Receiver drier	Effective inner capacity	220 cm ³ (13.42 cu in)
Expansion valve	Type	External average pressure equation
Evaporator	Type	Single tank
	Dimension (height × length × width)	176.5 × 266 × 60 mm (6.95 × 10.47 × 2.36 in)
Blower fan	Fan type	Sirocco fan
	Outer diameter × width	150 × 75 mm (5.91 × 2.95 in)
	Power consumption	230 W or less at 12.5 V

General Description

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

Item		Specifications	
Condenser fan (Sub fan)	Motor type	Magnet	
	Power consumption	120 W at 12 V	
	Fan outer diameter	320 mm (12.6 in)	
Radiator fan (Main fan)	Motor type	Magnet	
	Power consumption	120 W at 12 V	
	Fan outer diameter	320 mm (12.6 in)	
Idling speed (A/C ON)		800±100 rpm	
Triple switch (Pressure switch)	Low-pressure switch working pressure	ON → OFF	177±25 kPa (1.80±0.25 kg/cm ² , 25.60±3.56 psi)
		OFF → ON	206±30 kPa (2.10±0.31 kg/cm ² , 29.86±4.41 psi)
	High-pressure switch working pressure	ON → OFF	2,940±200 kPa (29.98±2.03 kg/cm ² , 426.32±28.87 psi)
		Difference	590±200 kPa (6.02±2.03 kg/cm ² , 85.6±28.87 psi)
	Middle-pressure switch operating pressure	ON → OFF	1,370±120 kPa (13.97±1.22 kg/cm ² , 198.65±17.35 psi)
		OFF → ON	1,770±100 kPa (18.05±1.02 kg/cm ² , 256.81±14.50 psi)
Thermo-control amplifier working temperature (Evaporator outlet air)		 <p style="text-align: right;">AC-00601</p>	
		(1) ON (2) OFF (3) 1.5±0.3°C (37±0.4°F) (4) 1.0±0.5°C (35±0.9°F)	

- Manual A/C model

Item		Specifications	
Type of air conditioner		Reheat air-mix type	
Cooling capacity		5.0 kW (4,300 kcal/h, 17,064 BTU/h)	
Refrigerant		HFC-134a (CH ₂ FCF ₃) [600±50 g (1.32±0.11 lb)]	
Compressor	Type	Vane rotary, fix volume (DKV-14G)	
	Discharge	140 cm ³ (8.54 cu in) per rotation	
	Max. permissible speed	7,000 rpm	
Magnet clutch	Type	Dry, single-disc type	
	Power consumption	38 W (DC12 V-25°C)	
	Type of belt	V-belt 4 PK	
	Pulley dia. (effective dia.)	125 mm (4.92 in)	
	Pulley ratio	1.064	
Condenser	Type	Corrugated fin (Sub cool type)	
	Core face area	0.247 m ² (2.69 sq ft)	
	Core thickness	16 mm (0.63 in)	
	Radiation area	5.9 m ² (63.51 sq ft)	

General Description

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

Item		Specifications	
Receiver drier		Effective inner capacity	220 cm ³ (13.42 cu in)
Expansion valve		Type	External average pressure equation
Evaporator		Type	Single tank
		Dimensions (W × H × T)	176.5 × 266 × 60 mm (6.95 × 10.47 × 2.36 in)
Blower fan		Fan type	Sirocco fan
		Outer diameter × width	150 × 75 mm (5.91 × 2.95 in)
		Power consumption	260 W or less at 12.5 V
Condenser fan (Sub fan)		Motor type	Magnet
		Power consumption	120 W at 12 V
		Fan outer diameter	320 mm (12.6 in)
Radiator fan (Main fan)		Motor type	Magnet
		Power consumption	120 W at 12 V
		Fan outer diameter	320 mm (12.6 in)
Idling speed (A/C ON)		MPFI model	800±100 rpm
Triple switch (Pressure switch)	Low-pressure switch working pressure	ON → OFF	177±25 kPa (1.80±0.25 kg/cm ² , 25.60±3.56 psi)
		OFF → ON	206±30 kPa (2.10±0.31 kg/cm ² , 29.86±4.41 psi)
	High-pressure switch working pressure	ON → OFF	2,940±200 kPa (29.98±2.03 kg/cm ² , 426.32±28.87 psi)
		Difference	590±200 kPa (6.02±2.03 kg/cm ² , 85.6±28.87 psi)
	Middle-pressure switch operating pressure	ON → OFF	1,370±120 kPa (13.97±1.22 kg/cm ² , 198.65±17.35 psi)
		OFF → ON	1,770±100 kPa (18.05±1.02 kg/cm ² , 256.81±14.50 psi)
Thermo control amplifier working temperature (Evaporator outlet air)			
		AC-00601	
		(1) ON (2) OFF (3) 1.5±0.3°C (37±0.4°F) (4) 1.0±0.5°C (35±0.9°F)	

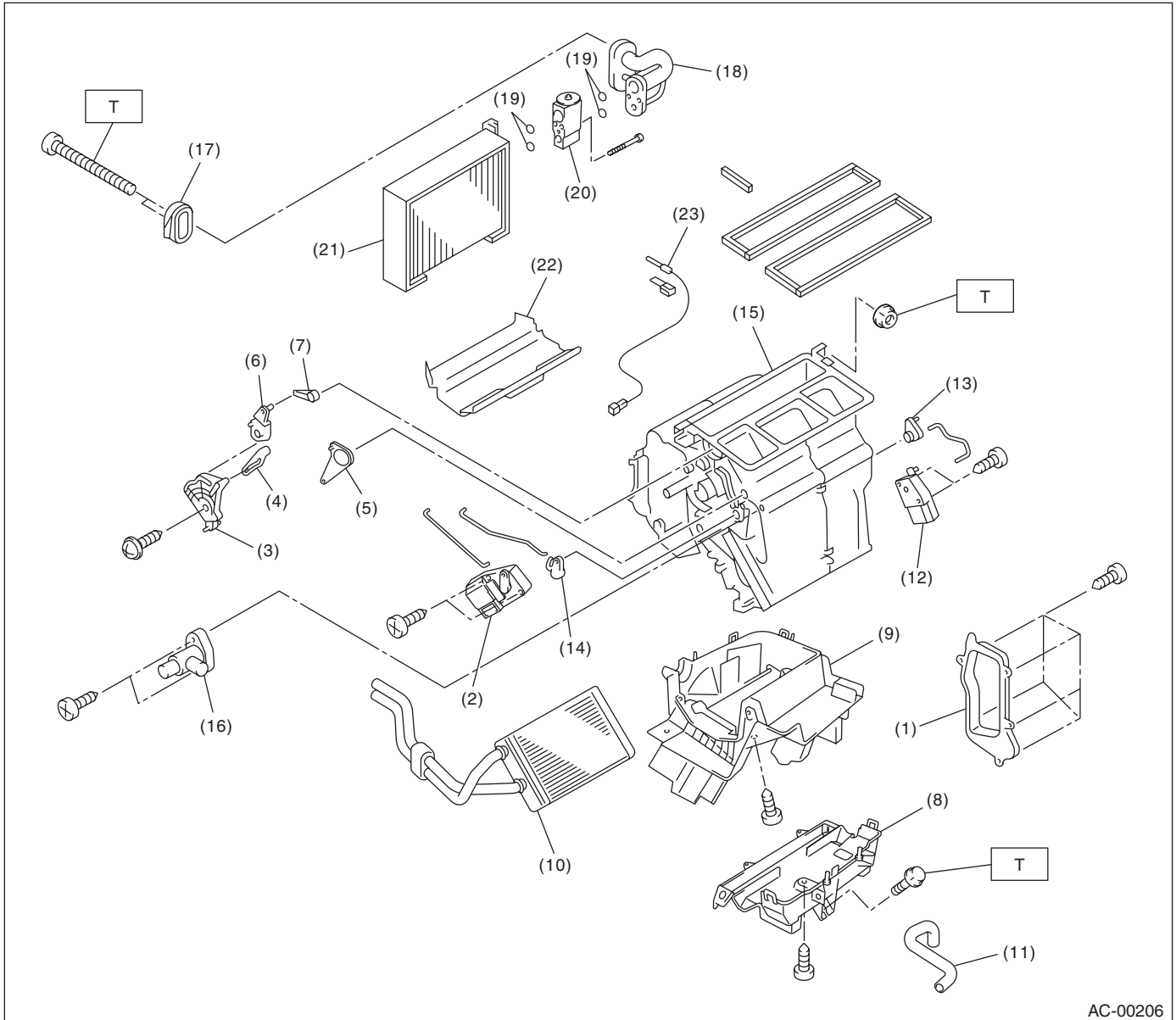
General Description

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

B: COMPONENT

1. HEATER COOLING UNIT

- Auto A/C model



AC-00206

- | | | |
|------------------------|--------------------------|------------------------|
| (1) Evaporator cover | (10) Heater core | (19) O-ring |
| (2) Mode actuator | (11) Drain hose | (20) Expansion valve |
| (3) Mode main lever | (12) Mix actuator | (21) Evaporator |
| (4) Vent door lever | (13) Mix door lever | (22) Evaporator lining |
| (5) Foot door lever | (14) Foot door lever (B) | (23) Evaporator sensor |
| (6) Mode actuator link | (15) Upper case | |
| (7) Defroster lever | (16) Aspirator | |
| (8) Foot duct | (17) Packing | |
| (9) Lower case | (18) Cooling unit pipe | |

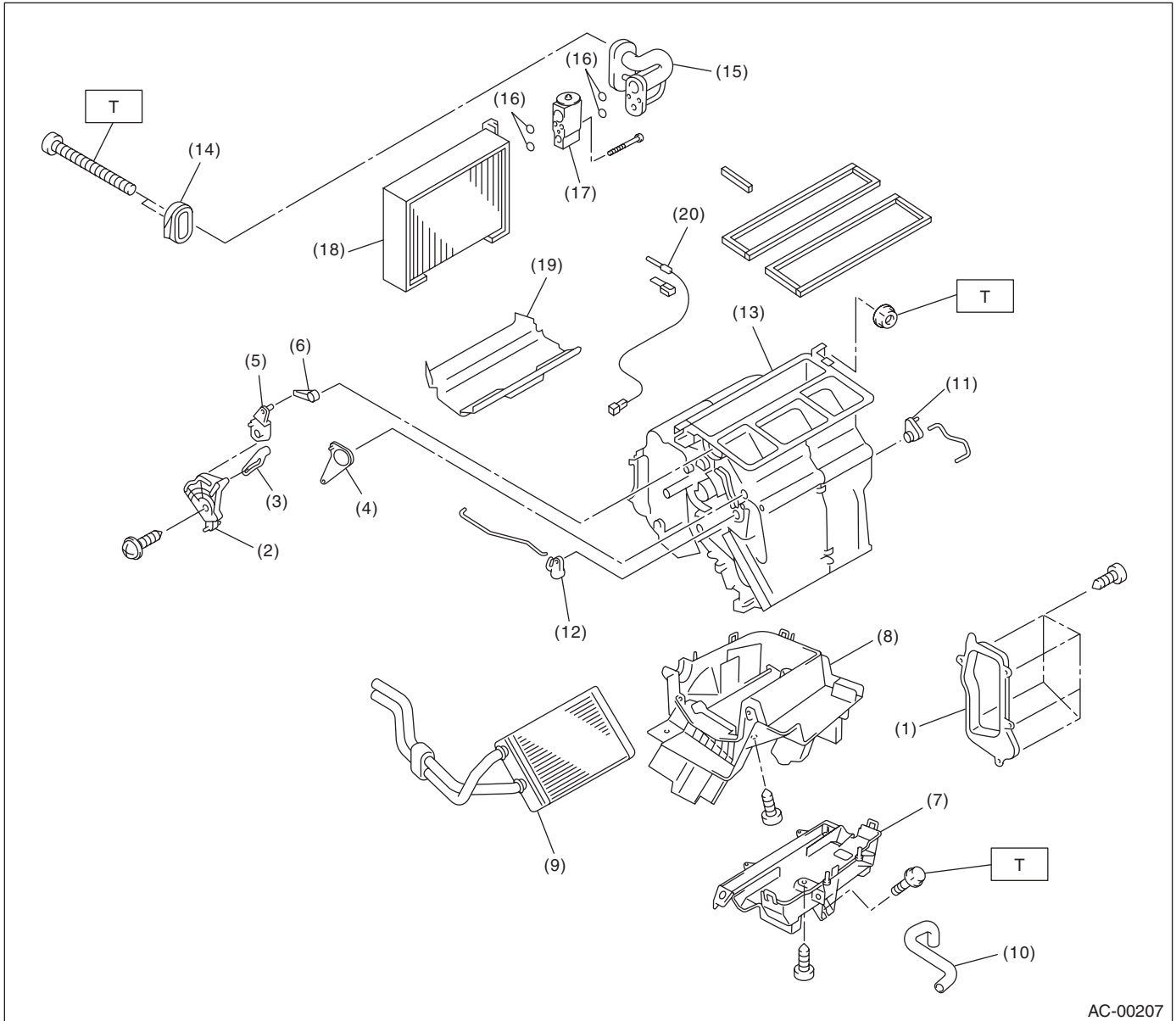
Tightening torque: N·m (kgf·m, ft·lb)

T: 7.5 (0.76, 5.5)

General Description

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

- Manual A/C model



AC-00207

- | | | |
|------------------------|-------------------------|------------------------|
| (1) Evaporator cover | (9) Heater core | (17) Expansion valve |
| (2) Mode main lever | (10) Drain hose | (18) Evaporator |
| (3) Vent door lever | (11) Mix actuator lever | (19) Evaporator lining |
| (4) Foot door lever | (12) Foot door lever | (20) Evaporator sensor |
| (5) Mode actuator link | (13) Upper case | |
| (6) Defroster lever | (14) Packing | |
| (7) Foot duct | (15) Cooling unit pipe | |
| (8) Lower case | (16) O-ring | |

Tightening torque: N·m (kgf·m, ft·lb)

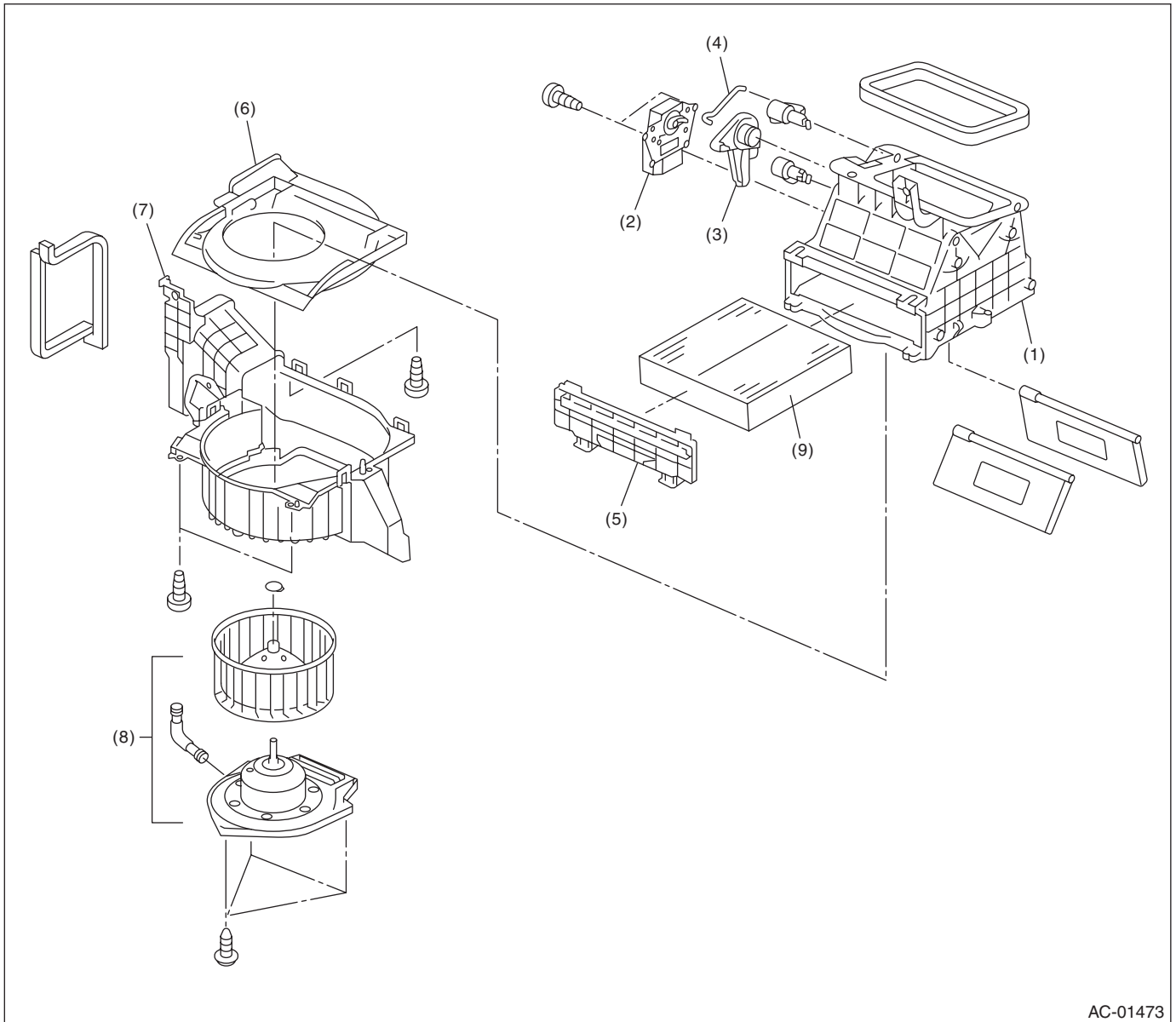
T: 7.5 (0.76, 5.5)

General Description

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

2. BLOWER MOTOR UNIT

- Auto A/C model



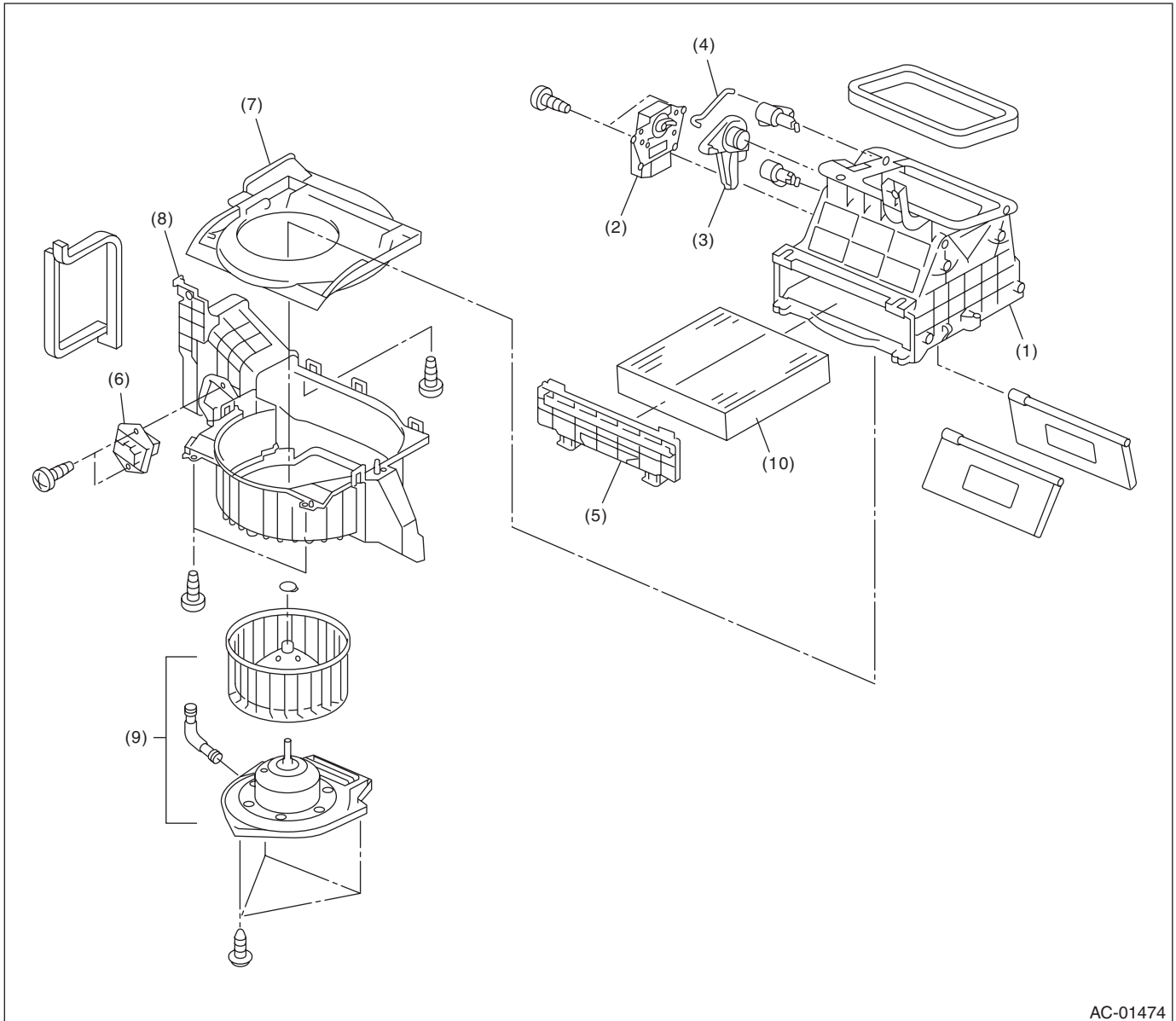
AC-01473

- | | | |
|--------------------------|------------------|----------------------------|
| (1) Upper case | (4) Link lever | (7) Lower case |
| (2) Intake door actuator | (5) Filter cover | (8) Blower motor ASSY |
| (3) FRESH/RECIRC link | (6) Cover | (9) Air conditioner filter |

General Description

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

- Manual A/C model



AC-01474

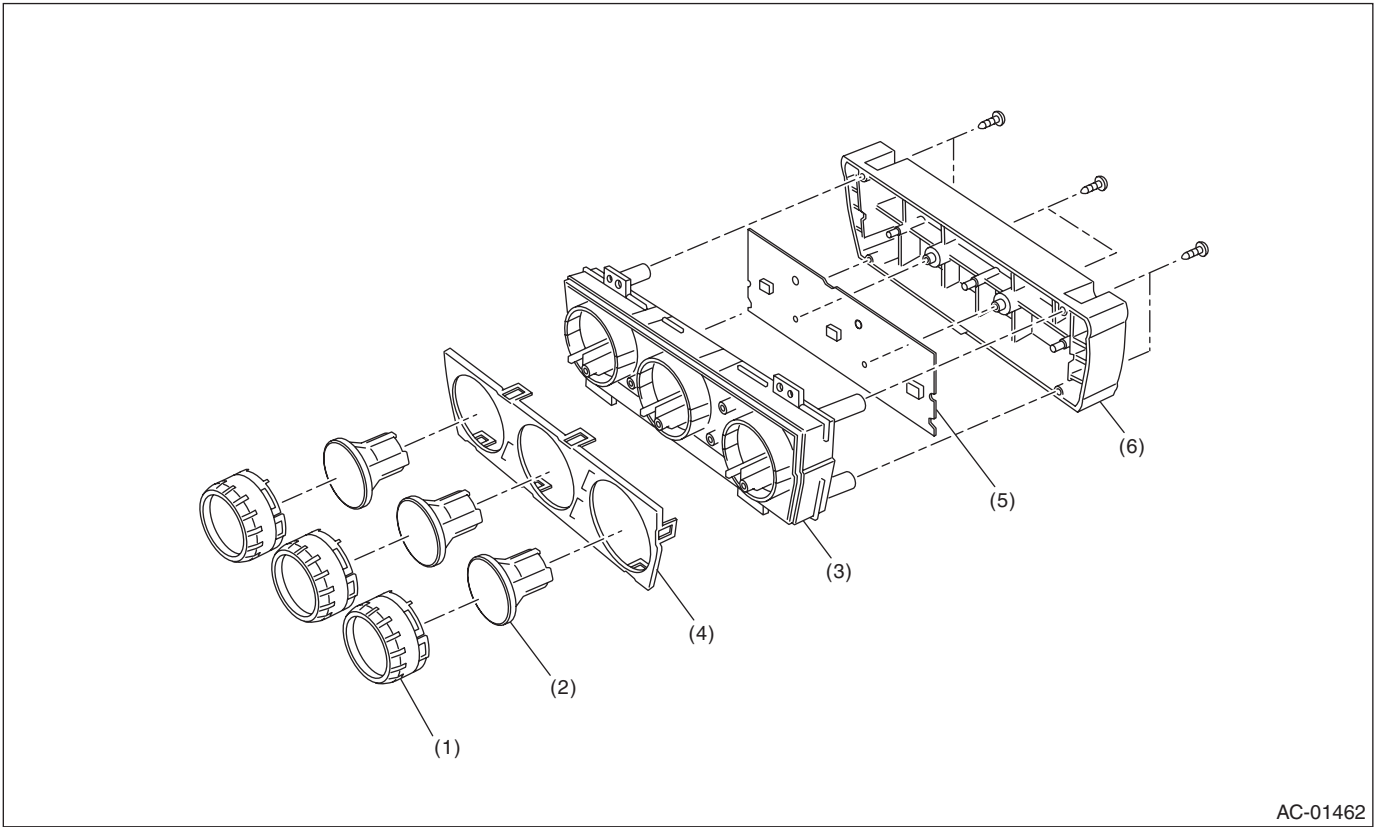
- | | | |
|--------------------------|---------------------|-----------------------------|
| (1) Upper case | (5) Filter cover | (8) Lower case |
| (2) Intake door actuator | (6) Blower resistor | (9) Blower motor ASSY |
| (3) FRESH/RECIRC link | (7) Cover | (10) Air conditioner filter |
| (4) Link rod | | |

General Description

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

3. CONTROL UNIT

- Auto A/C model



AC-01462

(1) Control dial
(2) Switch

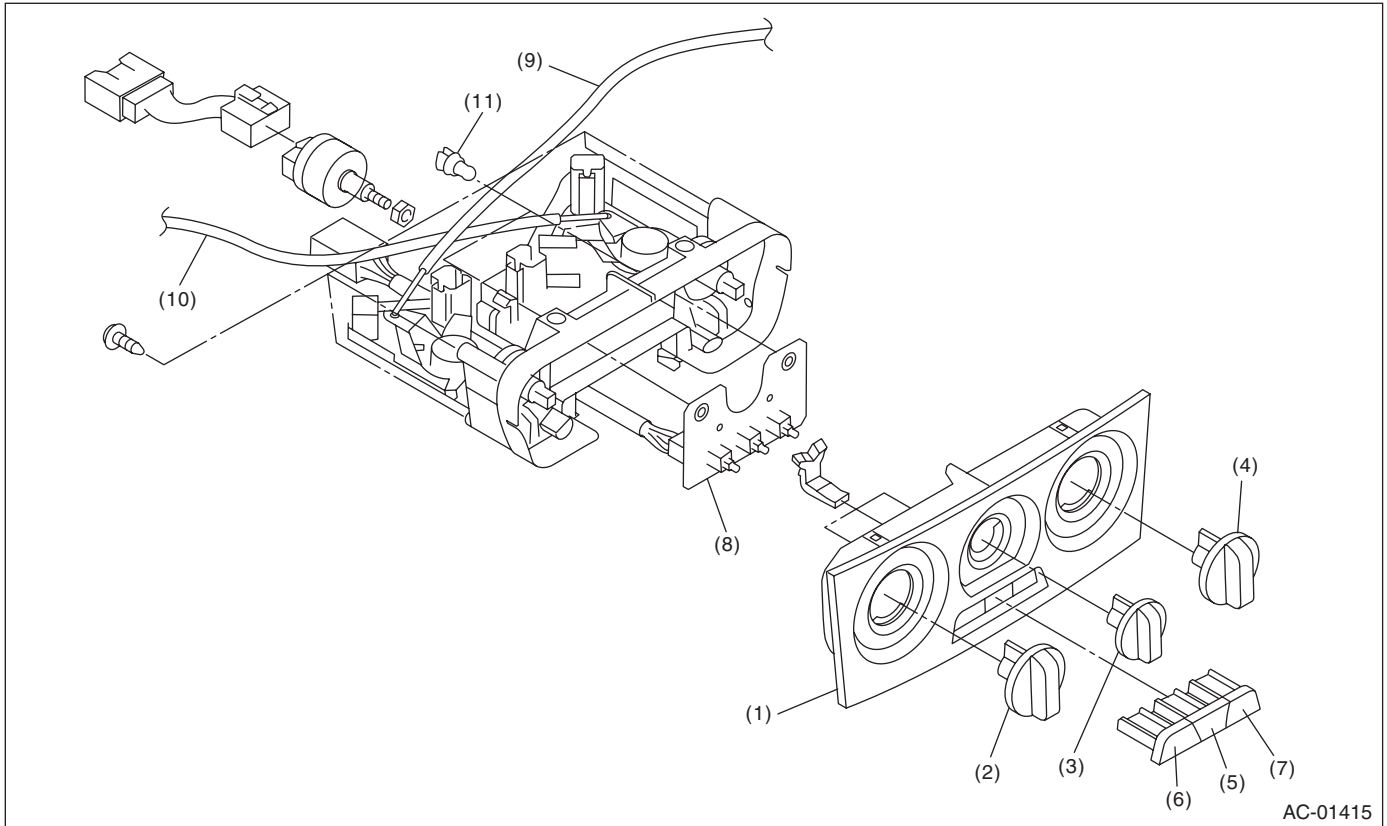
(3) Control case (front)
(4) Front cover

(5) Control unit circuit
(6) Control case (rear)

General Description

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

- Manual A/C model

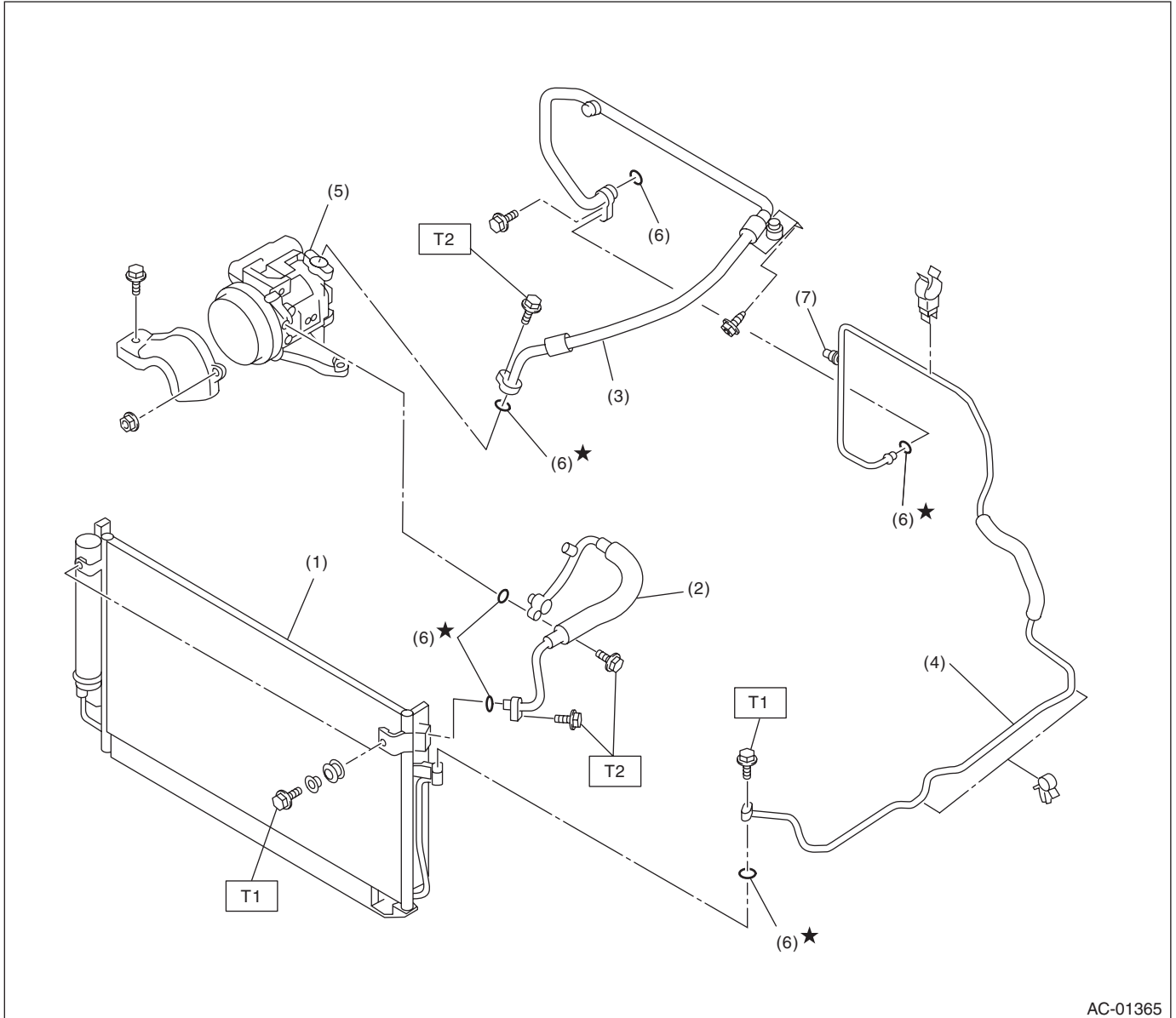


- | | | |
|---------------------------------|--------------------------|-----------------------------------|
| (1) Panel | (5) A/C switch | (9) Mode switch cable |
| (2) Temperature adjustment dial | (6) FRESH/RECIRC switch | (10) Temperature adjustment cable |
| (3) Fan speed control dial | (7) Rear defogger switch | (11) Valve |
| (4) Mode switch dial | (8) Switch board | |

General Description

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

4. AIR CONDITIONING UNIT



AC-01365

- | | |
|------------------------|----------------------------|
| (1) Condenser | (5) Compressor |
| (2) High-pressure hose | (6) O-ring |
| (3) Low-pressure hose | (7) Triple pressure switch |
| (4) Pipe | |

Tightening torque: N·m (kgf·m, ft·lb)

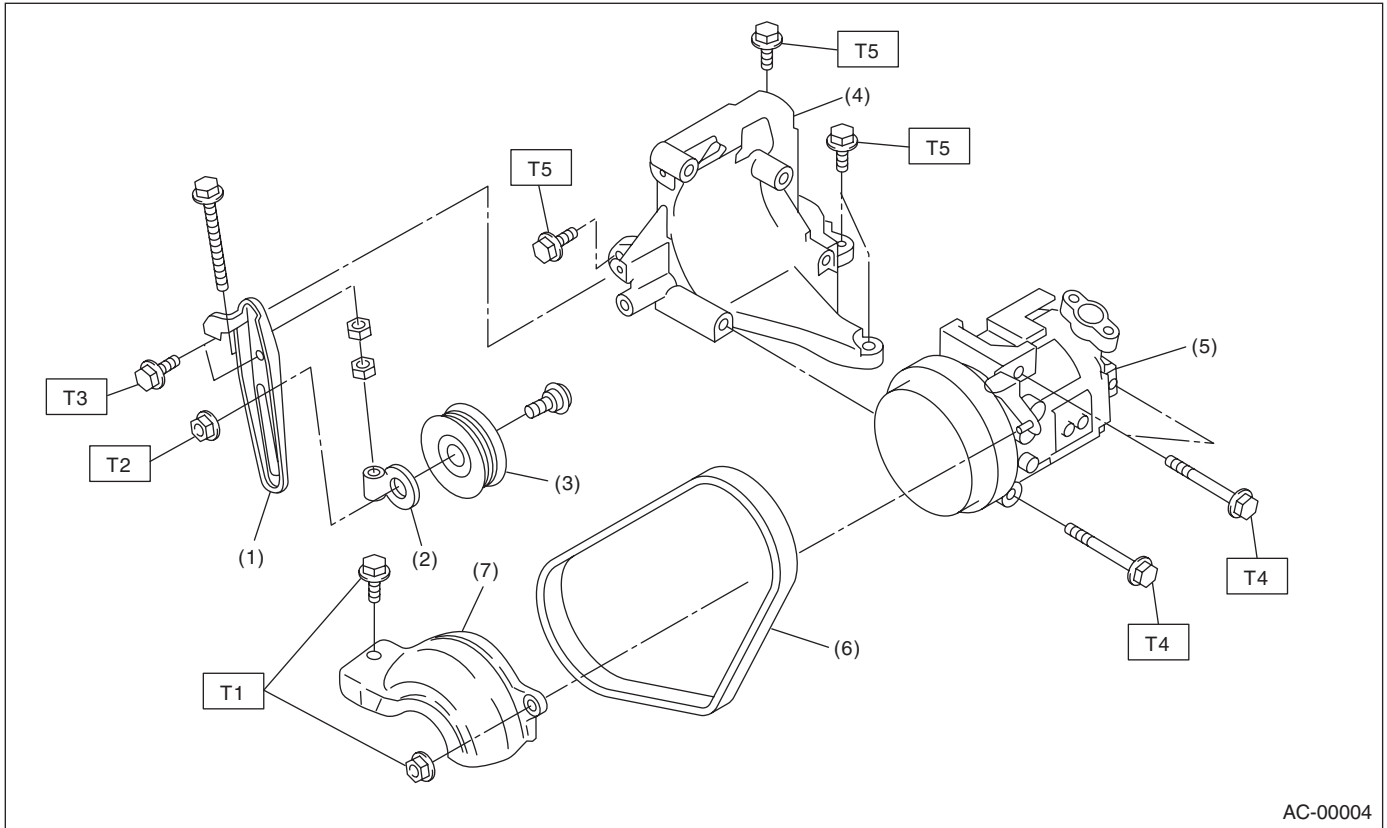
T1: 7.4 (0.75, 5.4)

T2: 15 (1.5, 10.8)

General Description

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

5. COMPRESSOR



AC-00004

- (1) Idler pulley bracket
- (2) Idler pulley adjuster
- (3) Idler pulley
- (4) Compressor bracket
- (5) Compressor
- (6) V-belt

- (7) Compressor belt cover (Non-turbo model)

Tightening torque: N-m (kgf-m, ft-lb)

T1: 4.0 (0.40, 2.95)

T2: 22.6 (2.3, 16.6)

T3: 23.0 (2.35, 17.0)

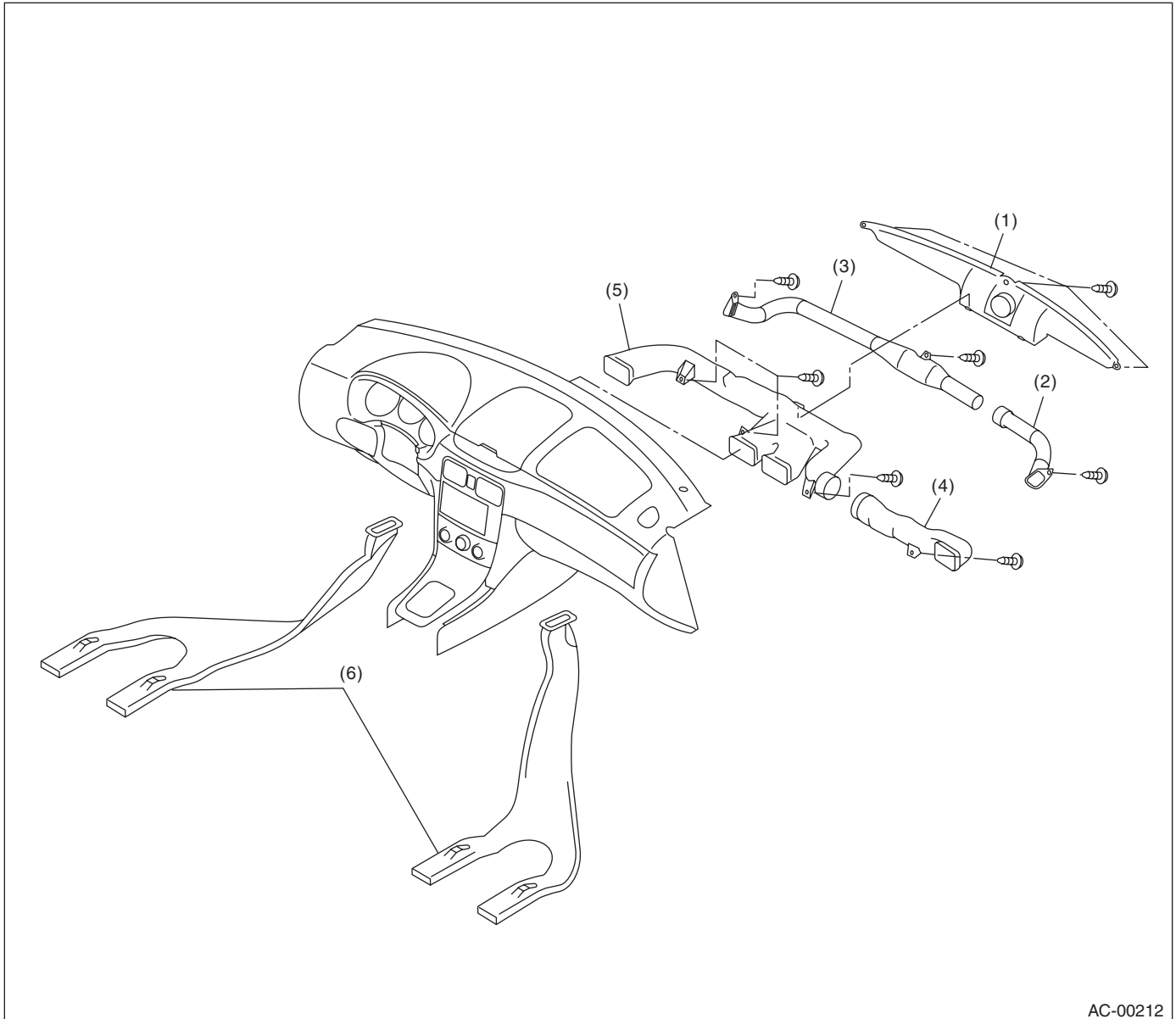
T4: 28.9 (2.95, 21.3)

T5: 35 (3.6, 26)

General Description

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

6. HEATER DUCT



AC-00212

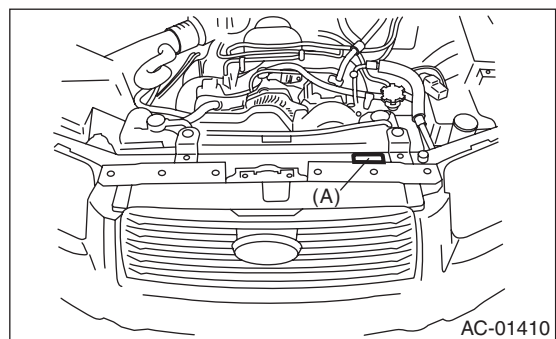
- | | | |
|------------------------------|--------------------------------|--------------------------------|
| (1) Front defroster nozzle | (3) Side defroster duct (RH) | (5) Side ventilation duct (RH) |
| (2) Side defroster duct (LH) | (4) Side ventilation duct (LH) | (6) Rear heater duct |

C: CAUTION

1. HFC-134A A/C SYSTEM

- The cooling system components for the HFC-134a system such as the refrigerant and compressor oil are different from the conventional CFC-12 system components and they are incompatible with each other.

- Vehicles with the HFC-134a system can be identified by the label (A) attached to the vehicle. Before maintenance, check which A/C system is installed to the vehicle.



AC-01410

General Description

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

2. COMPRESSOR OIL

- HFC-134a compressor oil has no compatibility with that for CFC-12 system.
- Use only the manufacturer-authorized compressor oil for the HFC-134a system; only use ZXL200PG.
- Do not mix multiple compressor oils.

If CFC-12 compressor oil is used in the HFC-134a A/C system, the compressor may become stuck due to poor lubrication, or the refrigerant may leak due to swelling of rubber parts.

On the other hand, if HFC-134a compressor oil is used in a CFC-12 A/C system, the durability of the A/C system will be lowered.

- HFC-134a compressor oil is very hygroscopic. When replacing or installing/removing A/C parts, immediately isolate the oil from atmosphere using a plug or tape. In order to avoid moisture, store the oil in a container with its cap tightly closed.

3. REFRIGERANT

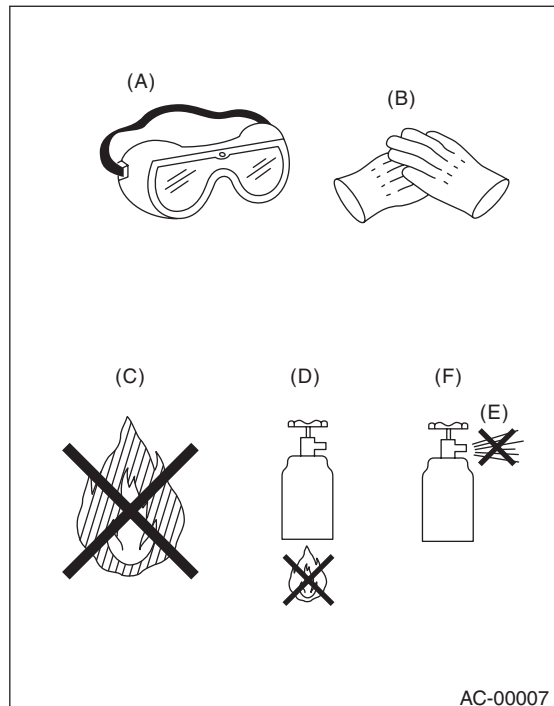
- The CFC-12 refrigerant cannot be used in the HFC-134a A/C system. The HFC-134a refrigerant also cannot be used in the CFC-12 A/C system.
- If an incorrect or no refrigerant is used, it will result in poor lubrication and the compressor itself may be damaged.

4. HANDLING OF REFRIGERANT

- The refrigerant boils at approx. -30°C (-22°F). When handling it, be sure to wear protective goggles and protective gloves. Direct contact of the refrigerant with skin may cause frostbite.

If the refrigerant gets into your eye, avoid rubbing your eyes with your hands. Wash your eye with plenty of water, and receive medical treatment from an eye doctor.

- Do not heat a service can. If a service can is directly heated, or put into boiling water, the inside pressure will become extremely high. This may cause the can to explode. If a service can must be warmed up, use hot water in 40°C (104°F) max.
- Do not drop or impact a service can. (Observe the precautions and operation procedure described on the refrigerant can.)
- When the engine is running, do not open the high-pressure valve of manifold gauge. The high-pressure gas will back-flow resulting in an explosion of the can.
- Provide good ventilation and do not work in a closed area.
- In order to prevent from global warming, avoid releasing HFC-134a into the atmosphere. Using a refrigerant recovery system, discharge and reuse it.



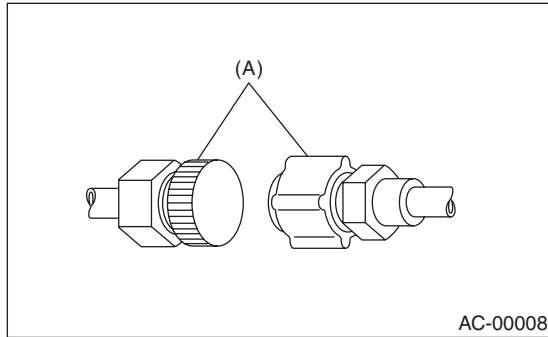
- (A) Goggles
- (B) Gloves
- (C) Avoid open flame
- (D) No direct heat on container
- (E) Do not discharge
- (F) Loosen

General Description

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

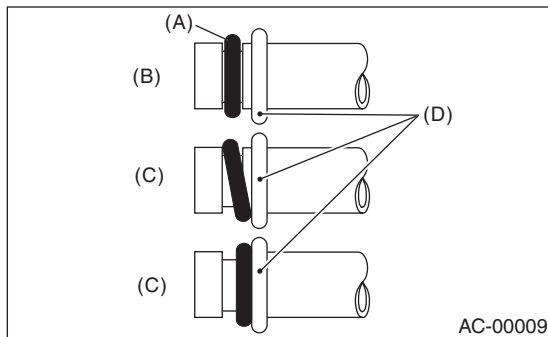
5. O-RING CONNECTIONS

- Always use a new O-ring.
- In order to keep the O-rings free of lint which will cause a refrigerant gas leak, perform operations without gloves and cloth.
- Apply compressor oil to O-rings to avoid sticking, before installation.
- Use a torque wrench to tighten the O-ring fittings. Over-tightening will damage the O-ring and tube end distortion.
- If the operation is interrupted before completing a pipe connection; recap the tubes, components and fittings with a plug or tape to prevent dirt from entering.



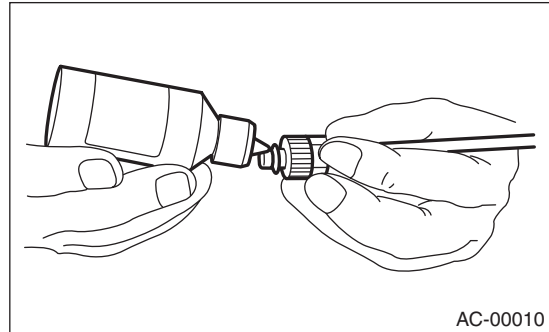
(A) Seal

- Visually check the surfaces and mating surfaces of O-rings, threads and connecting points. If a failure is found, replace the applicable parts.
- Install the O-rings straight against the groove of the tube.



- (A) O-ring
- (B) OK
- (C) NG
- (D) Groove

- Use oil specified in the service manual to lubricate the O-rings. Apply oil to the top and sides of O-rings before installation. Apply the oil to the area including the O-rings and tube beads.



- After tightening, use a clean cloth to remove the excess oil from the connections and any oil which may have run on the vehicle body or other parts.
- If any leakage is suspected after tightening, do not further tighten the connections, but disconnect the connections, remove the O-rings, and check the O-rings, threads, and connections.

D: PREPARATION TOOL

CAUTION:

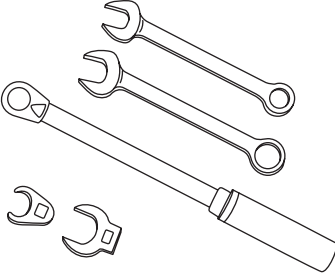
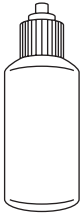
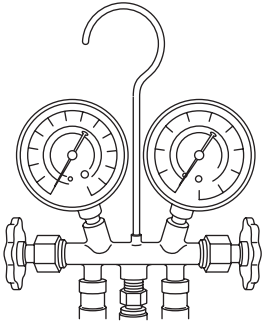
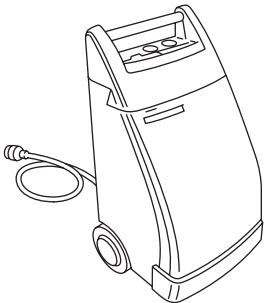
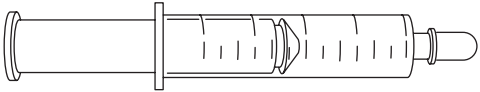
When working on vehicles with HFC-134a system, only use HFC-134a specified tools and parts. Do not mix with those of CFC-12. If HFC-134a and CFC-12 refrigerant or compressor oil is mixed, it will result in poor lubrication and the compressor itself may be destroyed.

In order to prevent the mixture of HFC-134a and CFC-12 parts and liquid, the tool and screw type and the type of service valves used are different. The gas leak detectors for the HFC-134a and CFC-12 systems must also not be interchanged.

	HFC-134a	CFC-12
Tool & screw type	Millimeter size	Inch size
Valve type	Quick joint type	Screw-in type

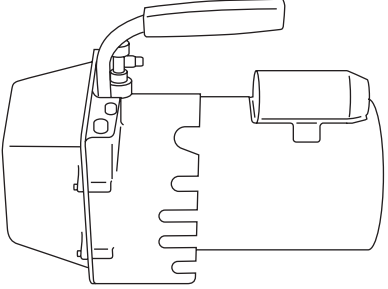
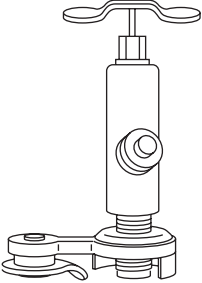
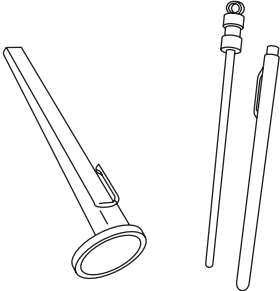
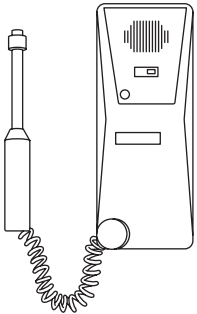
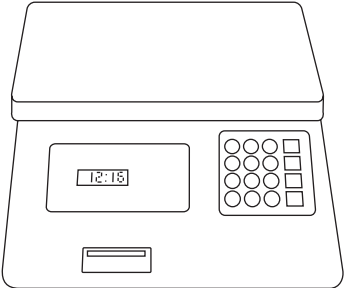
General Description

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

Description	Tools and Equipment
 <p style="text-align: right;">AC-00213</p>	<p>Wrench</p> <p>Various WRENCHES will be required to service any A/C system. A 7 to 40 N-m (0.7 to 4.1 kg-m, 5 to 30 ft-lb) torque wrench and various crow-foot wrenches will be needed. Open end or flare nut wrenches will be needed to hold the tube and hose fittings.</p>
 <p style="text-align: right;">AC-00012</p>	<p>Applicator bottle</p> <p>A small APPLICATOR BOTTLE is recommended to apply refrigerant oil to the various parts. It can be available at a hardware or drug store.</p>
 <p style="text-align: right;">AC-00013</p>	<p>Manifold gauge set</p> <p>A MANIFOLD GAUGE SET (with hoses) can be obtained at either a refrigerant supplier or an automotive equipment supplier.</p>
 <p style="text-align: right;">AC-00014</p>	<p>Refrigerant recovery system</p> <p>A REFRIGERANT RECOVERY SYSTEM is used for the recovery and reuse of A/C system refrigerant after contaminants and moisture have been removed from the refrigerant.</p>
 <p style="text-align: right;">AC-00015</p>	<p>Syringe</p> <p>A graduated plastic SYRINGE will be needed to add oil into the system again. A syringe can be available at a pharmacy or drug store.</p>

General Description

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

Description	Tools and Equipment
 <p>AC-00016</p>	<p>Vacuum pump</p> <p>A VACUUM PUMP (in good working condition) is necessary, and may be obtained from either a refrigerant supplier or an automotive equipment supplier.</p>
 <p>AC-00017</p>	<p>Can tap</p> <p>A CAN TAP for the 397 g (14 oz.) can is available at an automotive equipment supplier.</p>
 <p>AC-00018</p>	<p>Thermometer</p> <p>Pocket THERMOMETERS are available from either industrial hardware stores or commercial refrigeration supply houses.</p>
 <p>AC-00019</p>	<p>Electronic leak detector</p> <p>An ELECTRONIC LEAK DETECTOR can be available at either a specialty tool supplier or an A/C equipment supplier.</p>
 <p>AC-00020</p>	<p>Weight scale</p> <p>A WEIGHT SCALE such as an electronic charging scale or a bathroom scale with digital display will be needed, if a 13.6 kg (30 lb) refrigerant container is used.</p>

Refrigerant Pressure with Manifold Gauge Set

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

2. Refrigerant Pressure with Manifold Gauge Set

A: PROCEDURE

- 1) Place the vehicle in the shade and windless condition.
- 2) Open the front hood.
- 3) Connect the manifold gauge set.
- 4) Open all windows and close all doors.
- 5) Increase the engine to 1,500 rpm.
- 6) Turn on the A/C switch.
- 7) Turn the temperature control switch to MAX COOL.

- 8) Put in RECIRC position.
- 9) Turn the blower control switch to HI.
- 10) Read the gauge.

Standard:

Low pressure:

127 — 196 kPa
(1.3 — 2.0 kg/cm², 18 — 28 psi)

High pressure:

1,471 — 1,667 kPa
(15 — 17 kg/cm², 213 — 242 psi)

Ambient temperature:

30 — 35°C (86 — 95°F)

B: INSPECTION

Symptom	Probable cause	Repair order
High-pressure side is unusually high.	<ul style="list-style-type: none"> • Defective condenser fin motor • Clogged condenser fin • Too much refrigerant • Air inside the system • Defective receiver dryer 	<ul style="list-style-type: none"> • Replace the fan motor. • Clean the condenser fin. • Discharge refrigerant. • Replace the receiver dryer. • After evacuating again, charge an appropriate amount of refrigerant.
High-pressure side is unusually low.	<ul style="list-style-type: none"> • Defective compressor • Not enough refrigerant • Clogged expansion valve • Expansion valve frozen temporarily by moisture. 	<ul style="list-style-type: none"> • Replace the compressor. • Check for leaks. • Replace the expansion valve. • Fully evacuate the expansion valve.
Low-pressure side is unusually high.	<ul style="list-style-type: none"> • Defective compressor • Defective expansion valve • Too much refrigerant 	<ul style="list-style-type: none"> • Replace the compressor. • Replace the expansion valve. • Discharge refrigerant.
Low-pressure side is unusually low.	<ul style="list-style-type: none"> • Not enough refrigerant • Clogged expansion valve • Expansion valve frozen temporarily by moisture. • Saturated receiver dryer 	<ul style="list-style-type: none"> • Check for leaks. • Replace the expansion valve. • Replace the receiver dryer.

Refrigerant Recovery Procedure

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

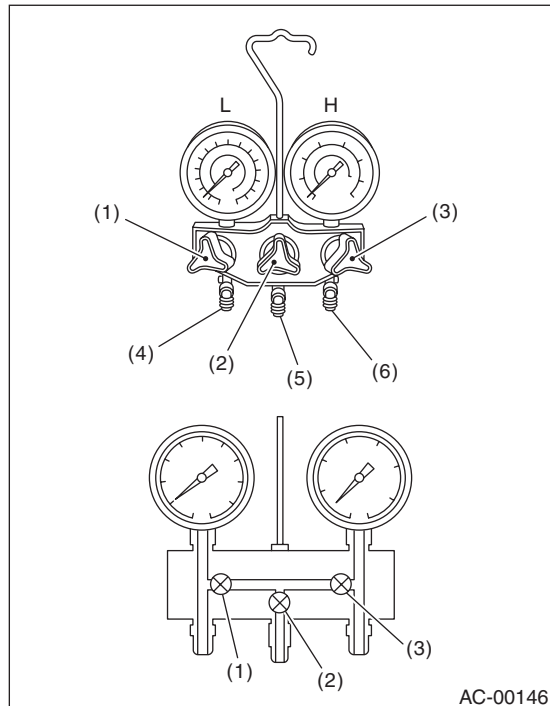
3. Refrigerant Recovery Procedure

A: PROCEDURE

CAUTION:

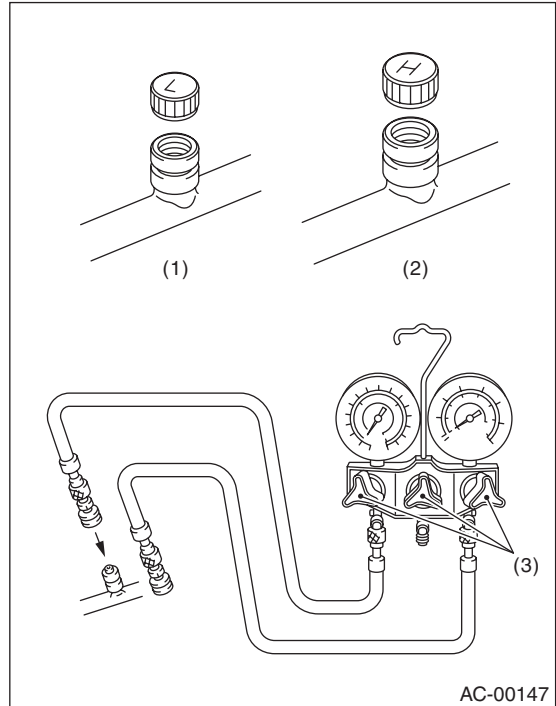
- During operation, be sure to wear protective goggles and protective gloves.
- Connect the refrigerant recovery system with the manifold gauge set set to discharge the refrigerant from the A/C system and reuse it.
- When reusing the discharged refrigerant, keep service cans on hand. Because the recovery rate with the recovery system is approx. 90%, service cans are necessary to charge the refrigerant.
- Follow the detailed operation procedure described in the operation manual attached to the refrigerant recovery system.

- 1) Perform the compressor oil return operation. <Ref. to AC-24, PROCEDURE, Compressor Oil.>
- 2) Stop the engine.
- 3) Make sure the valves on low-/high-pressure sides of manifold gauge set are fully closed.



- L: Low pressure gauge
- H: High-pressure gauge
- (1) Low pressure valve
- (2) Vacuum pump valve
- (3) High pressure valve
- (4) For low pressure
- (5) For vacuum pump
- (6) For high pressure

- 4) Install the low-/high-pressure hoses to the service ports on the low-/high-pressure sides of the vehicle respectively.



- (1) Low-pressure side service port
- (2) High-pressure side service port
- (3) Close

- 5) Connect the center hose to the refrigerant recovery system.
- 6) Follow the operation manual to activate the refrigerant recovery system.

Refrigerant Charging Procedure

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

4. Refrigerant Charging Procedure

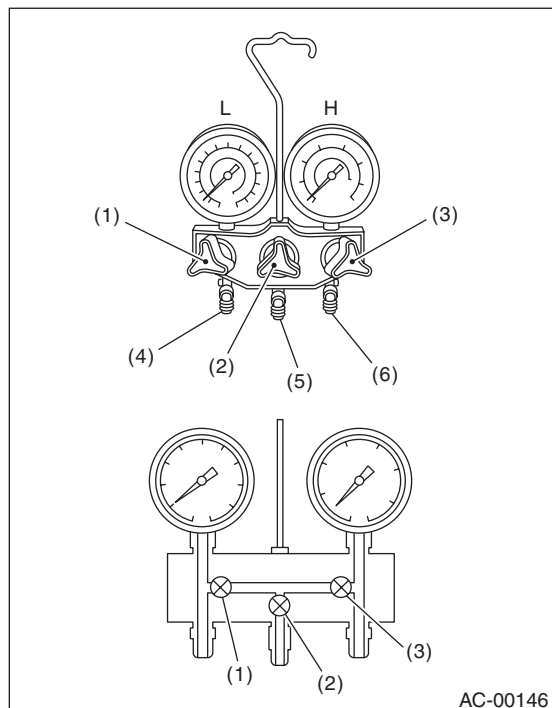
A: PROCEDURE

CAUTION:

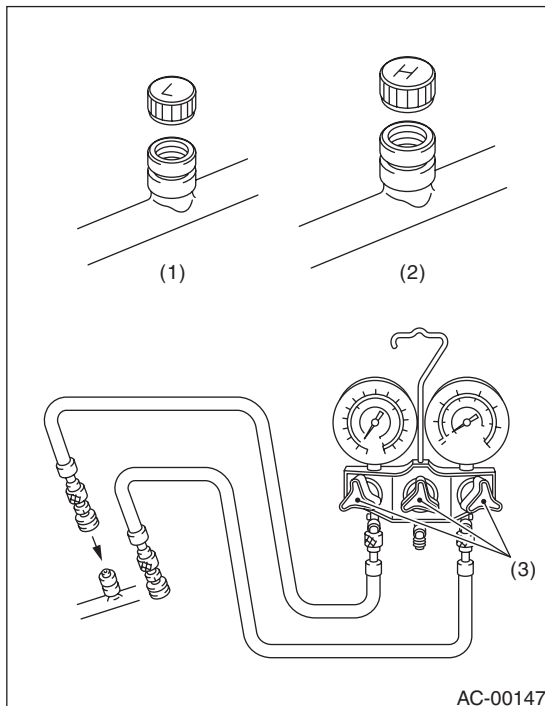
- During operation, be sure to wear safety goggles and protective gloves.
- If air is mixed in refrigeration cycle, poor cooling may result, and also if moisture is mixed in refrigeration cycle, clogging (freezing) or rust may result.

Before charging the refrigerant, evacuate the system using vacuum pump to remove air and moisture in the system. Moisture can be evaporated and removed easily even at normal temperature, if the system is evacuated using vacuum pump.

1) Close all valves of the manifold gauge.



2) Install the low-/high-pressure hoses to the service ports on the vehicle.



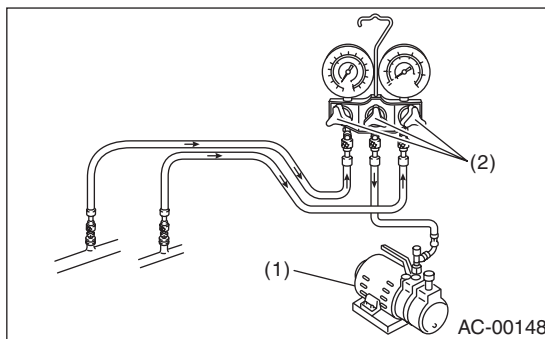
- (1) Low-pressure side service port
- (2) High-pressure side service port
- (3) Close

CAUTION:

Be sure that the hoses are securely connected.

3) Connect the center manifold hose of the manifold gauge to the vacuum pump.

4) Operate the vacuum pump, then open the low-/high-pressure sides of the valve. Next, open the center manifold hose valve to begin vacuuming.



- (1) Vacuum pump
- (2) Open

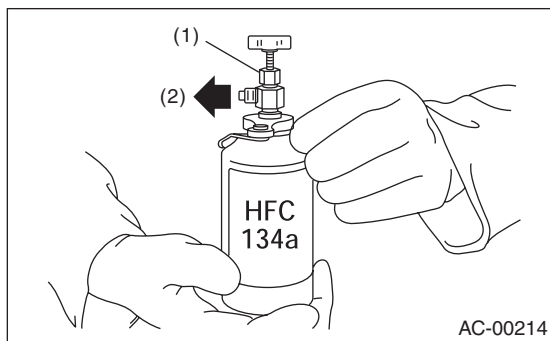
CAUTION:

Be sure to evacuate the system using vacuum pump.

Refrigerant Charging Procedure

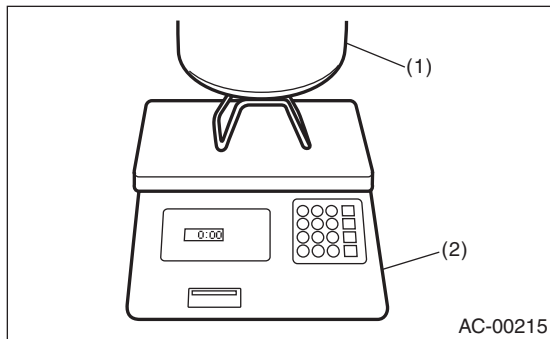
HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

- 5) After 5 minutes of evacuation, when the reading of the low pressure gauge is 100.0 kPa (750 mm-Hg, 29.5 inHg) or higher, close the valves on the center manifold hose and stop the vacuum pump.
- 6) Keep the status for 5 to 10 minutes after closing both the low pressure side and high pressure side valves, then check if there is any change in the low pressure gauge indicator. When the gauge indicator changes, it is a sign of leakage. Check and repair the connections of the pipe and hose. After repairing fault, repeat from step 1).
- 7) If there is a leak, continue vacuuming for another 20 to 30 minutes.
- 8) Close all the valves and stop the vacuum pump.
- 9) Following the can tap operation manual to install it to the refrigerant can.



- (1) Tap valve
- (2) Center manifold hose

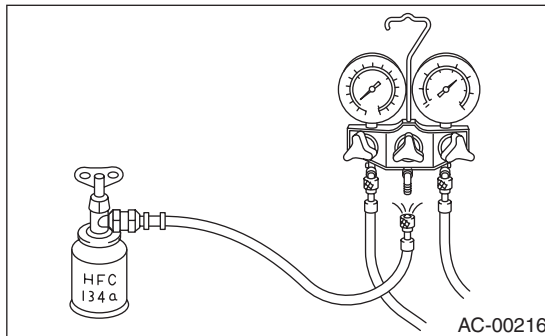
- 10) Disconnect the center manifold hose from the vacuum pump, and connect the hose to the tap valve.
- 11) When a refrigerant recovery container is used, measure the refrigerant amount in use using a weight scale. Then, connect with the center manifold hose.



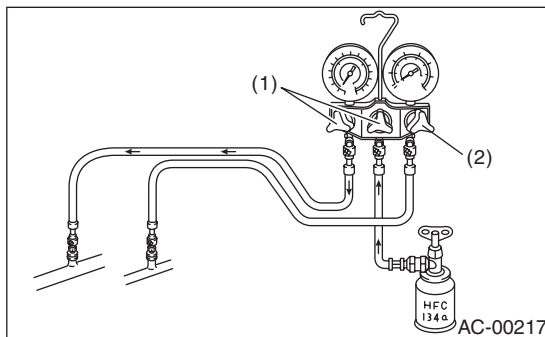
- (1) Refrigerant recovery container
- (2) Weight scale

- 12) Open the valve on the HFC-134a source.

- 13) Loosen the center manifold hose connection on the manifold gauge set (if applicable, press a purge valve on the manifold gauge) only for a couple of seconds to allow the air in the center manifold hose to be bled by the refrigerant pressure.



- 14) Open the high pressure side valve and the low pressure side valve on the manifold gauge and fill the coolant.



- (1) Open
- (2) Open

CAUTION:

When starting the engine and filling, do not open the high pressure side valve. Always make sure to fill from the lower pressure side.

- 15) Close all valves when the gauge indicator reaches 200 kPa (1,500 mmHg, 59.1 inHg).
- 16) Using a leak tester, check the system for coolant leaks.
- 17) After checking for coolant leaks, fill the coolant to the prescribed level.
- 18) If the HFC-134a source is empty, close all valves, close the valve on the can tap, and replace the empty source with a new part. After replacing HFC-134a source with a new part, and purging the air, restart the work.
- 19) If the filling efficiency of the coolant worsens, close all valves.
- 20) Check that the valves on low-/high-pressure sides are closed. Start the engine with the A/C switch OFF.
- 21) To prevent damaging the compressor, turn the A/C switch ON and OFF several times quickly.

Refrigerant Charging Procedure

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

22) Set up the vehicle to the following status:

CAUTION:

When starting the engine and filling, do not open the high pressure side valve. Always make sure to fill from the lower pressure side.

- A/C switch ON
- Engine running at 1,500 rpm
- Blower speed setting to "HI"
- Temperature setting to "MAX COOL"
- Air inlet setting to "RECIRC"
- Window open

23) Open the low pressure side valve and fill the coolant to the prescribed level.

24) After filling the coolant, close all valves and remove the hose from the service port.

25) Mount the cap to the service port.

Refrigerant Leak Check

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

5. Refrigerant Leak Check

A: INSPECTION

1) Operate the A/C system for approx. 10 minutes, and check that the high-side pressure shows at least 690 kPa (7.03 kg/cm², 100 psi). Then stop the engine to start the leak test.

2) Starting from the connection between high-pressure pipe and evaporator, check the system for leaks along the high-pressure side through the compressor. The following items must be checked thoroughly.

3) Check the joint and seam between pressure switch (triple pressure switch) and high-pressure pipe.

4) Check the connections between condenser and pipes, and welded joints on the condenser.

The leak tester may detect the oil on the condenser fins as a leak.

5) Check the joint between compressor and hoses.

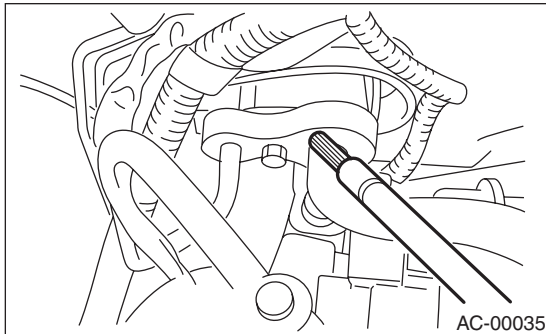
6) Check the machined area of compressor and other joints on the compressor.

7) Check the compressor shaft seal at the area near the center of compressor clutch pulley.

Some shaft seals show a slight amount of leakage about 10 g (0.4 oz) per year. This is not a problem.

8) Starting from the connection between low-pressure pipe and evaporator, check the system for leakage along the low-pressure side through the compressor. The following items must be checked thoroughly.

- Connection between 2 parts
- Connection between pipe and plate

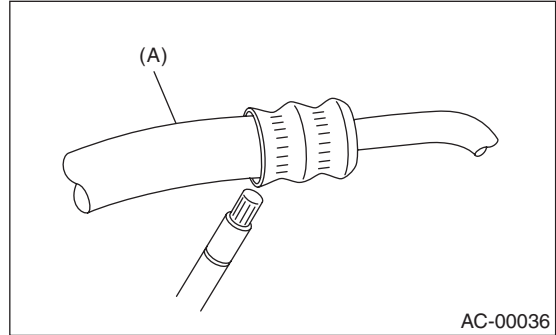


9) Visually check the rubber area of the flexible hose for cracks.

Check the entire length of the flexible hose, especially the connection with the metal hose end.

CAUTION:

Carefully check the external surface of hoses and tubes at approx. 25 mm (0.98 in) per second.

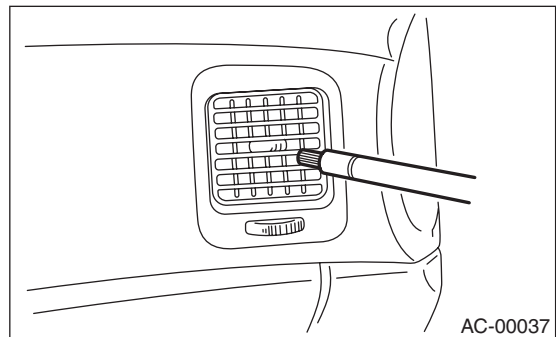


(A) Flexible hose

10) Disconnect the drain hose from heater case, and check the hose end for at least 10 seconds.

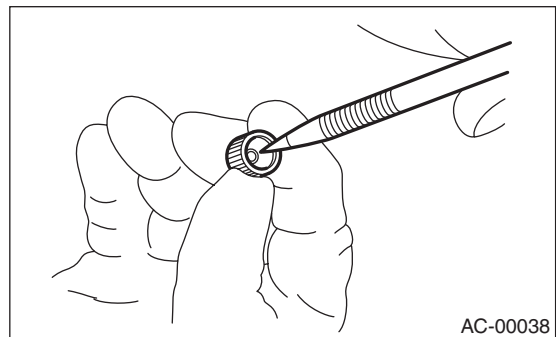
After the test is finished, reconnect the drain hose.

11) Turn the ignition key to the ON position, and run the blower at high speed for approx. 1 minute. Stop the blower to check the ventilation grille on the instrument panel. While moving the tester closer to the grille, run the blower for 1 or 2 seconds, then stop it. Check the grille at that point for at least 10 seconds.



12) Check the valve in the service port.

13) Visually check the rubber seal in the service port cap.



Compressor Oil

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

6. Compressor Oil

A: PROCEDURE

NOTE:

Before making repairs, conduct the oil return operation to return the compressor oil to the compressor in circulation with the refrigerant.

- 1) Increase the engine to 1,500 rpm.
- 2) Turn on the A/C switch.
- 3) Turn the temperature control switch to MAX COOL.
- 4) Put in RECIRC position.
- 5) Turn the blower control switch to HI.
- 6) Leave in this condition for 10 minutes.

B: REPLACEMENT

NOTE:

- After replacing the component, add an appropriate amount of compressor oil.
- When replacing the compressor, the new compressor will already have the specified amount of oil in it. Install the new compressor after removing the same amount of oil that is remaining in the compressor removed.

Replacement parts	Amount of oil replenishment
Evaporator	Approximately 50 cm ³ (1.7 US fl oz, 1.8 Imp fl oz)
Condenser	Approximately 30 cm ³ (1.0 US fl oz, 1.1 Imp fl oz)
Hose layout	Approximately 10 cm ³ (0.4 US fl oz, 0.4 Imp fl oz)
Receiver drier	Approximately 10 cm ³ (0.4 US fl oz, 0.4 Imp fl oz)

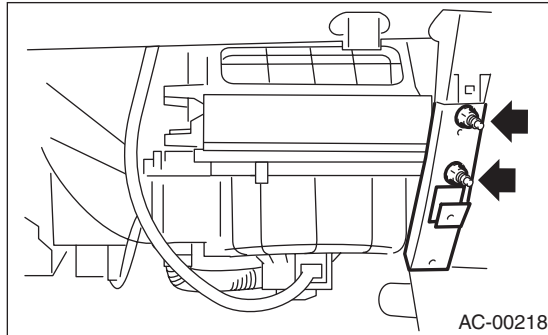
Blower Motor Unit Assembly

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

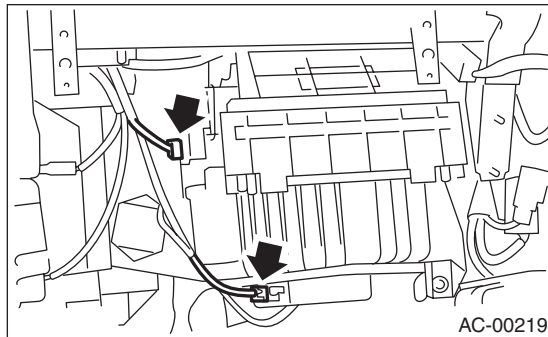
7. Blower Motor Unit Assembly

A: REMOVAL

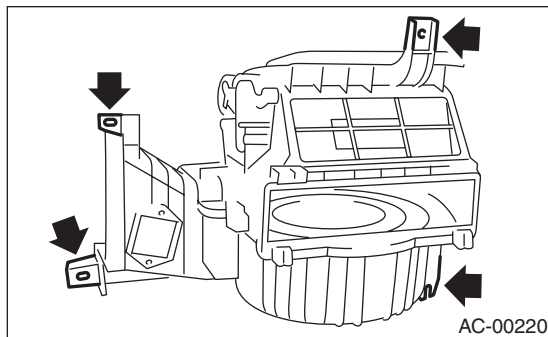
- 1) Disconnect the ground cable from the battery.
- 2) Remove the glove box. <Ref. to EI-36, REMOVAL, Glove Box.>
- 3) Loosen the nut to remove support beam stay.



- 4) Disconnect the connectors of the blower motor and intake actuator register.



- 5) Loosen the bolt and nut to remove blower motor unit assembly.



B: INSTALLATION

Install in the reverse order of removal.

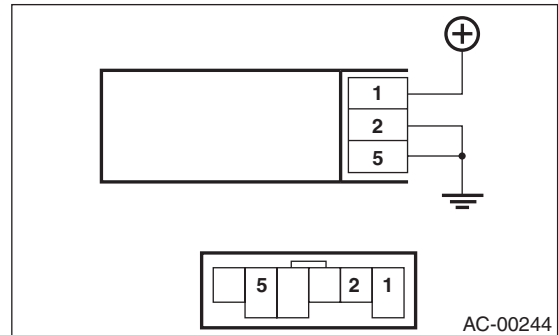
Tightening torque:

Refer to “COMPONENT” of “General Description”. <Ref. to AC-5, HEATER COOLING UNIT, COMPONENT, General Description.>
<Ref. to AC-7, BLOWER MOTOR UNIT, COMPONENT, General Description.>

C: INSPECTION

Inspection of auto A/C brushless motor operation.

Connect the motor connector terminal 1 from the battery to the positive (+) lead and terminals 2 and 5 at the same time to the negative (-) lead. Make sure the motor runs smoothly.



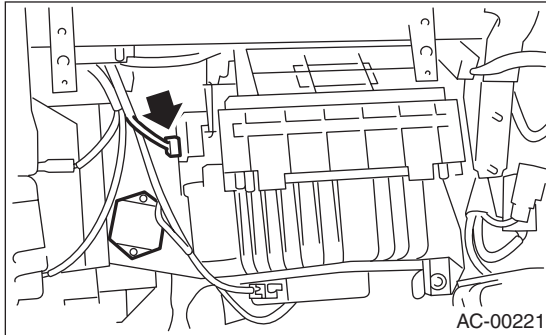
Blower Resistor (Manual A/C Model)

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

8. Blower Resistor (Manual A/C Model)

A: REMOVAL

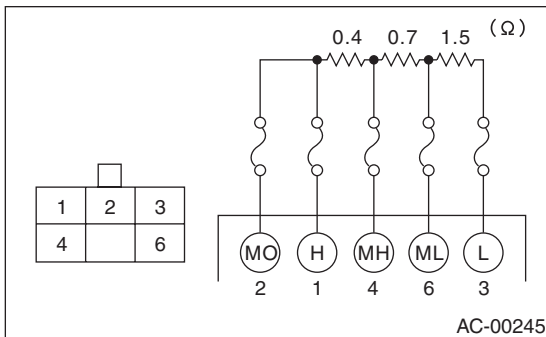
- 1) Remove the glove box. <Ref. to EI-36, REMOVAL, Glove Box.>
- 2) Disconnect the blower resistor connector.
- 3) Loosen the two screws and remove the blower resistor.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION



Measure the blower resistor resistance.

Terminal No.	Standard
2 — 1	Approximately 0 Ω
2 — 4	Approximately 0.4 Ω
2 — 6	Approximately 1.1 Ω
2 — 3	Approximately 2.6 Ω

If NG, replace the blower resistor.

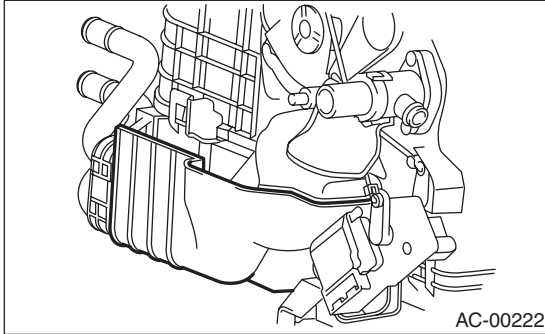
Heater Core

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

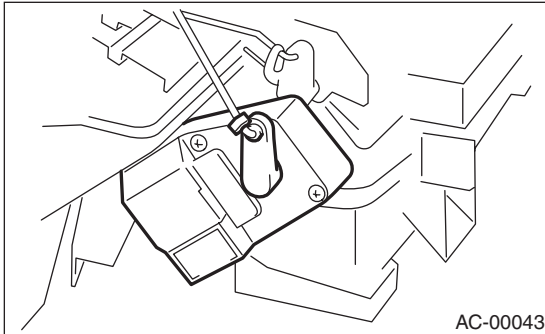
9. Heater Core

A: REMOVAL

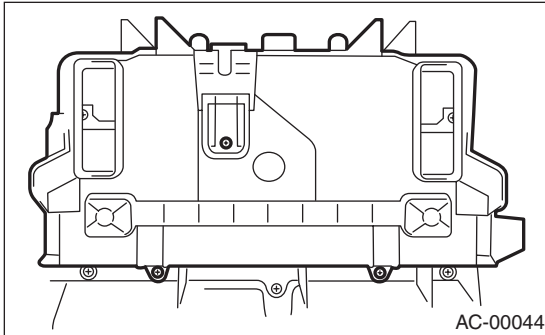
- 1) Remove the heater and cooling unit. <Ref. to AC-32, REMOVAL, Heater and Cooling Unit.>
- 2) Open the heater core pipe cover.



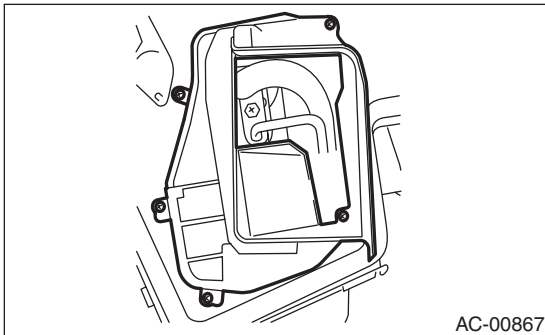
- 3) Loosen the screws to remove the mode actuator.



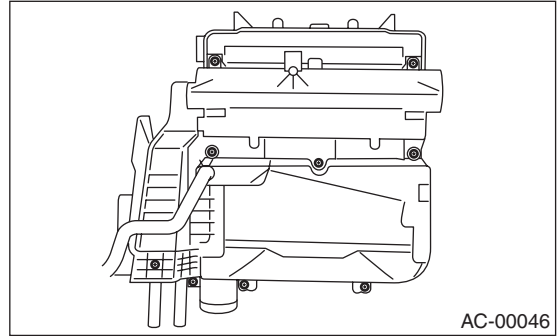
- 4) Loosen the screws to remove the foot duct.



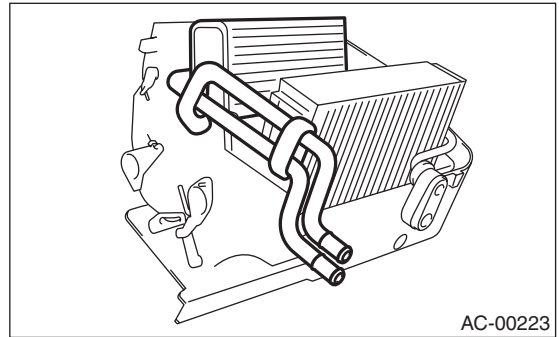
- 5) Loosen the screws to remove evaporator cover.



- 6) Loosen the screws to remove lower case.



- 7) Remove the heater core.



B: INSTALLATION

Install in the reverse order of removal.

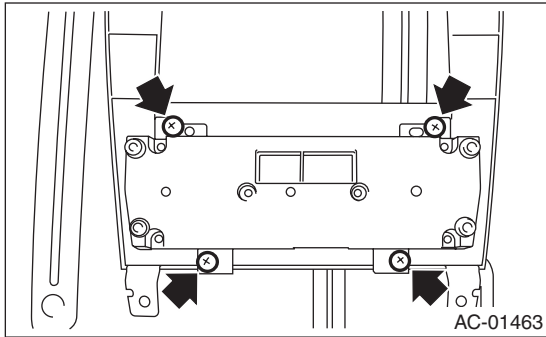
Control Unit

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

10. Control Unit

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) For manual A/C, remove the mode cable and air mix cable from the each link of the heater unit.
- 3) Remove the console front cover. <Ref. to EI-39, REMOVAL, Instrument Panel Assembly.>
- 4) Loosen the four screws on the backside of the center console panel and remove the control unit.



B: INSTALLATION

Install in the reverse order of removal.

Compressor

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

11. Compressor

A: INSPECTION

1. MAGNETIC CLUTCH CLEARANCE

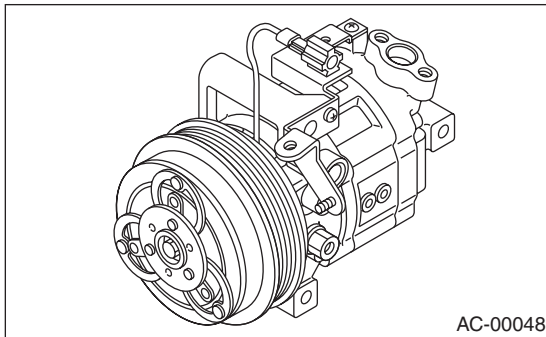
Check the clearance of entire circumference around the drive plate and pulley.

Standard:

0.3 — 0.6 mm (0.0118 — 0.0236 in)

2. MAGNETIC CLUTCH OPERATION

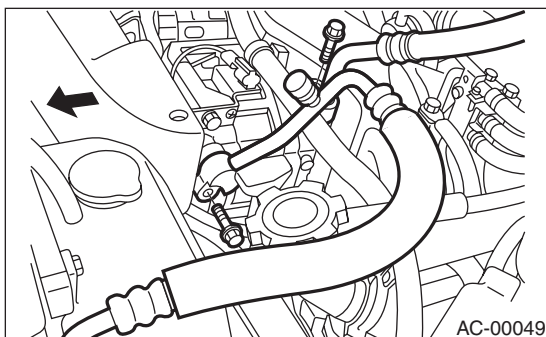
- 1) Disconnect the compressor connector.
- 2) Connect the battery positive (+) terminal to the No. 3 terminal of the compressor connector.



- 3) Confirm the magnet clutch engagement.
If NG, replace the compressor.

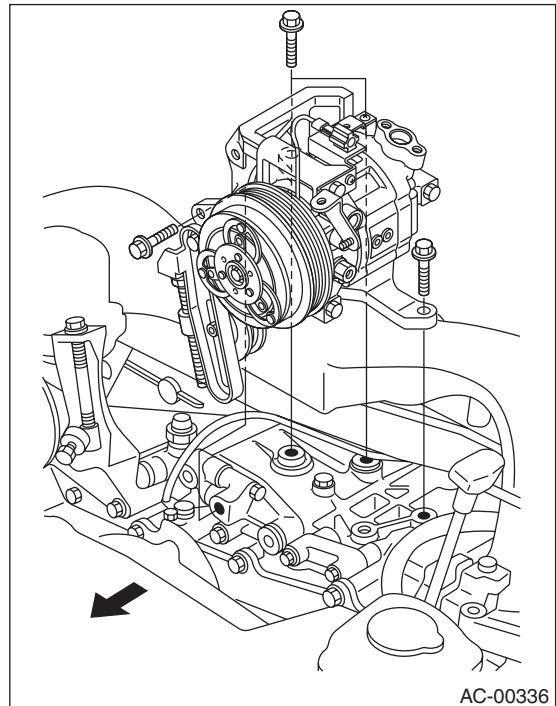
B: REMOVAL

- 1) Perform the compressor oil return operation. <Ref. to AC-24, PROCEDURE, Compressor Oil.>
- 2) Turn the A/C switch to OFF and stop the engine.
- 3) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-19, PROCEDURE, Refrigerant Recovery Procedure.>
- 4) Disconnect the ground cable from the battery.
- 5) Remove the V-belts. <Ref. to ME(H4SO)-40, REMOVAL, V-belt.> <Ref. to ME(H4DOTC)-40, REMOVAL, V-belt.>
- 6) Remove the generator. <Ref. to SC (H4SO)-14, REMOVAL, Generator.>
- 7) Remove the low-pressure hose and high-pressure hose.

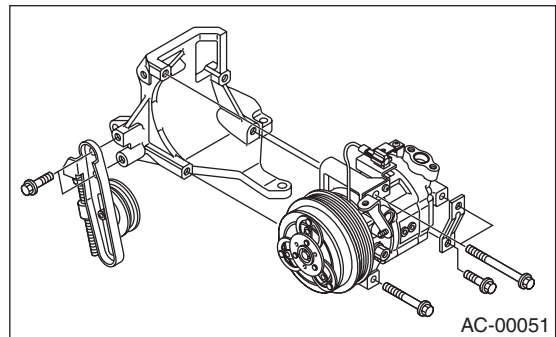


- 8) Disconnect the compressor harness from body harness.

- 9) Loosen the bolts and remove the compressor bracket.



- 10) Loosen the bolts, then remove the bracket from the compressor.



C: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Replace the O-rings on low-/high-pressure hoses with new parts, then apply compressor oil.
- 3) After replacing the compressor, adjust amount of compressor oil. <Ref. to AC-24, PROCEDURE, Compressor Oil.>
- 4) Charge refrigerant. <Ref. to AC-20, PROCEDURE, Refrigerant Charging Procedure.>

Tightening torque:

Refer to "COMPONENT" of "General Description". <Ref. to AC-11, AIR CONDITIONING UNIT, COMPONENT, General Description.> <Ref. to AC-12, COMPRESSOR, COMPONENT, General Description.>

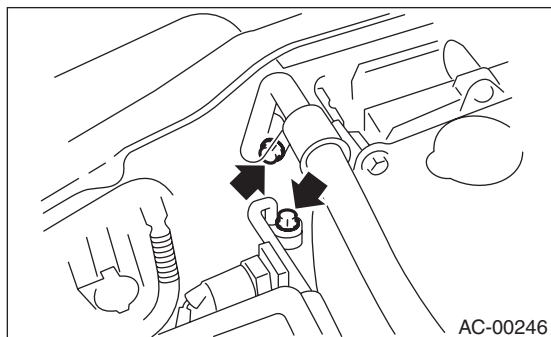
Condenser

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

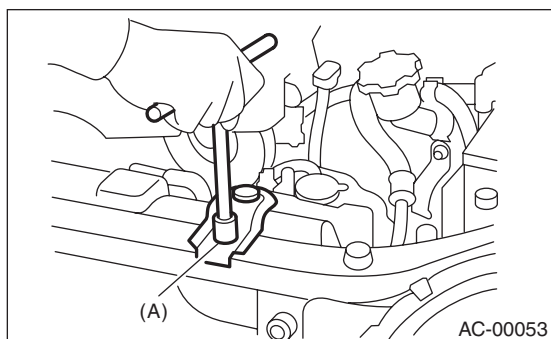
12. Condenser

A: REMOVAL

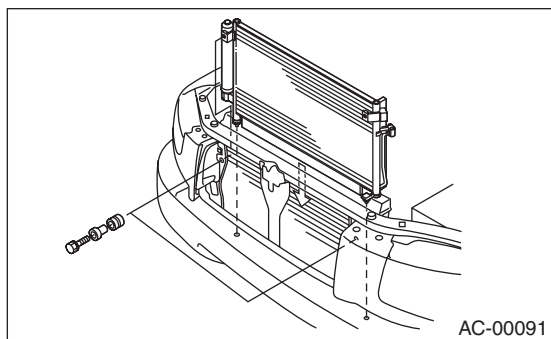
- 1) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-19, PROCEDURE, Refrigerant Recovery Procedure.>
- 2) Disconnect the ground cable from the battery.
- 3) Disconnect the pressure hose and pipe from the condenser.



- 4) Remove the radiator bracket (A).



- 5) Remove two bolts. While lifting condenser, pull it out through space between the radiator and the radiator panel.



CAUTION:

Be careful not to damage the radiator fins and condenser fins. If a damaged fin is found, repair it using a thin screwdriver.

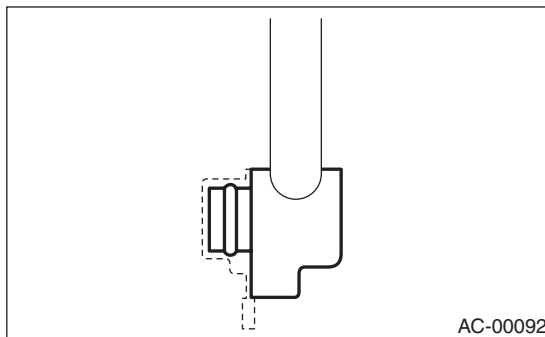
If the condenser is replaced, add appropriate amount of compressor oil to the compressor. <Ref. to AC-24, REPLACEMENT, Compressor Oil.>

B: INSTALLATION

- 1) Install in the reverse order of removal.

CAUTION:

Replace the O-rings on hoses or pipes with new parts, and then apply compressor oil. Confirm that lower guide of condenser fits into holes on radiator panel.



- 2) Charge refrigerant. <Ref. to AC-20, PROCEDURE, Refrigerant Charging Procedure.>

Tightening torque:

Refer to "COMPONENT" of "General Description". <Ref. to AC-11, AIR CONDITIONING UNIT, COMPONENT, General Description.> <Ref. to CO(H4SO)-7, RADIATOR AND ELECTRIC FAN, COMPONENT, General Description.>

C: INSPECTION

- 1) Confirm that no dust or insects are found on the condenser fins. Air-blow or flush fins with water as needed.
- 2) Confirm that no oil leakage from the condenser. If a failure is found, replace the condenser with a new part.

13. Condenser (Sub Fan)

A: REMOVAL

<Ref. to CO(H4SO)-34, REMOVAL, Radiator Main Fan and Fan Motor.>

B: INSTALLATION

<Ref. to CO(H4SO)-37, INSTALLATION, Radiator Main Fan and Fan Motor.>

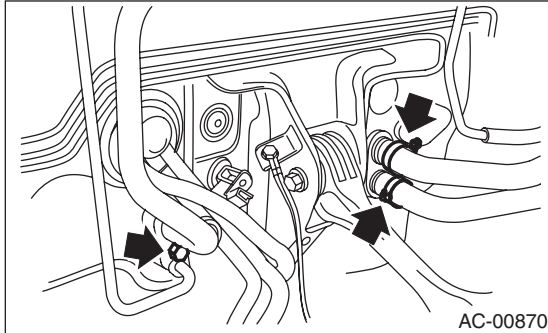
Heater and Cooling Unit

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

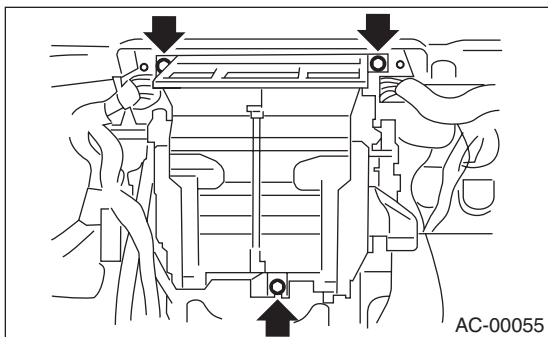
14. Heater and Cooling Unit

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-19, PROCEDURE, Refrigerant Recovery Procedure.>
- 3) Drain LLC from the radiator.
- 4) Remove the bolts securing expansion valve and pipe in engine compartment. Release the heater hose clamps in engine compartment to disconnect the hoses.



- 5) Remove the instrument panel. <Ref. to EI-39, REMOVAL, Instrument Panel Assembly.>
- 6) Remove the support beam.
- 7) Remove the blower motor unit assembly. <Ref. to AC-25, REMOVAL, Blower Motor Unit Assembly.>
- 8) Disconnect the servo motor connector.
- 9) Loosen the bolt and nuts and remove the heater and cooling unit.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Charge refrigerant. <Ref. to AC-20, PROCEDURE, Refrigerant Charging Procedure.>

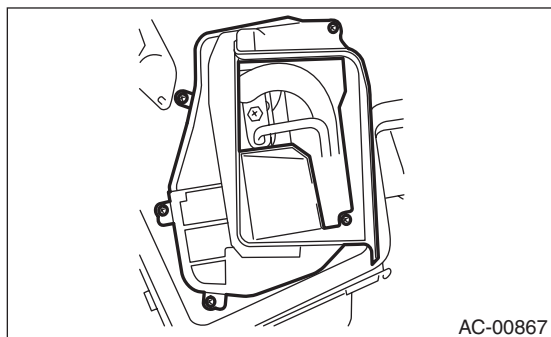
Tightening torque:

Refer to “COMPONENT” of “General Description”. <Ref. to AC-5, HEATER COOLING UNIT, COMPONENT, General Description.>

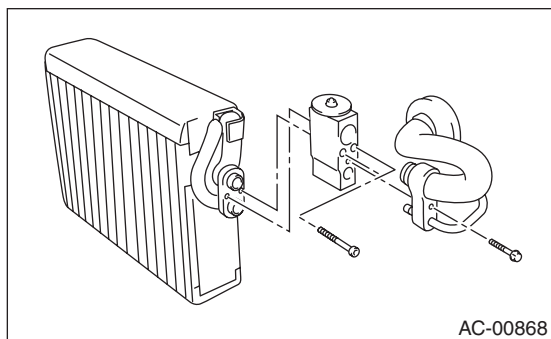
15. Evaporator

A: REMOVAL

- 1) Recover the coolant and disconnect the toe board A/C pipe. <Ref. to AC-19, PROCEDURE, Refrigerant Recovery Procedure.>
- 2) Remove the glove box.
- 3) Remove the blower motor unit assembly. <Ref. to AC-25, REMOVAL, Blower Motor Unit Assembly.>
- 4) Loosen the screws to remove evaporator cover.



- 5) Remove the auto A/C hose in the unit.
- 6) Rotate the evaporator core top portion to the front of the vehicle and the bottom portion to lay over into the compartment, then pull out the heater case to the left side.
- 7) Loosen the two bolts to remove the expansion valve.



CAUTION:

If the evaporator is replaced, add an appropriate amount of compressor oil to evaporator. <Ref. to AC-24, REPLACEMENT, Compressor Oil.>

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Replace the O-rings on the pipes with new parts, and then apply compressor oil.

Hose and Tube

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

16.Hose and Tube

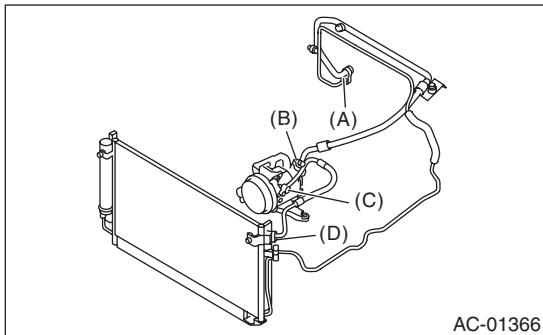
A: REMOVAL

CAUTION:

- When disconnecting/connecting hoses, do not apply an excessive force to them. Confirm that no torsion and excessive tension is charged after installing.

- Seal the disconnected hose with a plug or vinyl tape to prevent dirt from entering.

- 1) Disconnect the ground cable from the battery.
- 2) Using the refrigerant recovery system, discharge refrigerant. <Ref. to AC-19, PROCEDURE, Refrigerant Recovery Procedure.>
- 3) Remove the evaporator unit attaching bolts (A).
- 4) Remove the low-pressure hose attaching bolts (B).
- 5) Disconnect the low-pressure hose from evaporator unit.
- 6) Disconnect the low-pressure hose from compressor.
- 7) Remove the low-pressure hose from vehicle.
- 8) Remove the high-pressure hose attaching bolts (C).
- 9) Disconnect the high-pressure hose from compressor.
- 10) Disconnect the high-pressure hose from condenser.
- 11) Remove the high-pressure hose from vehicle.
- 12) Remove the high-pressure tube attaching bolt (D).
- 13) Remove the high-pressure tube from vehicle.



B: INSTALLATION

CAUTION:

- When disconnecting/connecting hoses, do not apply an excessive force to them. Confirm that no torsion and excessive tension is charged after installing.

- Seal the disconnected hose with a plug or vinyl tape to prevent dirt from entering.

- Replace the O-rings on the hoses or pipes with new parts, and then apply compressor oil.

- 1) Install in the reverse order of removal.
- 2) Charge refrigerant. <Ref. to AC-20, PROCEDURE, Refrigerant Charging Procedure.>

Tightening torque:

Refer to “COMPONENT” of “General Description”. <Ref. to AC-11, AIR CONDITIONING UNIT, COMPONENT, General Description.>

C: INSPECTION

NOTE:

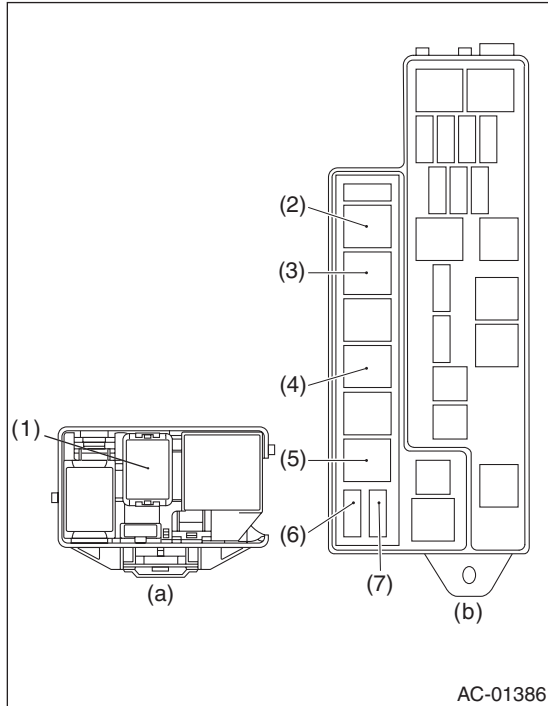
If any cracks, damage, or expansion are found in the hose, replace it with new parts.

Relay and Fuse

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

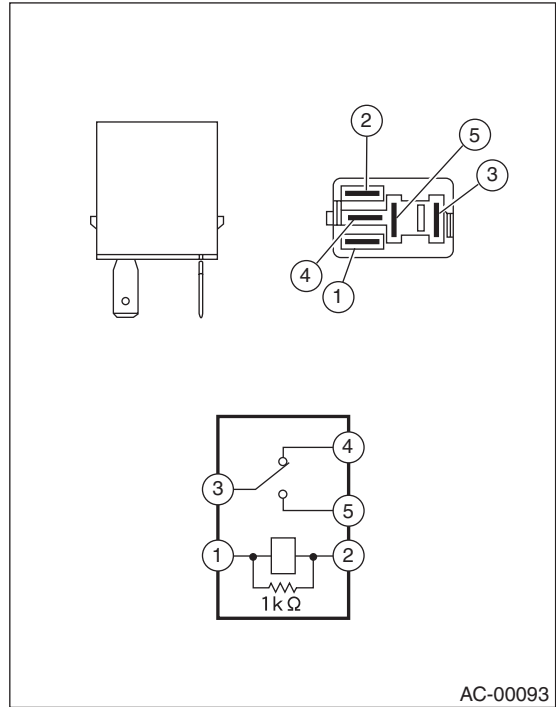
17. Relay and Fuse

A: LOCATION



- (a) Relay holder (Turbo model)
- (b) Main fuse box
- (1) A/C relay (Turbo model)
- (2) Main fan relay
- (3) Sub fan relay
- (4) A/C relay (Non-turbo model)
- (5) Fan mode relay
- (6) Main fan 30A fuse
- (7) Sub fan 30A fuse

B: INSPECTION



- (1) — (2): Continuity exists.
 - (3) — (4): Continuity exists.
 - (3) — (5): Continuity does not exist.
- While applying battery voltage to the terminal between (1) and (2), check continuity between (3) and (5).
If no continuity exists, replace the relay with a new part.

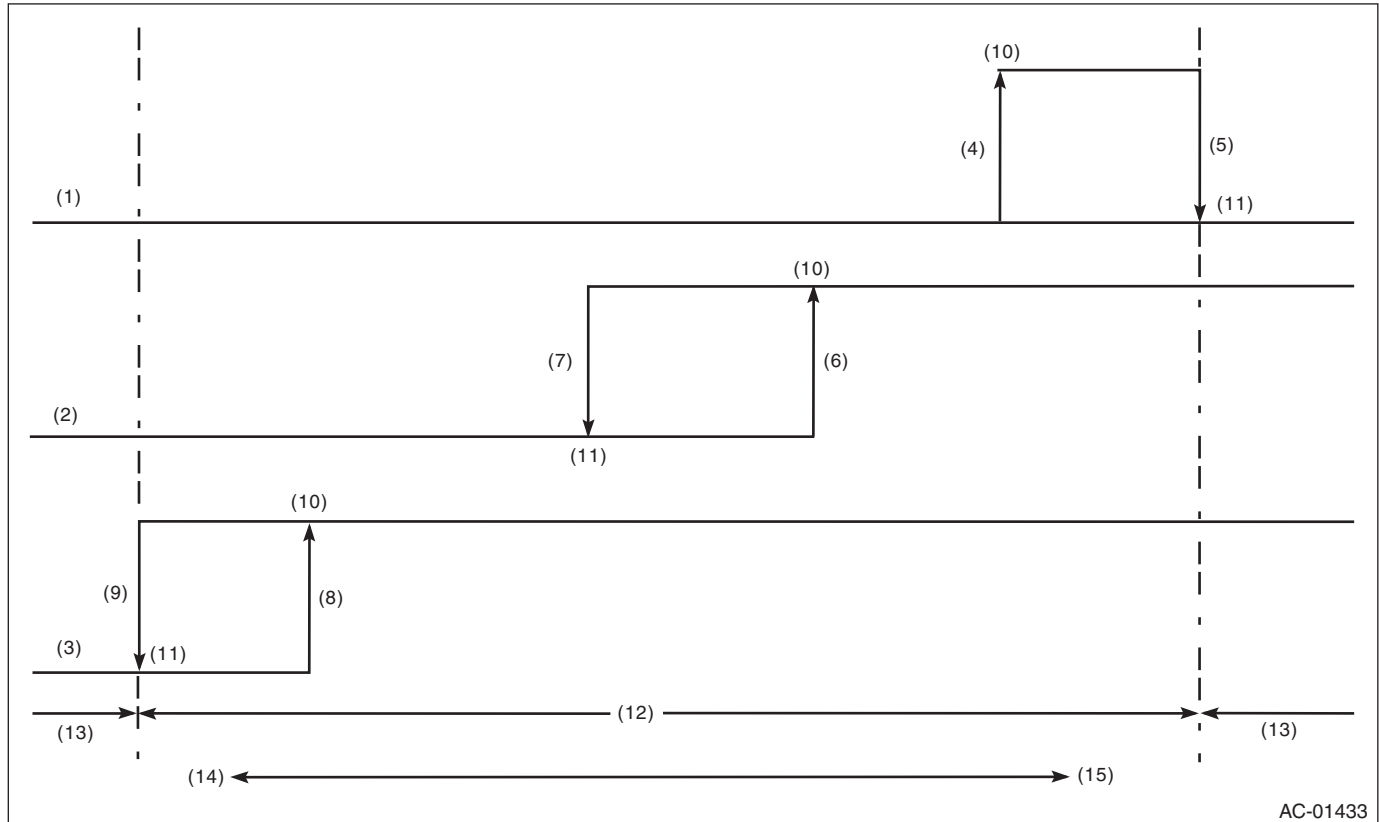
Pressure Switch (Triple Pressure Switch)

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

18. Pressure Switch (Triple Pressure Switch)

A: INSPECTION

- 1) Connect the manifold gauge to the service valve on the high-pressure side.
- 2) Start the air conditioner, and check the operating pressure of switch by turning the compressor (magnet clutch) to ON/OFF. Operation of each switch is as follows.



(1) High pressure switch	(7) 1,370±120 kPa (14±1 kg/cm ² , 199±14 psi)	(10) ON
(2) Middle pressure switch	(8) 206±30 kPa (2.1±0.3 kg/cm ² , 30±4 psi)	(11) OFF
(3) Low pressure switch	(9) 177±25 kPa (1.8±0.3 kg/cm ² , 26±4 psi)	(12) Operative range of compressor
(4) 2,350±200 kPa (24±2 kg/cm ² , 341±28 psi)		(13) Inoperative range of compressor
(5) 2,940±200 kPa (30.0±2 kg/cm ² , 427±28 psi)		(14) Pressure is low
(6) 1,770±100 kPa (18±1 kg/cm ² , 256±14 psi)		(15) Pressure is high

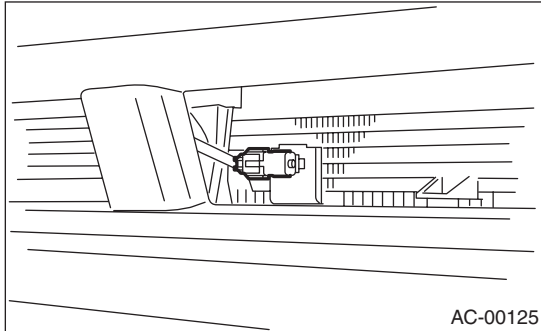
NOTE:

- High pressure switch turns the compressor (magnet clutch) to OFF when the refrigerant pressure becomes extremely high, in order to prevent the evaporator, air conditioner piping and expansion valve from getting damaged or frozen.
- Middle pressure switch effectively controls the radiator fan output by judging high load/low load in normal pressure range.
- Low pressure switch turns the compressor (magnet clutch) to OFF, judging as low refrigerant level when the refrigerant pressure becomes extremely low, in order to prevent the possible seizure when the compressor rotates.

19. Ambient Sensor (Auto A/C Model)

A: REMOVAL

- 1) Open the front hood.
- 2) Disconnect the ground cable from the battery.
- 3) Disconnect the ambient sensor connector.
- 4) Remove the ambient sensor from the radiator lower panel.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

<Ref. to AC(diag)-30, AMBIENT SENSOR, Diagnostic Procedure for Sensors.>

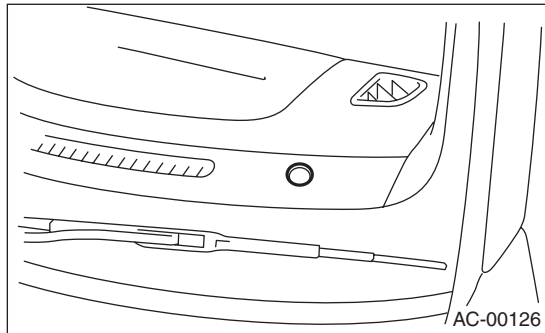
Sunload Sensor (Auto A/C Model)

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

20. Sunload Sensor (Auto A/C Model)

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Disconnect the sunload sensor connector.



CAUTION:

Be careful not to damage the sensors and interior trims when removing.

B: INSTALLATION

Install in the reverse order of removal.

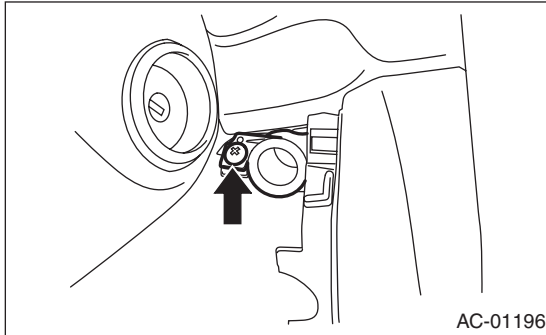
C: INSPECTION

<Ref. to AC(diag)-36, SUNLOAD SENSOR, Diagnostic Procedure for Sensors.>

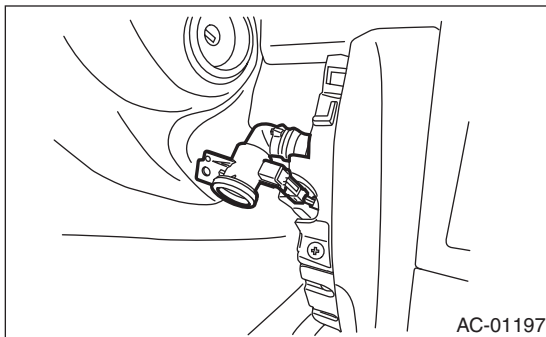
21. In-vehicle Sensor (Auto A/C Model)

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the instrument panel lower cover. <Ref. to EI-39, REMOVAL, Instrument Panel Assembly.>
- 3) Remove the in-vehicle sensor from the instrument panel.



- 4) Disconnect the connector and aspirator hose.



CAUTION:

Be careful not to damage the sensors and interior trims when removing.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

<Ref. to AC(diag)-32, IN-VEHICLE SENSOR, Diagnostic Procedure for Sensors.>

Air Vent Grille

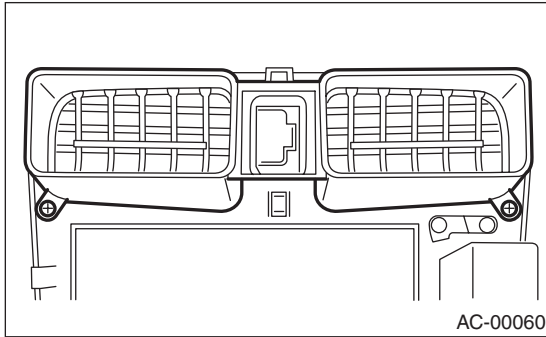
HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

22. Air Vent Grille

A: REMOVAL

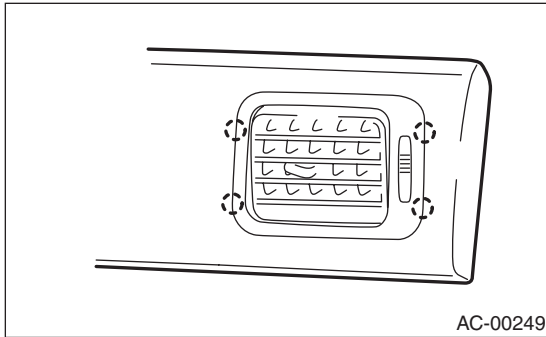
1. CENTER GRILLE

- 1) Disconnect the ground cable from the battery.
- 2) Remove the center console panel. <Ref. to EI-39, REMOVAL, Instrument Panel Assembly.>
- 3) Loosen two screws to remove the center air vent grille.



2. SIDE GRILLE

Remove the side vent grill by prying four points.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

The direction and amount of air should be adjusted smoothly.

The adjustment should be maintained in each position.

23.Heater Duct

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the front seats. <Ref. to SE-7, REMOVAL, Front Seat.>
- 3) Remove the front side sill cover.
- 4) Turn over the floor mat and remove the cover of the part engaging the heater unit, then remove the heater duct.

B: INSTALLATION

Install in the reverse order of removal.

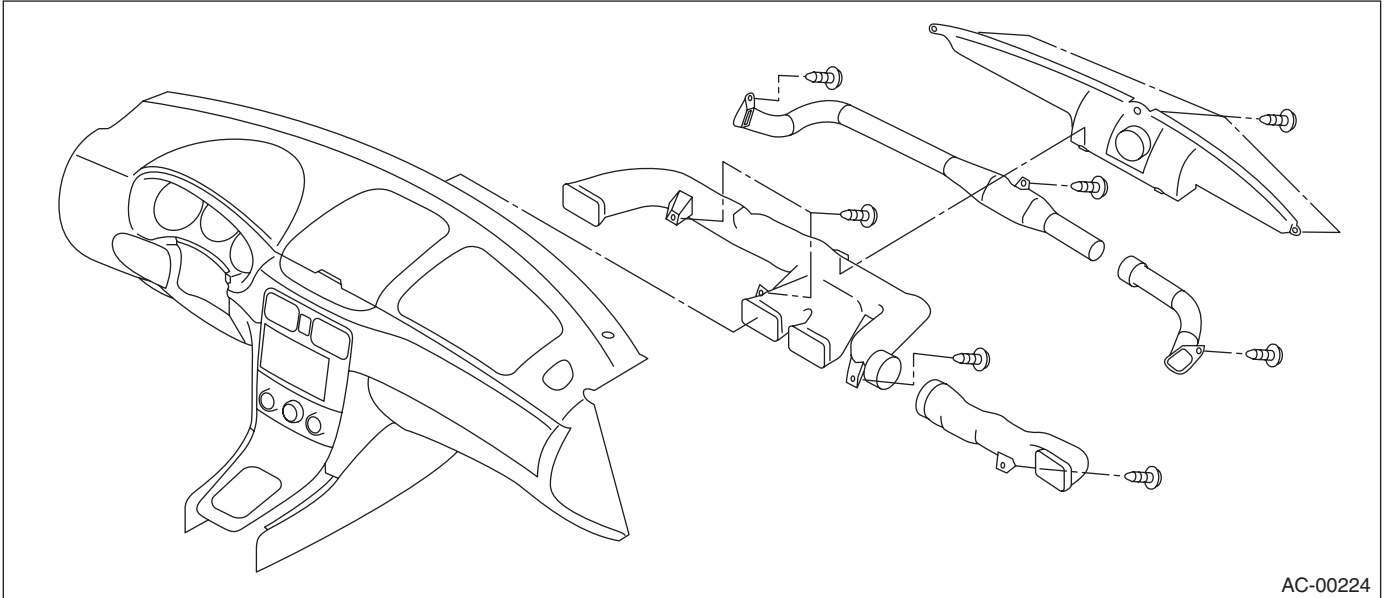
Heater Vent Duct

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

24.Heater Vent Duct

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the instrument panel. <Ref. to EI-39, REMOVAL, Instrument Panel Assembly.>
- 3) Remove the screws.
- 4) Remove the heater vent duct.



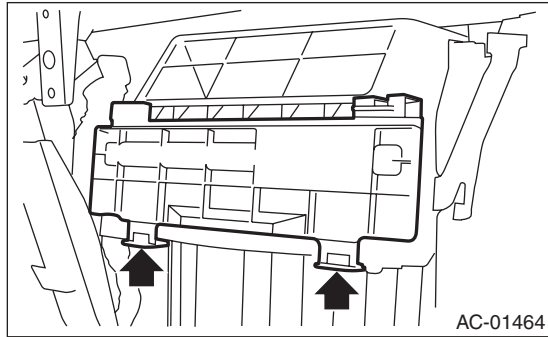
B: INSTALLATION

Install in the reverse order of removal.

25.A/C Filter

A: REPLACEMENT

- 1) Disconnect the ground cable from the battery.
- 2) Remove the glove box. <Ref. to EI-36, REMOV-AL, Glove Box.>
- 3) Remove the A/C filter cover and remove the A/C filter.



- 4) Install in the reverse order of removal.

General Diagnostic Table

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

26. General Diagnostic Table

A: INSPECTION

Symptom		Repair order
Blower motor	Does not run.	Fuse
		Blower motor relay
		Wiring harness
		Blower motor
		Blower motor register (Manual A/C model)
	Noise	Blower motor
Compressor	Does not run.	Refrigerant
		Fuse
		Air conditioning relay
		Wiring harness
		Magnet clutch
		Compressor
		Pressure switch
		A/C switch
	Blower switch	
	Noise	V-belt
Condenser fan	Does not run.	Fuse
		Sub fan relay
		Wiring harness
	Noise	Condenser fan motor
Cold air not emitted.	Refrigerant	
	V-belt	
	Magnet clutch	
	Compressor	
	Pressure switch	
	Blower fan relay, blower motor	
	A/C switch	
	Blower switch	
	Wiring harness	
	Heater duct	
	Heater vent duct	
	Control unit	
	Expansion valve	
	Evaporator	
Air mix actuator (Auto A/C), Temperature adjustment cable (Manual A/C)		
Warm air not emitted.	Engine coolant	
	Aspirator hose	
	Blower switch	
	Air mix actuator (Auto A/C), Temperature adjustment cable (Manual A/C)	
	Heater core	

General Diagnostic Table

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

Symptom	Repair order
Temperature of air from vents does not change.	Wiring harness
	Air mix actuator (Auto A/C), Temperature adjustment cable (Manual A/C)
	Temperature adjustment switch
Unable to switch blow vents.	Wiring harness
	Mode actuator (Auto A/C), Mode switch cable (Manual A/C)
	MODE switch
Unable to switch suction vents.	Wiring harness
	FRESH/RECIRC actuator
	FRESH/RECIRC switch

General Diagnostic Table

HVAC SYSTEM (HEATER, VENTILATOR AND A/C)

Basic Diagnostic Procedure

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

Step	Check	Yes	No
1 START INSPECTIONS. 1) Perform the pre-inspection. <Ref. to AC(diag)-3, INSPECTION, General Description.> 2) Perform the self-diagnosis. <Ref. to AC(diag)-9, OPERATION, Diagnostic Chart for Self-diagnosis.>	Does the self-diagnosis operate?	Go to step 2.	<Ref. to AC(diag)-12, A/C OR SELF-DIAGNOSIS SYSTEMS DO NOT OPERATE, Diagnostics for A/C System Malfunction.>
2 IDENTIFY MALFUNCTION PART. Identify the malfunction part with self-diagnosis.	Can the malfunction part be confirmed?	Repair the malfunctioning part in accordance with each diagnostic chart.	Go to step 3.
3 CHECK COMPARTMENT TEMPERATURE. 1) Turn on the A/C switch. 2) Turn the temperature control dial at maximum cool position. 3) Check the compartment temperature change.	Does the compartment temperature change?	Go to step 4.	<Ref. to AC(diag)-16, COMPARTMENT TEMPERATURE DOES NOT CHANGE, OR A/C SYSTEM DOES NOT RESPOND PROMPTLY, Diagnostics for A/C System Malfunction.>
4 CHECK A/C SYSTEM RESPONSE. Change the temperature setting, and check the response of A/C system.	Does the A/C system respond quickly?	A/C system is normal.	<Ref. to AC(diag)-16, COMPARTMENT TEMPERATURE DOES NOT CHANGE, OR A/C SYSTEM DOES NOT RESPOND PROMPTLY, Diagnostics for A/C System Malfunction.>

General Description

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

2. General Description

A: CAUTION

- 1) Never connect the battery in reverse polarity.
 - Doing so may immediately damage the auto A/C control module.
- 2) Do not disconnect the battery terminals while the engine is running.
 - A large counter electromotive force will be generated in the generator, and this voltage may damage electronic parts such as auto A/C control module etc.
- 3) Before disconnecting the connectors of sensors and the auto A/C control module, be sure to turn off the ignition switch.
 - Otherwise, the auto A/C control module may be damaged.
- 4) Every A/C-related part is a precision part. Do not drop them.
- 5) The airbag system wiring harness is routed near the A/C control panel (auto A/C control module) and junction box.

CAUTION:

- The airbag system wiring harnesses and connectors are all yellow in color. Do not use the electrical test equipment on these circuits.
- Be careful not to damage the airbag system wiring harness when servicing the A/C control panel (auto A/C control module) and junction box.

B: INSPECTION

Before performing the diagnosis, check the following items which may cause problems in the A/C system.

1. BATTERY

- 1) Measure the battery voltage and check electrolyte.

Standard voltage:

12 V

Specific gravity:

1.260 or more

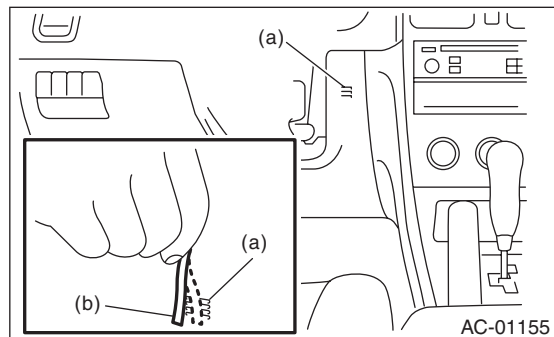
- 2) Check the condition of the fuses for A/C system power supply and other fuses.
- 3) Check the condition of harness and harness connector connections.

2. ASPIRATOR HOSE

- 1) Turn the ignition switch to ON.
- 2) Turn the temperature control dial at maximum hot position.
- 3) Set the air flow control dial to the DEF position.
- 4) Turn the fan speed control dial to the maximum position.
- 5) Approach a strip of paper in front of the in-vehicle sensor suction port (A) of the auto A/C control module, and check that air is being sucked into the port by seeing the paper moving towards the port.

NOTE:

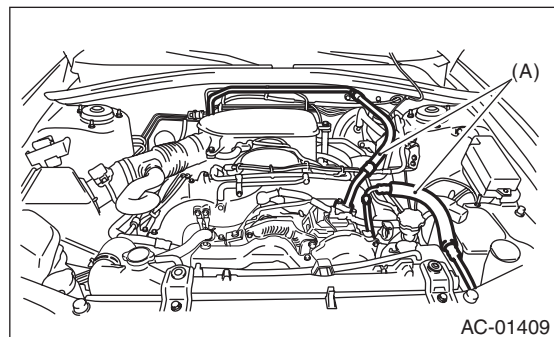
- Be careful not to let the paper get sucked into the port.
- Hold the paper approx. 5 mm (0.02 in) away from port when the suction force is not very strong.



- 6) If the paper does not move at all, remove the lower cover <Ref. to AC-28, REMOVAL, Control Unit.> and check for improper connection of the aspirator hose, lower cover, and heater unit, and fix them if necessary.

3. REFRIGERANT LINE

Check the connection for A/C line (A) and high-pressure pipe.



4. CONTROL LINKAGE

- 1) Check the state of mode door linkage.
- 2) Check the state of air mix door linkage.
- 3) Check the state of FRESH/RECIRC door linkage.

General Description

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

5. CONTROL SWITCHES

Start the engine and warm-up completely.

1) Inspection using switches

No.	Point to check	Switch operation	Judgment standard
1	Air flow control dial	Turn the dial to the right.	Outlet opening switches in order to AUTO → VENT → BILEVEL → HEAT → DEF/HEAT → DEF each time the dial is turned.
2	Fan speed control dial	Turn the dial to the right.	Fan speeds switch OFF → AUTO → 1st → 2nd → 3rd → 4th → 5th → 6th → 7th each time the dial is turned.
3	FRESH/RECIRC switch	Press the FRESH/RECIRC switch.	Inlet opening switches RECIRC → FRESH → RECIRC each time the switch is pressed. (The LED lights for RECIRC.)
		Press the FRESH/RECIRC switch for a longer period of time. (1 second or more)	The LED blinks twice and the system switches to AUTO.
4	A/C switch	Turn the A/C switch to ON with the fan speed control dial is set to other than OFF position.	The LED lights and the compressor operates.
		Press the FRESH/RECIRC switch for a longer period of time. (1 second or more)	The LED blinks twice and the system switches to AUTO.
5	Auto function Operate in order from 1).	1) Set the following dial and switch to AUTO. • Air flow control dial • Fan speed control dial • FRESH/RECIRC switch • A/C switch 2) Turn the temperature control dial completely to the left, and set to the maximum cool position.	<ul style="list-style-type: none"> • Outlet air temperature: COOL • Fan speed: Max. • Outlet opening: VENT • Inlet opening: RECIRC • Compressor: AUTO
		3) Turn the temperature control dial to the right slowly up to the maximum warm position.	<ul style="list-style-type: none"> • Outlet air temperature: COOL → HOT • Fan speed: AUTO • Outlet opening: AUTO • Inlet opening: AUTO • Compressor: AUTO
		4) Turn the temperature control dial fully to the right, to the maximum hot position.	<ul style="list-style-type: none"> • Outlet air temperature: HOT • Fan speed: Max. • Outlet opening: HEAT • Inlet opening: FRESH • Compressor: AUTO
6	Defroster Interlock Function	Set the air flow control dial to the DEF or the DEF/HEAT position.	<ul style="list-style-type: none"> • Outlet opening: AUTO • Fan speed: AUTO • Outlet opening: DEF or DEF/HEAT • Inlet opening: FRESH • Compressor: ON
7	Rear defogger switch	Press the rear defogger switch.	The LED lights.

2) Inspection of illumination control

No.	Point to check	Switch operation	Judgment standard
1	Illumination	Turn the lighting switch ON.	Illumination comes on. If the LED lights, the LED will dim.

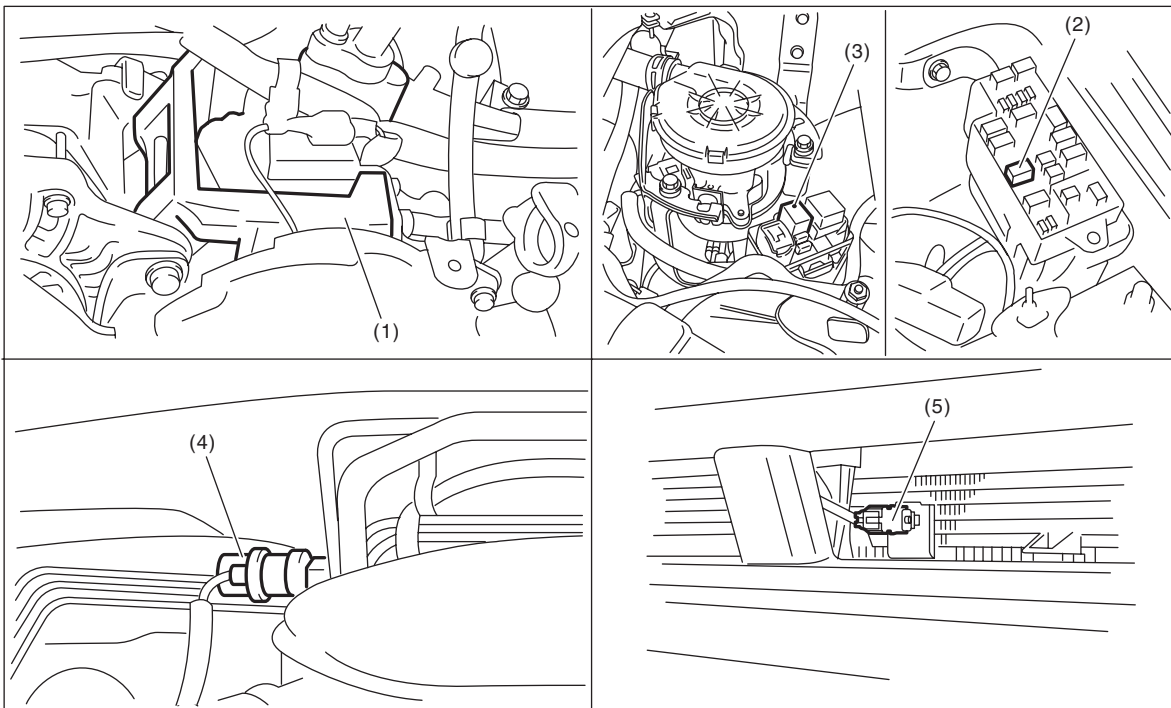
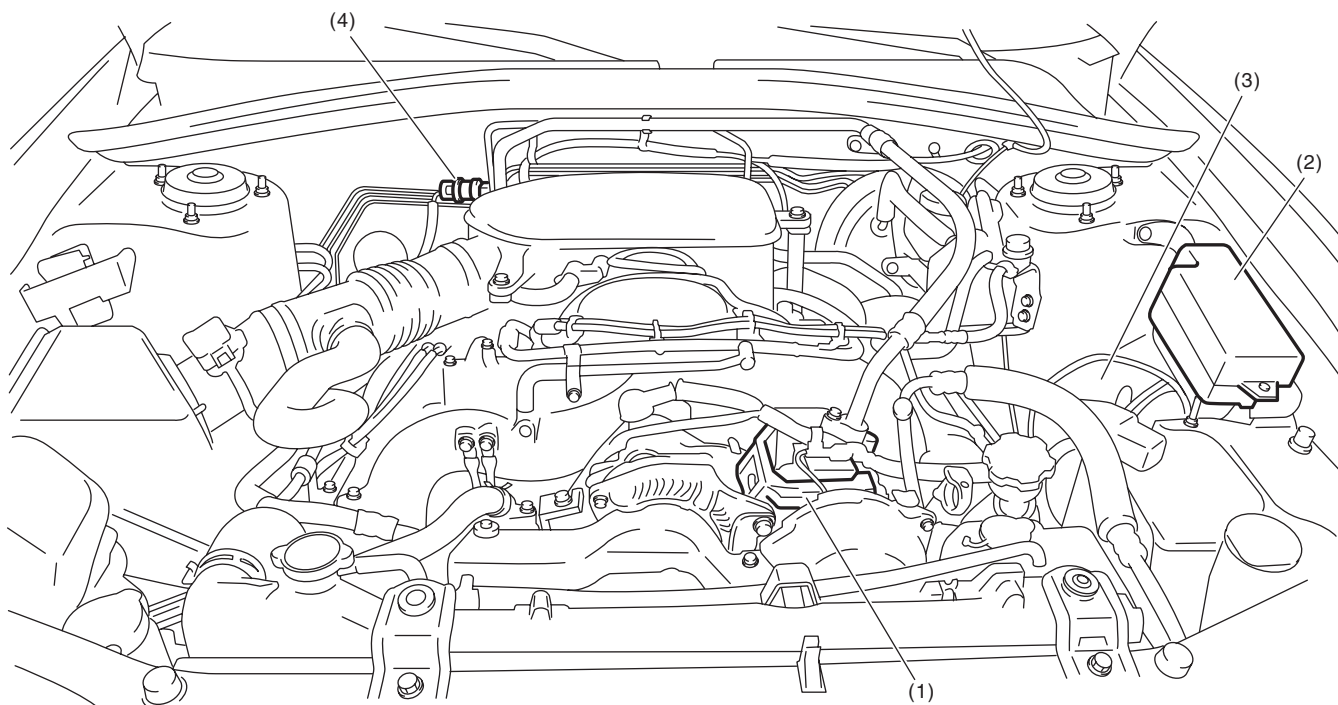
Electrical Component Location

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

3. Electrical Component Location

A: LOCATION

1. ENGINE COMPARTMENT



AC-01368

(1) A/C compressor

(3) A/C relay (Turbo model)

(5) Ambient sensor

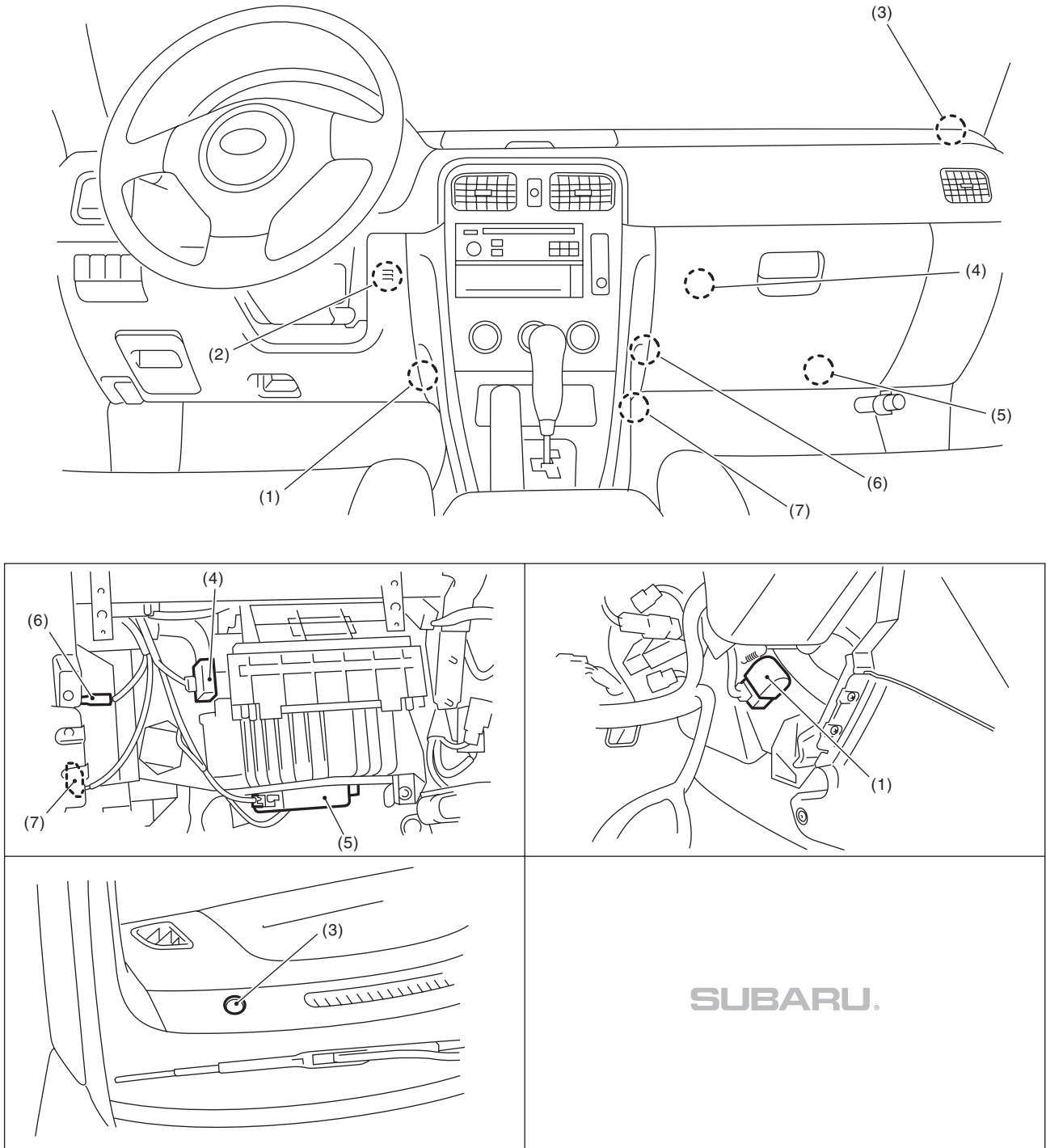
(2) A/C relay (Non-turbo model)

(4) Pressure switch

Electrical Component Location

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

2. PASSENGER COMPARTMENT



AC-01189

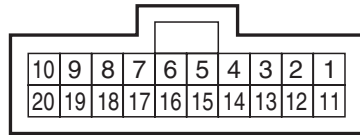
- | | | |
|------------------------|--------------------------|---------------------------|
| (1) Mode door actuator | (4) Intake door actuator | (6) Evaporator sensor |
| (2) In-vehicle sensor | (5) Blower motor | (7) Air mix door actuator |
| (3) Sunload sensor | | |

Auto A/C Control Module I/O Signal

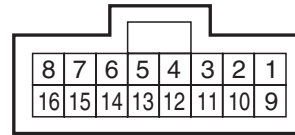
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

4. Auto A/C Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



To B: **i49**



To A: **i48**

AC-00099

Auto A/C Control Module I/O Signal

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Connector & Terminal No.	Content	Measuring condition	Specified value	
B9	Mode door actuator	Switch the outlet opening to VENT → DEF.	*2	
B8		Switch the outlet opening to DEF → VENT.		
B7	Air mix door actuator	Switching the air mix door from COOL → HOT	*1	
B6		Switching the air mix door from HOT → COOL		
B5	Ignition power supply	Ignition switch: ON	Battery voltage	
B4	Battery power supply	Ignition switch: OFF, ACC, ON	Battery voltage	
B3	Sunload sensor	Ignition switch: ON, With Normal Sunload (No sunload: 5 V)	3 V	
B2	Evaporator sensor	Ignition switch: ON	Less than 5 V	
B1	Air mix door actuator PBR signal	Air mix door: COOL position	0.5 V	
		Air mix door: HOT position	4.5 V	
B20	Intake door actuator signal	Inlet opening: FRESH (Other positions: 12 V)	0 V	
B19		Inlet opening: MIX (Other positions: 12 V)	0 V	
B18		Inlet opening: RECIRC (Other positions: 12 V)	0 V	
B17	A/C ON signal	A/C: ON (A/C OFF: 0 V)	8 — 10 V	
B16	Blower motor control	*3	*3	
B15	Blower fan ON signal	When blower fan is rotating (Not rotating: 12 V)	0 V	
B13	Engine coolant temperature sensor	When the engine coolant temperature is 49°C (120°F).	8.9 V	
B12	In-vehicle sensor	—	—	
B11	Ground	Continuity to chassis ground	0 Ω	
A7	Air mix door actuator PBR specified voltage	Ignition switch: ON	5 V	
A5	Mode door actuator position detection signal	Outlet opening	BI-LEVEL, DEF	5 V
			VENT, HEAT, DEF/HEAT	0 V
A4	Mode door actuator position detection signal	Outlet opening	HEAT, DEF/HEAT, DEF	5 V
			VENT, BI-LEVEL	0 V
A1	Illumination power supply	Ignition switch: ON, Light switch: ON	Battery voltage	
		Ignition switch: ON, Light switch: OFF	0 V	
A16	Sensor ground circuit	Continuity to chassis ground	0 Ω	
A14	Combination meter (Ambient temperature signal)	*3	*3	
A13	Mode door actuator position detection signal	Outlet opening	VENT, BI-LEVEL, HEAT	5 V
			DEF/HEAT, DEF	0 V
A12	Mode door actuator position detection signal	Outlet opening	VENT, DEF/HEAT	5 V
			BI-LEVEL, HEAT, DEF	0 V
A10	A/C cut signal	A/C: ON	Battery voltage	
		Pressure switch operated	0 V	
A9	Illumination ground	Continuity to chassis ground	0 Ω	

*1: Shows the battery voltage while the motor is running. When stopped, it will output 0 V, or the pulse signals of the battery voltage.

*2: Shows the battery voltage while the motor is running. When stopped, it shows 0 V.

*3: Unable to measure the voltage because it is a pulse signal.

B: WIRING DIAGRAM

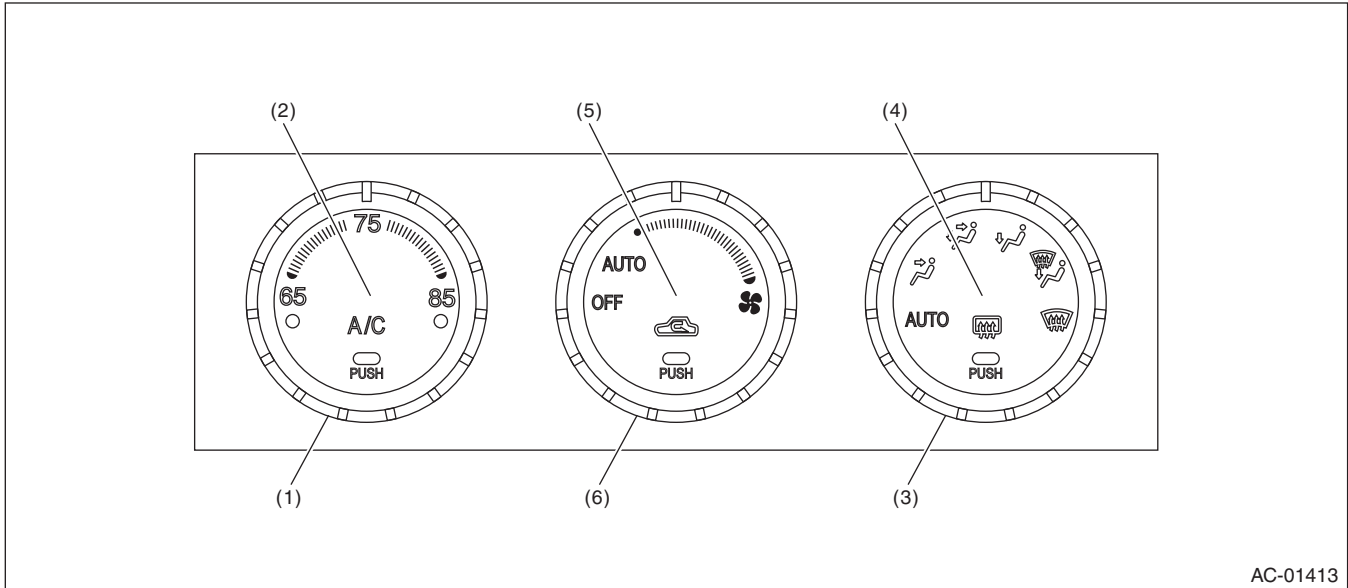
<Ref. to WI-79, WIRING DIAGRAM, Air Conditioning System.>

Diagnostic Chart for Self-diagnosis

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

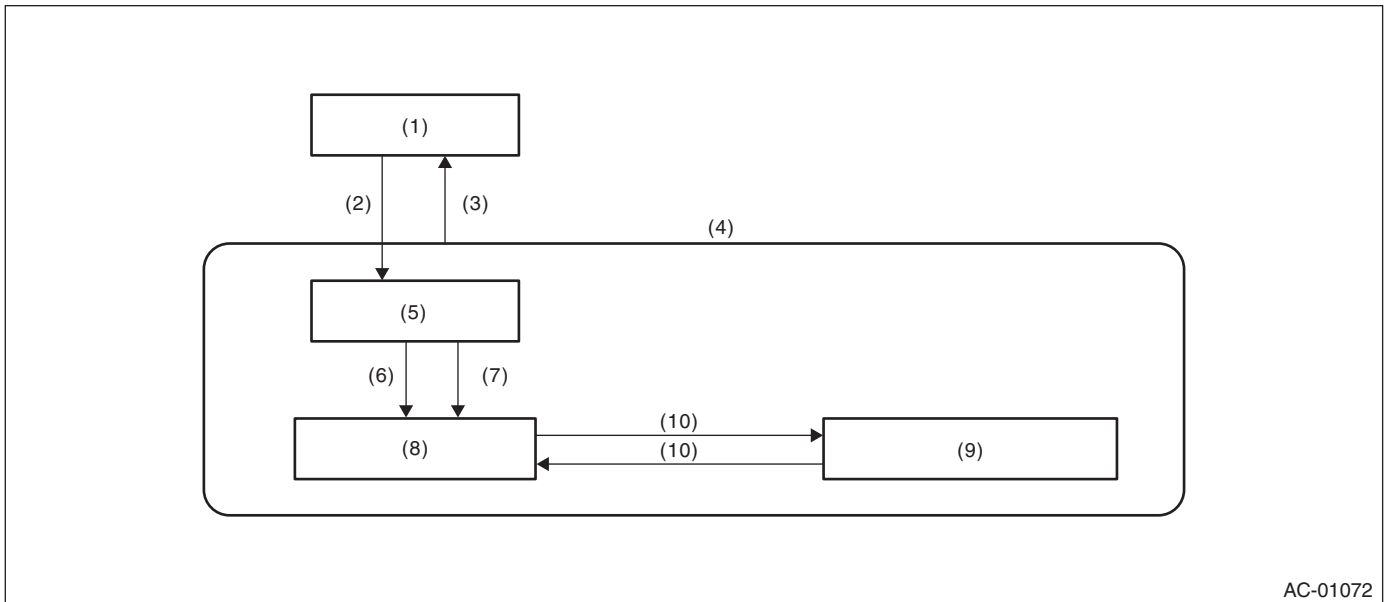
5. Diagnostic Chart for Self-diagnosis

A: OPERATION



AC-01413

- | | | |
|------------------------------|---------------------------|----------------------------|
| (1) Temperature control dial | (3) Air flow control dial | (5) FRESH/RECIRC switch |
| (2) A/C switch | (4) Rear defogger switch | (6) Fan speed control dial |



AC-01072

- | | | |
|---|--|--|
| (1) Normal operation | (3) Turn the fan speed control dial switch to the OFF position, or the ignition switch from ON to OFF. | (7) Press the rear defogger switch. |
| (2) Set the air flow control dial to the AUTO position, and the fan speed control dial to the AUTO position. Then, turn the ignition switch from OFF to ON while holding down the FRESH/RECIRC switch and the A/C switch. | (4) Self-diagnosis function | (8) Sensor check (Step operation) |
| | (5) Display check | (9) Output device operation (Step operation) |
| | (6) After completing the display check (approximately 8 seconds) | (10) Press the A/C switch. |

Diagnostic Chart for Self-diagnosis

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Check	Yes	No
1 SET SELF-DIAGNOSIS MODE BY OPERATING CONTROL PANEL. 1) Turn the ignition switch to OFF. 2) Set the air flow control dial to the AUTO position. 3) Set the fan speed control dial to the AUTO position. 4) Turn the ignition switch to ON while pressing the FRESH/RECIRC switch and the A/C switch. 5) The A/C control panel LED will blink.	Does the self-diagnosis function operate?	Go to step 2.	<Ref. to AC(diag)-12, A/C OR SELF-DIAGNOSIS SYSTEMS DO NOT OPERATE, Diagnostics for A/C System Malfunction.>
2 CHECK THE LIGHTING OF THE LED. Check whether the A/C control panel LED blinks. (Lighting and extinguishing repeated 8 times.)	Are all LEDs blinking?	Go to step 3.	Go to step 5.
3 SENSOR MALFUNCTION CHECK. 1) The A/C switch LED turns off and the sensor inspection is started, after the LED check is completed or when the rear defogger switch is pressed. 2) Switch the air flow control dial to check the sensors. 3) If there is no problem with the sensors, the FRESH/RECIRC switch LED will light, regardless of the position of the air flow control dial. NOTE: At this time, the rear defogger LED will light if there are previous failures. For current failures, it will turn off. It is possible to judge whether there is an open or short circuit by using the blinking patterns of the FRESH/RECIRC switch.	Does the LED of the FRESH/RECIRC switch illuminate?	Go to step 4.	Check the relationship of the air flow control dial position and sensors using the sensor check list, and check/repair sensors that have failed. <Ref. to AC(diag)-11, SENSOR CHECK TABLE, OPERATION, Diagnostic Chart for Self-diagnosis.>
4 OPERATION CHECK OF ACTUATORS, COMPRESSOR AND FAN MOTOR. 1) Press the A/C switch. (At this time, the A/C switch LED illuminates.) 2) Operate the fan speed control dial to check the operations of each of the actuator, compressor and fan motor. <Ref. to AC(diag)-11, OPERATING MODE TABLE, OPERATION, Diagnostic Chart for Self-diagnosis.> NOTE: Switching the fan speed control dial position enables the individual check of each step.	Do the actuators, compressor, and fan motor operate according to the operating mode table? <Ref. to AC(diag)-11, OPERATING MODE TABLE, OPERATION, Diagnostic Chart for Self-diagnosis.>	Either turn the fan control dial to the OFF position, or turn the ignition switch to the OFF position to quit the self-diagnosis function.	Refer to each of the diagnostics for the actuator, compressor and fan motor to repair the areas that have malfunctioned. <Ref. to AC(diag)-12, Diagnostics for A/C System Malfunction.> <Ref. to AC(diag)-21, Diagnostic Procedure for Actuators.>
5 CHECK POOR CONTACT. Check poor contact of auto A/C control module connector.	Is there poor contact in the auto A/C control module connector?	Repair the poor contact in the auto A/C control module connector.	Replace the auto A/C control module.

Diagnostic Chart for Self-diagnosis

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

1. SENSOR CHECK TABLE

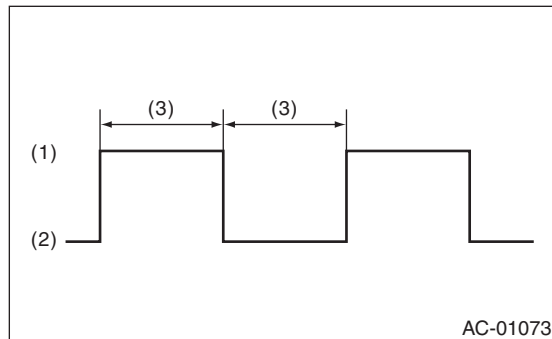
NOTE:

When checking the sunload sensor indoor or in the shade, an open circuit might be indicated. Always check the sunload sensor at a location exposed to direct sunlight.

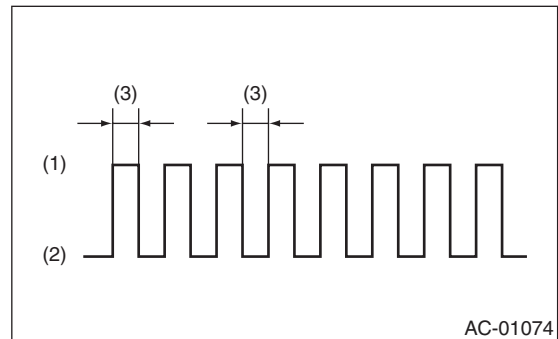
No.	Target for inspection	Air flow control dial position
1	In-vehicle sensor	AUTO
2	Ambient sensor	VENT
3	Evaporator sensor	B/L
4	Sunload sensor *1	HEAT
5	Air mix door actuator PBR	D/H
6	Meter communication	DEF

*1: For a sunload sensor open circuit, only the current malfunction is displayed. (However, it is possible to display past failures for short circuits.)

- The LED blinking pattern for open circuit failures
- The LED blinking pattern for short circuit failures



- (1) Light ON
- (2) Light OFF
- (3) Approx. 1 sec.



- (1) Light ON
- (2) Light OFF
- (3) Approx. 0.2 sec.

2. OPERATING MODE TABLE

Step	1	2	3	4	5	6	7	8
Fan control dial position	AUTO	1st	2nd	3rd	4th	5th	6th	7th
Fan speed (%)	24.0	24.0	34.0	45.0	42.0	59.0	71.0	100.0
Mode door actuator	VENT	VENT	VENT	B/L	HEAT	HEAT	D/H	DEF
Intake door actuator	FRE	REC	REC	FRE	FRE	FRE	FRE	FRE
Air mix door actuator	Maximum cool (0%)	Maximum cool (0%)	Maximum cool (0%)	Mid (50%)	Mid (50%)	Maximum hot (100%)	Maximum hot (100%)	Maximum hot (100%)
Compressor (Magnet clutch)	OFF	ON	ON	ON	ON	ON	ON	ON

Diagnostics for A/C System Malfunction

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

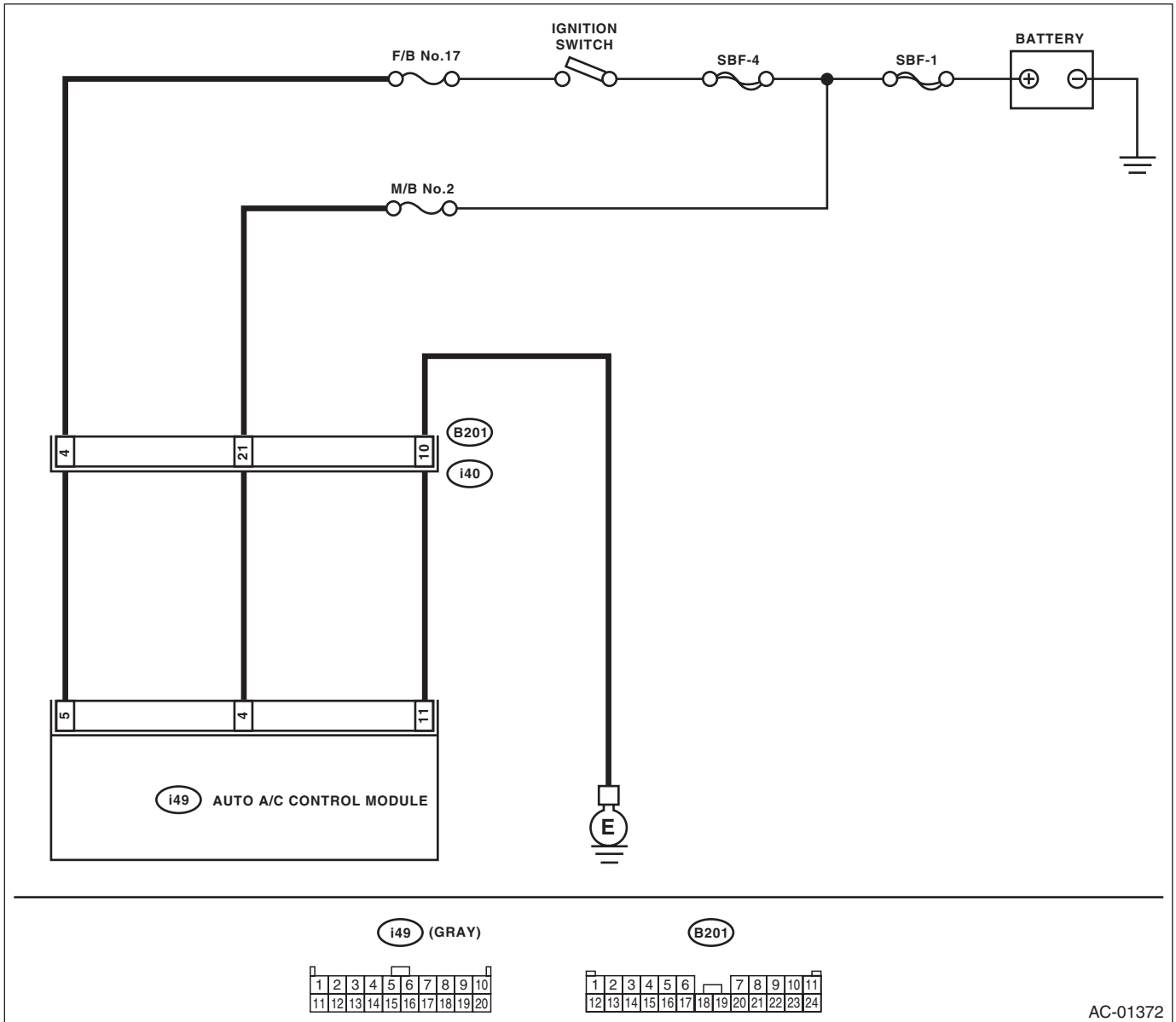
6. Diagnostics for A/C System Malfunction

A: A/C OR SELF-DIAGNOSIS SYSTEMS DO NOT OPERATE

TROUBLE SYMPTOM:

- Set temperature is not indicated on the display, switch LEDs are faulty or switches do not operate.
- Self-diagnosis system does not operate.

WIRING DIAGRAM:



AC-01372

Diagnostics for A/C System Malfunction

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Check	Yes	No	
1	CHECK FUSE. 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 2 from main fuse box. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Go to step 2.
2	CHECK FUSE. 1) Turn the ignition switch to OFF. 2) Remove the fuse No. 17 from fuse & relay box. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Go to step 3.
3	CHECK AUTO A/C CONTROL MODULE POWER CIRCUIT. 1) Pull out the auto A/C control module connector. 2) Measure the voltage between auto A/C control module connector terminal and chassis ground after turning the ignition switch OFF. <i>Connector & terminal</i> <i>(i49) No. 4 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Go to step 4.	Repair the short circuit in harness for power supply line.
4	CHECK AUTO A/C CONTROL MODULE POWER CIRCUIT. Measure the voltage between auto A/C control module connector terminal and chassis ground after turning the ignition switch to the ON position. <i>Connector & terminal</i> <i>(i49) No. 5 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Go to step 5.	Repair the short circuit in harness for power supply line.
5	CHECK AUTO A/C CONTROL MODULE GROUND CIRCUIT. Measure the resistance of harness between auto A/C control module and chassis ground after turning the ignition switch to the ON position. <i>Connector & terminal</i> <i>(i49) No. 11 — Chassis ground:</i>	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the short circuit in harness for ground line.
6	CHECK POOR CONTACT. Check poor contact of auto A/C control module connector.	Is there poor contact in the connector?	Repair the connector.	Replace the auto A/C control module.

Diagnostics for A/C System Malfunction

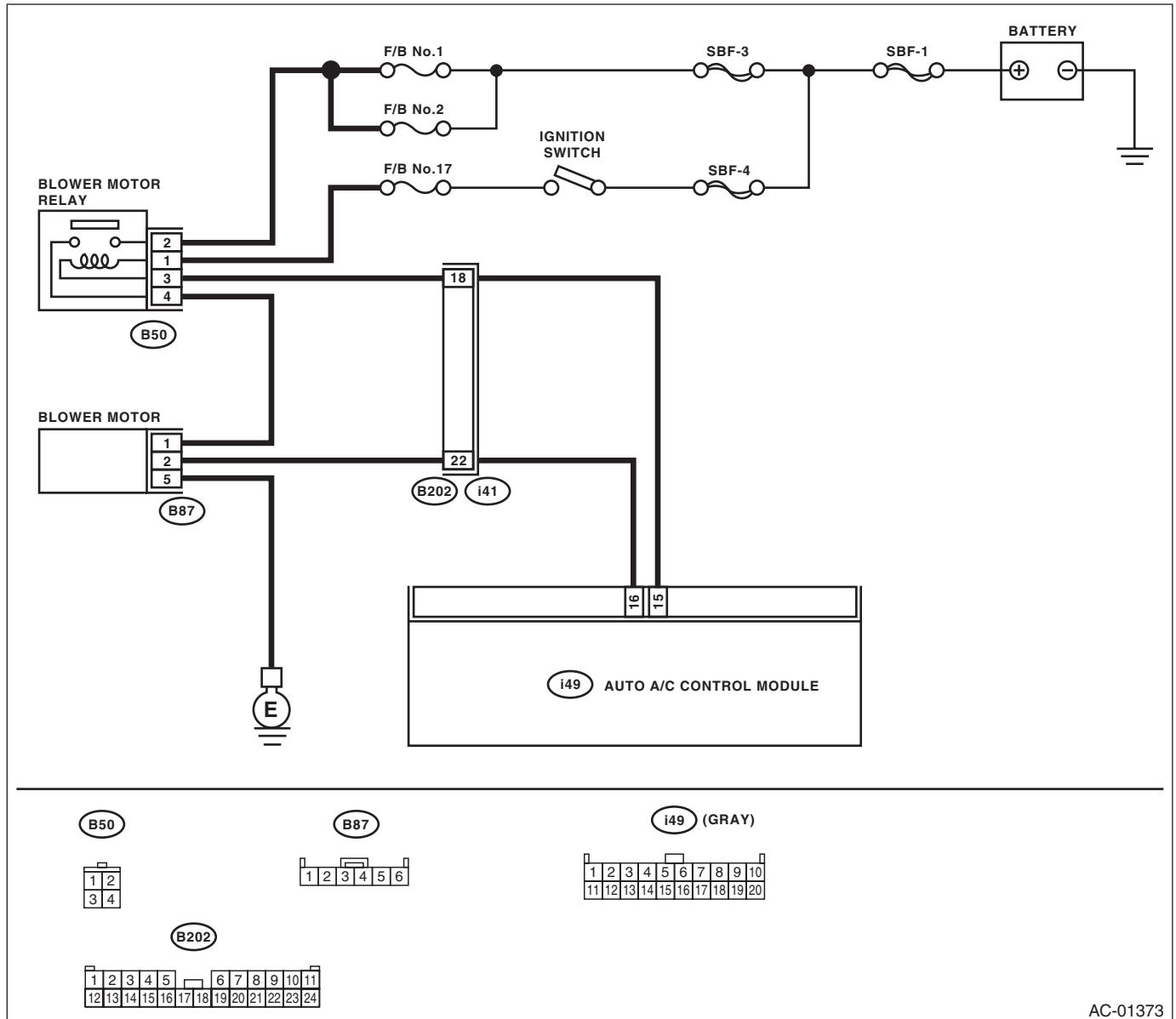
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

B: BLOWER FAN DOES NOT ROTATE

TROUBLE SYMPTOM:

- Blower motor does not rotate.
- Blower motor does not change speeds.

WIRING DIAGRAM:



AC-01373

Diagnostics for A/C System Malfunction

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FUSE. 1) Remove fuse No. 1, 2 and 17 from fuse & relay box. 2) Check the condition of fuse.	Is any of the fuses blown out?	Replace the fuse.	Go to step 2.
2 CHECK POWER SUPPLY FOR BLOWER MOTOR. 1) Turn the ignition switch to ON. 2) Turn the fan speed control dial to the right. 3) Measure the voltage between blower motor and chassis ground. Connector & terminal (B87) No. 1 (+) — Chassis ground (-):	Is the voltage 8 V or more (at normal temperature)?	Go to step 3.	Repair the open circuit of blower motor power supply line harness.
3 CHECK BLOWER MOTOR RELAY. 1) Turn the ignition switch to OFF. 2) Remove the blower motor relay. 3) Connect the battery positive (+) terminal to terminal No. 1 of blower motor connector, and negative (-) terminal to terminal No. 3. 4) Measure the resistance between terminals No. 2 and 4. Terminals No. 2 — No. 4:	Is the resistance less than 1 Ω ?	Go to step 4.	Replace the blower motor relay.
4 CHECK BLOWER MOTOR. 1) Disconnect the connector from the blower motor. 2) Connect the battery positive (+) terminal to terminal No. 1 of the blower motor connector, and negative (-) terminal to terminals No. 2 and 5. 3) Make sure the blower motor runs.	Does the blower motor run?	Go to step 5.	Replace the blower motor.
5 CHECK POOR CONTACT. Check poor contact of auto A/C control module connector.	Is there poor contact in the connector?	Repair the connector.	Replace the auto A/C control module.

Diagnostics for A/C System Malfunction

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

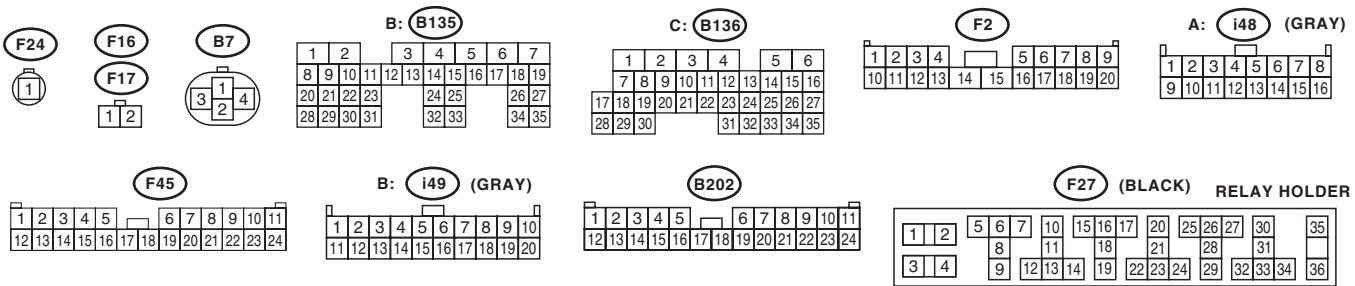
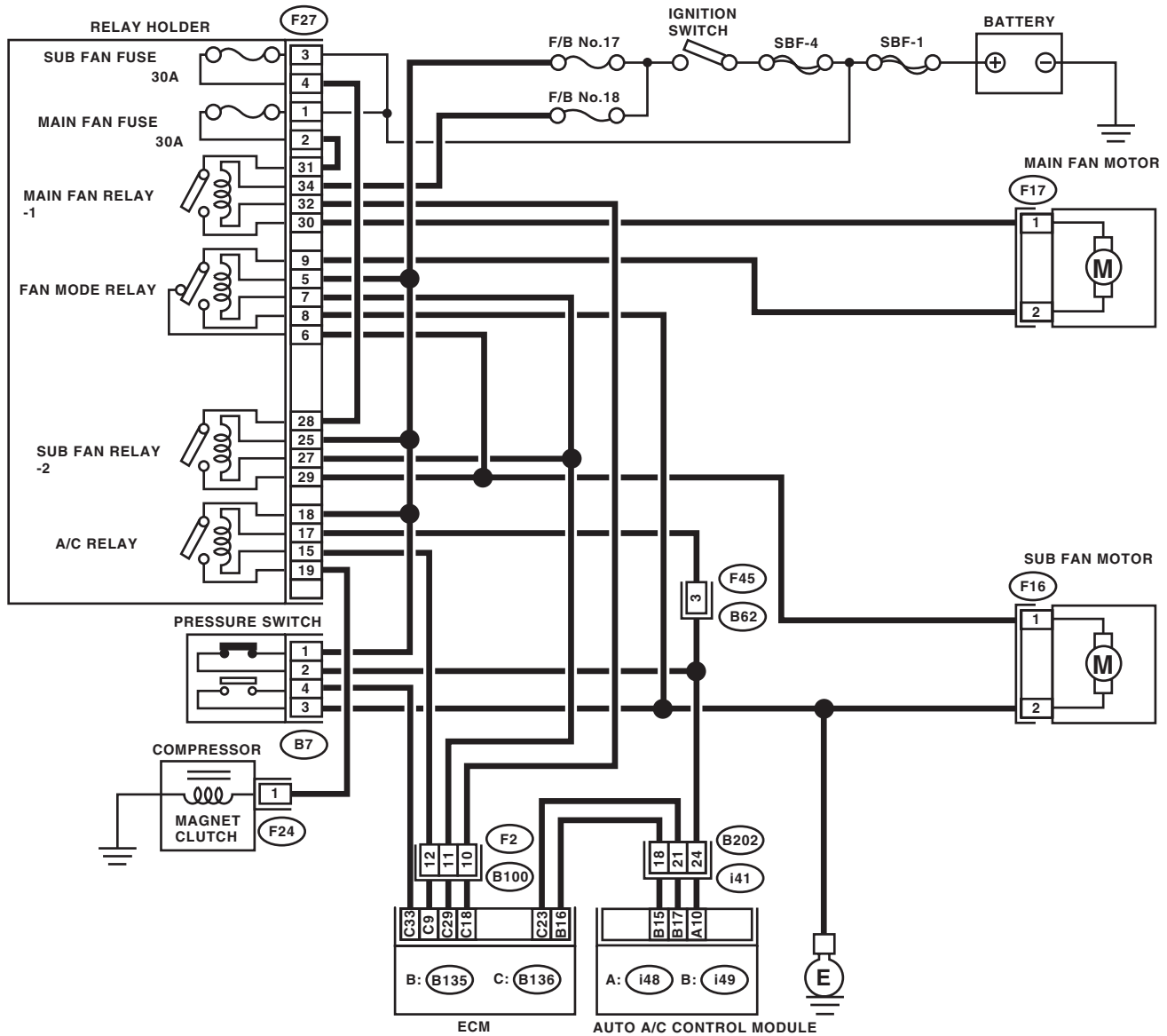
C: COMPARTMENT TEMPERATURE DOES NOT CHANGE, OR A/C SYSTEM DOES NOT RESPOND PROMPTLY

TROUBLE SYMPTOM:

- Compartment temperature does not change.
- A/C system does not respond quickly.

WIRING DIAGRAM:

- Non-turbo model

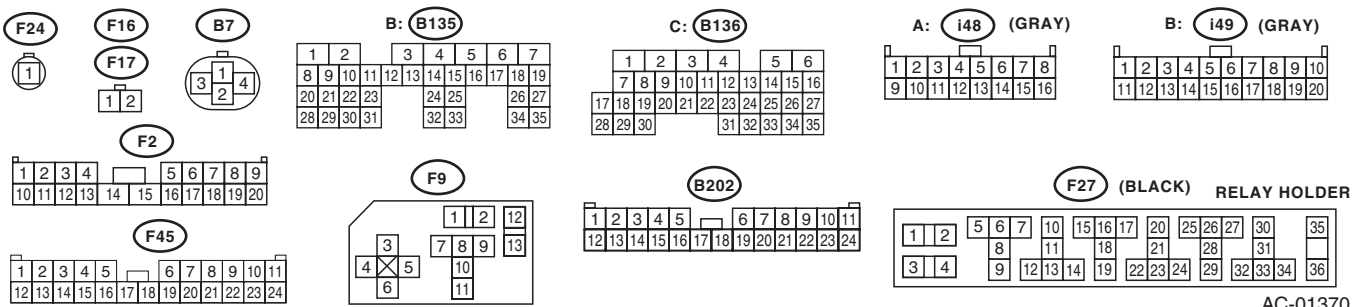
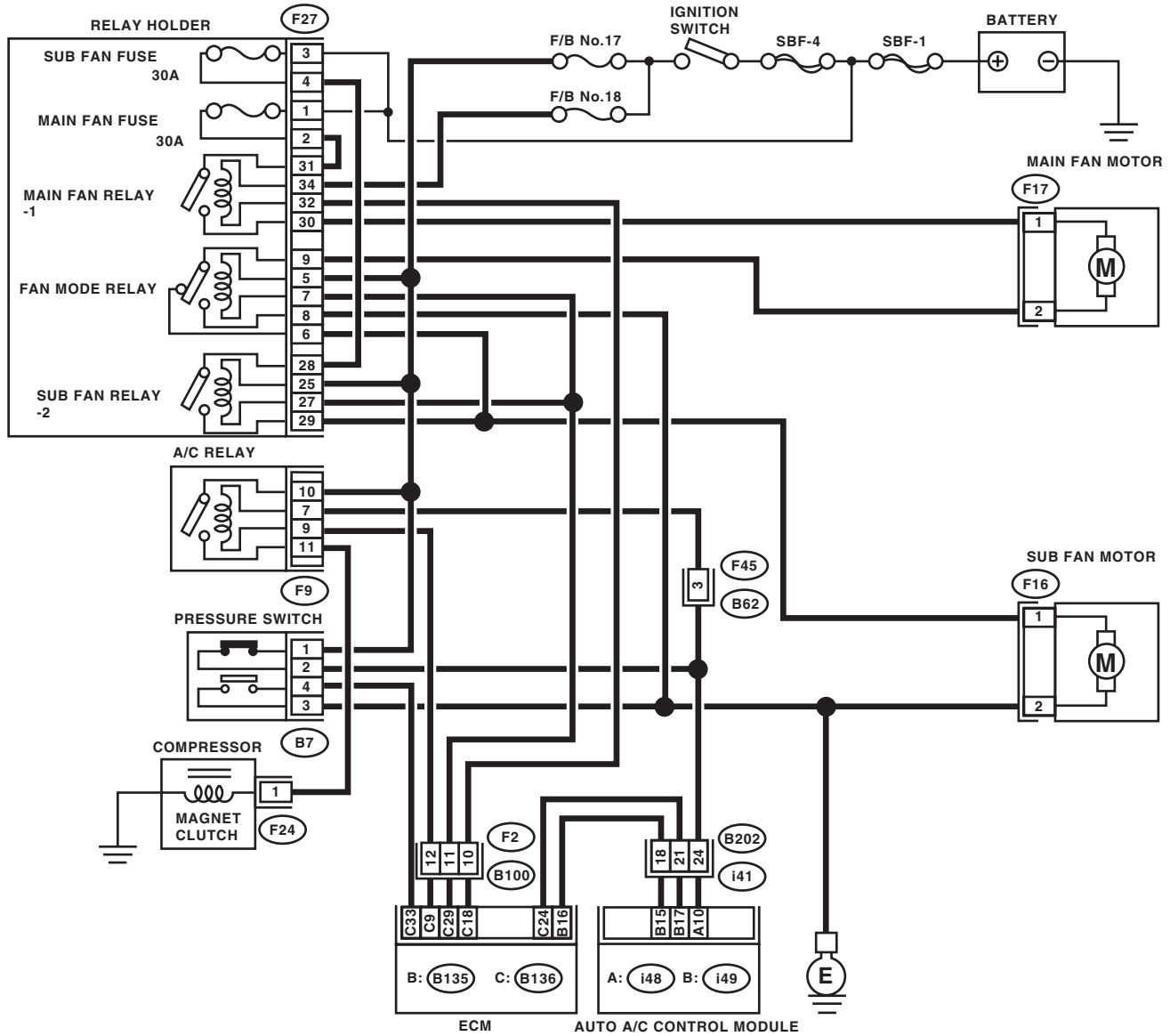


AC-01369

Diagnostics for A/C System Malfunction

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

- Turbo model



AC-01370

Diagnostics for A/C System Malfunction

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK FUSE. 1) Turn the ignition switch to OFF. 2) Remove the main fan fuse and sub fan fuse of the main fuse box. 3) Check the condition of fuse.	Is the fuse blown out?	Replace the fuse.	Go to step 2.
2 CHECK POWER SUPPLY FOR PRESSURE SWITCH. 1) Disconnect the connector from the pressure switch. 2) Turn the ignition switch to ON. 3) Measure the voltage between pressure switch harness connector and chassis ground. Connector & terminal (B7) No. 1 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 3.	Repair the open circuit in harness of pressure switch power supply circuit.
3 CHECK HARNESS BETWEEN PRESSURE SWITCH AND A/C RELAY. 1) Turn the ignition switch to OFF. 2) Remove the A/C relay of the fuse box. 3) Measure the resistance of the A/C relay and pressure switch connector. Connector & terminal Non-turbo model (F27) No. 17 — (B7) No. 2: Turbo model (F9) No. 7 — (B7) No. 2:	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit of the harness between the A/C relay and pressure switch.
4 CHECK PRESSURE SWITCH. Measure the resistance between the pressure switch terminals. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Go to step 5.	Replace the pressure switch.
5 CHECK A/C CUT SIGNAL CIRCUIT. 1) Disconnect the connector from the auto A/C control module. 2) Measure the resistance between the auto A/C control module and the pressure switch connector. Connector & terminal (i48) No. 10 — (B7) No. 2:	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the open circuit of the harness between auto A/C control module and pressure switch.
6 CHECK A/C ON SIGNAL CIRCUIT. 1) Disconnect the connectors from ECM. 2) Measure the resistance between the ECM and the auto A/C control module connector. Connector & terminal Non-turbo model (B136) No. 23 — (i49) No. 17: Turbo model (B136) No. 24 — (i49) No. 17:	Is the resistance less than 1 Ω ?	Go to step 7.	Repair the open circuit of the harness between auto A/C control module and ECM.
7 CHECK A/C RELAY. 1) Remove the A/C relay of the fuse box. 2) Check the A/C relay. <Ref. to AC-35, INSPECTION, Relay and Fuse.>	Does the relay operate normally?	Go to step 8.	Replace the A/C relay.

Diagnostics for A/C System Malfunction

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Check	Yes	No
8 CHECK POWER SUPPLY TO MAGNET CLUTCH OF A/C COMPRESSOR. 1) Turn the ignition switch to OFF, and connect the A/C relay and all disconnected connectors. 2) Start the engine and turn the A/C switch ON. 3) Turn the temperature control dial at maximum cool position. 4) Measure the voltage between magnet clutch connector and chassis ground. Connector & terminal (F24) No. 1 (+) — Chassis ground (-):	Is the voltage 10.5 V or more (at normal temperature)?	Go to step 9.	Repair the open circuit in harness of the A/C compressor power circuit.
9 CHECK MAIN FAN MOTOR OPERATION. 1) Start the engine. 2) Turn on the A/C switch. 3) Check the operation of the main fan motor.	Does the main fan motor operate normally?	Go to step 14.	Go to step 10.
10 CHECK POWER SUPPLY TO MAIN FAN MOTOR. CAUTION: Be careful not to overheat the engine during repair. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the main fan motor. 3) Start the engine, and warm it up until engine coolant temperature increases over 100°C (212°F). 4) Stop the engine and turn the ignition switch to ON. 5) Measure the voltage between main fan motor connector and chassis ground. Connector & terminal (F17) No. 1 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 11.	Repair the open circuit in harness of main fan motor power supply circuit.
11 CHECK MAIN FAN MOTOR GROUND CIRCUIT. 1) Turn the ignition switch to OFF. 2) Measure the resistance between main fan motor connector and chassis ground. Connector & terminal (F17) No. 2 — Chassis ground:	Is the resistance less than 1 Ω?	Go to step 12.	Repair the open circuit in harness of main fan motor ground circuit.
12 CHECK MAIN FAN MOTOR. Connect the positive terminal (+) of the battery to No. 1 terminal of the main fan motor connector, and the negative (-) terminal to No. 2 terminal. Check that the main fan motor is running.	Is the main fan motor rotating?	Go to step 13.	Replace the main fan motor with a new one.
13 CHECK POOR CONTACT OF THE MAIN FAN MOTOR CONNECTOR. Check poor contact of main fan motor connector.	Is there poor contact in the connector?	Go to step 14.	Repair the poor contact of main fan motor connector.
14 CHECK SUB FAN MOTOR OPERATION. 1) Start the engine and turn the A/C switch ON. 2) Check the operation of the sub fan motor.	Does the sub fan motor operate normally?	Go to step 19.	Go to step 15.

Diagnostics for A/C System Malfunction

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Check	Yes	No
15 CHECK POWER SUPPLY TO SUB FAN MOTOR. CAUTION: Be careful not to overheat the engine during repair. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the sub fan motor. 3) Start the engine, and warm it up until engine coolant temperature increases over 100°C (212°F). 4) Stop the engine and turn the ignition switch to ON. 5) Measure the voltage between sub fan motor connector and chassis ground. Connector & terminal (F16) No. 1 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 16.	Repair the open circuit in the harness of the sub fan motor power supply circuit.
16 CHECK SUB FAN MOTOR GROUND CIRCUIT. 1) Turn the ignition switch to OFF. 2) Measure the resistance between the sub fan motor connector and chassis ground. Connector & terminal (F16) No. 2 — Chassis ground:	Is the resistance less than 1 Ω?	Go to step 17.	Repair the open circuit in the harness of sub fan motor ground circuit.
17 CHECK SUB FAN MOTOR. Connect the positive terminal (+) of the battery to No. 1 terminal of the sub fan motor connector, and the negative (-) terminal to No. 2 terminal. Check that the sub fan motor is running.	Does the sub fan motor rotate?	Go to step 18.	Replace the sub fan motor with a new one.
18 CHECK POOR CONTACT OF THE SUB FAN MOTOR CONNECTOR. Check for poor contact of sub fan motor connector.	Is there poor contact in the connector?	Repair the poor contact of sub fan motor connector.	Go to step 19.
19 CHECK FOR POOR CONTACT OF THE AUTO A/C CONTROL MODULE CONNECTOR. Check poor contact of auto A/C control module connector.	Is there poor contact in the connector?	Repair the connector.	Replace the auto A/C control module.

Diagnostic Procedure for Actuators

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

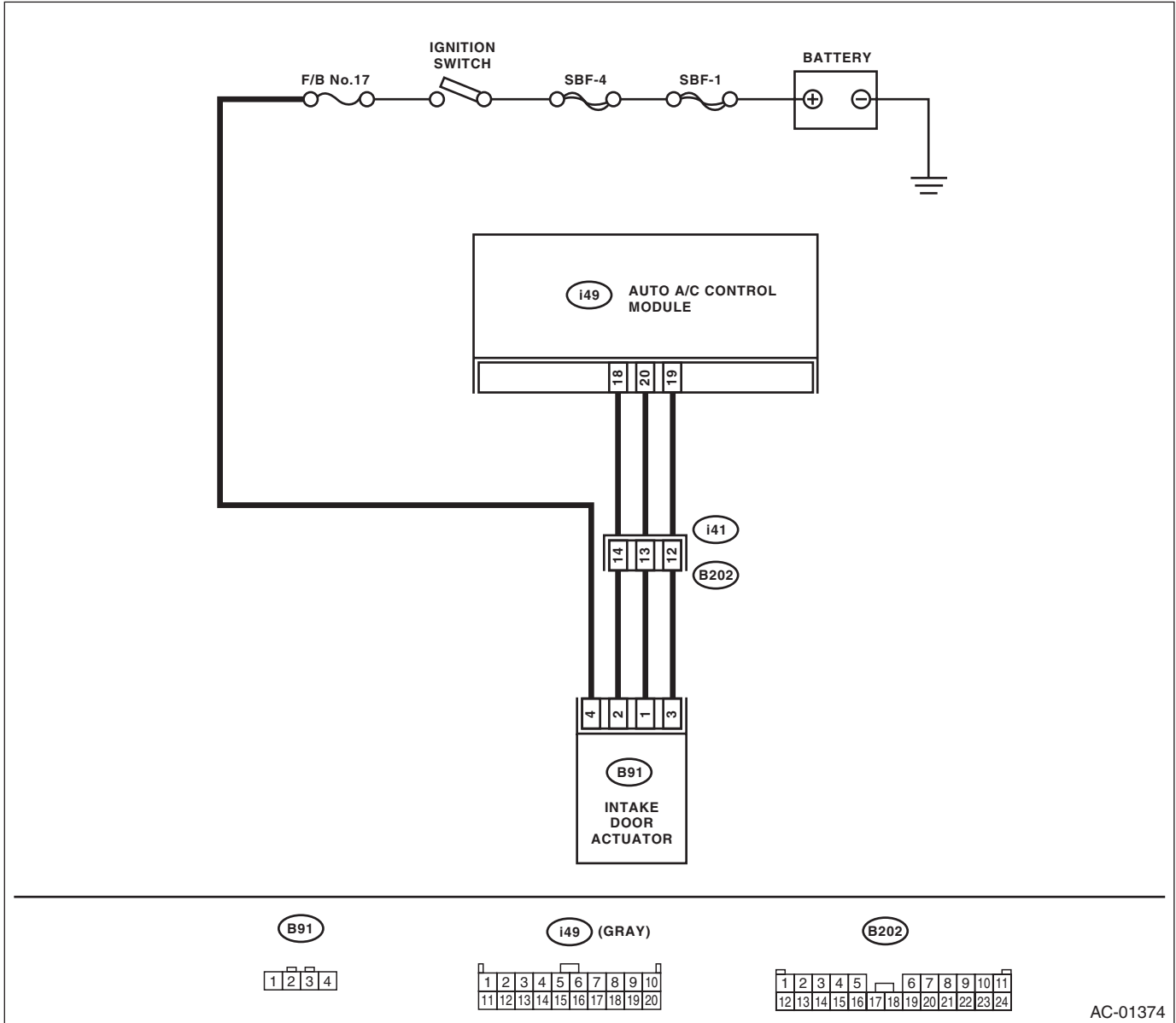
7. Diagnostic Procedure for Actuators

A: INTAKE DOOR ACTUATOR

TROUBLE SYMPTOM:

FRESH/RECIRC mode is not changed.

WIRING DIAGRAM:



AC-01374

Diagnostic Procedure for Actuators

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POWER SUPPLY FOR INTAKE DOOR ACTUATOR. 1) Turn the ignition switch to OFF. 2) Disconnect the intake door actuator connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between intake door actuator connector and chassis ground. Connector & terminal (B91) No. 4 (+) — Chassis ground (-):	Is the voltage 7 V or more (at normal temperature)?	Go to step 2.	Check for open or short circuit in the harness between intake door actuator and fuse.
2 CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND INTAKE DOOR ACTUATOR. 1) Turn the ignition switch to OFF. 2) Disconnect the auto A/C control module connector. 3) Measure the resistance between intake door actuator connector and auto A/C control module connector. Connector & terminal (i49) No. 18 — (B91) No. 2: (i49) No. 20 — (B91) No. 1: (i49) No. 19 — (B91) No. 3:	Is the resistance less than 1 Ω ?	Go to step 3.	Repair the open circuit in harness between auto A/C control module and intake door actuator.
3 CHECK OPERATION OF INTAKE DOOR ACTUATOR. 1) Connect the intake door actuator connector. 2) Ground the auto A/C control module connector with a suitable wire. 3) Turn the ignition switch to ON, and check the operation of intake door actuator. Connector & terminal (i49) No. 20 — Chassis ground:	Is the intake door actuator moved to FRESH?	Go to step 4.	Replace the intake door actuator.
4 CHECK OPERATION OF INTAKE DOOR ACTUATOR. 1) Turn the ignition switch to OFF. 2) Ground the auto A/C control module connector with a suitable wire. 3) Turn the ignition switch to ON, and check the operation of intake door actuator. Connector & terminal (i49) No. 18 — Chassis ground:	Is the intake door actuator moved to RECIRC?	Replace the auto A/C control module.	Replace the intake door actuator.

Diagnostic Procedure for Actuators

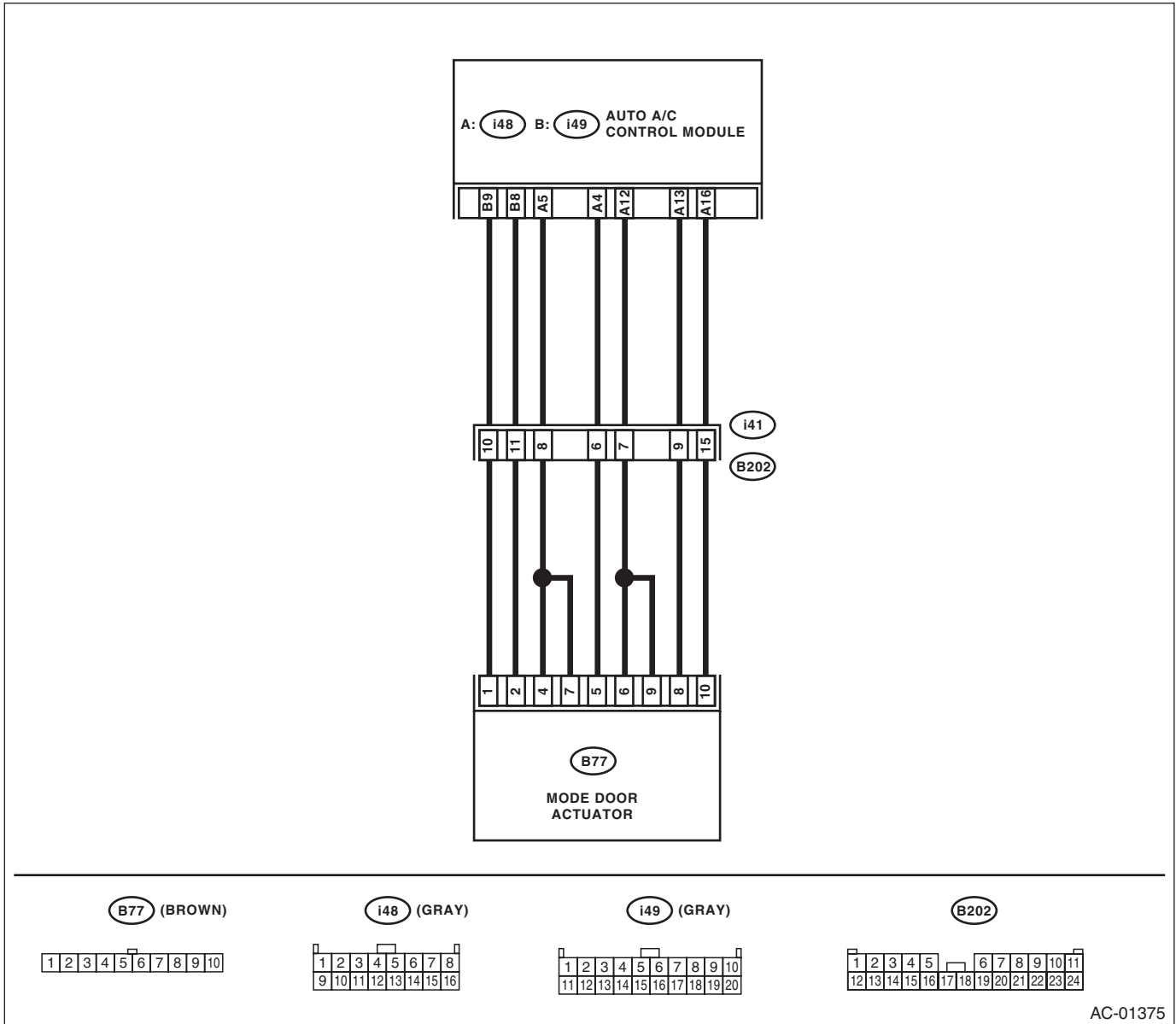
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

B: MODE DOOR ACTUATOR

TROUBLE SYMPTOM:

Air flow outlet is not changed.

WIRING DIAGRAM:



AC-01375

Diagnostic Procedure for Actuators

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK THE POWER SUPPLY OF THE AUTO A/C CONTROL MODULE.</p> <p>1) Turn the ignition switch to ON. 2) Set the air flow control dial to the VENT position. 3) Press the defroster switch and measure the voltage between the auto A/C control module and the chassis ground when switching from VENT to DEF.</p> <p>Connector & terminal (i49) No. 9 (+) — Chassis ground (-):</p>	Is the voltage 12 V or more?	Go to step 2.	Replace the auto A/C control module.
2	<p>CHECK THE POWER SUPPLY OF THE ACTUATOR.</p> <p>1) Set the air flow control dial to the VENT position. 2) Press the defroster switch and measure the voltage between the mode door actuator harness connector terminal and the chassis ground when switching from VENT to DEF.</p> <p>Connector & terminal (B77) No. 1 (+) — Chassis ground (-):</p>	Is the voltage 7 V or more (at normal temperature)?	Go to step 3.	Repair the open circuit of harness between the auto A/C control module and mode door actuator.
3	<p>CHECK AUTO A/C CONTROL MODULE SIGNALS.</p> <p>1) Press the defroster switch. 2) Turn the air flow control dial to VENT and measure the voltage between the auto A/C control module and the chassis ground when switching from DEF to VENT.</p> <p>Connector & terminal (i49) No. 8 (+) — Chassis ground (-):</p>	Is the voltage 12 V or more?	Go to step 4.	Replace the auto A/C control module.
4	<p>CHECK THE SIGNALS OF THE ACTUATOR.</p> <p>1) Press the defroster switch. 2) Turn the air flow control dial to the VENT position and measure the voltage between the mode door actuator harness connector terminal and the chassis ground when switching from DEF to VENT.</p> <p>Connector & terminal (B77) No. 2 (+) — Chassis ground (-):</p>	Is the voltage 7 V or more (at normal temperature)?	Go to step 5.	Repair the open circuit of harness between the auto A/C control module and mode door actuator.
5	<p>CHECK THE ACTUATOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from the mode door actuator. 3) Connect the positive terminal (+) of the battery to No. 1 terminal of the mode door actuator, and the negative (-) terminal to No. 2 terminal. Check whether the actuator is running. 4) Connect the negative (-) terminal of the battery to No. 1 and the positive terminal (+) to No. 2 terminal and check whether the actuator is running.</p>	Does the motor operate normally?	Go to step 6.	Replace the mode door actuator.
6	<p>CHECK AUTO A/C CONTROL MODULE SIGNAL VOLTAGE.</p> <p>1) Turn the ignition switch to ON. 2) Turn the air flow control dial and measure the voltage between auto A/C control module harness connector terminal and chassis ground for each mode.</p> <p>Connector & terminal (i48) No. 4 (+) — Chassis ground (-):</p>	Is the voltage approx. 5 V at the HEAT, D/H and DEF positions; and approx. 0 V at the VENT and BI-LEVEL positions?	Go to step 9.	Go to step 7.

Diagnostic Procedure for Actuators

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Check	Yes	No
<p>7 CHECK AUTO A/C CONTROL MODULE SIGNAL POWER.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from the mode door actuator. 3) Turn the ignition switch to ON. 4) Measure the voltage between the mode door actuator harness connector terminal and chassis ground.</p> <p>Connector & terminal <i>(B77) No. 5 (+) — Chassis ground (-):</i></p>	Is the voltage approx. 5 V?	Go to step 9.	Go to step 8.
<p>8 CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND MODE DOOR ACTUATOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from the auto A/C control module and mode door actuator. 3) Measure the resistance of the harness between the auto A/C control module and mode door actuator.</p> <p>Connector & terminal <i>(i48) No. 4 — (B77) No. 5:</i></p>	Is the resistance less than 1 Ω ?	Replace the auto A/C control module.	Repair the open circuit of harness between the auto A/C control module and mode door actuator.
<p>9 CHECK AUTO A/C CONTROL MODULE SIGNAL VOLTAGE.</p> <p>1) Turn the ignition switch to ON. 2) Turn the air flow control dial and measure the voltage between auto A/C control module harness connector terminal and chassis ground for each mode.</p> <p>Connector & terminal <i>(i48) No. 12 (+) — Chassis ground (-):</i></p>	Is the voltage approx. 5 V at the VENT position; and approx. 0 V at the BI-LEVEL, HEAT and DEF positions?	Go to step 12.	Go to step 10.
<p>10 CHECK AUTO A/C CONTROL MODULE SIGNAL POWER.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from the mode door actuator. 3) Turn the ignition switch to ON. 4) Measure the voltage between the mode door actuator harness connector and chassis ground.</p> <p>Connector & terminal <i>(B77) No. 6 (+) — Chassis ground (-):</i> <i>(B77) No. 9 (+) — Chassis ground (-):</i></p>	Is the voltage approx. 5 V?	Go to step 12.	Go to step 11.
<p>11 CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND MODE DOOR ACTUATOR.</p> <p>1) Turn the ignition switch to OFF. 2) Disconnect the connector from the auto A/C control module and mode door actuator. 3) Measure the resistance of the harness between the auto A/C control module and mode door actuator.</p> <p>Connector & terminal <i>(i48) No. 12 — (B77) No. 6:</i> <i>(i48) No. 12 — (B77) No. 9:</i></p>	Is the resistance less than 1 Ω ?	Replace the auto A/C control module.	Repair the open circuit of harness between the auto A/C control module and mode door actuator.

Diagnostic Procedure for Actuators

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Check	Yes	No
12 CHECK AUTO A/C CONTROL MODULE SIGNAL VOLTAGE. 1) Turn the ignition switch to ON. 2) Turn the air flow control dial and measure the voltage between auto A/C control module harness connector and chassis ground for each mode. <i>Connector & terminal</i> <i>(i48) No. 5 (+) — Chassis ground (-):</i>	Is the voltage approx. 5 V at the BI-LEVEL and DEF positions; and approx. 0 V at the VENT, HEAT and D/H positions?	Go to step 15.	Go to step 13.
13 CHECK AUTO A/C CONTROL MODULE SIGNAL POWER. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the mode door actuator. 3) Turn the ignition switch to ON. 4) Measure the voltage between the mode door actuator harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B77) No. 4 (+) — Chassis ground (-):</i> <i>(B77) No. 7 (+) — Chassis ground (-):</i>	Is the voltage approx. 5 V?	Go to step 15.	Go to step 14.
14 CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND MODE DOOR ACTUATOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the auto A/C control module and mode door actuator. 3) Measure the resistance of the harness between the auto A/C control module and mode door actuator. <i>Connector & terminal</i> <i>(i48) No. 5 — (B77) No. 4:</i> <i>(i48) No. 5 — (B77) No. 7:</i>	Is the resistance less than 1 Ω ?	Replace the auto A/C control module.	Repair the open circuit of harness between the auto A/C control module and mode door actuator.
15 CHECK AUTO A/C CONTROL MODULE SIGNAL VOLTAGE. 1) Turn the ignition switch to ON. 2) Turn the air flow control dial and measure the voltage between auto A/C control module harness connector terminal and chassis ground for each mode. <i>Connector & terminal</i> <i>(i48) No. 13 (+) — Chassis ground (-):</i>	Is the voltage approx. 5 V at the VENT, BI-LEVEL and HEAT positions; and approx. 0 V at the D/H and DEF positions?	Go to step 19.	Go to step 16.
16 CHECK AUTO A/C CONTROL MODULE SIGNAL POWER. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the mode door actuator. 3) Turn the ignition switch to ON. 4) Measure the voltage between mode door actuator. <i>Connector & terminal</i> <i>(B77) No. 8 (+) — Chassis ground (-):</i>	Is the voltage approx. 5 V?	Go to step 18.	Go to step 17.

Diagnostic Procedure for Actuators

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Check	Yes	No
17 CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND MODE DOOR ACTUATOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the auto A/C control module and mode door actuator. 3) Measure the resistance of the harness between the auto A/C control module and mode door actuator. <i>Connector & terminal (i48) No. 13 — (B77) No. 8:</i>	Is the resistance less than 1 Ω ?	Replace the auto A/C control module.	Repair the open circuit of harness between the auto A/C control module and mode door actuator.
18 CHECK ACTUATOR GROUND CIRCUIT. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the auto A/C control module. 3) Measure the resistance of the harness between the auto A/C control module and mode door actuator. <i>Connector & terminal (i48) No. 16 — (B77) No. 10:</i>	Is the resistance less than 1 Ω ?	Replace the mode door actuator.	Repair the open circuit of harness between the auto A/C control module and mode door actuator.
19 CHECK POOR CONTACT. Check poor contact of auto A/C control module connector.	Is there poor contact in the connector?	Repair the connector.	Replace the auto A/C control module.

Diagnostic Procedure for Actuators

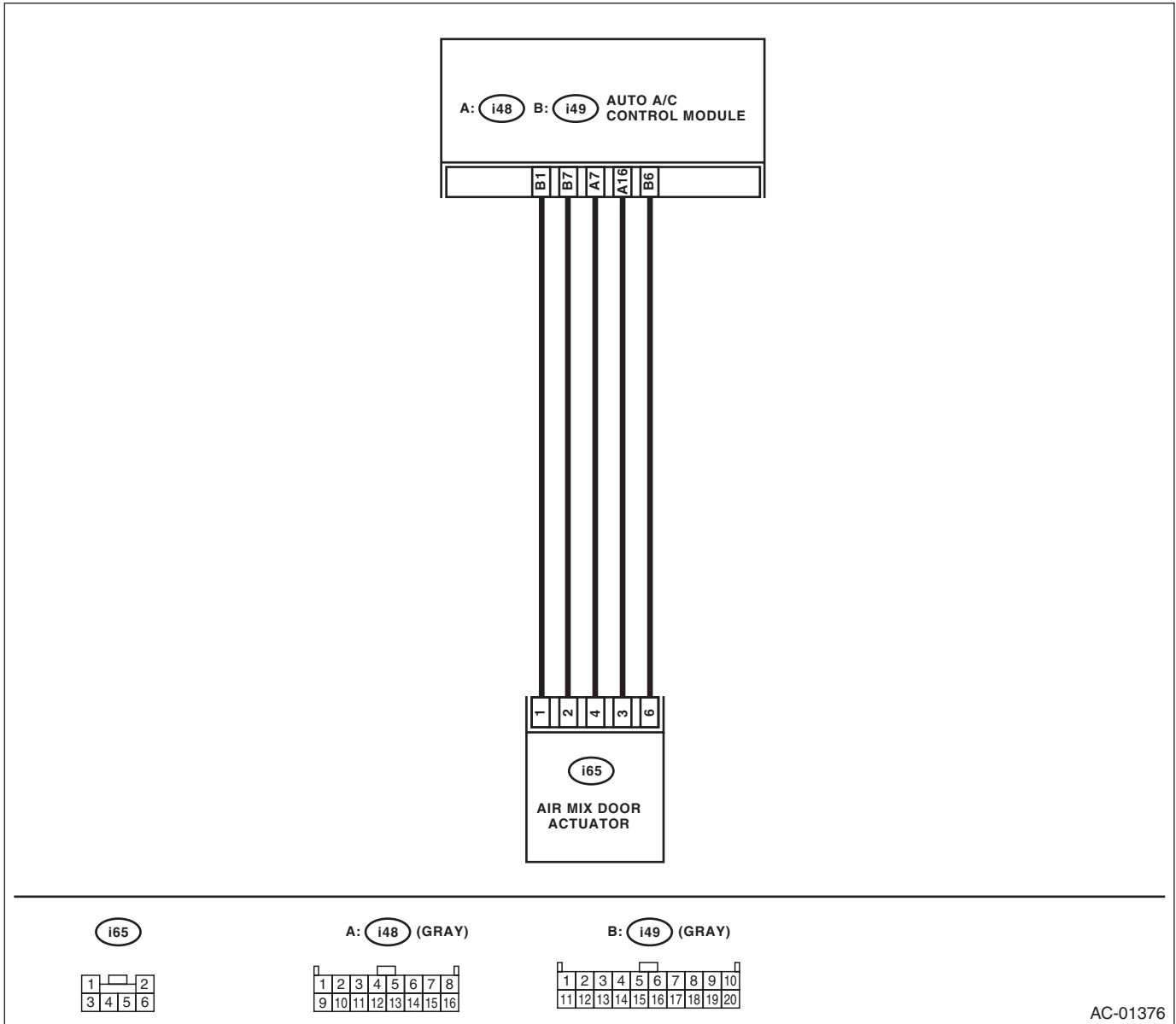
HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

C: AIR MIX DOOR ACTUATOR

TROUBLE SYMPTOM:

Outlet air temperature does not change.

WIRING DIAGRAM:



AC-01376

Diagnostic Procedure for Actuators

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POWER SUPPLY FOR AIR MIX DOOR ACTUATOR PBR. 1) Turn the ignition switch to OFF. 2) Disconnect the air mix door actuator connector. 3) Turn the ignition switch and AUTO switch ON. 4) Measure the voltage between auto A/C control module connector terminals. <i>Connector & terminal (i48) No. 7 (+) — (i48) No. 16 (-):</i>	Is the voltage approx. 5 V?	Go to step 2.	Replace the auto A/C control module.
2 CHECK POWER SUPPLY FOR AIR MIX DOOR ACTUATOR. Measure the voltage between auto A/C control module connector terminal and chassis ground after turning the temperature control dial to maximum COOL position. <i>Connector & terminal (i49) No. 6 (+) — Chassis ground (-):</i>	Is the voltage 7 V or more (at normal temperature)?	Go to step 3.	Replace the auto A/C control module.
3 CHECK POWER SUPPLY FOR AIR MIX DOOR ACTUATOR. Measure the voltage between auto A/C control module connector terminal and chassis ground after turning the temperature control dial to maximum HOT position. <i>Connector & terminal (i49) No. 7 (+) — Chassis ground (-):</i>	Is the voltage 7 V or more (at normal temperature)?	Go to step 4.	Replace the auto A/C control module.
4 CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND AIR MIX DOOR ACTUATOR. 1) Turn the A/C and ignition switch to OFF. 2) Disconnect the auto A/C control module connector. 3) Measure the resistance between auto A/C control module and air mix door actuator connector. <i>Connector & terminal (i65) No. 1 — (i49) No. 1: (i65) No. 2 — (i49) No. 7: (i65) No. 3 — (i48) No. 16: (i65) No. 4 — (i48) No. 7: (i65) No. 6 — (i49) No. 6:</i>	Is the resistance less than 1 Ω ?	Go to step 5.	Repair the open circuit of harness between auto A/C control module and air mix door actuator.
5 CHECK AIR MIX DOOR ACTUATOR PBR SIGNAL. 1) Connect the auto A/C control module and air mix door actuator connector. 2) Turn the ignition switch and AUTO switch ON. 3) Check the voltage between auto A/C control module connector terminals while changing the setting temperature between maximum COOL and maximum HOT. <i>Connector & terminal (i49) No. 1 (+) — (i48) No. 16 (-):</i>	Is the voltage 0.5 (Max. HOT) — 4.5 (Max. COOL) V?	Go to step 6.	Replace the air mix door actuator.
6 CHECK POOR CONTACT. Check poor contact of auto A/C control module and connector.	Is there poor contact in the connector?	Repair the connector.	Replace the auto A/C control module.

Diagnostic Procedure for Sensors

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

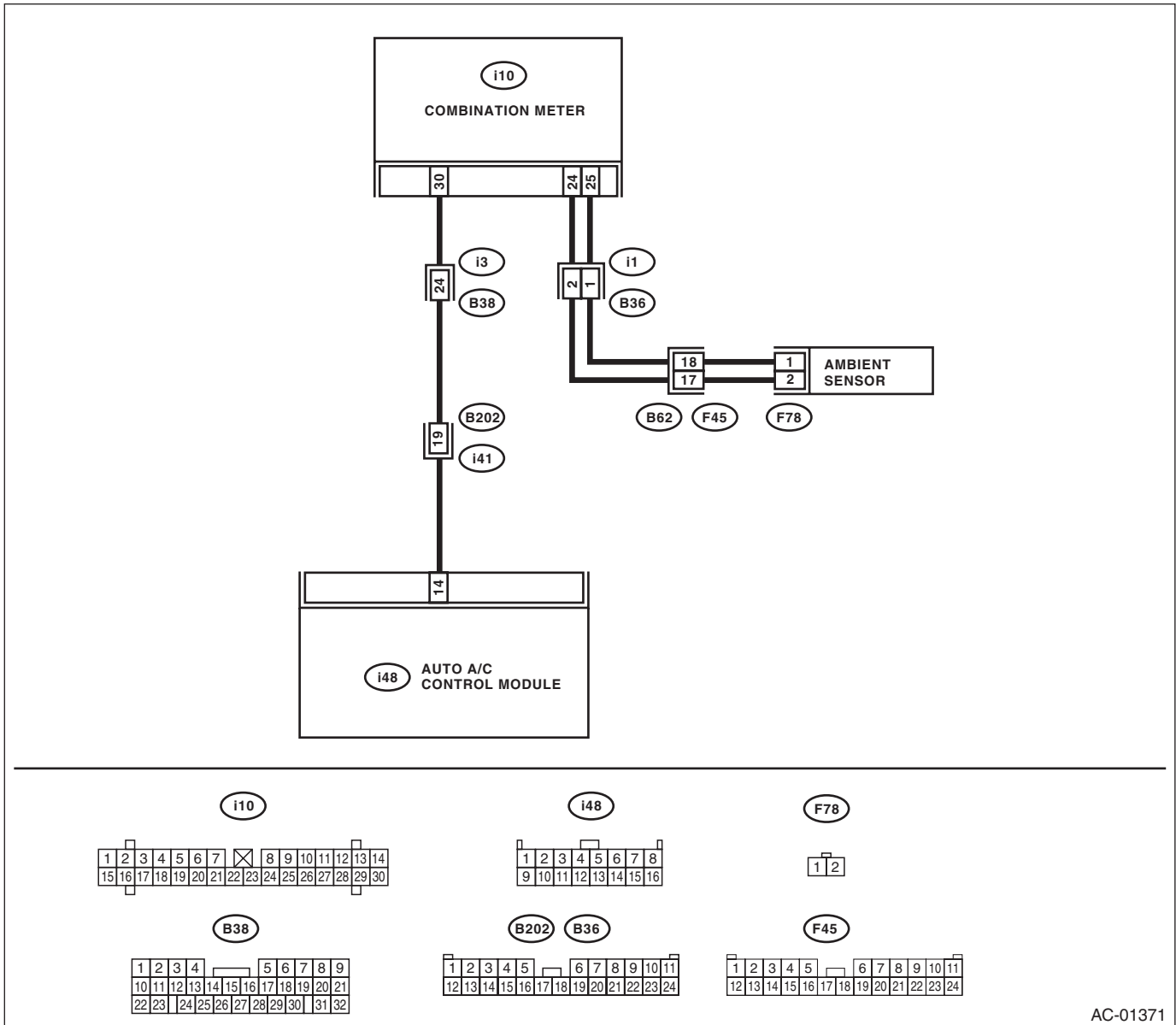
8. Diagnostic Procedure for Sensors

A: AMBIENT SENSOR

TROUBLE SYMPTOM:

- Fan speed is not switched when the fan speed control dial is in AUTO position.
- Failure related to the ambient sensor is indicated in self-diagnosis.

WIRING DIAGRAM:



AC-01371

Diagnostic Procedure for Sensors

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND COMBINATION METER. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from auto A/C control module and the combination meter. 3) Measure the resistance of harness between the auto A/C control module and combination meter. Connector & terminal (i10) No. 30 — (i48) No. 14:	Is the resistance less than 1 Ω ?	Go to step 2.	Repair the open circuit of the harness between auto A/C control module and combination meter.
2 CHECK AMBIENT SENSOR CIRCUIT. Check the ambient sensor circuit. <Ref. to IDI-9, CHECK OUTSIDE TEMPERATURE INDICATOR, INSPECTION, Combination Meter System.>	Is the ambient sensor circuit normal?	Go to step 3.	Repair the ambient sensor circuit.
3 CHECK POOR CONTACT. Check poor contact of auto A/C control module connector.	Is there poor contact in the connector?	Repair the connector.	Replace the auto A/C control module.

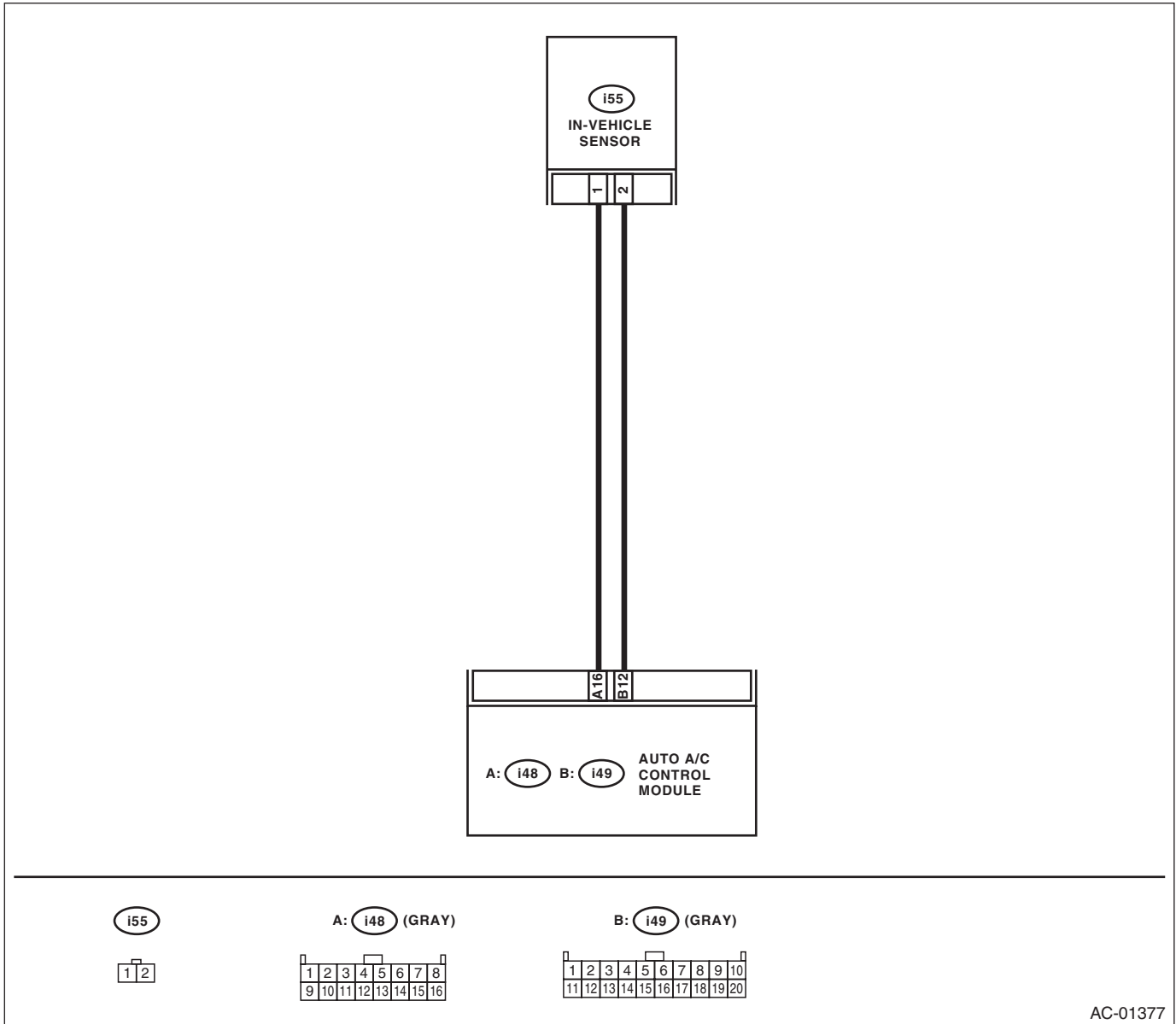
Diagnostic Procedure for Sensors

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

B: IN-VEHICLE SENSOR

TROUBLE SYMPTOM:

- Blower fan speed, outlet port and inlet port do not change after turning the AUTO switch ON
- Failure related to the in-vehicle sensor is indicated in self-diagnosis.



AC-01377

Diagnostic Procedure for Sensors

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

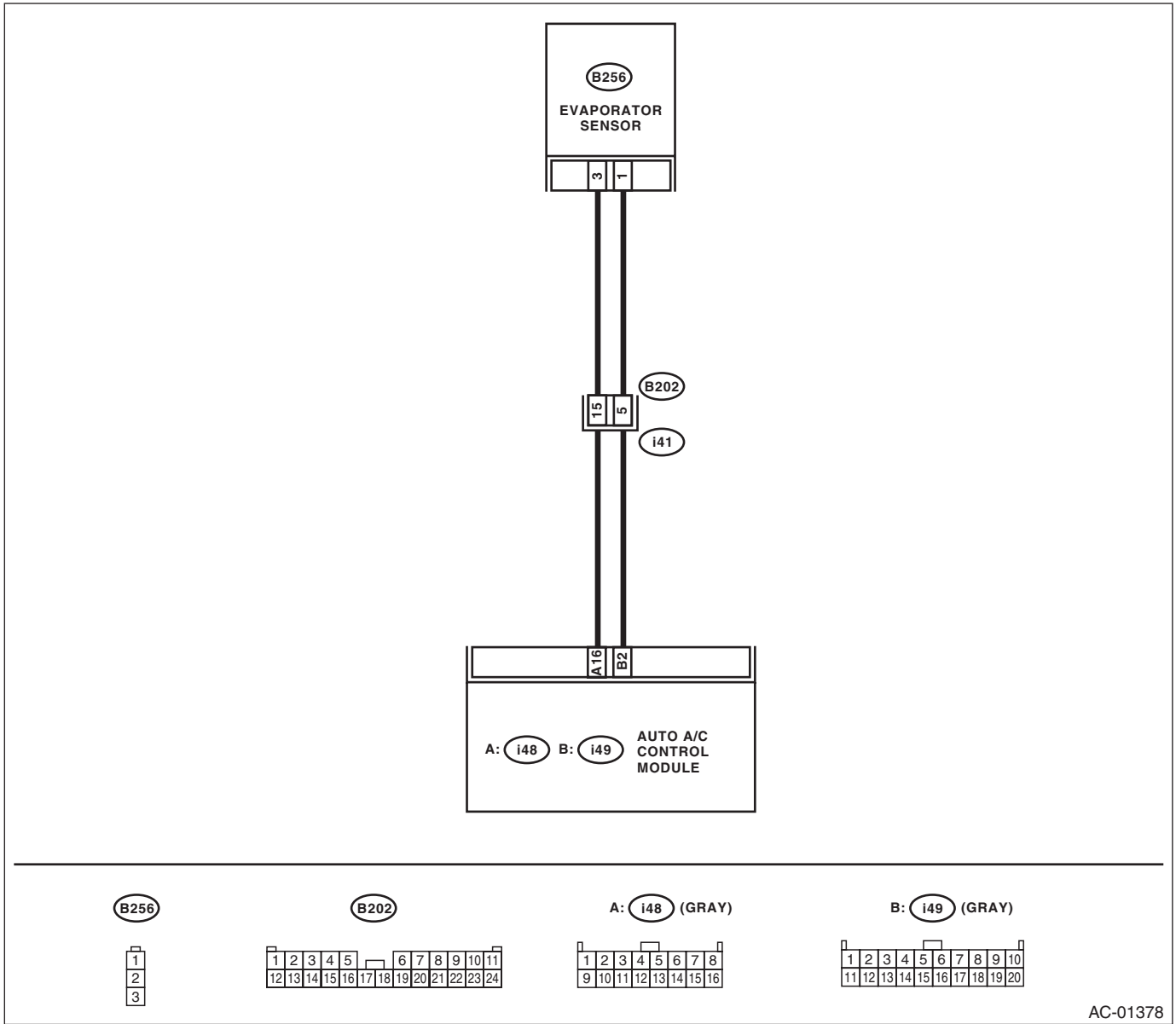
Step	Check	Yes	No
1 CHECK IN-VEHICLE SENSOR. 1) Turn the ignition switch to OFF. 2) Remove the driver side lower cover. 3) Disconnect the connector from in-vehicle sensor. 4) Measure the resistance between connector terminals of in-vehicle sensor. Terminals No. 1 — No. 2:	Is the resistance approximately 2.7 k Ω at 20°C (68°F)?	Go to step 2.	Replace the in-vehicle sensor.
2 CHECK INPUT SIGNAL FOR IN-VEHICLE SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between in-vehicle sensor harness connector terminal and chassis ground. Connector & terminal (i55) No. 2 (+) — Chassis ground (-):	Is the voltage approx. 5 V?	Go to step 5.	Go to step 3.
3 CHECK AUTO A/C CONTROL MODULE OUTPUT SIGNAL. 1) Turn the ignition switch to OFF. 2) Pull out the auto A/C control module. 3) Turn the ignition switch to ON. 4) Measure the voltage between connector terminals of auto A/C control module. Connector & terminal (i49) No. 12 (+) — (i48) No. 16 (-):	Is the voltage approx. 5 V?	Go to step 4.	Go to step 6.
4 CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND IN-VEHICLE SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the auto A/C control module. 3) Measure the resistance of harness between auto A/C control module and in-vehicle sensor. Connector & terminal (i55) No. 2 — (i49) No. 12:	Is the resistance less than 1 Ω ?	Go to step 5.	Repair the open circuit of the harness between auto A/C control module and in-vehicle sensor.
5 CHECK HARNESS BETWEEN AUTO A/C CONTROL MODULE AND IN-VEHICLE SENSOR. Measure the resistance of harness between auto A/C control module and in-vehicle sensor. Connector & terminal (i55) No. 1 — (i48) No. 16:	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the open circuit of the harness between auto A/C control module and in-vehicle sensor.
6 CHECK POOR CONTACT. Check poor contact of auto A/C control module connector.	Is there poor contact in the connector?	Repair the connector.	Replace the auto A/C control module.

Diagnostic Procedure for Sensors

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

C: EVAPORATOR SENSOR

WIRING DIAGRAM:



AC-01378

Diagnostic Procedure for Sensors

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK EVAPORATOR SENSOR. 1) Turn the ignition switch to OFF. 2) Remove the glove box. 3) Disconnect the connector from evaporator sensor. 4) Measure the resistance between connector terminals of the evaporator sensor. <i>Terminals</i> <i>No. 1 — No. 3:</i>	Is the resistance approximately 2.7 k Ω at 20°C (68°F)?	Go to step 2.	Replace the evaporator sensor.
2 CHECK INPUT SIGNAL FOR EVAPORATOR SENSOR. 1) Turn the ignition switch to ON. 2) Measure the voltage between evaporator sensor harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B256) No. 1 (+) — Chassis ground (-):</i>	Is the voltage approx. 5 V?	Go to step 5.	Go to step 3.
3 CHECK AUTO A/C CONTROL MODULE OUTPUT SIGNAL. 1) Turn the ignition switch to OFF. 2) Pull out the auto A/C control module. 3) Turn the ignition switch to ON. 4) Measure the voltage between connector terminals of auto A/C control module. <i>Connector & terminal</i> <i>(i49) No. 2 (+) — (i48) No. 16 (-):</i>	Is the voltage approx. 5 V?	Go to step 4.	Go to step 6.
4 CHECK HARNESS CONNECTOR BETWEEN AUTO A/C CONTROL MODULE AND EVAPORATOR SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the auto A/C control module. 3) Measure the resistance of harness between auto A/C control module and evaporator sensor. <i>Connector & terminal</i> <i>(B256) No. 1 — (i49) No. 2:</i>	Is the resistance less than 1 Ω ?	Go to step 5.	Repair the open circuit of harness between auto A/C control module and evaporator sensor.
5 CHECK HARNESS CONNECTOR BETWEEN AUTO A/C CONTROL MODULE AND EVAPORATOR SENSOR. Measure the resistance of harness between auto A/C control module and evaporator sensor. <i>Connector & terminal</i> <i>(B256) No. 3 — (i48) No. 16:</i>	Is the resistance less than 1 Ω ?	Go to step 6.	Repair the open circuit of harness between auto A/C control module and evaporator sensor.
6 CHECK POOR CONTACT. Check poor contact of auto A/C control module connector.	Is there poor contact in the connector?	Repair the connector.	Replace the auto A/C control module.

Diagnostic Procedure for Sensors

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

D: SUNLOAD SENSOR

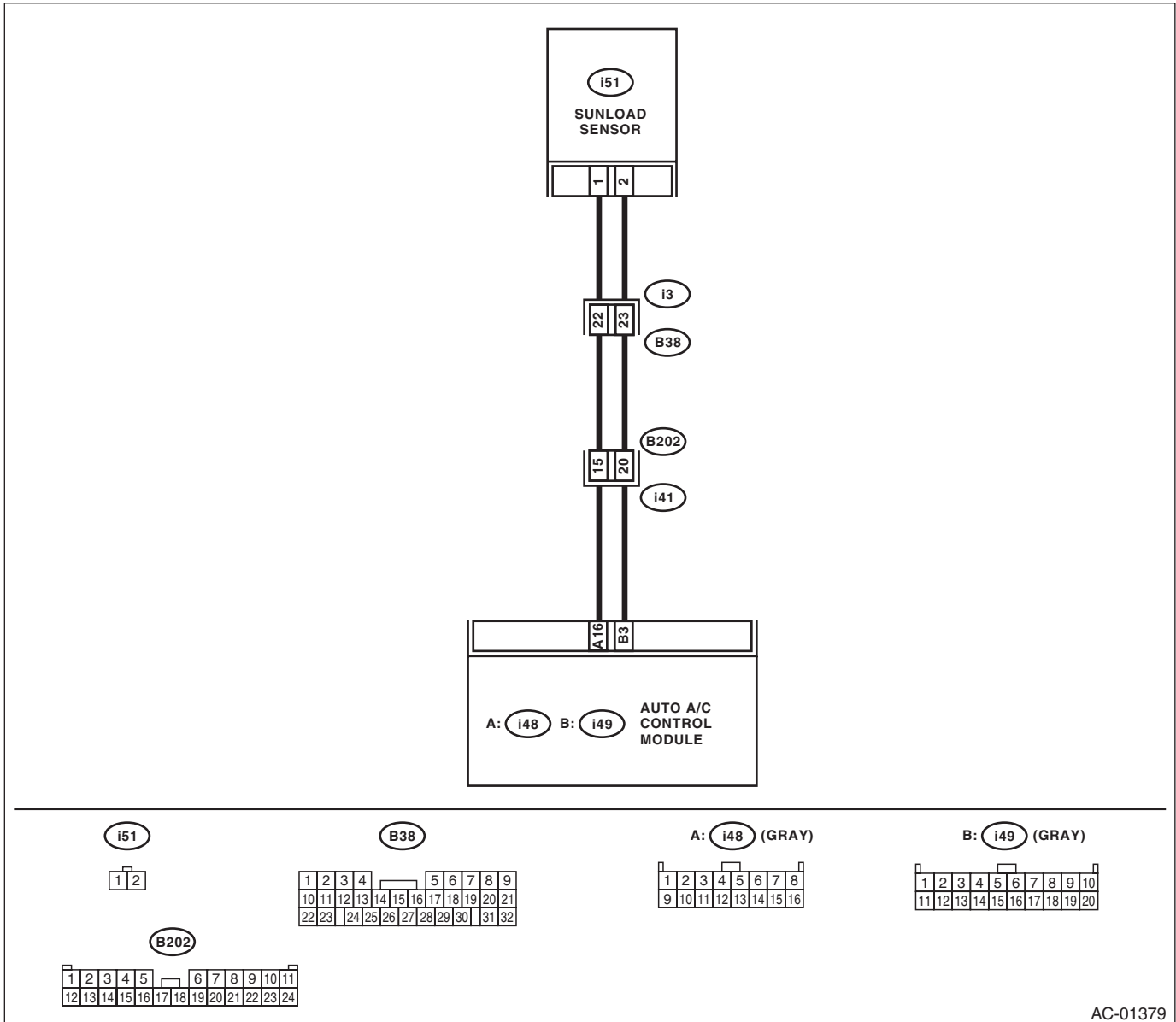
TROUBLE SYMPTOM:

- Sensor identifies that sunlight is at maximum. Then, A/C system is controlled to COOL side.
- Sensor identifies that sunlight is at minimum. Then, A/C system is controlled to HOT side.

NOTE:

When the sunload sensor is checked indoors or in the shade, an open circuit might be indicated. Always check the sunload sensor at a location exposed to direct sunlight.

WIRING DIAGRAM:



AC-01379

Diagnostic Procedure for Sensors

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK INPUT VOLTAGE TO SUNLOAD SENSOR. 1) Turn the ignition switch to ON. 2) Measure the input voltage to sunload sensor. <i>Connector & terminal</i> <i>(i51) No. 2 (+) — Chassis ground (-):</i>	Is the voltage approx. 5 V?	Go to step 3.	Go to step 2.
2 CHECK HARNESS CONNECTOR BETWEEN AUTO A/C CONTROL MODULE AND SUNLOAD SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the auto A/C control module. 3) Measure the resistance of the harness between the auto A/C control module and sunload sensor. <i>Connector & terminal</i> <i>(i51) No. 2 — (i49) No. 3:</i>	Is the resistance less than 1 Ω ?	Go to step 5.	Repair the harness between auto A/C control module and sunload sensor.
3 CHECK HARNESS CONNECTOR BETWEEN AUTO A/C CONTROL MODULE AND SUNLOAD SENSOR. Measure the resistance of the harness between the auto A/C control module and sunload sensor. <i>Connector & terminal</i> <i>(i51) No. 1 — (i48) No. 16:</i>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the harness between auto A/C control module and sunload sensor.
4 CHECK INPUT VOLTAGE FOR AUTO A/C CONTROL MODULE. 1) Connect the auto A/C control module connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between connector terminals of auto A/C control module. <i>Connector & terminal</i> <i>(i49) No. 3 (+) — (i48) No. 16 (-):</i>	Is the voltage approx. 2.5 V?	Go to step 5.	Replace the sunload sensor.
5 CHECK POOR CONTACT. Check poor contact of auto A/C control module connector.	Is there poor contact of the connector?	Repair the connector.	Replace the auto A/C control module.

Diagnostics with Phenomenon

HVAC SYSTEM (AUTO A/C) (DIAGNOSTICS)

9. Diagnostics with Phenomenon

A: GENERAL DIAGNOSTIC TABLE

Symptom	Problem parts
A/C system fails to operate.	<ul style="list-style-type: none"> • Fuse • Connector (Poor contact) • Ground • Auto A/C control module • Blower fan motor • Blower fan relay • A/C relay • Compressor (Magnet clutch) • Evaporator sensor
Fuse is blown out.	<ul style="list-style-type: none"> • Fuse • Connector (Poor contact)
Illumination cannot dim.	<ul style="list-style-type: none"> • Fuse • Connector (Poor contact) • Auto A/C control module
Blower fan does not rotate or fan speed cannot be controlled.	<ul style="list-style-type: none"> • Fuse • Connector (Poor contact) • Ground • Auto A/C control module • Blower fan motor • Blower fan relay
Unable to switch suction vents.	<ul style="list-style-type: none"> • Connector (Poor contact) • Auto A/C control module • Intake door actuator
Unable to switch vents.	<ul style="list-style-type: none"> • Connector (Poor contact) • Auto A/C control module • Mode door actuator
The compartment temperature does not rise. (Warm air does not come out.)	<ul style="list-style-type: none"> • Connector (Poor contact) • Auto A/C control module • Air mix door actuator • In-vehicle sensor, ambient sensor, evaporator sensor and sunload sensor • In-vehicle sensor aspirator hose
The compartment temperature does not lower. (Cold air does not come out.)	<ul style="list-style-type: none"> • Connector (Poor contact) • Auto A/C control module • Air mix door actuator • A/C relay • Compressor (Magnet clutch) • Radiator fan motor • Radiator fan relay • In-vehicle sensor, ambient sensor, evaporator sensor and sunload sensor • In-vehicle sensor aspirator hose
Compartment temperature is higher or lower than setting temperature.	<ul style="list-style-type: none"> • Auto A/C control module • Air mix door actuator • In-vehicle sensor, ambient sensor, evaporator sensor and sunload sensor • In-vehicle sensor aspirator hose
Compartment temperature does not quickly respond to setting temperature.	<ul style="list-style-type: none"> • Air mix door actuator • In-vehicle sensor, ambient sensor, evaporator sensor and sunload sensor • In-vehicle sensor aspirator hose
Radiator fan does not rotate during A/C operation.	<ul style="list-style-type: none"> • Radiator fan motor • Radiator fan relay

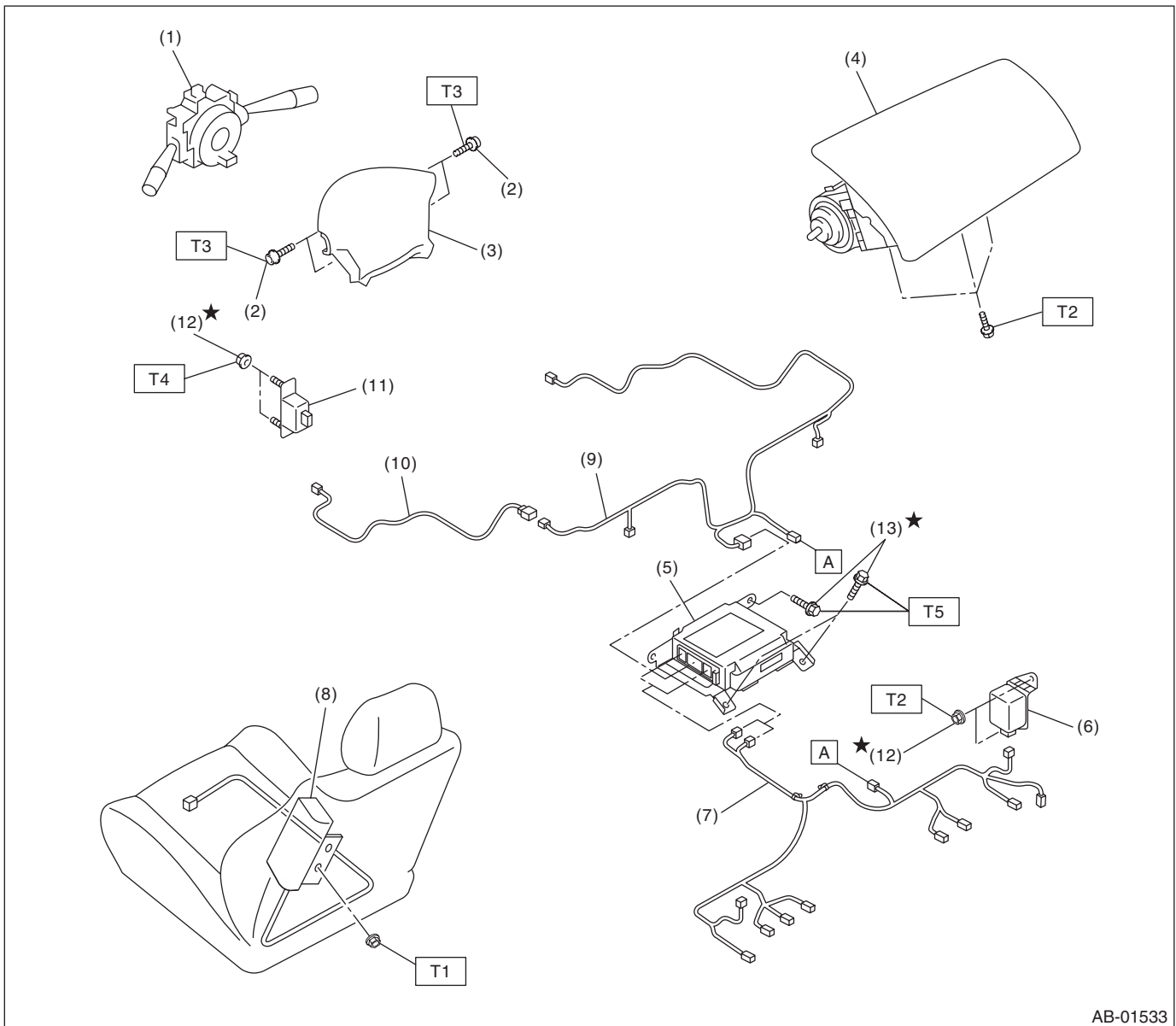
General Description

AIRBAG SYSTEM

1. General Description

A: COMPONENT

1. SRS AIRBAG



AB-01533

- | | |
|---|---------------------------|
| (1) Combination switch ASSY with roll connector | (7) Wiring harness rear |
| (2) TORX® bolt T30 | (8) Side airbag module |
| (3) Airbag module ASSY (Driver) | (9) Wiring harness center |
| (4) Airbag module ASSY (Passenger) | (10) Wiring harness front |
| (5) Airbag control module | (11) Front sub sensor |
| (6) Side airbag sensor | (12) Nut |
| | (13) Bolt |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 7.5 (0.8, 5.5)

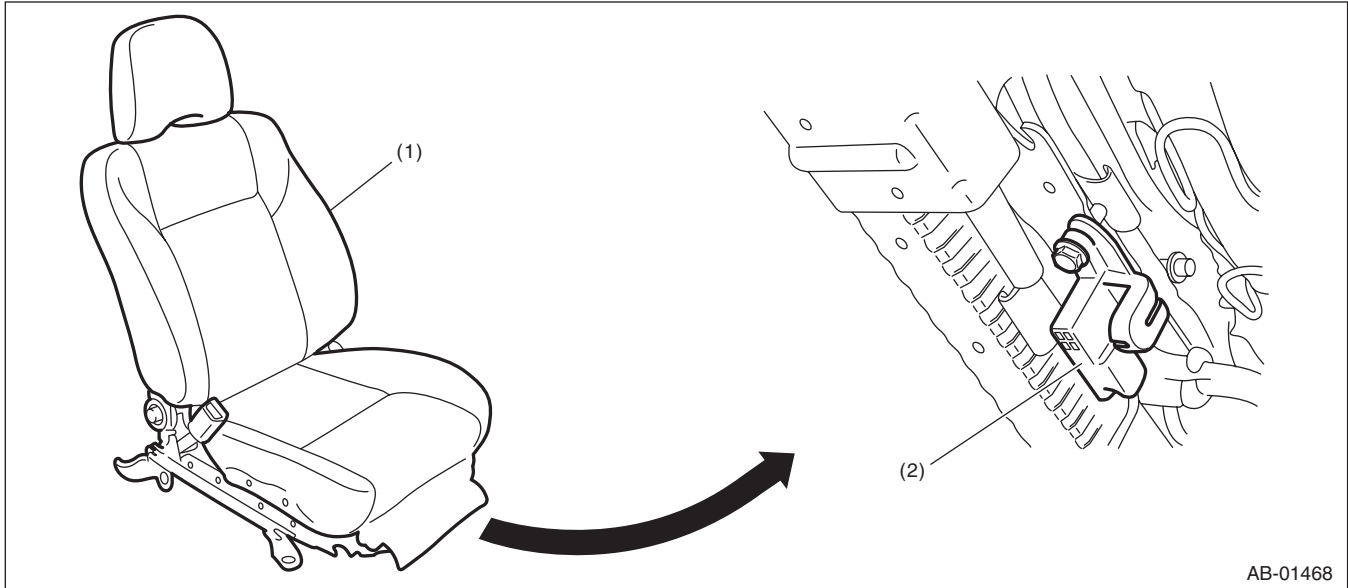
T2: 7.4 (0.75, 5.4)

T3: 10 (1.0, 7.2)

T4: 20 (2.0, 14.5)

T5: 25 (2.5, 18.1)

2. SEAT POSITION SENSOR



AB-01468

(1) Driver's seat

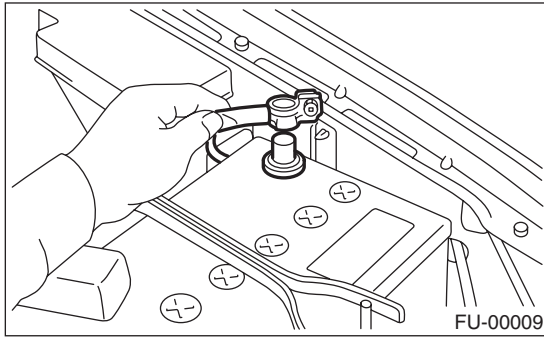
(2) Seat position sensor

General Description

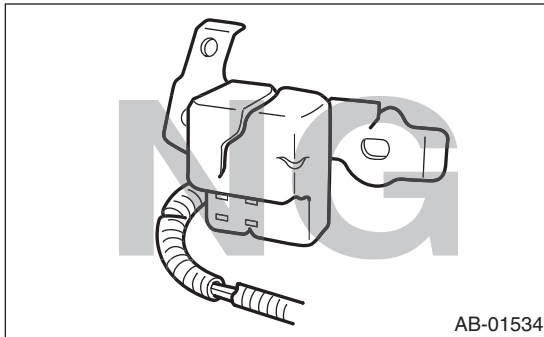
AIRBAG SYSTEM

B: CAUTION

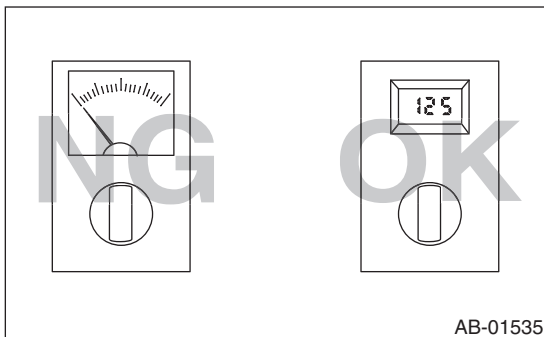
- When servicing a vehicle, be sure to turn the ignition switch to OFF, disconnect the ground cable from battery, and wait for more than 20 seconds before starting work.
- The airbag system is fitted with a backup power source. Be careful that the airbag may deploy after disconnecting the battery ground cable, if you do not wait for more than 20 seconds before starting the service of airbag system.



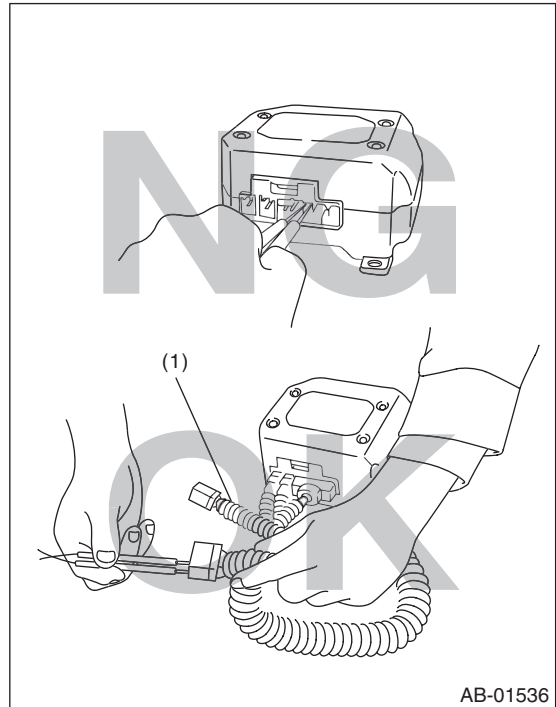
- If the airbag warning light illuminates, repair the vehicle immediately. Be careful that the airbag or pretensioner may inflate incorrectly, or not inflate in collision without repair.
- If sensors, airbag module, airbag control module, pretensioner or harness is deformed or damaged, replace with new parts.



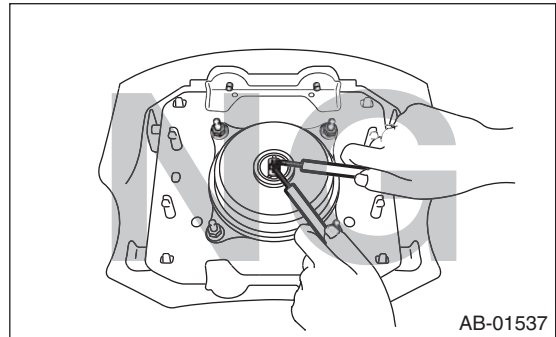
- When checking the airbag system, be sure to use a digital circuit tester. Use of an analog circuit tester may cause the airbag to activate erroneously due to a minimal current inside tester.



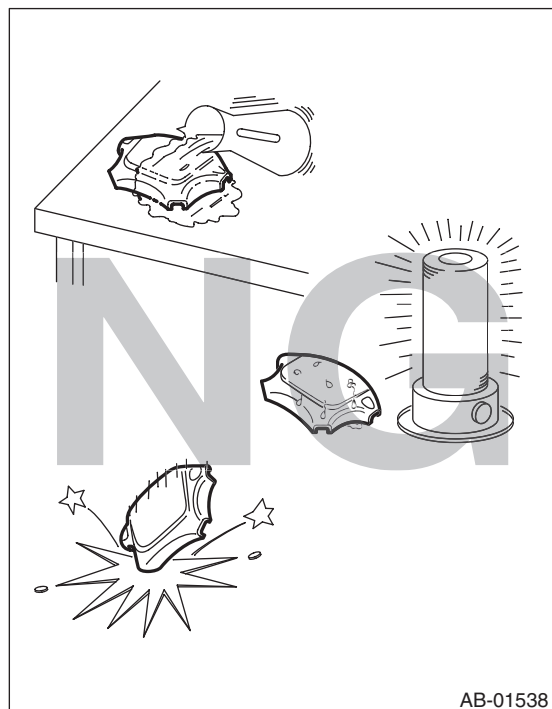
- When checking, use a test harness (1). Damage to connector terminal cause malfunction. Do not directly apply the tester probe to connector terminal of airbag.



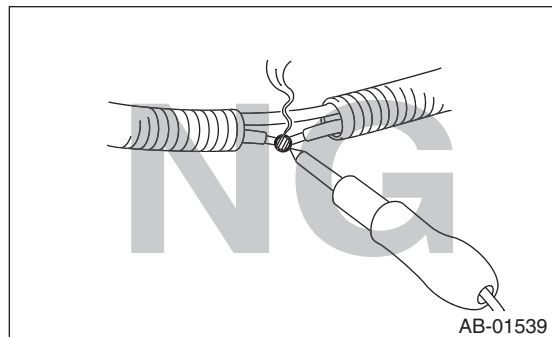
- Do not check continuity of the airbag modules for driver's side, passenger's side, or pretensioner.



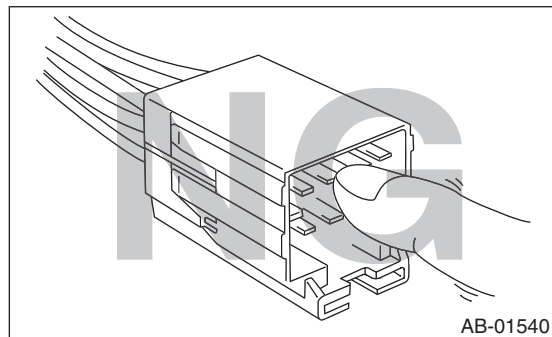
- Do not drop any parts of the airbag system, subject them to high temperature over 93°C (199°F), or let water, oil or grease get on them; the internal parts may be damaged and reliability greatly lowered.



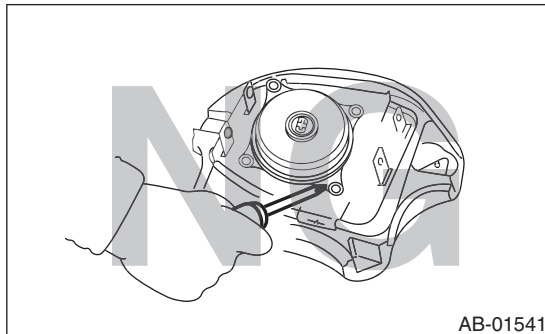
- If damage, open circuit or rust is found on airbag system wiring harness, do not use a soldering equipment to repair. Replace the faulty harness with a new genuine part.



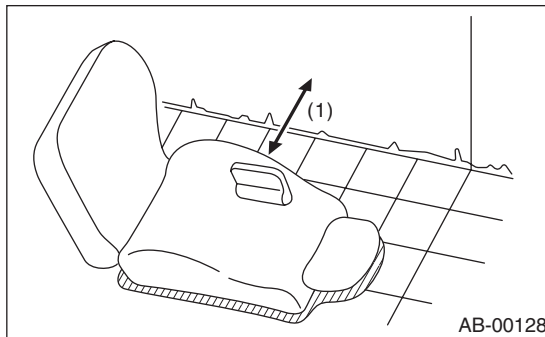
- Do not allow water or oil to come in contact with the connector terminals. Also, do not touch the connector terminals.



- When airbag control module, front sub sensor, side airbag sensor and curtain airbag sensor are removed, do not reuse the bolts and nuts. Always use new bolts and nuts.
- Either of the airbag modules for driver's, passenger's and side or the pretensioner must not be disassembled.



- The removed front seat with airbag module must be kept at least 200 mm (8 in) away from walls and other objects.



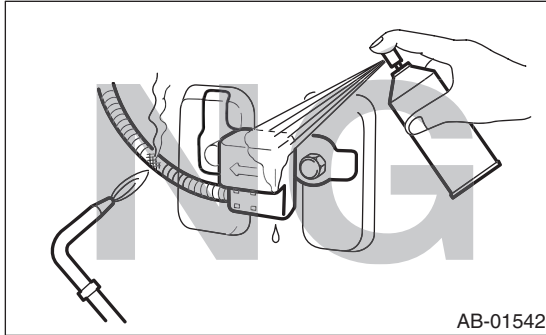
(1) 200 mm (8 in) or more

- Do not use the airbag or pretensioner parts from other vehicles. Always replace the defective parts with new parts.
- Never reuse a deployed airbag and pretensioner.
- When painting or performing sheet metal work on the front part of the vehicle, including the front wheel apron, front fender and front side frame, remove the front sub sensors and wiring harness of airbag system.

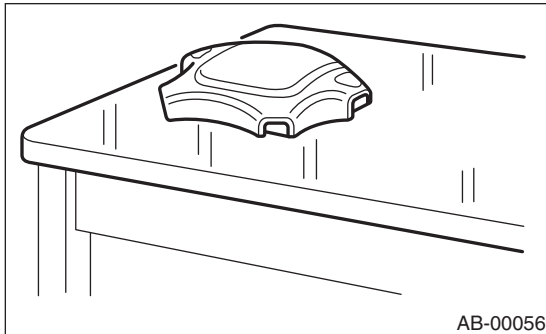
General Description

AIRBAG SYSTEM

- When painting or performing sheet metal work on the side of the vehicle, including the side sill, center pillar and front and rear doors, remove the side airbag sensors and wiring harness of the airbag system.

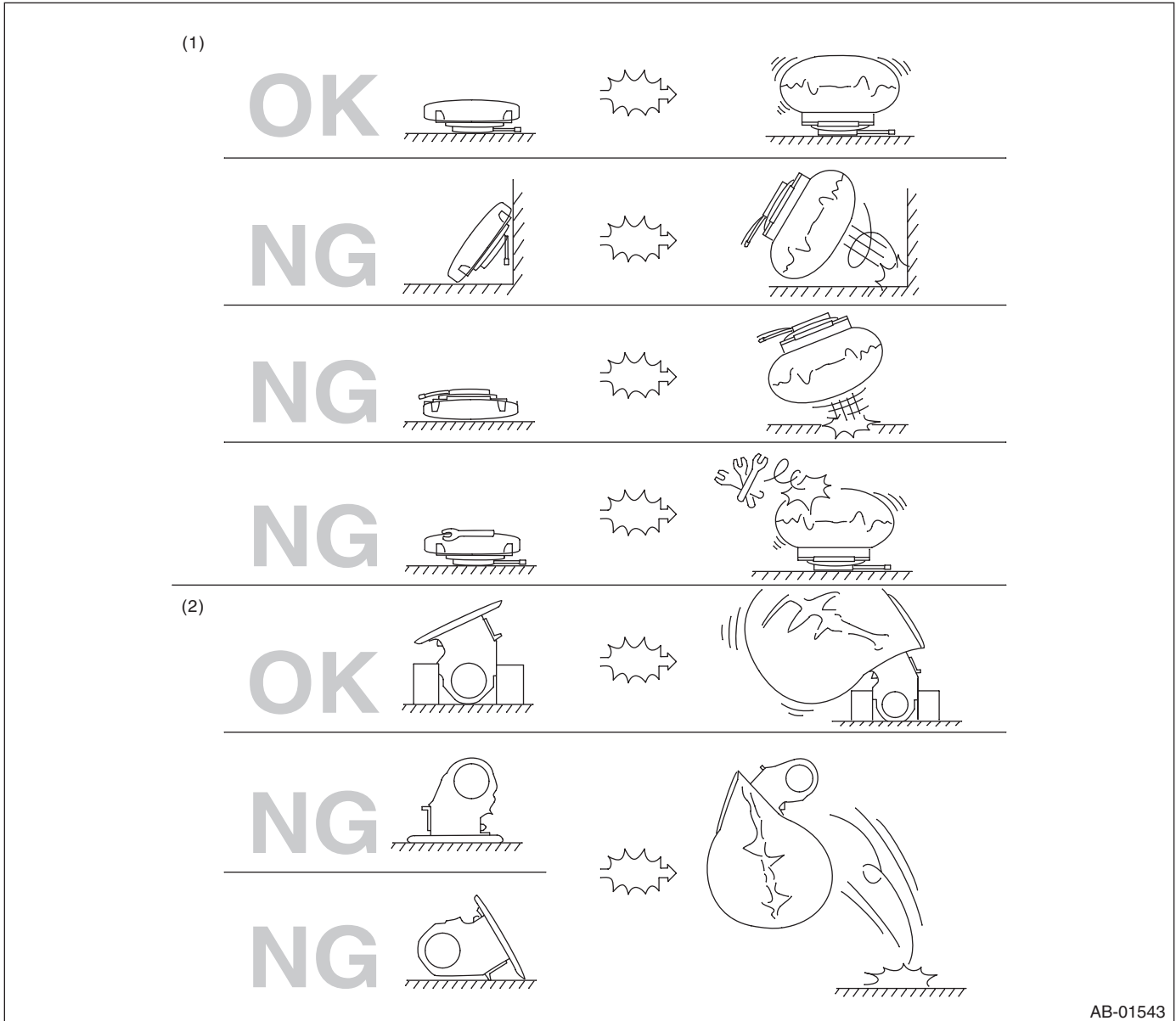


- Do not discard an undeployed airbag module or pretensioner.
- After removing the parts of airbag system, keep them with the pad facing upward on a dry, clean, and flat surface away from heat and light sources, and moisture and dust.



- When airbag control module, front sub sensor and side airbag sensor are removed, do not reuse the bolts and nuts. Always use new bolts and nuts.

- When storing the removed airbag module, do not place with the pad side facing down. Do not place any objects on top of the airbag module. Do not stack other airbag modules on top of each other. If the airbag module pads are in contact with other objects, it may lead to a major accident when the airbag is deployed unexpectedly.



AB-01543

(1) Driver's airbag module

(2) Passenger's airbag module

C: PREPARATION TOOL

1. GENERAL TOOL

TOOL NAME	REMARKS
TORX® T30	Used for removal/installation of drivers airbag module

Airbag Connector

AIRBAG SYSTEM

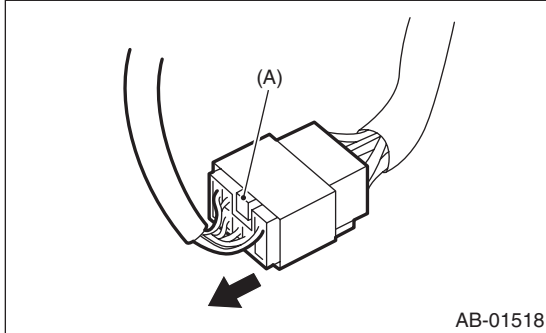
2. Airbag Connector

A: PROCEDURE

1. POWER SUPPLY

1) How to disconnect:

(1) With the lock arm (A) pushed in, move the connector in the direction of arrow.

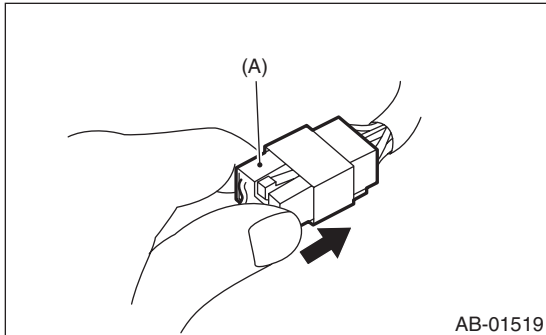


CAUTION:

When pulling the slide lock or disconnecting connector, be sure to hold the connector, not the harness.

2) How to connect:

Holding the connector (A), and push it in carefully until a clicking sound is heard.



CAUTION:

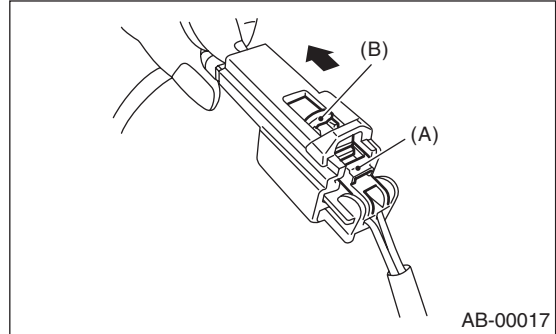
Be sure to insert the connector in until it is locked. Then pull it gently to make sure that it is locked.

2. DRIVER'S AIRBAG (BETWEEN AIRBAG HARNESS AND ROLL CONNECTOR) AND SIDE AIRBAG

1) How to disconnect:

(1) Push the lock arm (A).

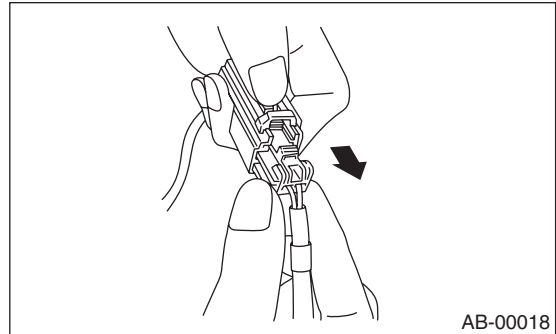
(2) With the lock arm (A) pushed in, move the slide lock (B) in the direction of arrow.



(3) With the slide lock pulled, release the lock arm (return to original position) and disconnect the connector.

CAUTION:

When pulling the slide lock or disconnecting connector, be sure to hold the connector, not the harness.

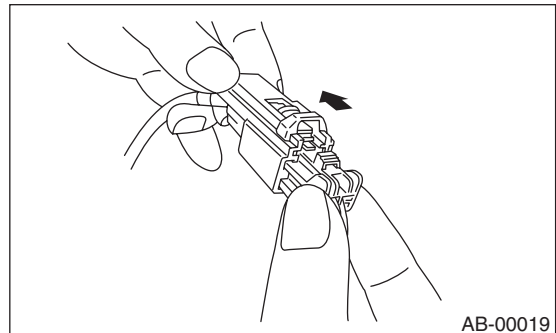


2) How to connect:

Holding the connector, push it in securely until a clicking sound is heard.

CAUTION:

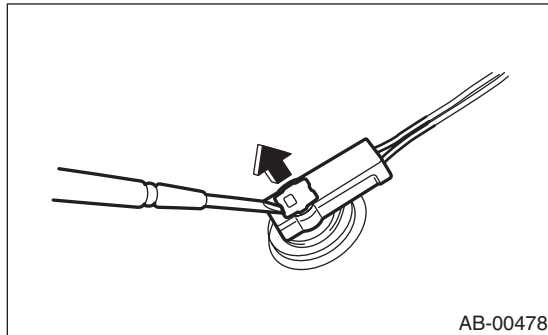
Be sure to insert the connector in until it is locked. Then pull it gently to make sure that it is locked.



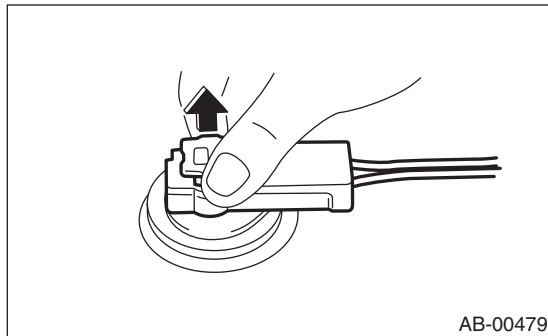
3. DRIVER'S AIRBAG MODULE AND PRE-TENSIONER

1) How to disconnect:

(1) Using a flat tip screwdriver, pull the push lock upward to unlock.



(2) Pull the connector to disconnect from driver's airbag module assembly or retractor assembly.

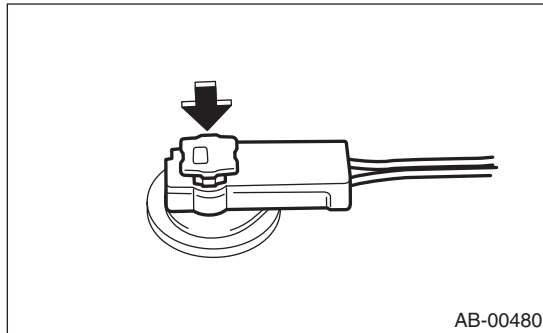


2) How to connect:

Connect the connector in the reverse order of disconnecting. At this time, be sure to insert the push lock until a clicking sound is heard.

CAUTION:

- Be sure to insert the connector in until it is locked. Then pull it gently to make sure that it is locked.
- Be sure to push the push lock in securely.



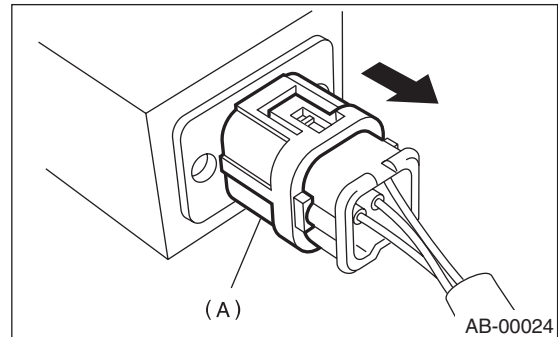
4. FRONT SUB-SENSOR AND SIDE AIRBAG SENSOR

1) How to disconnect:

Holding outer part (A), pull it in the direction of arrow.

CAUTION:

When pulling the slide lock or disconnecting connector, be sure to hold the connector, not the harness.



2) How to connect:

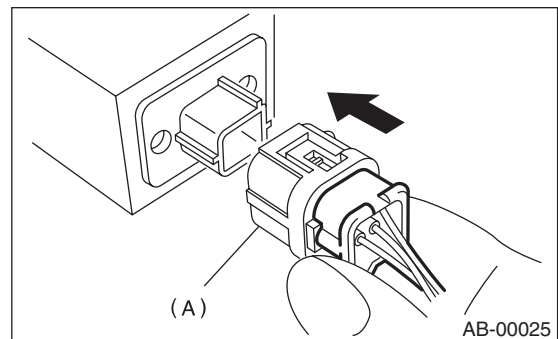
Holding the connector, push it in securely until a clicking sound is heard.

NOTE:

You cannot connect the connector when the push lock is in the lock position. Move the push lock to the release position to connect the connector.

CAUTION:

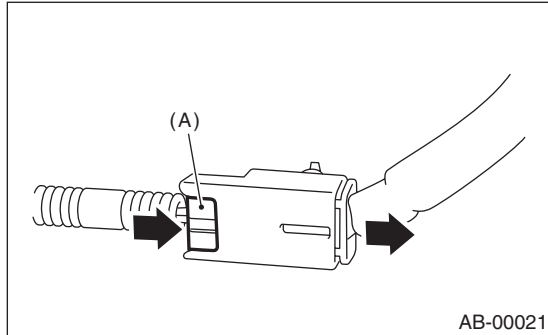
- Do not touch the outer section since outer side (A) will move back.
- Be sure to insert the connector in until it is locked. Then pull it gently to make sure that it is locked.



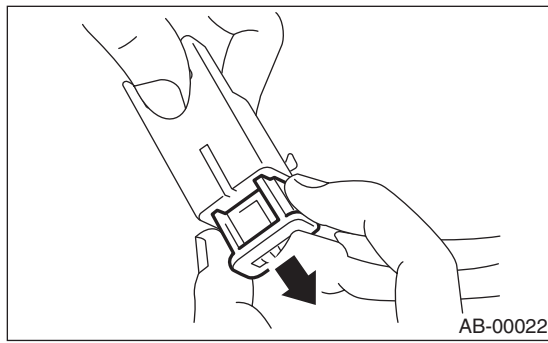
5. PASSENGER'S AIRBAG

1) How to disconnect:

(1) Move the slide lock (A) in the direction of arrow.



(2) With the slide lock pushed, pull it in the direction of arrow and disconnect the connector.



CAUTION:

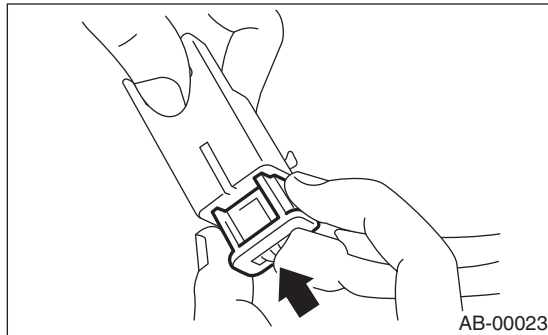
When pulling the slide lock or disconnecting connector, be sure to hold the connector, not the harness.

2) How to connect:

Holding the connector, push it in securely until a clicking sound is heard.

CAUTION:

Be sure to insert the connector in until it is locked. Then pull it gently to make sure that it is locked.



3. Inspection Locations After a Collision

A: REPLACEMENT

Replace the following parts when the airbag is deployed.

1. FRONT COLLISION

- 1) Driver's airbag module
- 2) Passenger's airbag module
- 3) Driver's seat belt (Pretensioner)
- 4) Passenger's seat belt (Pretensioner)
- 5) Airbag control module
- 6) Front sub sensor
- 7) Roll connector
- 8) Occupant detection system and seat cushion pad

2. SIDE COLLISION

- 1) Airbag control module
- 2) Side airbag module (operating side seat back)
- 3) Side airbag sensor (Operating side)

3. INSPECTION OF OTHER PARTS

Check for the following parts, and replace the damaged parts with new parts.

- 1) Steering wheel and steering shaft

Check the steering shaft for mounting conditions and deflection of front and rear, upward and downward directions, and deflection of front and rear direction with tilt lever released. (After a collision, absorbing part of steering shaft may have been operated.)

2) Check the connector of airbag module, pretensioner, etc. for damage, and also check each harness for pinch and connector damage. Replace the harness as a unit if damage is found.

3) Check the seat cushion frame, backrest, seat rail and headrest for deformation, distortion, crack, and installing condition and play.

4) If deformation or cracks are seen in the seat cushion frame of the passenger's seat, replace the occupant detection system.

5) If there are tears or loosening in the passenger's seat cushion cover, it may interfere with the proper operation of the occupant detection system. Replace with a new cushion cover.

6) If the seat cushion cover is removed or replaced, make sure to perform occupant detection system adjustment after installing the seat. <Ref. to OD(diag)-17, SYSTEM CALIBRATION (REZEROING), OPERATION, Subaru Select Monitor.>

Failure to do so may cause improper activation of passenger's airbag.

7) Use the Subaru Select Monitor to check whether the driver's seat position sensor and the front left/right seat belt buckle switches are operating normally.

B: INSPECTION

If the vehicle is involved in a collision on any side, even if it is a slight collision, be sure to check the following systems.

1. DRIVER'S AIRBAG MODULE

1) Check for the following, and replace the damaged parts with new parts.

- Airbag module is cracked or deformed.
- Harness and/or connector is cracked, deformed or open. Harness wire is exposed.
- The module surface is fouled with grease, oil, water or cleaning solvent.

2) When installing a new driver's airbag module, check the following. If necessary, install a new airbag module and steering wheel.

- The steering wheel is in the way, making it difficult to install the airbag module.
- The clearance between the driver's airbag module and steering wheel is not constant.
- When steering wheel deformation in axial and vertical directions exceed limits.

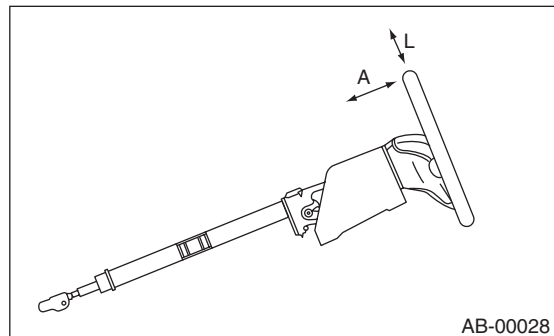
Specification:

Axial deflection A

Less than 6 mm (0.24 in)

Vertical deflection L

Less than 17 mm (0.67 in)



2. PASSENGER'S AIRBAG MODULE

Check for the following, and replace the damaged parts with new parts.

- Airbag module is cracked or deformed.
- Harness and/or connector is cracked, deformed or open. Harness wire is exposed.
- Mounting bracket is cracked or deformed.

Inspection Locations After a Collision

AIRBAG SYSTEM

3. SIDE AIRBAG MODULE

Check for the following, and replace the damaged parts with new parts.

- Front seat is damaged or deformed.
- Harness and/or connector is cracked, deformed or open.
- Harness wire is exposed.

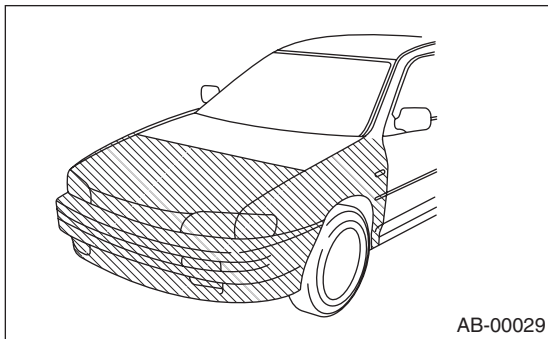
4. AIRBAG CONTROL MODULE

Check for the following, and replace the damaged parts with new parts.

- Control unit is cracked or deformed.
- Mounting bracket is cracked or deformed.
- Connector is scratched or deformed.
- Airbag is deployed.
- Side airbag is deployed.

5. FRONT SUB SENSOR

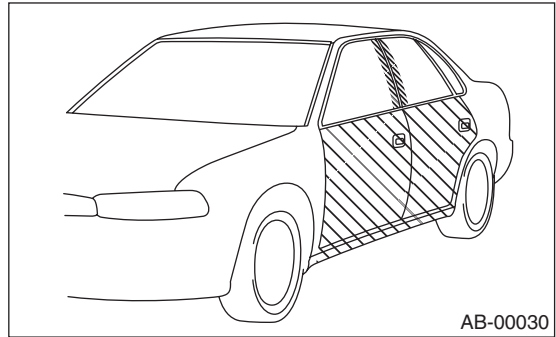
If the section of vehicle as shown in the figure is damaged, check the following items and replace the damaged parts with new parts.



- Front sub sensor is cracked or deformed.
- Mounting bracket is cracked or deformed.
- Connector is scratched or cracked.
- Airbag is deployed.

6. SIDE AIRBAG SENSOR

If the section of vehicle as shown in the figure is damaged, check the following items and replace the damaged parts with new parts.



- Side airbag sensor is cracked or deformed.
- Mounting bracket is cracked or deformed.
- Connector is scratched or cracked.
- Side airbag is deployed. (operating side)

7. ROLL CONNECTOR

Check for the following, and replace the damaged parts with new parts.

- Combination switch or steering roll connector is cracked or deformed.

8. STEERING SHAFT

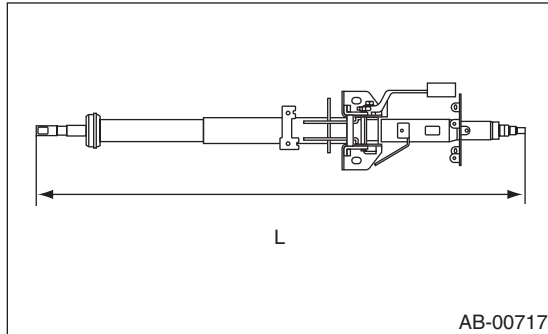
Check for the following, and replace the damaged parts with new parts.

- Overall length of steering column should be within specification.

Specification:

Overall length L

808.6±1.5 mm (31.83±0.06 in)



If necessary, replace it with new part.

9. DRIVER'S SEAT

Check for the following, and replace the damaged parts with new parts.

- Seat belt buckle switch or seat position sensor body/bracket is cracked or deformed.
- Harness and/or connector is cracked, deformed or open. Harness wire is exposed.

10.PASSENGER'S SEAT

1) Check for the following, and replace the damaged parts with new parts.

- Seat belt buckle body/bracket is scratched, cracked or deformed.
- Backrest frame for crack or deformation
- Headrest for deformation or play
- If the seat cushion cover and seat back cover is scratched or frayed, replace with a new cover and readjust the system. <Ref. to OD(diag)-17, SYSTEM CALIBRATION (REZEROING), OPERATION, Subaru Select Monitor.>

CAUTION:

If any of the following applies, replace the seat cushion pad and frame assembly. Do not disassemble.

- Cracks or deformation is found in the seat cushion frame or seat cushion pad.
- Scratches, cracks, or deformation is found on the occupant detection system pressure sensor hoses, occupant detection control module, or attachment brackets of the control module.
- Harness and/or connector is cracked, deformed or open. Harness wire is exposed.

2) After checking the installing condition of passenger's seat, perform the system calibration of occupant detection system. <Ref. to OD(diag)-17, SYSTEM CALIBRATION (REZEROING), OPERATION, Subaru Select Monitor.>

11.BELT TENSION SENSOR

Check for the following, and replace the damaged parts with new parts.

- Belt tension sensor is scratched, cracked, or deformed.
- Harness and/or connector is cracked, deformed or open. Harness wire is exposed.

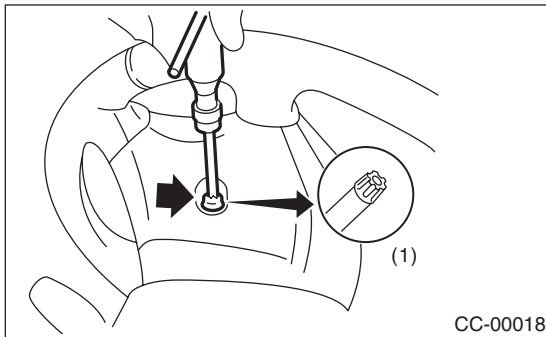
4. Driver's Airbag Module

A: REMOVAL

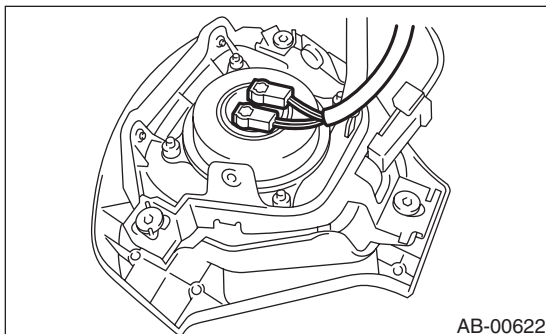
CAUTION:

Refer to "CAUTION" of "General Description" before handling the airbag module. <Ref. to AB-4, CAUTION, General Description.>

- 1) Position the front wheels straight ahead. (After moving a vehicle more than 5 m (16 ft) with front wheels positioned straight ahead, make sure that the vehicle moves straight ahead.)
- 2) Turn the ignition switch to OFF.
- 3) Disconnect the ground cable from battery and wait for at least 20 seconds before starting work.
- 4) Using TORX® bit T30 (1), remove the two TORX® bit bolts on the side of steering wheel.



- 5) Disconnect the horn harness.
- 6) Disconnect the airbag connector on the back of airbag module, and then remove the airbag module. <Ref. to AB-8, PROCEDURE, Airbag Connector.>



- 7) Refer to "CAUTION" for handling of a removed airbag module. <Ref. to AB-4, CAUTION, General Description.>

B: INSTALLATION

CAUTION:

- Refer to "CAUTION" of "General Description" before handling the airbag module. <Ref. to AB-4, CAUTION, General Description.>
- To prevent the misconnection, the connector is colored. Connect the harness side connector to the same color of module side connector. Install in the reverse order of removal.

CAUTION:

Do not allow harness and connectors to interfere or get tangled up with other parts.

Tightening torque:

Refer to "COMPONENT" of "General Description". <Ref. to AB-2, SRS AIRBAG, COMPONENT, General Description.>

C: INSPECTION

CAUTION:

Refer to "CAUTION" of "General Description" before handling the airbag module. <Ref. to AB-4, CAUTION, General Description.>

Check for the following, and replace the damaged parts with new parts.

- Airbag module, harness, connector and mounting bracket are damaged. <Ref. to AB-11, DRIVER'S AIRBAG MODULE, INSPECTION, Inspection Locations After a Collision.>

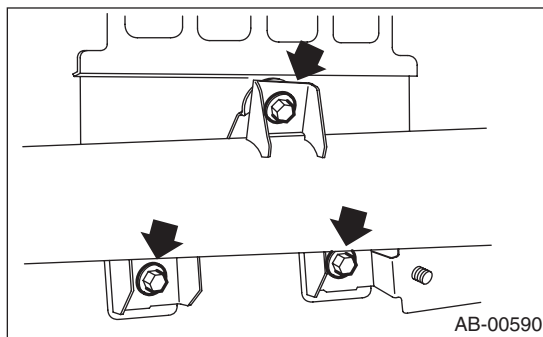
5. Passenger's Airbag Module

A: REMOVAL

CAUTION:

Refer to "CAUTION" of "General Description" before handling the airbag module. <Ref. to AB-4, CAUTION, General Description.>

- 1) Turn the ignition switch to OFF.
- 2) Disconnect the ground cable from battery and wait for at least 20 seconds before starting work.
- 3) Remove the glove box. <Ref. to EI-36, REMOVAL, Glove Box.>
- 4) Disconnect the airbag connector.
- 5) Remove the three bolts, and then carefully remove the airbag module.



- 6) Refer to "CAUTION" for handling of a removed airbag module. <Ref. to AB-4, CAUTION, General Description.>

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

Do not allow harness and connectors to interfere or get tangled up with other parts.

Tightening torque:

Refer to "COMPONENT" of "General Description". <Ref. to AB-2, SRS AIRBAG, COMPONENT, General Description.>

C: INSPECTION

CAUTION:

Refer to "CAUTION" of "General Description" before handling the airbag module. <Ref. to AB-4, CAUTION, General Description.>

Check for the following, and replace the damaged parts with new parts.

Airbag module, harness, connector and mounting bracket are damaged. <Ref. to AB-11, PASSENGER'S AIRBAG MODULE, INSPECTION, Inspection Locations After a Collision.>

Side Airbag Module

AIRBAG SYSTEM

6. Side Airbag Module

A: REMOVAL

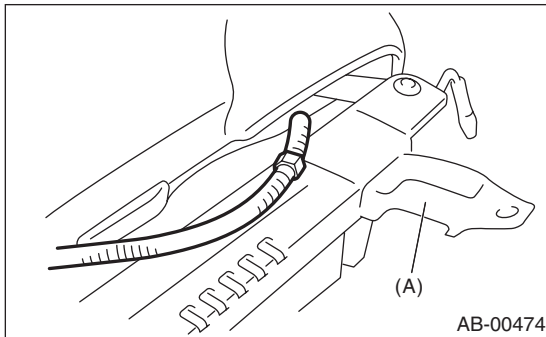
CAUTION:

Refer to “CAUTION” of “General Description” before handling the airbag module. <Ref. to AB-4, CAUTION, General Description.>

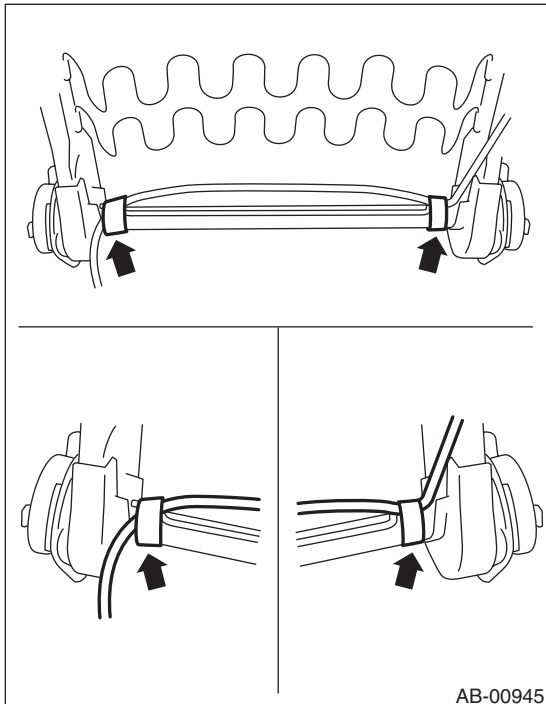
NOTE:

Remove the passenger’s side by referring to driver’s side.

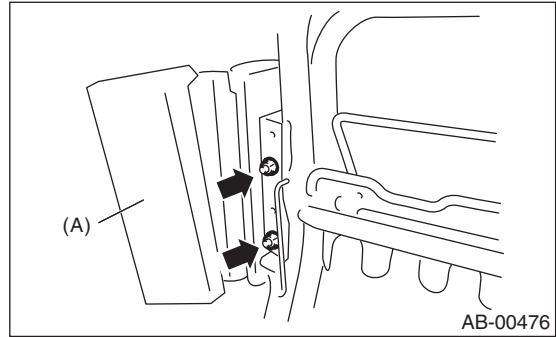
- 1) Turn the ignition switch to OFF.
- 2) Disconnect the ground cable from battery and wait for at least 20 seconds before starting work.
- 3) Remove the front seat. <Ref. to SE-7, REMOVAL, Front Seat.>
- 4) Remove the clip from reverse side of seat cushion assembly and slide rail IN (A), and then remove the side airbag harness.



- 5) Remove the backrest cover. <Ref. to SE-9, DISASSEMBLY, Front Seat.>
- 6) Remove the side airbag harness from backrest frame assembly.



- 7) Remove the side airbag module (A) from backrest frame assembly.



B: INSTALLATION

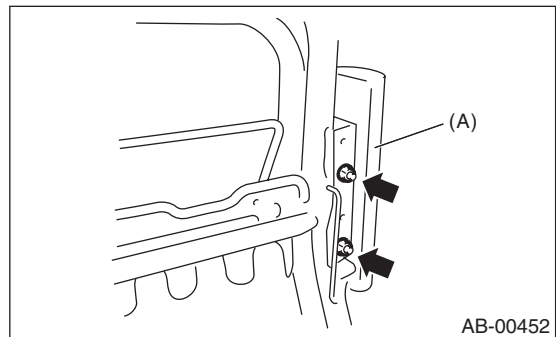
CAUTION:

- Refer to “CAUTION” of “General Description” before handling the airbag module. <Ref. to AB-4, CAUTION, General Description.>
- Be sure to perform the system calibration for occupant detection system after passenger’s seat installation. <Ref. to OD(diag)-17, SYSTEM CALIBRATION (REZEROING), OPERATION, Subaru Select Monitor.>

- 1) Make sure that there is no foreign matter on side airbag module.
- 2) Install the side airbag module (A) to backrest frame assembly.

Tightening torque:

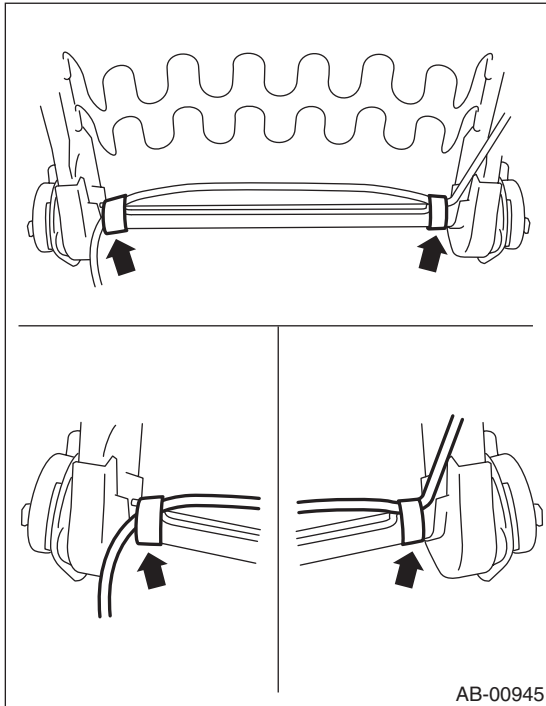
7.5 N·m (0.8 kgf-m, 5.5 ft-lb)



3) Install the side airbag harness to backrest frame assembly.

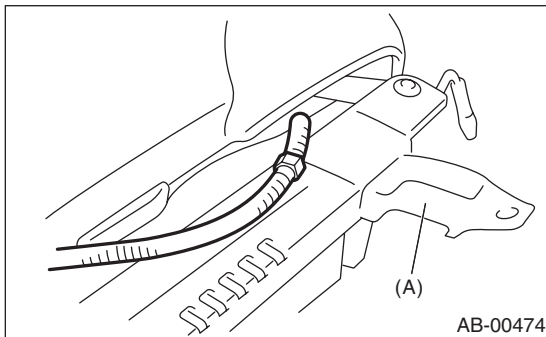
NOTE:

Secure the harness to its original position of seat.



4) Install the backrest cover. <Ref. to SE-16, ASSEMBLY, Front Seat.>

5) Install the side airbag harness to slide rail IN (A), then secure the connector to the bracket on the back side of the seat cushion assembly.



6) Recline the seat or slide it backward and forward, and check there is no contact between the seat backrest assembly, cushion cover assembly and side airbag harness.

C: INSPECTION

CAUTION:

Refer to “CAUTION” of “General Description” before handling the airbag module. <Ref. to AB-4, CAUTION, General Description.>

Check for the following, and replace the damaged parts with new parts. <Ref. to AB-12, SIDE AIRBAG MODULE, INSPECTION, Inspection Locations After a Collision.>

1) With side collision (when side airbag is deployed)

- Side airbag module assembly
 - Backrest pad assembly
 - Backrest frame assembly
 - Backrest cover assembly
- 2) When any damage is found by visual check
- Headrest assembly
 - Bushing
 - Slide rail OUT
 - Slide rail IN
 - Seat cushion frame assembly (Passenger’s side)
 - Seat hinge cover
 - Seat lifter lever
 - Reclining lever
 - Side airbag harness and connector on body side

3) With side collision (when side airbag is not deployed)

Check the seat and airbag module visually, and then replace them with new parts if damaged or cracked.

Specially inspect the damage of airbag module body, mounting bracket and harness connector.

4) Without side collision (dirt and damage of cover)
Replace the corresponding part with a new part.

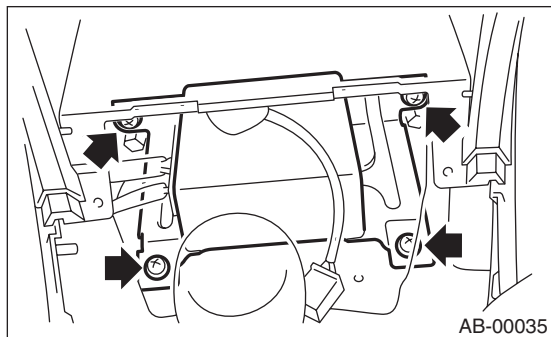
7. Airbag Control Module

A: REMOVAL

CAUTION:

- Do not disassemble the airbag control module.
- If the airbag control module is deformed or if the damage from water is suspected, replace the airbag control module with a new part.
- Do not drop the airbag control module.
- After removal, keep the airbag control module on a dry, clean surface away from moisture, heat and dust.

- 1) Turn the ignition switch to OFF.
- 2) Disconnect the ground cable from battery and wait for at least 20 seconds before starting work.
- 3) Remove the console cover. <Ref. to EI-38, REMOVAL, Console Box.>
- 4) Remove the center console panel. <Ref. to EI-39, REMOVAL, Instrument Panel Assembly.>
- 5) Disconnect the connector from airbag control module.
- 6) Remove the four bolts and remove the airbag control module.



B: INSTALLATION

CAUTION:

- Do not reuse the bolts and nuts.
- Always use new bolts and nuts.
- Be sure to put the water protection cover over the connector.

Install in the reverse order of removal.

Tightening torque:

Refer to "COMPONENT" of "General Description". <Ref. to AB-2, SRS AIRBAG, COMPONENT, General Description.>

C: INSPECTION

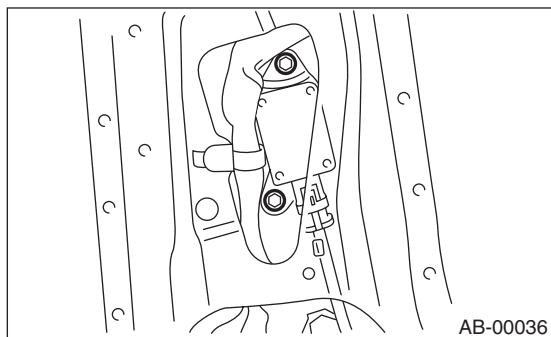
Check for the following, and replace the damaged parts with new parts.

- Control module, connector, and mounting bracket are damaged.
- Airbag is deployed.
- Side airbag is deployed.

8. Side Airbag Sensor

A: REMOVAL

- 1) Turn the ignition switch to OFF.
- 2) Disconnect the ground cable from battery and wait for at least 20 seconds before starting work.
- 3) Remove the front outer belt. <Ref. to SB-10, FRONT OUTER BELT, REMOVAL, Front Seat Belt.>
- 4) Detach the side airbag sensor, and then disconnect the airbag connector.



B: INSTALLATION

CAUTION:

- Do not reuse the bolts and nuts.
- Always use new bolts and nuts.

Install in the reverse order of removal.

Tightening torque:

Refer to “COMPONENT” of “General Description”. <Ref. to AB-2, SRS AIRBAG, COMPONENT, General Description.>

C: INSPECTION

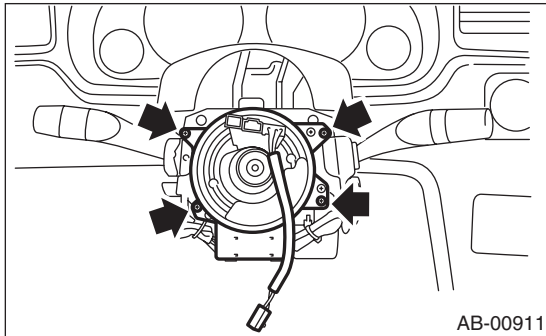
Check for the following, and replace the damaged parts with new parts.

- Bracket connector for side airbag sensor is damaged.
- Side airbag is deployed.

9. Roll Connector

A: REMOVAL

- 1) Turn the ignition switch to OFF.
- 2) Disconnect the ground cable from battery and wait for at least 20 seconds before starting work.
- 3) Remove the driver's airbag module. <Ref. to AB-14, Driver's Airbag Module.>
- 4) Remove the steering wheel. <Ref. to PS-13, REMOVAL, Steering Wheel.>
- 5) Remove the steering column cover.
- 6) Remove the screws, and then remove the roll connector.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Before installing steering wheel, be sure to adjust the direction of roll connector with steering. <Ref. to AB-20, ADJUSTMENT, Roll Connector.>

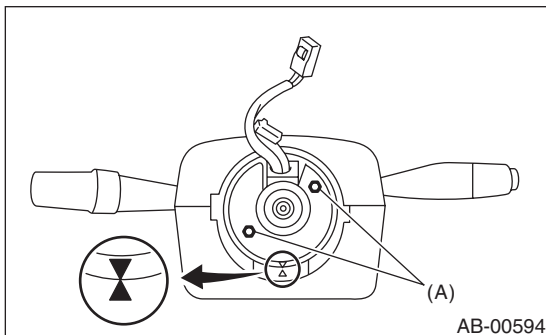
C: INSPECTION

Check for the following, and replace the damaged parts with new parts.

- Combination switch and roll connector are cracked or deformed.

D: ADJUSTMENT

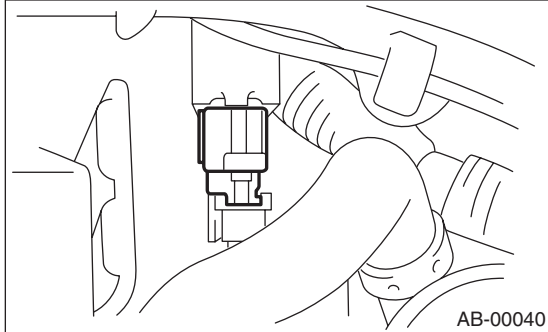
- 1) Check that front wheels are positioned in straight ahead direction.
- 2) Turn the roll connector pin (A) clockwise until it stops.
- 3) Turn the roll connector pins (A) approx. 3.25 turns until "▲" marks are aligned.



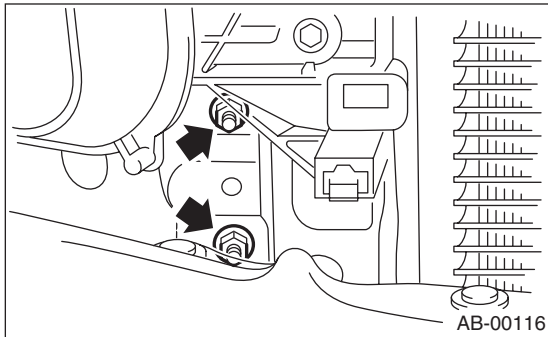
10. Front Sub Sensor

A: REMOVAL

- 1) Turn the ignition switch to OFF.
- 2) Disconnect the ground cable from battery and wait for at least 20 seconds before starting work.
- 3) Remove the front grille and the front grille side.
<Ref. to EI-16, REMOVAL, Front Grille.>
- 4) Disconnect the connector from front sub sensor.



- 5) Loosen the nut and remove the front sub sensor.



B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

- Do not reuse the bolts and nuts.
- Always use new bolts and nuts.

Tightening torque:

Refer to “COMPONENT” of “General Description”. <Ref. to AB-2, SRS AIRBAG, COMPONENT, General Description.>

C: INSPECTION

Check for the following, and replace the damaged parts with new parts.

- Front sub sensor, mounting bracket and connector are damaged.
- Airbag is deployed.

Front Sub Sensor

AIRBAG SYSTEM

Basic Diagnostic Procedure

AIRBAG SYSTEM (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Check	Yes	No
1	CHECK AIRBAG WARNING LIGHT. Turn the ignition switch to ON.	Does airbag warning light turn on?	Go to step 2.	<Ref. to AB(diag)-37, Airbag Warning Light Failure.>Go to "Airbag Warning Light Failure".
2	READ DTC. <Ref. to AB(diag)-29, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.>	Is the normal code being detected?	Finish the diagnosis.	Go to step 3.
3	PERFORM DIAGNOSIS. 1) Judge the possible cause from "List of Diagnostic Trouble Code" <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).> 2) Inspect the DTC using "List of Diagnostic Trouble Code (DTC)". 3) Repair the trouble cause. 4) Perform the Clear Memory Mode. <Ref. to AB(diag)-35, Clear Memory Mode.> 5) Perform the Inspection Mode. <Ref. to AB(diag)-34, Inspection Mode.> 6) Read any other DTCs displayed.	Is DTC being displayed?	Perform the procedure 1) to 5) in step 3.	Finish the diagnosis.

Check List for Interview

AIRBAG SYSTEM (DIAGNOSTICS)

2. Check List for Interview

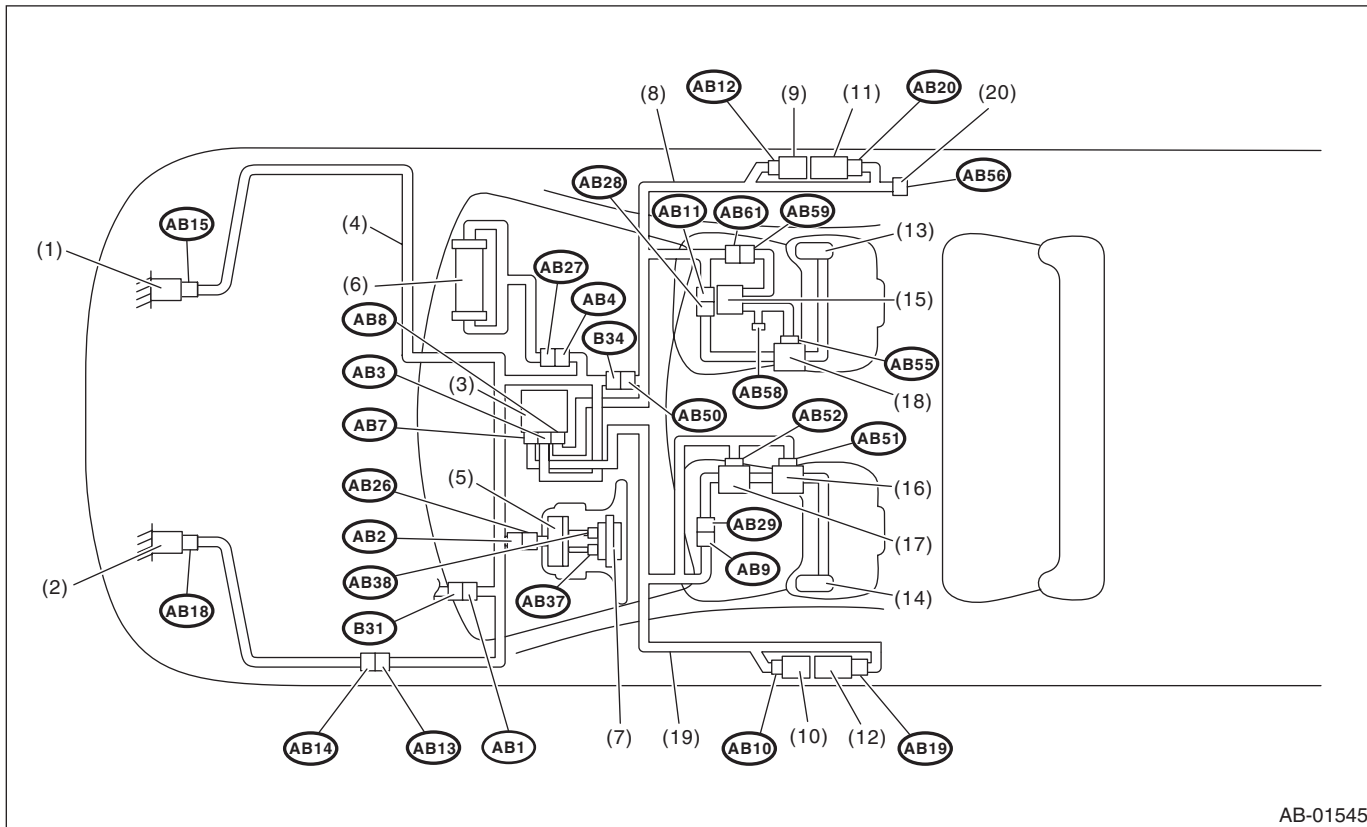
A: CHECK

Customer's name		Inspector's name	
Date vehicle brought in	/ /	Registration No.	
Odometer reading	km miles	V.I.N.	
Date Problem Occurred	/ /	Registration Year	/ /
Weather	<input type="checkbox"/> Fine <input type="checkbox"/> Cloudy <input type="checkbox"/> Rainy <input type="checkbox"/> Snowy <input type="checkbox"/> Others :		
Temperature	°C (°F)		
Road Condition	<input type="checkbox"/> Flat road <input type="checkbox"/> Uphill <input type="checkbox"/> Downhill <input type="checkbox"/> Gravel road <input type="checkbox"/> Others :		
Vehicle operation	<input type="checkbox"/> Starting <input type="checkbox"/> Idling <input type="checkbox"/> Driving <input type="checkbox"/> Constant speed <input type="checkbox"/> Accelerating <input type="checkbox"/> Decelerating <input type="checkbox"/> Turning <input type="checkbox"/> Others:		
Details of problem			
Airbag warning light operation	<input type="checkbox"/> Normal (After turning the ignition switch to ON, illuminates for 6 seconds then goes off.) <input type="checkbox"/> Remains ON <input type="checkbox"/> Light OFF		
DTC output	<input type="checkbox"/> OK code <input type="checkbox"/> DTC:(Code:)		

Electrical Component Location

4. Electrical Component Location

A: LOCATION



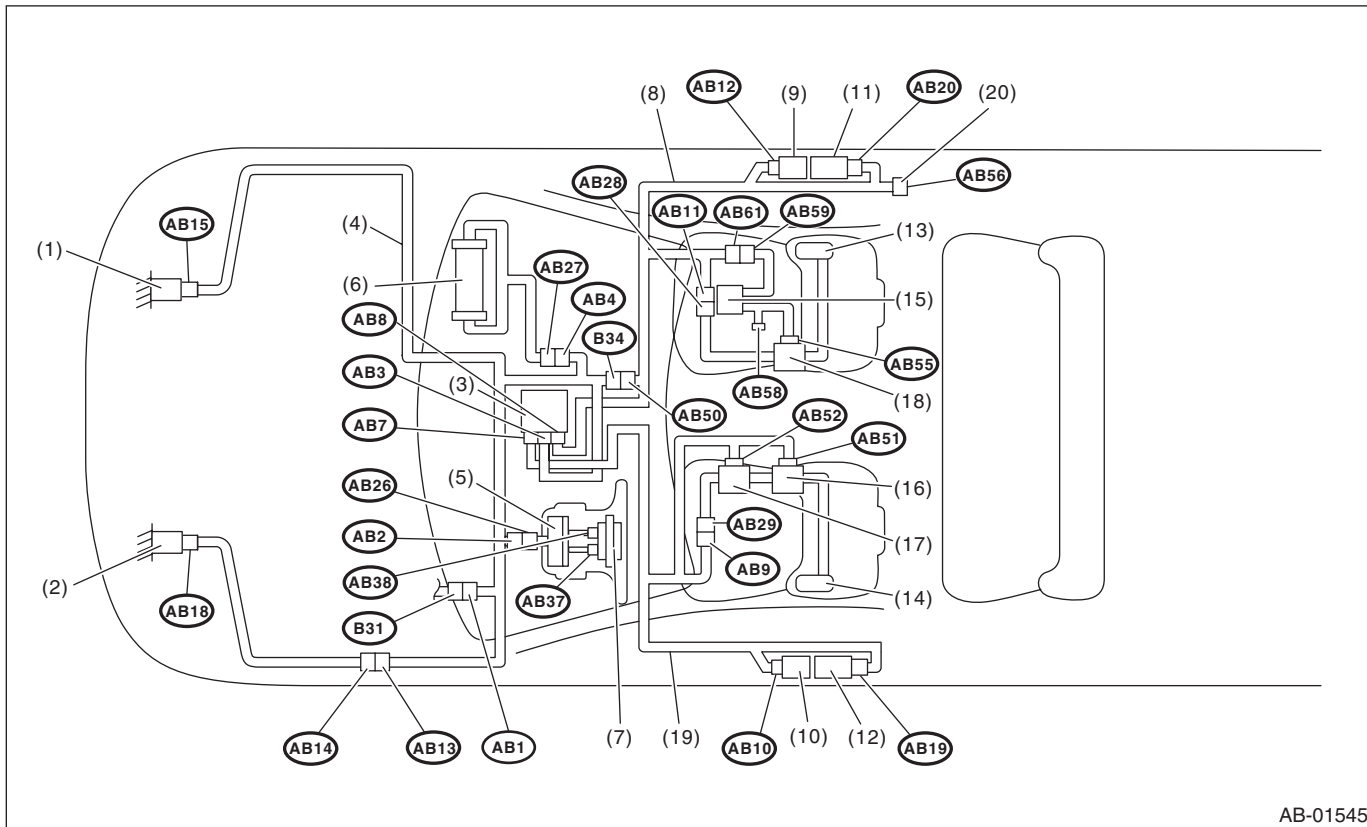
- | | | |
|--|----------------------------------|--|
| (1) Front sub sensor (RH) | (8) Airbag rear harness (RH) | (15) Occupant detection control module |
| (2) Front sub sensor (LH) | (9) Side airbag sensor (RH) | (16) Buckle switch (LH) |
| (3) Airbag control module with built-in safing and electric sensor | (10) Side airbag sensor (LH) | (17) Seat position sensor (LH) |
| (4) Airbag main harness | (11) Seat belt pretensioner (RH) | (18) Buckle switch (RH) |
| (5) Roll connector | (12) Seat belt pretensioner (LH) | (19) Airbag rear harness (LH) |
| (6) Passenger's airbag inflator | (13) Side airbag inflator (RH) | (20) Belt tension sensor (RH) |
| (7) Driver's airbag inflator | (14) Side airbag inflator (LH) | |

Connector No.	(AB1)	(AB2)	(AB3)	(AB4)	(AB7)	(AB8)	(AB9)	(AB10)	(AB11)	(AB12)	(AB13)	(AB14)
Pin	8	4	28	4	12	12	2	4	2	4	2	2
Color	White	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Male/Female	Male	Female	Female	Female	Female	Female	Female	Female	Female	Female	Female	Male
Connector No.	(AB15)	(AB18)	(AB19)	(AB20)	(AB26)	(AB27)	(AB28)	(AB29)	(AB37)	(AB38)	(AB50)	(AB51)
Pin	2	2	2	2	4	4	2	2	2	2	2	2
Color	Yellow	Yellow	Black	Black	Yellow	Yellow	Yellow	Yellow	Orange	Black	Yellow	Yellow
Male/Female	Female	Female	Female	Female	Male	Male	Male	Male	Female	Female	Male	Female
Connector No.	(AB52)	(AB55)	(AB56)	(AB58)	(AB59)	(AB61)						
Pin	2	2	3	3	6	6						
Color	Yellow	Black	Brown	Gray	Gray	Gray						
Male/Female	Female	Female	Female	Female	Male	Female						

Electrical Component Location

4. Electrical Component Location

A: LOCATION



AB-01545

- | | | |
|--|----------------------------------|--|
| (1) Front sub sensor (RH) | (8) Airbag rear harness (RH) | (15) Occupant detection control module |
| (2) Front sub sensor (LH) | (9) Side airbag sensor (RH) | (16) Buckle switch (LH) |
| (3) Airbag control module with built-in safing and electric sensor | (10) Side airbag sensor (LH) | (17) Seat position sensor (LH) |
| (4) Airbag main harness | (11) Seat belt pretensioner (RH) | (18) Buckle switch (RH) |
| (5) Roll connector | (12) Seat belt pretensioner (LH) | (19) Airbag rear harness (LH) |
| (6) Passenger's airbag inflator | (13) Side airbag inflator (RH) | (20) Belt tension sensor (RH) |
| (7) Driver's airbag inflator | (14) Side airbag inflator (LH) | |

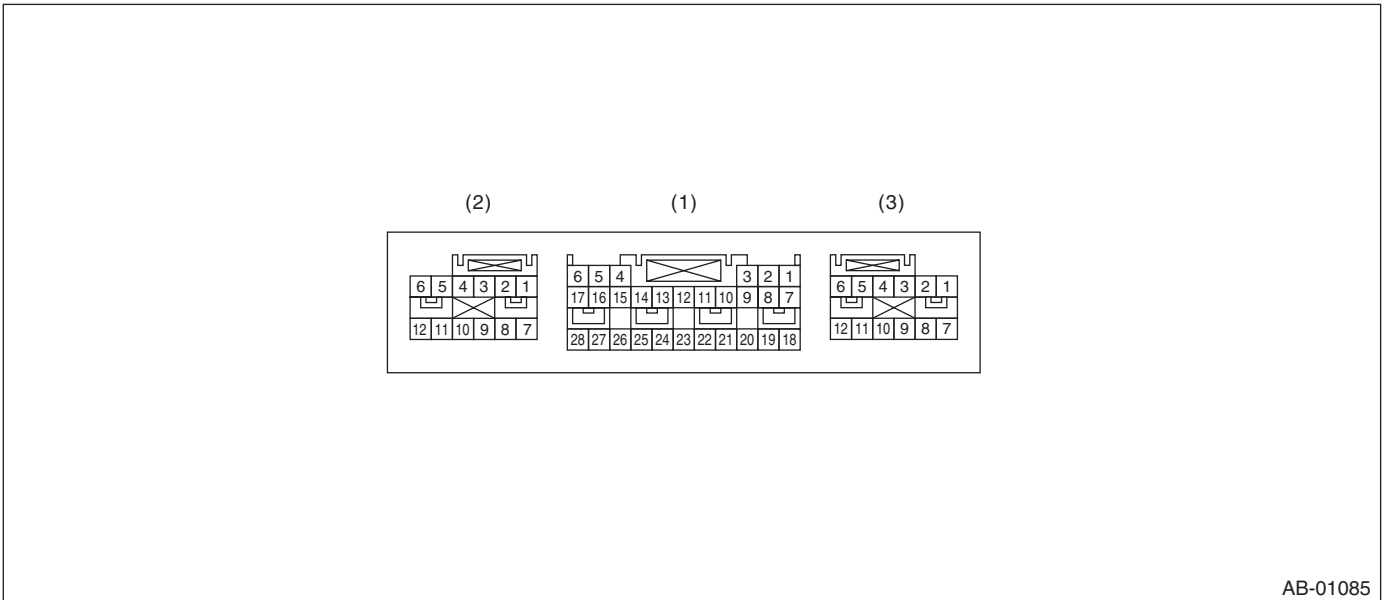
Connector No.	(AB1)	(AB2)	(AB3)	(AB4)	(AB7)	(AB8)	(AB9)	(AB10)	(AB11)	(AB12)	(AB13)	(AB14)
Pin	8	4	28	4	12	12	2	4	2	4	2	2
Color	White	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Male/Female	Male	Female	Female	Female	Female	Female	Female	Female	Female	Female	Female	Male
Connector No.	(AB15)	(AB18)	(AB19)	(AB20)	(AB26)	(AB27)	(AB28)	(AB29)	(AB37)	(AB38)	(AB50)	(AB51)
Pin	2	2	2	2	4	4	2	2	2	2	2	2
Color	Yellow	Yellow	Black	Black	Yellow	Yellow	Yellow	Yellow	Orange	Black	Yellow	Yellow
Male/Female	Female	Female	Female	Female	Male	Male	Male	Male	Female	Female	Male	Female
Connector No.	(AB52)	(AB55)	(AB56)	(AB58)	(AB59)	(AB61)						
Pin	2	2	3	3	6	6						
Color	Yellow	Black	Brown	Gray	Gray	Gray						
Male/Female	Female	Female	Female	Female	Male	Female						

Airbag Control Module I/O Signal

AIRBAG SYSTEM (DIAGNOSTICS)

5. Airbag Control Module I/O Signal

A: ELECTRICAL SPECIFICATION



AB-01085

- Terminal numbers in airbag control module connector are shown in the figure.
- Airbag warning light illuminates when the connector is removed from airbag control module.

Airbag Control Module I/O Signal

AIRBAG SYSTEM (DIAGNOSTICS)

Item	Control module terminal No.	
Data link connector	(1) - 12	
Combination meter	(1) - 3	
Battery power supply	Common use fuse	(1) - 6
	Dedicated fuse	(1) - 5
Passenger's airbag module level one	+	(1) - 10
	-	(1) - 11
Passenger's airbag module level two	+	(1) - 8
	-	(1) - 7
Driver's airbag module level one	+	(1) - 14
	-	(1) - 13
Driver's airbag module level two	+	(1) - 16
	-	(1) - 17
Front sub sensor LH	Power supply and communication	(1) - 15
	GND	(1) - 26
Front sub sensor RH	Power supply and communication	(1) - 9
	GND	(1) - 20
Ground line (GND)		(1) - 27
		(1) - 28
Passenger's airbag OFF indicator light	(1) - 1	
Passenger's airbag ON indicator light	(1) - 18	
Seat belt buckle switch LH	+	(2) - 11
	-	(2) - 8
Seat position sensor LH	+	(2) - 3
	-	(2) - 4
Seat belt pretensioner LH	+	(2) - 2
	-	(2) - 1
Side airbag sensor LH	Power supply and communication	(2) - 7
	GND	(2) - 9
	+	(2) - 10
	-	(2) - 12
Side airbag module LH	+	(2) - 6
	-	(2) - 3
Seat belt pretensioner RH	+	(3) - 5
	-	(3) - 6
Side airbag sensor RH	Power supply and communication	(3) - 12
	GND	(3) - 10
	+	(3) - 9
	-	(3) - 7
Side airbag module RH	+	(3) - 1
	-	(3) - 2
Occupant detection control module	+	(3) - 11
	-	(3) - 8

B: WIRING DIAGRAM

Refer to the WI section wiring diagram. <Ref. to WI-85, WIRING DIAGRAM, Airbag System.>

Airbag Connector

AIRBAG SYSTEM (DIAGNOSTICS)

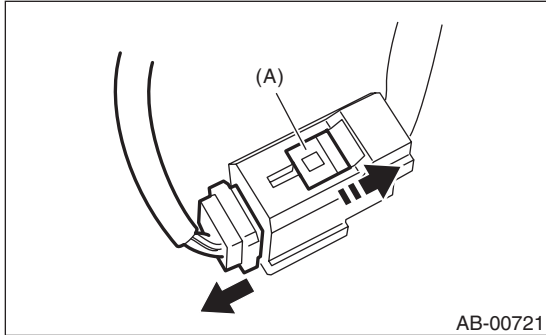
6. Airbag Connector

A: PROCEDURE

1. BUCKLE SWITCH AND OCCUPANT DETECTION CONTROL MODULE

1) How to disconnect:

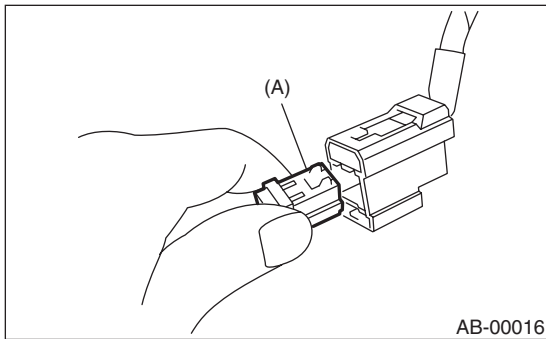
- (1) Move the slide lock (A) in the direction of arrow.
- (2) With the slide lock (A) moved, disconnect the connector.



CAUTION:
When pulling the slide lock or disconnecting connector, be sure to hold the connector, not the harness.

2) How to connect:

Holding the connector (A), and push it in carefully until a clicking sound is heard.

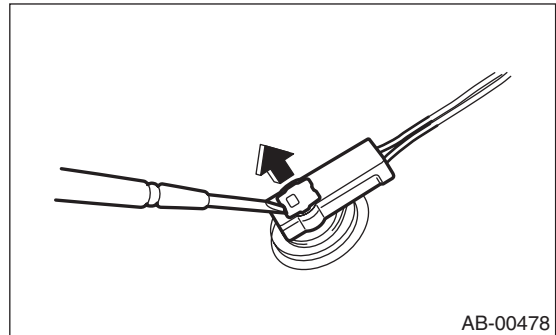


CAUTION:
Be sure to insert the connector in until it is locked. Then pull it gently to make sure that it is locked.

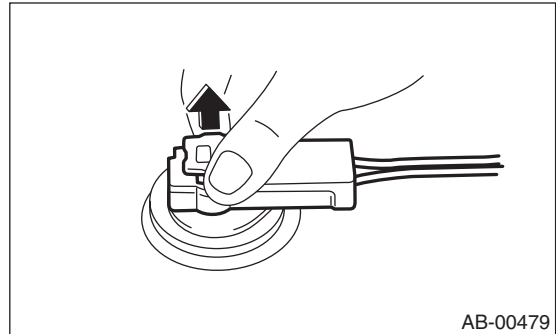
2. DRIVER'S AIRBAG MODULE AND PRE-TENSIONER

1) How to disconnect:

- (1) Using a flat tip screwdriver, pry the push lock upward to unlock.



- (2) Pull the connector to disconnect from driver's airbag module assembly or retractor assembly.

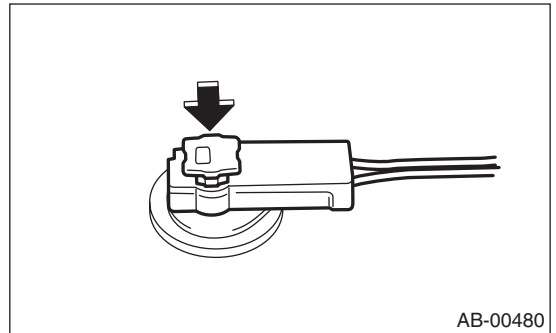


2) How to connect:

Connect the connector in the reverse order of disconnecting. At this time, be sure to insert the push lock until a clicking sound is heard.

CAUTION:

- Be sure to insert the connector in until it is locked. Then pull it gently to make sure that it is locked.
- Be sure to push the push lock in securely.



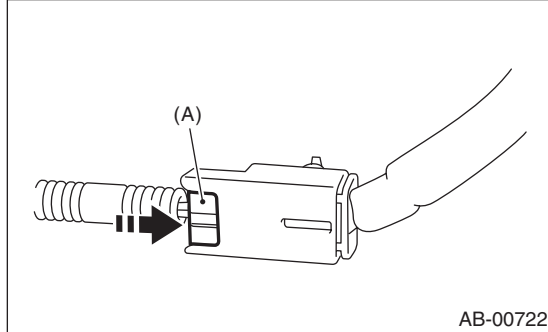
NOTE:

You cannot connect the connector when the push lock is in the lock position. Move the push lock to the release position to connect the connector.

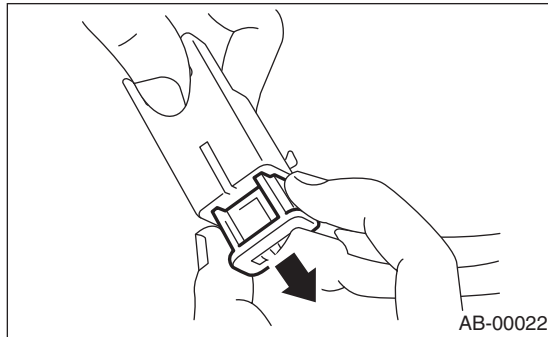
3. DRIVER'S AIRBAG (BETWEEN AIRBAG MAIN HARNESS AND ROLL CONNECTOR) AND PASSENGER'S AIRBAG

1) How to disconnect:

(1) Push in the slide lock (A) in the direction of arrow.



(2) With the slide lock pushed in, disconnect the connector.



CAUTION:

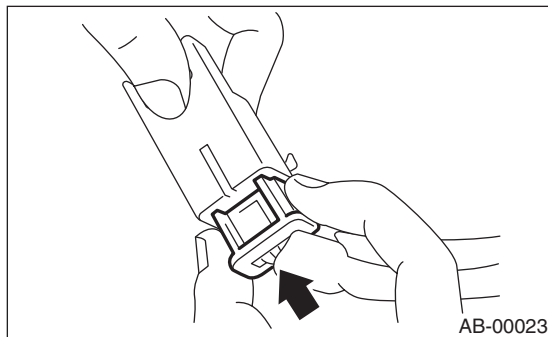
When pulling the slide lock or disconnecting connector, be sure to hold the connector, not the harness.

2) How to connect:

Holding the connector, push it in securely until a clicking sound is heard.

CAUTION:

Be sure to insert the connector in until it is locked. Then pull it gently to make sure that it is locked.

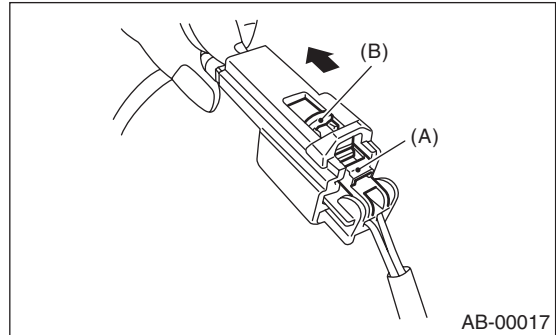


4. SIDE AIRBAG

1) How to disconnect:

(1) Push the lock arm (A).

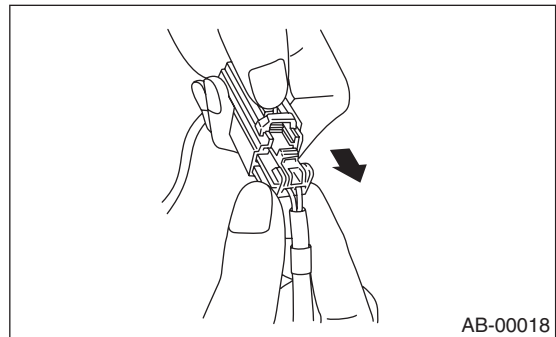
(2) With the lock arm (A) pushed in, move the slide lock (B) in the direction of arrow.



(3) With the slide lock moved, release the lock arm (return to original position) and disconnect the connector.

CAUTION:

When pulling the slide lock or disconnecting connector, be sure to hold the connector, not the harness.



Airbag Connector

AIRBAG SYSTEM (DIAGNOSTICS)

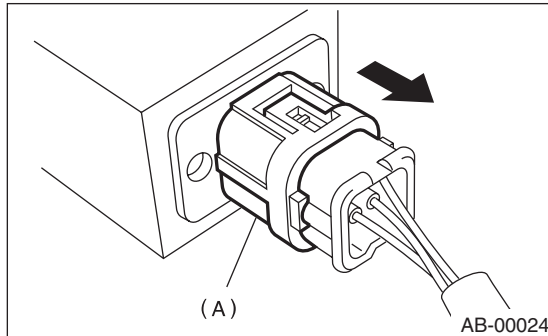
5. FRONT SUB SENSOR, SIDE AIRBAG SENSOR AND SEAT POSITION SENSOR

1) How to disconnect:

Holding outer part (A), pull it in the direction of arrow.

CAUTION:

When pulling the slide lock, be sure to hold the connector, not the harness.

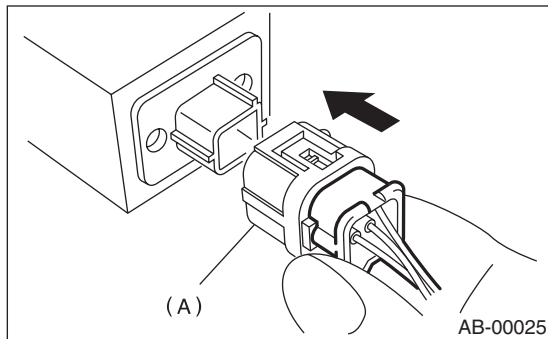


2) How to connect:

Holding the connector, push it in securely until a clicking sound is heard.

CAUTION:

- Do not touch the outer section since outer side (A) will move back.
- Be sure to insert the connector in until it is locked. Then pull it gently to make sure that it is locked.



7. Subaru Select Monitor

A: OPERATION

1. READ DIAGNOSTIC TROUBLE CODE (DTC)

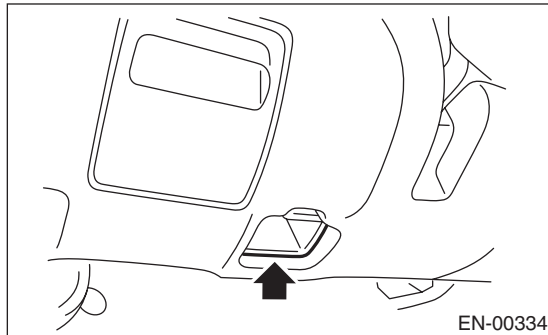
When malfunction of the airbag system occurs, the DTC stored in airbag control module will be read out.

1) Prepare the Subaru Select Monitor kit. <Ref. to AB(diag)-8, SPECIAL TOOL, PREPARATION TOOL, General Description.>

2) Connect the diagnosis cable to the Subaru Select Monitor.

3) Connect the Subaru Select Monitor to the data link connector.

(1) The data link connector is located in the lower portion of the instrument panel (on the driver's side).



(2) Connect the diagnosis cable to the data link connector.

CAUTION:

Do not connect the scan tools other than the Subaru Select Monitor.

4) Turn the ignition switch to ON (engine OFF) and run the Subaru Select Monitor.

5) On the «Main Menu» display screen, select the {Each System Check}.

6) On the «System Selection Menu» display screen, select the {Airbag System}.

7) Select the [OK] after the {**MY AIRBAG SYSTEM} is displayed.

8) On the «Airbag System» screen, select the {DTC Display}.

NOTE:

- For details concerning the operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

- For details concerning DTCs, refer to List of Diagnostic Trouble Code (DTC). <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>

Subaru Select Monitor

AIRBAG SYSTEM (DIAGNOSTICS)

2. DISPLAY OF STATUS INFORMATION

Check the operating condition of each sensor in the event of malfunction in the seat belt buckle switch and seat position sensor, or when the seat belt buckle switch and seat position sensor has been replaced.

- 1) On the «Main Menu» display screen, select the {Each System Check}.
- 2) On the «System Selection Menu» display screen, select the {Airbag System}.
- 3) On the «Airbag System» display screen, select the {Status Data}.

The following table is for support data.

Item	Display Contents
Seat position sensor LH	Front position ^{*9} /Rear position ^{*10} /Other ^{*11} /Initial Setting ^{*11} /— ^{*2}
Seat position sensor RH	— ^{*2}
Seat belt buckle switch LH	Belted ^{*3} /Unbelted ^{*4} /Other ^{*5} /Initial Setting ^{*1} /— ^{*6}
Seat belt buckle switch RH	Belted ^{*3} /Unbelted ^{*4} /Other ^{*5} /Initial Setting ^{*1} /— ^{*6}
Passenger's airbag status	ON ^{*7} /OFF ^{*8} /Initial Setting ^{*1}

*1: Displayed when it is initial.

*2: Seat position sensor not supported

*3: Seat belt fastened

*4: Seat belt not fastened

*5: Displayed when data other than belt fastened or not fastened, (such as breakdowns) is entered.

*6: Seat belt buckle switch not supported

*7: Passenger's seat airbag operating state

*8: Passenger's seat airbag non-operating state

*9: Seat position is at the front end.

*10: Seat position is at the rear end.

*11: Displayed when data other than seat position (forward/rear), is entered (ie. breakdown data)

NOTE:

For details concerning the operation procedure, refer to the "SUBARU SELECT MONITOR OPERATION MANUAL".

3. CLEAR MEMORY MODE

Clear the DTC stored in the airbag control module after repairing the airbag system. (After the breakdown is recovered, the breakdown code for completed recoveries are read out when the next breakdown occurs if the memory clear work is not performed.)

- 1) On the «Main Menu» display screen, select the {Each System Check}.
- 2) On the «System Selection Menu» display screen, select the {Airbag System}.
- 3) On the {Airbag System} menu screen, select the {Clear Memory}.
- 4) When the "Clear Memory?" is shown on the screen, select the [OK].
- 5) When "Done" is displayed, close the Subaru Select Monitor.

NOTE:

For details concerning the operation procedure, refer to the "SUBARU SELECT MONITOR OPERATION MANUAL".

B: INSPECTION

1. COMMUNICATION FOR INITIALIZING IMPOSSIBLE

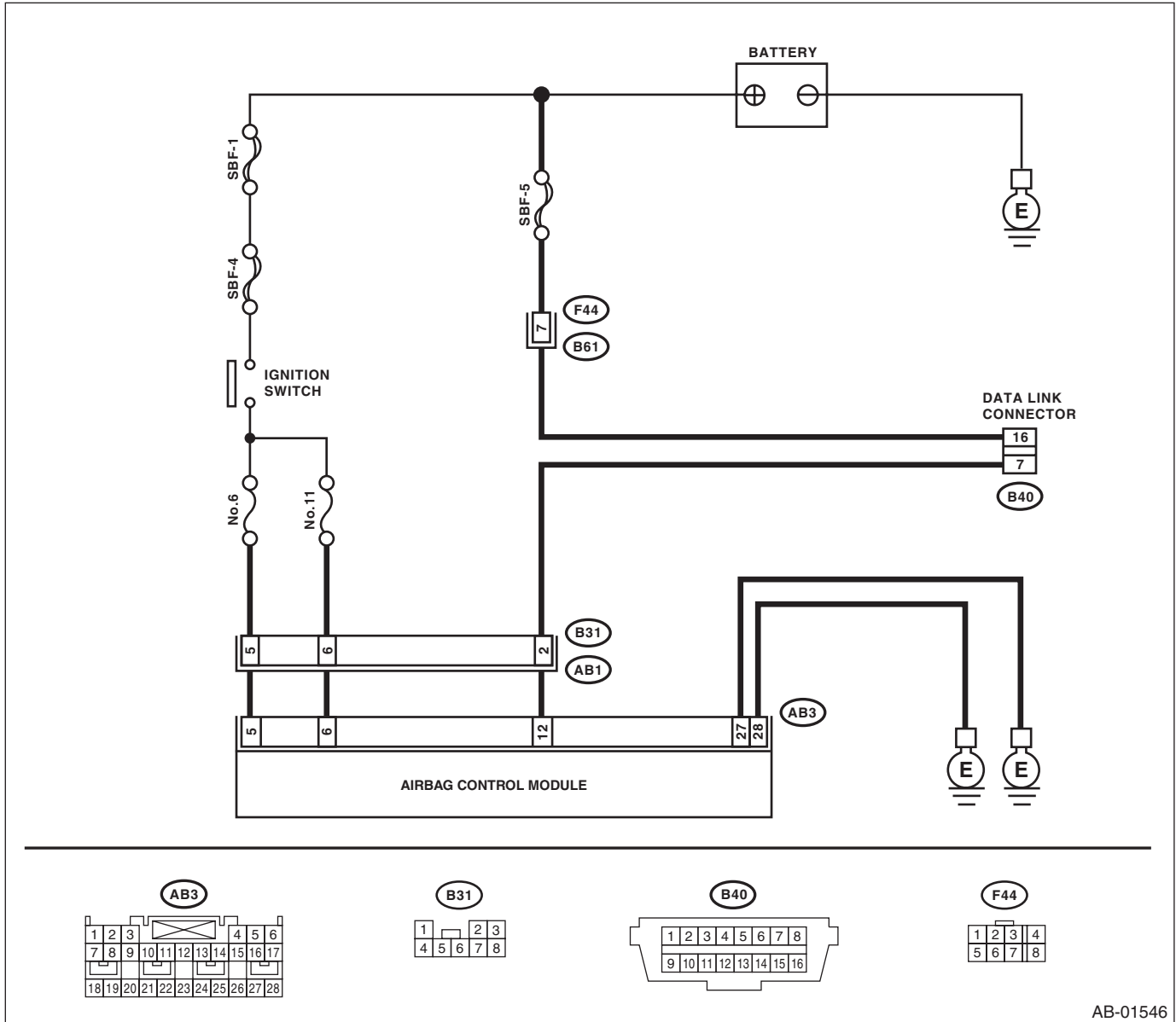
DETECTING CONDITION:

Defective harness connector

TROUBLE SYMPTOM:

Communication is impossible between the airbag control module and the Subaru Select Monitor.

WIRING DIAGRAM:



AB-01546

Subaru Select Monitor

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK IGNITION SWITCH.	Is the ignition switch ON?	Go to step 2.	Turn the ignition switch to ON, and select the airbag mode using the Subaru Select Monitor.
2 CHECK BATTERY. 1) Turn the ignition switch to OFF. 2) Measure the battery voltage.	Is the voltage 11 V or more?	Go to step 3.	Charge or replace the battery.
3 CHECK BATTERY TERMINAL.	Is there poor contact at the battery terminal?	Repair or tighten the battery terminal.	Go to step 4.
4 CHECK SUBARU SELECT MONITOR COMMUNICATION. 1) Turn the ignition switch to ON. 2) Using the Subaru Select Monitor, check whether communication to other systems can be executed normally.	Are the system name and model year displayed on Subaru Select Monitor?	Go to step 9.	Go to step 5.
5 CHECK SUBARU SELECT MONITOR COMMUNICATION. 1) Turn the ignition switch to OFF. 2) Disconnect the battery ground cable, and wait more than 20 seconds. 3) Disconnect the airbag control module connector. 4) Turn the ignition switch to ON. 5) Check whether communication to other systems can be executed normally.	Are the system name and model year displayed on Subaru Select Monitor?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 6.
6 CHECK HARNESS CONNECTOR BETWEEN EACH CONTROL MODULE AND DATA LINK CONNECTOR. 1) Turn the ignition switch to OFF. 2) Disconnect the airbag control module, ABSCM&H/U, ECM and TCM. 3) Measure the resistance between data link connector and chassis ground. Connector & terminal (B40) No. 10 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 7.	Repair the harness and connector between each control module and data link connector. (Replace the harness without repairing the airbag harness.)
7 CHECK OUTPUT SIGNAL TO THE AIRBAG CONTROL MODULE. 1) Turn the ignition switch to ON in the condition of step 6. 2) Measure the voltage between data link connector and chassis ground. Connector & terminal (B40) No. 10 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 8.	Repair the harness and connector between each control module and data link connector. (Replace the harness without repairing the airbag harness.)

Step	Check	Yes	No
8 CHECK THE HARNESS BETWEEN THE AIRBAG CONTROL MODULE AND DATA LINK CONNECTOR. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect connector (AB3) from airbag control module. 3) Connect the connector (1R) in the test harness R to connector (AB3). 4) Measure resistance between connector (4R) in the test harness R and data link connector. Connector & terminal (4R) No. 18 — (B40) No. 10:	Is the resistance less than 10 Ω ?	Go to step 9.	Repair the harness between the airbag control module and the data link connector. Or replace the airbag main harness along with the bulkhead harness.
9 CHECK POWER SUPPLY CIRCUIT. 1) Turn the ignition switch to ON. 2) Measure the voltage between connector (2R) in the test harness R and chassis ground. Connector & terminal (2R) No. 1 (+) — Chassis ground (-): (2R) No. 6 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 10.	Repair the harness between the airbag control module and the battery. Or replace the airbag main harness along with the bulkhead harness.
10 CHECK BETWEEN THE AIRBAG CONTROL MODULE AND CHASSIS GROUND. 1) Turn the ignition switch to OFF. 2) Measure resistance between connector (2R) in the test harness R and chassis ground. Connector & terminal (2R) No. 10 — Chassis ground: (2R) No. 11 — Chassis ground:	Is the resistance less than 10 Ω ?	Go to step 11.	Repair the harness between the airbag control module and the chassis ground. Or replace the airbag main harness along with the bulkhead harness.
11 CHECK POOR CONTACT OF CONNECTOR.	Is there poor contact in the control module power supply, ground circuit and data link connector?	Repair the connector. (For airbag system connectors, do not repair but replace the entire harness.)	Replace the only airbag control module. <Ref. to AB-18, REMOVAL, Airbag Control Module.>

2. WITHOUT DTC

DETECTING CONDITION:

- Defective combination meter
- Open circuit of harness

TROUBLE SYMPTOM:

- Airbag warning light remains on.
- “NO TROUBLE CODE” will be displayed on the Subaru Select Monitor.

For detailed operation procedures, refer to “Airbag Warning Light Failure”. <Ref. to AB(diag)-37, Airbag Warning Light Failure.>

NOTE:

When the airbag warning light is OFF and “NO TROUBLE CODE” is displayed on Subaru Select Monitor, the system is operating properly.

8. Inspection Mode

A: PROCEDURE

Recreate the condition by referring to the fault conditions described in the check list.

9. Clear Memory Mode

A: OPERATION

Clear the memory in the following steps after the malfunction is repaired.

For details concerning DTC clear operation, refer to "Subaru Select Monitor". <Ref. to AB(diag)-30, CLEAR MEMORY MODE, OPERATION, Subaru Select Monitor.>

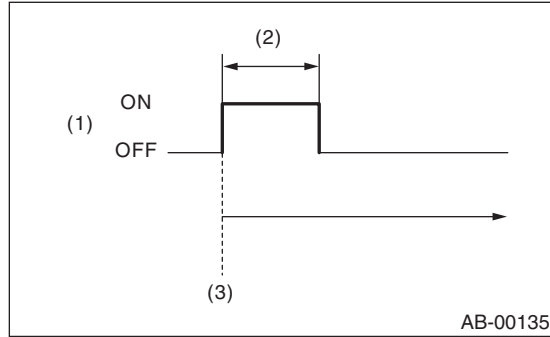
Airbag Warning Light Illumination Pattern

AIRBAG SYSTEM (DIAGNOSTICS)

10. Airbag Warning Light Illumination Pattern

A: INSPECTION

Turn the ignition switch to ON, and confirm that the airbag warning light remains on for approx. 6 seconds then turns off afterwards.



- (1) Airbag warning light
- (2) Approx. 6 sec.
- (3) Ignition switch ON

Airbag Warning Light Failure

A: AIRBAG WARNING LIGHT REMAINS ON

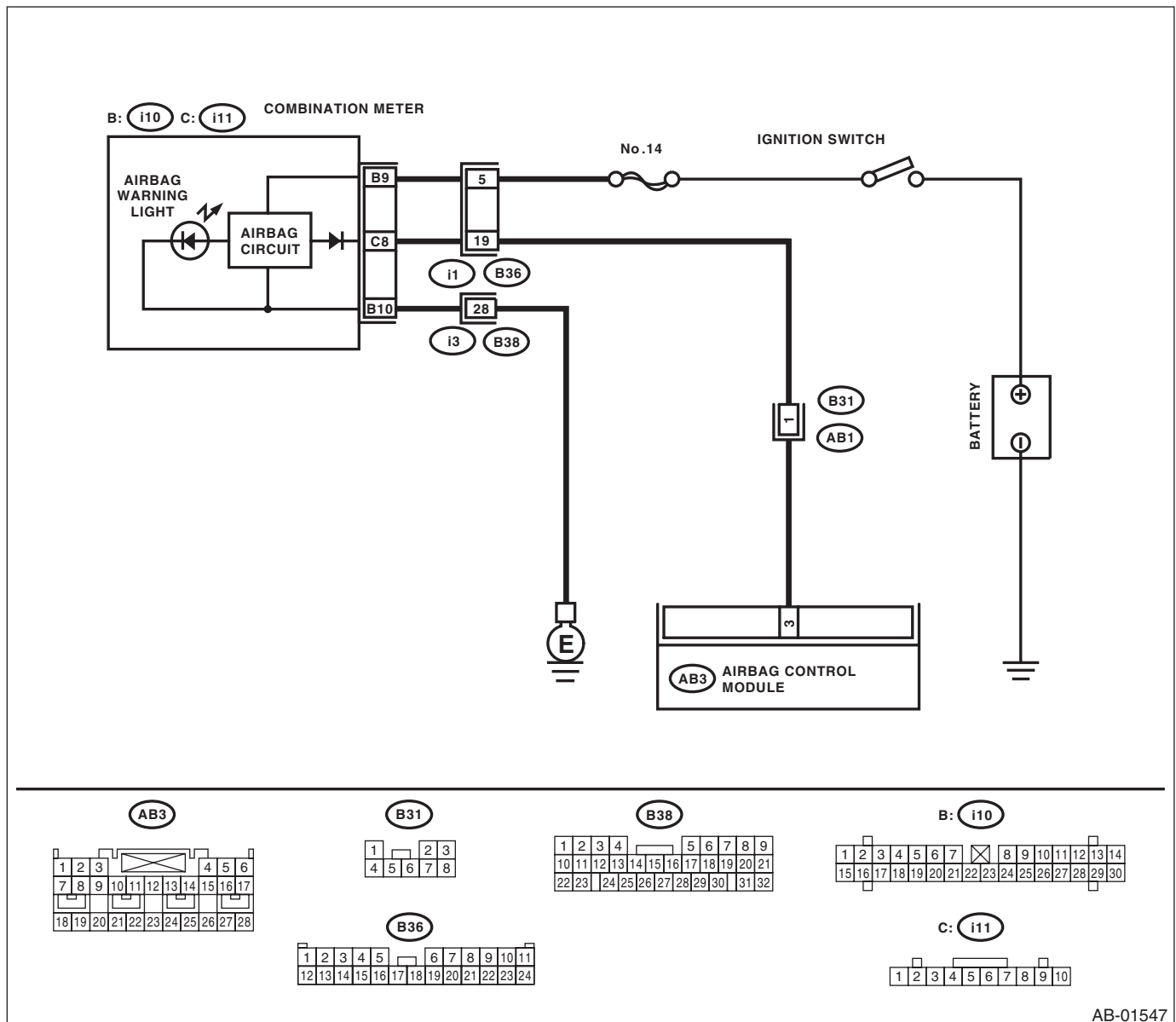
DETECTING CONDITION:

- Airbag warning light failure
- Airbag control module to airbag warning light circuit is shorted or open.
- Grounding circuit is faulty.
- Airbag control module is faulty.
- Improper connection of (AB1) and (B31)
- Improper connection of (AB3) to airbag control module

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the airbag module connectors of the driver's and passenger's seats for safety.

WIRING DIAGRAM:



Airbag Warning Light Failure

AIRBAG SYSTEM (DIAGNOSTICS)

	Step	Check	Yes	No
1	READ DTC. Read the DTC. <Ref. to AB(diag)-29, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.>	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step 2.
2	CHECK POOR CONTACT. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Check that firm contact is secured between the airbag control module and the connector (AB3).	Is there poor contact in the connector (AB3)?	Replace the body harness along with airbag main harness or airbag control module, if it is not eliminated the poor contact of connectors. <Ref. to AB-18, Airbag Control Module.>	Go to step 3.
3	CHECK AIRBAG MAIN HARNESS. 1) Remove the instrument panel lower cover, disconnect the connector (AB26) and (AB2). 2) Disconnect the connectors (AB27) and (AB4) of the passenger's airbag module. 3) Disconnect the connector (AB3) from airbag control module, and connect the connector (1R) in the test harness R. 4) Connect the battery ground terminal and turn the ignition switch to ON. 5) Connect two connectors, (5R) and (6R) in the test harness R. NOTE: After the problem has been eliminated, disconnect connectors (5R) and (6R).	Does the airbag warning light go off?	Go to step 4.	Go to step 5.
4	CHECK GROUND CIRCUIT. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect connector (AB3) from airbag control module. 3) Connect the connector (1R) in the test harness R to body harness connector (AB3). 4) Measure resistance between connector (2R) in the test harness R and chassis ground. Connector & terminal (2R) No. 10 — Chassis ground: (2R) No. 11 — Chassis ground:	Is the resistance less than 10 Ω ?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Repair the chassis ground circuit.
5	CHECK AIRBAG MAIN HARNESS AND BULKHEAD HARNESS. 1) Disconnect the connector (5R) and (6R). 2) Remove the combination meter. 3) Measure resistance between connector (i11) in the test harness R and connector (2R). Connector & terminal (2R) No. 7 — (i11) No. 8:	Is the resistance less than 10 Ω ?	Check the combination meter.	Go to step 6.
6	CHECK POOR CONTACT OF CONNECTORS (AB1) AND (B31). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Confirm that firm contact is secured between connectors (AB1) and (B31).	Is there poor contact in connectors (AB1) and (B31)?	Repair the bulkhead harness or replace the airbag main harness along with the body harness.	Go to step 7.

Airbag Warning Light Failure

AIRBAG SYSTEM (DIAGNOSTICS)

	Step	Check	Yes	No
7	CHECK AIRBAG MAIN HARNESS. Check the airbag main harness for abnormalities.	Is anything unusual to airbag main harness?	Replace the airbag main harness along with the bulk-head harness.	Repair the bulk-head harness.

Airbag Warning Light Failure

AIRBAG SYSTEM (DIAGNOSTICS)

B: AIRBAG WARNING LIGHT REMAINS OFF

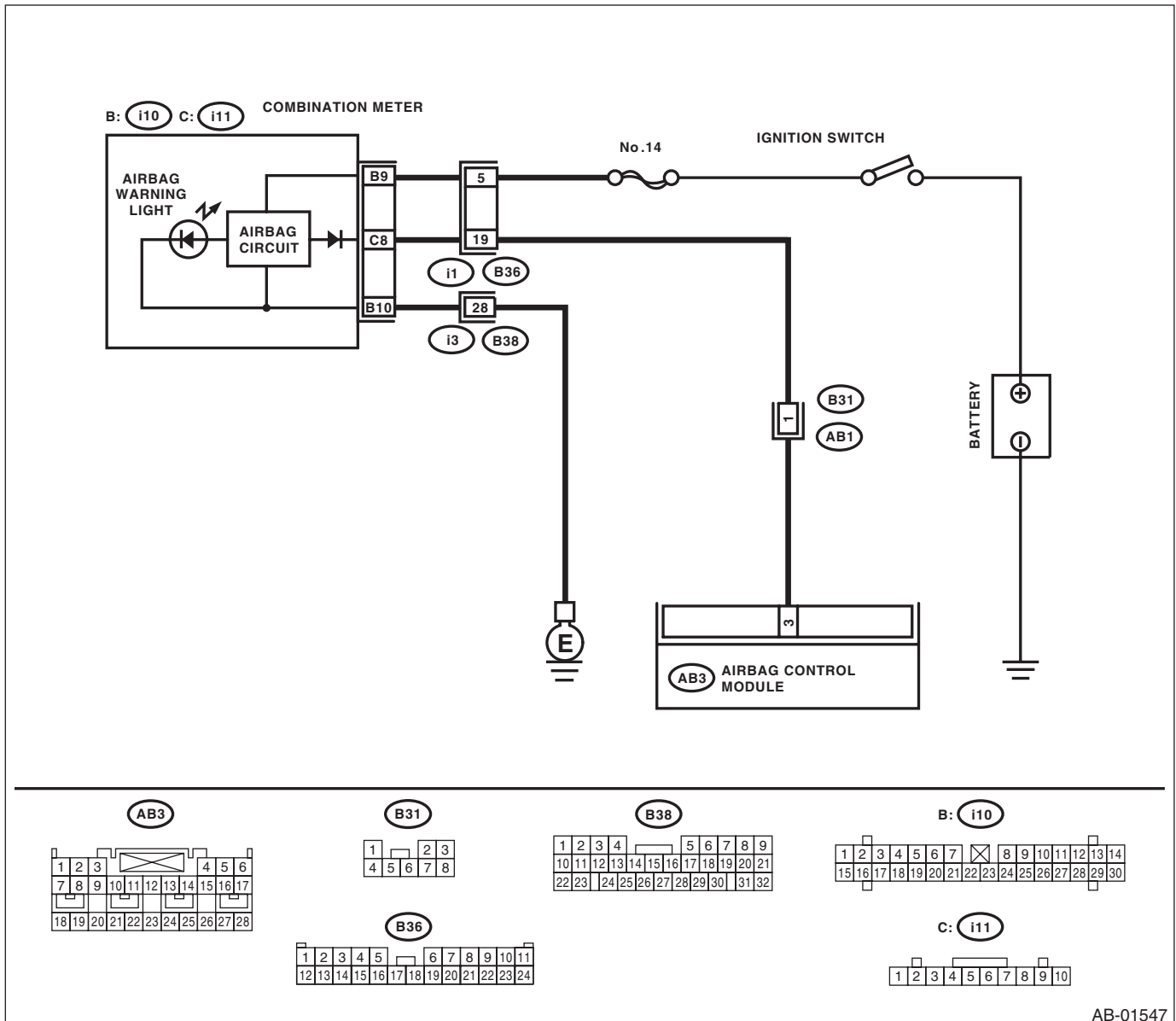
DETECTING CONDITION:

- Blown fuse No. 14 (in fuse box)
- Body harness is open.
- Airbag warning light failure
- Airbag main harness is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the airbag module connectors of the driver's and passenger's seats for safety.

WIRING DIAGRAM:



AB-01547

Airbag Warning Light Failure

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK COMBINATION METER. Turn the ignition switch to ON, and confirm that warning light embedded in the combination meter is turned on.	Do the warning lights except for the airbag turn on?	Go to step 2.	Check the combination meter. <Ref. to IDI-3, Combination Meter System.>
2 CHECK DTC. Read the DTC. <Ref. to AB(diag)-29, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.>	Is DTC displayed?	Perform the diagnosis according to DTC.	Go to step 3.
3 CHECK FUSE NO. 14 (IN MAIN FUSE BOX). Remove the fuse No. 14 and perform visual inspection.	Is fuse No. 14 (in the main fuse box) blown out?	Replace the fuse No. 14. If fuse No. 14 is blown out again, go to step 4.	Go to step 4.
4 CHECK AIRBAG WARNING LIGHT CIRCUIT (IN COMBINATION METER). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB1) from (B31). 3) Connect the battery ground terminal and turn the ignition switch to ON.	Does airbag warning light turn on?	Go to step 5.	Check the combination meter. <Ref. to IDI-10, Combination Meter.>
5 CHECK AIRBAG MAIN HARNESS. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Connect the connector (AB1) to (B31). 3) Disconnect connector (AB3) from airbag control module. 4) Connect the battery ground terminal and turn the ignition switch to ON.	Does airbag warning light turn on?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Replace the airbag main harness along with the body harness.

List of Diagnostic Trouble Code (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

12. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Display	Content of diagnosis	Reference
11	Driver's Airbag failure	<ul style="list-style-type: none"> • Airbag main harness circuit is open, shorted or shorted to ground. • Airbag module harness (driver's side) circuit is open, shorted or shorted to ground. • Roll connector circuit is open, shorted or shorted to ground. • Airbag control module is faulty. • Driver's airbag module is faulty. 	<Ref. to AB(diag)-46, DTC 11 DRIVER'S AIRBAG FAILURE, Diagnostic Chart with Trouble Code.>
12	Passenger's Airbag failure	<ul style="list-style-type: none"> • Airbag main harness circuit is open, shorted or shorted to ground. • Airbag module harness (passenger's side) circuit is open, shorted or shorted to ground. • Airbag control module is faulty. • Passenger's airbag module is faulty. 	<Ref. to AB(diag)-49, DTC 12 PASSENGER'S AIRBAG FAILURE, Diagnostic Chart with Trouble Code.>
15	Driver's Airbag failure	<ul style="list-style-type: none"> • Airbag main harness circuit (driver's side) is shorted to power supply. • Airbag module harness circuit (driver's side) is shorted to power supply. • Roll connector is shorted to power supply. • Airbag control module is faulty. • Driver's airbag module is faulty. 	<Ref. to AB(diag)-51, DTC 15 DRIVER'S AIRBAG FAILURE, Diagnostic Chart with Trouble Code.>
16	Passenger's Airbag failure	<ul style="list-style-type: none"> • Airbag main harness circuit (passenger's side) is shorted to power supply. • Airbag module harness circuit (passenger's side) is shorted to power supply. • Airbag control module is faulty. • Passenger's airbag module is faulty. 	<Ref. to AB(diag)-54, DTC 16 PASSENGER'S AIRBAG FAILURE, Diagnostic Chart with Trouble Code.>
21	Airbag ECM failure	Airbag control module is faulty.	<Ref. to AB(diag)-56, DTC 21 AIRBAG ECM FAILURE, Diagnostic Chart with Trouble Code.>
22	Front Airbag Firing output	Front airbag module and seat belt pretensioner (LH/RH) are inflated.	<Ref. to AB(diag)-57, DTC 22 FRONT AIRBAG FIRING OUTPUT, Diagnostic Chart with Trouble Code.>
23	Connector to Airbag ECM failure	Improper connection of (AB3), (AB7) and (AB8) to airbag control module	<Ref. to AB(diag)-58, DTC 23 CONNECTOR TO AIRBAG ECM, Diagnostic Chart with Trouble Code.>
24	IG1 open	<ul style="list-style-type: none"> • Airbag control module is faulty. • Airbag main harness circuit is open. • Fuse No. 11 (in joint box) is blown. • Airbag rear harness circuit is open. 	<Ref. to AB(diag)-59, DTC 24 IG1 OPEN, Diagnostic Chart with Trouble Code.>
25	IG2 open	<ul style="list-style-type: none"> • Airbag control module is faulty. • Airbag main harness circuit is open. • Fuse No. 6 (in joint box) is blown. • Airbag rear harness circuit is open. 	<Ref. to AB(diag)-61, DTC 25 IG2 OPEN, Diagnostic Chart with Trouble Code.>

List of Diagnostic Trouble Code (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

DTC	Display	Content of diagnosis	Reference
26	Passenger's Airbag Indicator Failure	<ul style="list-style-type: none"> • Passenger's airbag indicator is faulty. • Airbag control module is faulty. • Airbag main harness circuit is open, shorted or shorted to ground. • Body harness is open. 	<Ref. to AB(diag)-63, DTC 26 PASSENGER'S AIRBAG INDICATOR FAILURE, Diagnostic Chart with Trouble Code.>
27	ODS Communication error	<ul style="list-style-type: none"> • Communication to the occupant detection control module is faulty. • Airbag rear harness circuit is open, shorted or shorted to ground, or shorted to power supply. • Occupant detection harness is faulty. • Airbag control module is faulty. • Occupant detection system is faulty. 	<Ref. to AB(diag)-65, DTC 27 ODS COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.>
29	ODS Failure	<ul style="list-style-type: none"> • Occupant detection sensor is faulty. • Occupant detection control module is faulty. • Occupant detection harness is faulty. • Fuse No. 6 (in joint box) is blown. 	Refer to "Occupant Detection System" for DTC 29. <Ref. to AB(diag)-66, DTC 29 ODS FAILURE, Diagnostic Chart with Trouble Code.>
2A	ODS Calibration error	System calibration (Rezeroing) of the occupant detection system was not ended normally.	Refer to "Occupant Detection System" for DTC 2A. <Ref. to AB(diag)-66, DTC 2A ODS CALIBRATION ERROR, Diagnostic Chart with Trouble Code.>
2B	ODS system wrong parts	<ul style="list-style-type: none"> • Wrong airbag control module is installed. • Wrong occupant detection system is installed. • Occupant detection system is faulty. 	Refer to "Occupant Detection System" for DTC 2B. <Ref. to AB(diag)-66, DTC 2B ODS SYSTEM WRONG PARTS, Diagnostic Chart with Trouble Code.>
2C	Belt Tension Sensor failure	<ul style="list-style-type: none"> • Passenger's seat belt tension sensor is faulty. • Occupant detection system is faulty. • Airbag rear harness circuit is open, shorted or shorted to ground, or shorted to power supply. • Occupant detection harness is faulty. 	Refer to "Occupant Detection System" for DTC 2C. <Ref. to AB(diag)-66, DTC 2C BELT TENSION SENSOR FAILURE, Diagnostic Chart with Trouble Code.>
31	Front Sub Sensor RH failure	<ul style="list-style-type: none"> • Front sub sensor harness (RH) circuit is shorted. • Front sub sensor harness (RH) circuit is open. • Front sub sensor (RH) is faulty. • Airbag control module is faulty. 	<Ref. to AB(diag)-67, DTC 31 FRONT SUB SENSOR RH FAILURE, Diagnostic Chart with Trouble Code.>
32	Front Sub Sensor LH failure	<ul style="list-style-type: none"> • Front sub sensor harness (LH) circuit is shorted. • Front sub sensor harness (LH) circuit is open. • Front sub sensor (LH) is faulty. • Airbag control module is faulty. 	<Ref. to AB(diag)-69, DTC 32 FRONT SUB SENSOR LH FAILURE, Diagnostic Chart with Trouble Code.>
33	Front Sub Sensor RH failure	Front sub sensor (RH) is faulty.	<Ref. to AB(diag)-71, DTC 33 FRONT SUB SENSOR RH FAILURE, Diagnostic Chart with Trouble Code.>

List of Diagnostic Trouble Code (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

DTC	Display	Content of diagnosis	Reference
34	Front Sub Sensor LH failure	Front sub sensor (LH) is faulty.	<Ref. to AB(diag)-71, DTC 34 FRONT SUB SENSOR LH FAILURE, Diagnostic Chart with Trouble Code.>
36	Seat Position Sensor LH Failure	<ul style="list-style-type: none"> • Driver's seat position sensor is faulty. • Airbag control module is faulty. • Airbag rear harness circuit is open, shorted or shorted to ground. 	<Ref. to AB(diag)-72, DTC 36 SEAT POSITION SENSOR LH FAILURE, Diagnostic Chart with Trouble Code.>
37	Buckle Switch RH Failure	<ul style="list-style-type: none"> • Passenger's buckle switch circuit is open, shorted or shorted to ground. • Airbag rear harness circuit is open, shorted or shorted to ground. • Airbag control module is faulty. • Occupant detection control module is faulty. 	Refer to "Occupant Detection System" for DTC 37. <Ref. to AB(diag)-73, DTC 37 BUCKLE SWITCH RH FAILURE, Diagnostic Chart with Trouble Code.>
38	Buckle Switch LH Failure	<ul style="list-style-type: none"> • Driver's buckle switch circuit is open, shorted or shorted to ground. • Airbag rear harness circuit is open, shorted or shorted to ground. • Airbag control module is faulty. 	<Ref. to AB(diag)-74, DTC 38 BUCKLE SWITCH LH FAILURE, Diagnostic Chart with Trouble Code.>
41	Side Airbag RH failure	<ul style="list-style-type: none"> • Side airbag harness (RH) circuit is faulty. • Side airbag module (RH) is faulty. • Airbag control module is faulty. 	<Ref. to AB(diag)-76, DTC 41 SIDE AIRBAG RH FAILURE, Diagnostic Chart with Trouble Code.>
42	Side Airbag LH failure	<ul style="list-style-type: none"> • Side airbag harness (LH) circuit is faulty. • Side airbag module (LH) is faulty. • Airbag control module is faulty. 	<Ref. to AB(diag)-78, DTC 42 SIDE AIRBAG LH FAILURE, Diagnostic Chart with Trouble Code.>
45	Side Airbag RH failure	<ul style="list-style-type: none"> • Side airbag harness (RH) is shorted to power supply. • Airbag control module is faulty. 	<Ref. to AB(diag)-80, DTC 45 SIDE AIRBAG RH FAILURE, Diagnostic Chart with Trouble Code.>
46	Side Airbag LH failure	<ul style="list-style-type: none"> • Side airbag harness (LH) is shorted to power supply. • Airbag control module is faulty. 	<Ref. to AB(diag)-82, DTC 46 SIDE AIRBAG LH FAILURE, Diagnostic Chart with Trouble Code.>
51	Side Airbag Sensor RH failure	<ul style="list-style-type: none"> • Side airbag sensor (RH) is faulty. • Side airbag harness (RH) circuit is faulty. • Airbag control module is faulty. 	<Ref. to AB(diag)-84, DTC 51 SIDE AIRBAG SENSOR RH FAILURE, Diagnostic Chart with Trouble Code.>
52	Side Airbag Sensor LH failure	<ul style="list-style-type: none"> • Side airbag sensor (LH) is faulty. • Side airbag harness (LH) circuit is faulty. • Airbag control module is faulty. 	<Ref. to AB(diag)-87, DTC 52 SIDE AIRBAG SENSOR LH FAILURE, Diagnostic Chart with Trouble Code.>
53	Side Airbag Sensor RH failure	Side airbag sensor (RH) is faulty.	<Ref. to AB(diag)-89, DTC 53 SIDE AIRBAG SENSOR RH FAILURE, Diagnostic Chart with Trouble Code.>

List of Diagnostic Trouble Code (DTC)

AIRBAG SYSTEM (DIAGNOSTICS)

DTC	Display	Content of diagnosis	Reference
54	Side Airbag Sensor LH failure	Side airbag sensor (LH) is faulty.	<Ref. to AB(diag)-89, DTC 54 SIDE AIRBAG SENSOR LH FAILURE, Diagnostic Chart with Trouble Code.>
55	Side Curtain Airbag Firing output	Side airbag module is deployed.	<Ref. to AB(diag)-89, DTC 55 SIDE CURTAIN AIRBAG FIRING OUTPUT, Diagnostic Chart with Trouble Code.>
61	Belt Pretensioner RH failure	<ul style="list-style-type: none"> • Seat belt pretensioner (RH) circuit is open, shorted or shorted to ground. • Airbag control module is faulty. • Pretensioner is faulty. • Pretensioner harness is faulty. 	<Ref. to AB(diag)-90, DTC 61 BELT PRETENSIONER RH FAILURE, Diagnostic Chart with Trouble Code.>
62	Belt Pretensioner LH failure	<ul style="list-style-type: none"> • Seat belt pretensioner (LH) circuit is open, shorted or shorted to ground. • Airbag control module is faulty. • Pretensioner is faulty. • Pretensioner harness is faulty. 	<Ref. to AB(diag)-92, DTC 62 BELT PRETENSIONER LH FAILURE, Diagnostic Chart with Trouble Code.>
65	Belt Pretensioner RH failure	<ul style="list-style-type: none"> • Seat belt pretensioner (RH) circuit is shorted to power supply. • Pretensioner is faulty. • Pretensioner harness is faulty. • Airbag control module is faulty. 	<Ref. to AB(diag)-94, DTC 65 BELT PRETENSIONER RH FAILURE, Diagnostic Chart with Trouble Code.>
66	Belt Pretensioner LH failure	<ul style="list-style-type: none"> • Seat belt pretensioner (LH) circuit is shorted to power supply. • Pretensioner is faulty. • Pretensioner harness is faulty. • Airbag control module is faulty. 	<Ref. to AB(diag)-96, DTC 66 BELT PRETENSIONER LH FAILURE, Diagnostic Chart with Trouble Code.>
71	Driver's Airbag failure	<ul style="list-style-type: none"> • Airbag main harness circuit is open, shorted or shorted to ground. • Airbag module harness (driver's side) circuit is open, shorted or shorted to ground. • Roll connector circuit is open, shorted or shorted to ground. • Airbag control module is faulty. • Driver's airbag module is faulty. 	<Ref. to AB(diag)-98, DTC 71 DRIVER'S AIRBAG FAILURE, Diagnostic Chart with Trouble Code.>
72	Passenger's Airbag failure	<ul style="list-style-type: none"> • Airbag main harness circuit is open, shorted or shorted to ground. • Airbag module harness (passenger's side) circuit is open, shorted or shorted to ground. • Airbag control module is faulty. • Passenger's airbag module is faulty. 	<Ref. to AB(diag)-101, DTC 72 PASSENGER'S AIRBAG FAILURE, Diagnostic Chart with Trouble Code.>
75	Driver's Airbag failure	<ul style="list-style-type: none"> • Airbag main harness circuit (driver's side) is shorted to power supply. • Airbag module harness circuit (driver's side) is shorted to power supply. • Roll connector is shorted to power supply. • Airbag control module is faulty. • Driver's airbag module is faulty. 	<Ref. to AB(diag)-103, DTC 75 DRIVER'S AIRBAG FAILURE, Diagnostic Chart with Trouble Code.>
76	Passenger's Airbag failure	<ul style="list-style-type: none"> • Airbag main harness circuit (passenger's side) is shorted to power supply. • Airbag module harness circuit (passenger's side) is shorted to power supply. • Airbag control module is faulty. • Passenger's airbag module is faulty. 	<Ref. to AB(diag)-106, DTC 76 PASSENGER'S AIRBAG FAILURE, Diagnostic Chart with Trouble Code.>

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

13. Diagnostic Chart with Trouble Code

A: DTC 11 DRIVER'S AIRBAG FAILURE

DTC DETECTING CONDITION:

- Airbag harness is open, shorted or shorted to ground.
- Airbag module harness (driver's side) is open, shorted or shorted to ground.
- Roll connector circuit is open, shorted or shorted to ground.
- Driver's airbag module is faulty.
- Airbag control module is faulty.

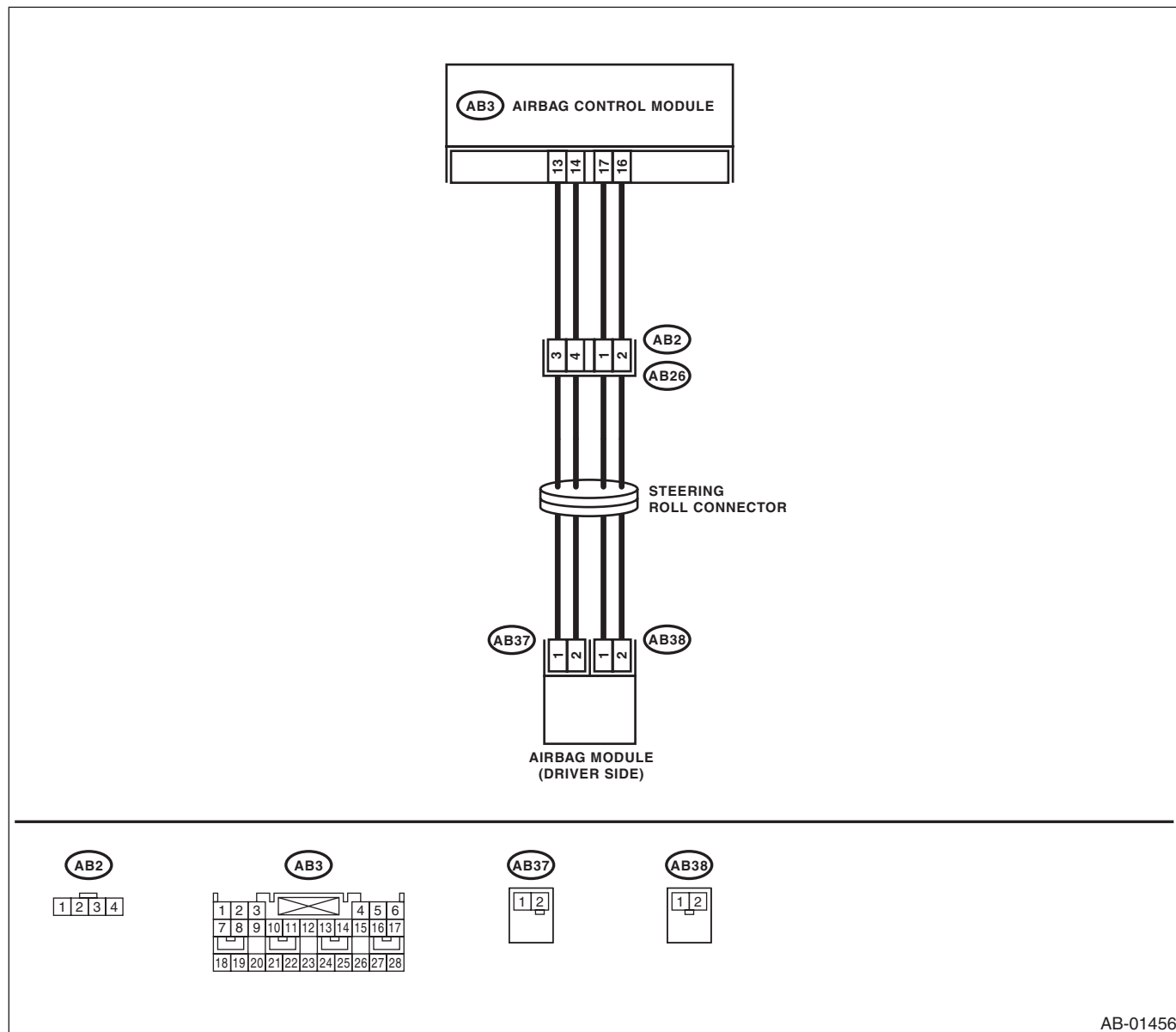
CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety.

NOTE:

Before diagnosing, prepare the two airbag resistors (98299PA040).

WIRING DIAGRAM:



AB-01456

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module and the driver's airbag module.	Is there poor contact?	Replace the airbag harness.	Go to step 2.
2 CHECK DRIVER'S AIRBAG MODULE. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Remove the driver's airbag module. 3) Connect connector (1N) in the test harness N to the connector (AB38). 4) Connect the airbag resistor to the connector (2N) in the test harness N. 5) Connect the connector (1Q) in the test harness Q to connector (AB37). 6) Connect the airbag resistor to the connector (2Q) in the test harness Q. 7) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the driver's airbag module. <Ref. to AB-14, Driver's Airbag Module.>	Go to step 3.
3 CHECK ROLL CONNECTOR. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the test harness N from connector (AB38). 3) Disconnect the test harness Q from connector (AB37). 4) Remove the instrument panel lower cover, disconnect the connector (AB26) from (AB2). 5) Connect the connector (1P) in the test harness P to connector (AB2). 6) Connect the airbag resistor to the connectors (2P) and (3P) in the test harness P. 7) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the roll connector. <Ref. to AB-20, Roll Connector.>	Go to step 4.
4 CHECK AIRBAG MAIN HARNESS (DRIVER'S AIRBAG HARNESS). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the connectors (2P) and (3P) in the test harness P. 3) Disconnect the connectors (AB4) and (AB27) from the passenger's airbag module. 4) Disconnect the connector (AB3) from airbag control module, and connect the connector (1R) in the test harness R. 5) Measure resistance between connector (2R) in the test harness R and connector (2P) and (3P) in the test harness P. Connector & terminal (2R) No. 2 — (2P) No. 1: (2R) No. 4 — (2P) No. 2: (2R) No. 8 — (3P) No. 3: (2R) No. 12 — (3P) No. 4:	Is the resistance less than 10 Ω ?	Go to step 5.	Replace the airbag main harness along with the body harness.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK AIRBAG MAIN HARNESS (DRIVER'S AIRBAG HARNESS). Measure resistance between connector (2R) terminals in the test harness R. <i>Connector & terminal</i> <i>(2R) No. 2 — (2R) No. 4:</i> <i>(2R) No. 4 — Chassis ground:</i> <i>(2R) No. 2 — Chassis ground:</i> <i>(2R) No. 8 — (2R) No. 12:</i> <i>(2R) No. 8 — Chassis ground:</i> <i>(2R) No. 12 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 6.	Replace the airbag main harness along with the body harness.
6 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 7.
7 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

B: DTC 12 PASSENGER'S AIRBAG FAILURE

DTC DETECTING CONDITION:

- Airbag harness is open, shorted or shorted to ground.
- Airbag module harness (passenger's side) is open, shorted or shorted to ground.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

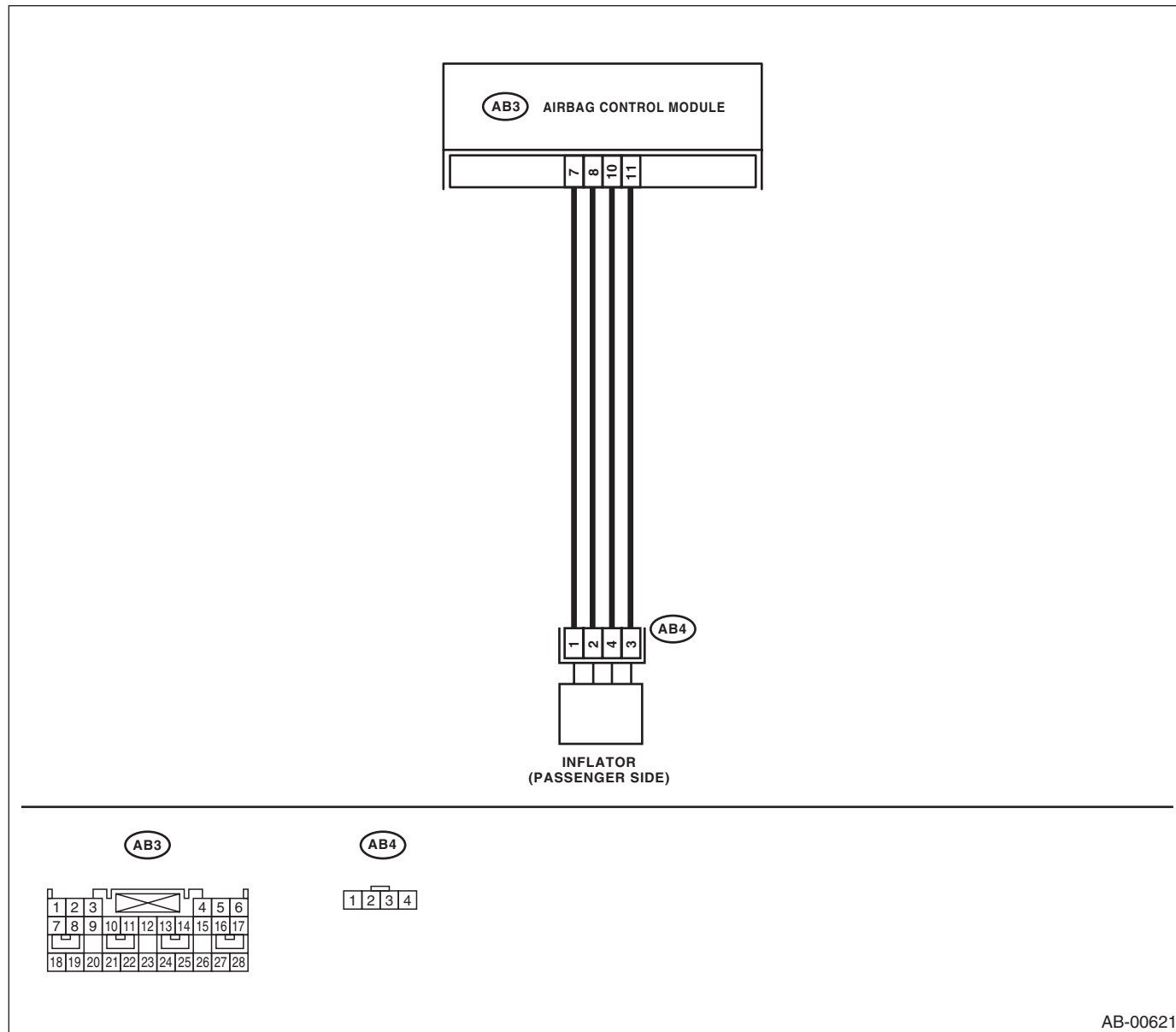
CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the airbag module connectors of the driver's and passenger's seats for safety.

NOTE:

Before diagnosing, prepare the two airbag resistors (98299PA040).

WIRING DIAGRAM:



AB-00621

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module and the passenger's airbag module.	Is there poor contact?	Replace the airbag harness.	Go to step 2.
2 CHECK PASSENGER'S AIRBAG MODULE. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connectors (AB27) from (AB4) of the passenger's airbag module. 3) Connect connector (1P) in the test harness P to connector (AB4). 4) Connect the airbag resistor to the connectors (2P) and (3P) in the test harness P. 5) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the passenger's airbag module. <Ref. to AB-15, Passenger's Airbag Module.>	Go to step 3.
3 CHECK AIRBAG MAIN HARNESS (PASSENGER'S AIRBAG HARNESS). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the connectors (2P) and (3P) in the test harness P. 3) Remove the instrument panel lower cover, disconnect the connector (AB26) from (AB2). 4) Disconnect the connector (AB3) from airbag control module, and connect the connector (1R) in the test harness R. 5) Measure resistance between connector (2R) in the test harness R and connector (2P) and (3P) in the test harness P. Connector & terminal (2R) No. 3 — (2P) No. 1: (2R) No. 5 — (2P) No. 2: (2R) No. 9 — (3P) No. 3: (2R) No. 13 — (3P) No. 4:	Is the resistance less than 10 Ω?	Go to step 4.	Replace the airbag main harness along with the body harness.
4 CHECK AIRBAG MAIN HARNESS (PASSENGER'S AIRBAG HARNESS). Measure resistance between connector (2R) in the test harness R and chassis ground. Connector & terminal (2R) No. 3 — (2R) No. 5: (2R) No. 3 — Chassis ground: (2R) No. 5 — Chassis ground: (2R) No. 9 — (2R) No. 13: (2R) No. 9 — Chassis ground: (2R) No. 13 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 5.	Replace the airbag main harness along with the body harness.
5 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 6.
6 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

C: DTC 15 DRIVER'S AIRBAG FAILURE

DTC DETECTING CONDITION:

- Airbag harness (driver's side) is shorted to power supply.
- Airbag module harness (driver's side) is shorted to power supply.
- Roll connector is shorted to power supply.
- Driver's airbag module is faulty.
- Airbag control module is faulty.

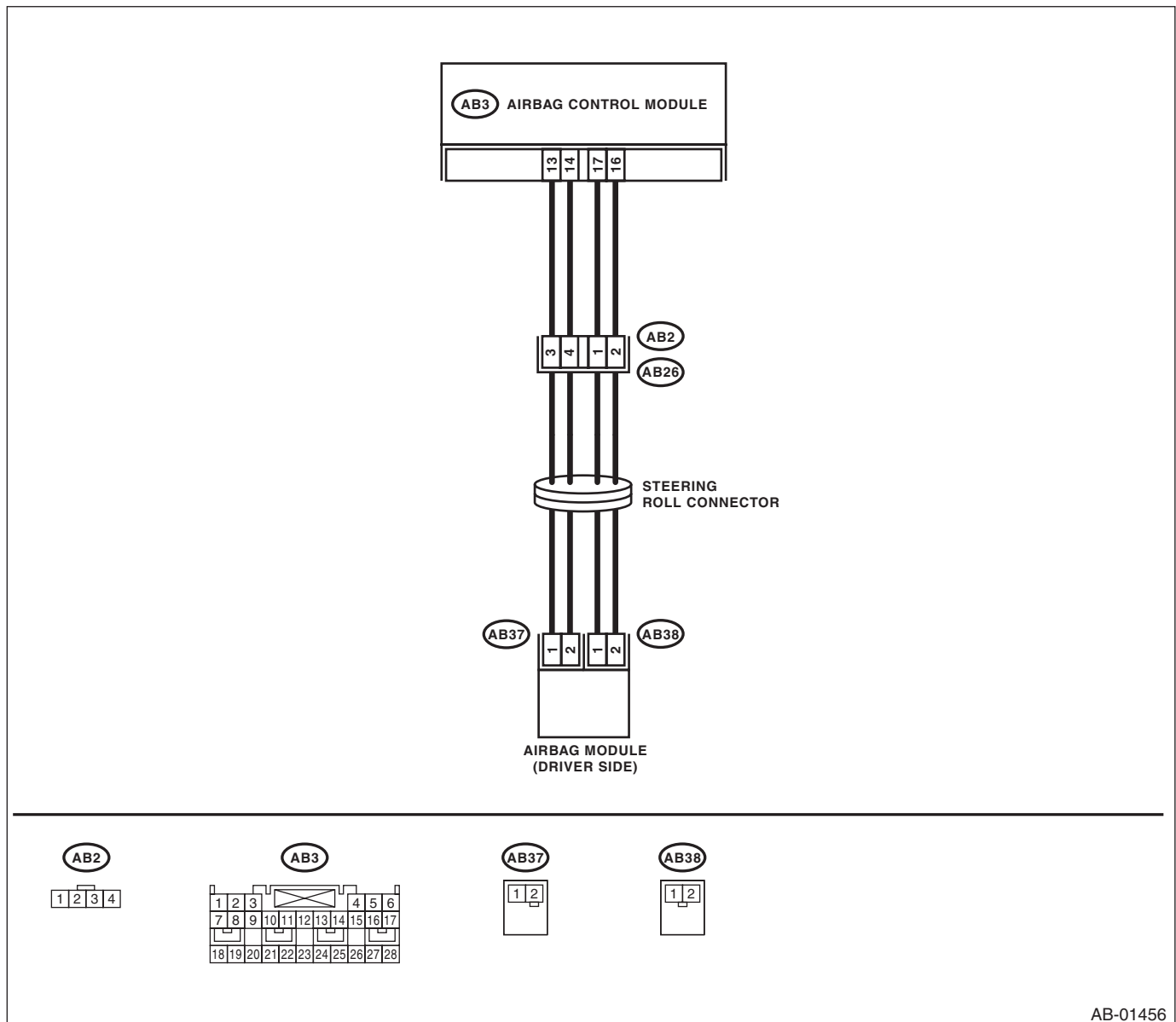
CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety.

NOTE:

Before diagnosing, prepare the two airbag resistors (98299PA040).

WIRING DIAGRAM:



AB-01456

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module and the driver's airbag module.	Is there poor contact?	Replace the airbag harness.	Go to step 2.
2 CHECK DRIVER'S AIRBAG MODULE. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Remove the driver's airbag module. 3) Connect the connector (AB38) to the connector (1N) in the test harness N. 4) Connect the airbag resistor to the connector (2N) in the test harness N. 5) Connect the connector (1Q) in the test harness Q to connector (AB37). 6) Connect the airbag resistor to the connector (2Q) in the test harness Q. 7) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the driver's airbag module. <Ref. to AB-14, Driver's Airbag Module.>	Go to step 3.
3 CHECK ROLL CONNECTOR. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the test harness N from connector (AB38). 3) Disconnect the test harness Q from connector (AB37). 4) Remove the instrument panel lower cover, disconnect the connector (AB26) from (AB2). 5) Connect the connector (1P) in the test harness P to connector (AB2). 6) Connect the airbag resistor to the connectors (2P) and (3P) in the test harness P. 7) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the roll connector. <Ref. to AB-20, Roll Connector.>	Go to step 4.
4 CHECK AIRBAG MAIN HARNESS (DRIVER'S AIRBAG HARNESS). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the connectors (2P) and (3P) in the test harness P. 3) Disconnect the connectors (AB27) and (AB4) of the passenger's airbag module. 4) Disconnect the connector (AB3) from airbag control module, and connect the connector (1R) in the test harness R. 5) Connect the battery ground terminal and turn the ignition switch to ON. (engine OFF) 6) Measure the voltage between connector (2R) in the test harness R and chassis ground. Connector & terminal (2R) No. 4 (+) — Chassis ground (-): (2R) No. 2 (+) — Chassis ground (-): (2R) No. 8 (+) — Chassis ground (-): (2R) No. 12 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 5.	Replace the airbag main harness along with the body harness.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 6.
6 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

D: DTC 16 PASSENGER'S AIRBAG FAILURE

DTC DETECTING CONDITION:

- Airbag harness (Passenger's side) is shorted to power supply.
- Airbag module harness (passenger's side) is shorted to power supply.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

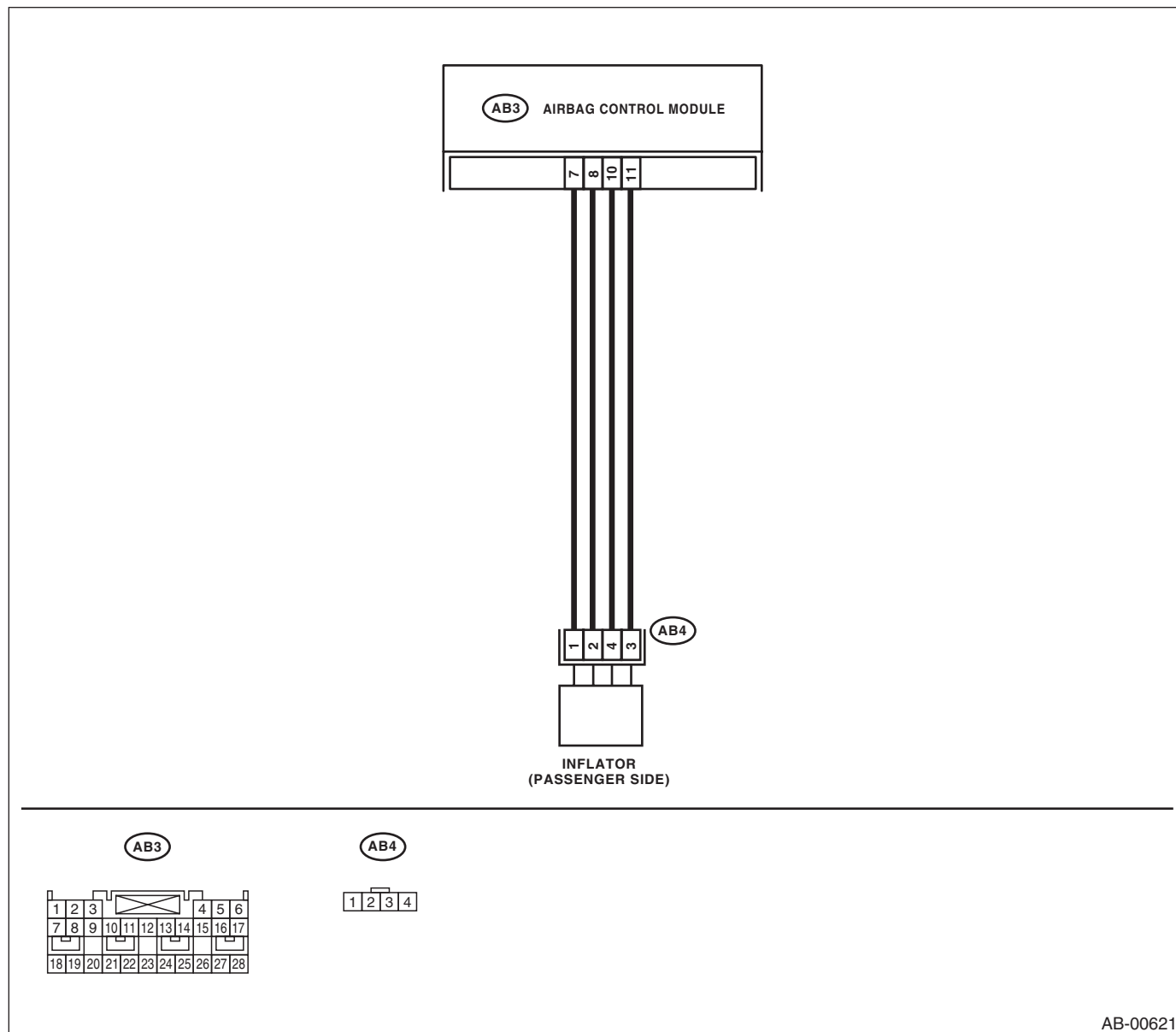
CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the airbag module connectors of the driver's and passenger's seats for safety.

NOTE:

Before diagnosing, prepare the two airbag resistors (98299PA040).

WIRING DIAGRAM:



Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module and the passenger's airbag module.	Is there poor contact?	Replace the airbag harness along with the body harness.	Go to step 2.
2 CHECK PASSENGER'S AIRBAG MODULE. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connectors (AB27) from (AB4) of the passenger's airbag module. 3) Connect connector (1P) in the test harness P to connector (AB4). 4) Connect the airbag resistor to the connectors (2P) and (3P) in the test harness P. 5) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the passenger's airbag module. <Ref. to AB-15, Passenger's Airbag Module.>	Go to step 3.
3 CHECK AIRBAG MAIN HARNESS (PASSENGER'S AIRBAG HARNESS). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the connectors (2P) and (3P) in the test harness P. 3) Remove the instrument panel lower cover, disconnect the connector (AB26) from (AB2). 4) Disconnect the connector (AB3) from airbag control module, and connect the connector (1R) in the test harness R. 5) Measure the voltage between connector (2R) in the test harness R and chassis ground. Connector & terminal <i>(2R) No. 3 (+) — Chassis ground (-):</i> <i>(2R) No. 5 (+) — Chassis ground (-):</i> <i>(2R) No. 9 (+) — Chassis ground (-):</i> <i>(2R) No. 13 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 4.	Replace the airbag main harness along with the body harness.
4 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 5.
5 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

E: DTC 21 AIRBAG ECM FAILURE

DTC DETECTING CONDITION:

Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When replacing the airbag module, seat belt pretensioner, roll connector, control module and sensor, reconnect each part and check that the warning light operates properly.

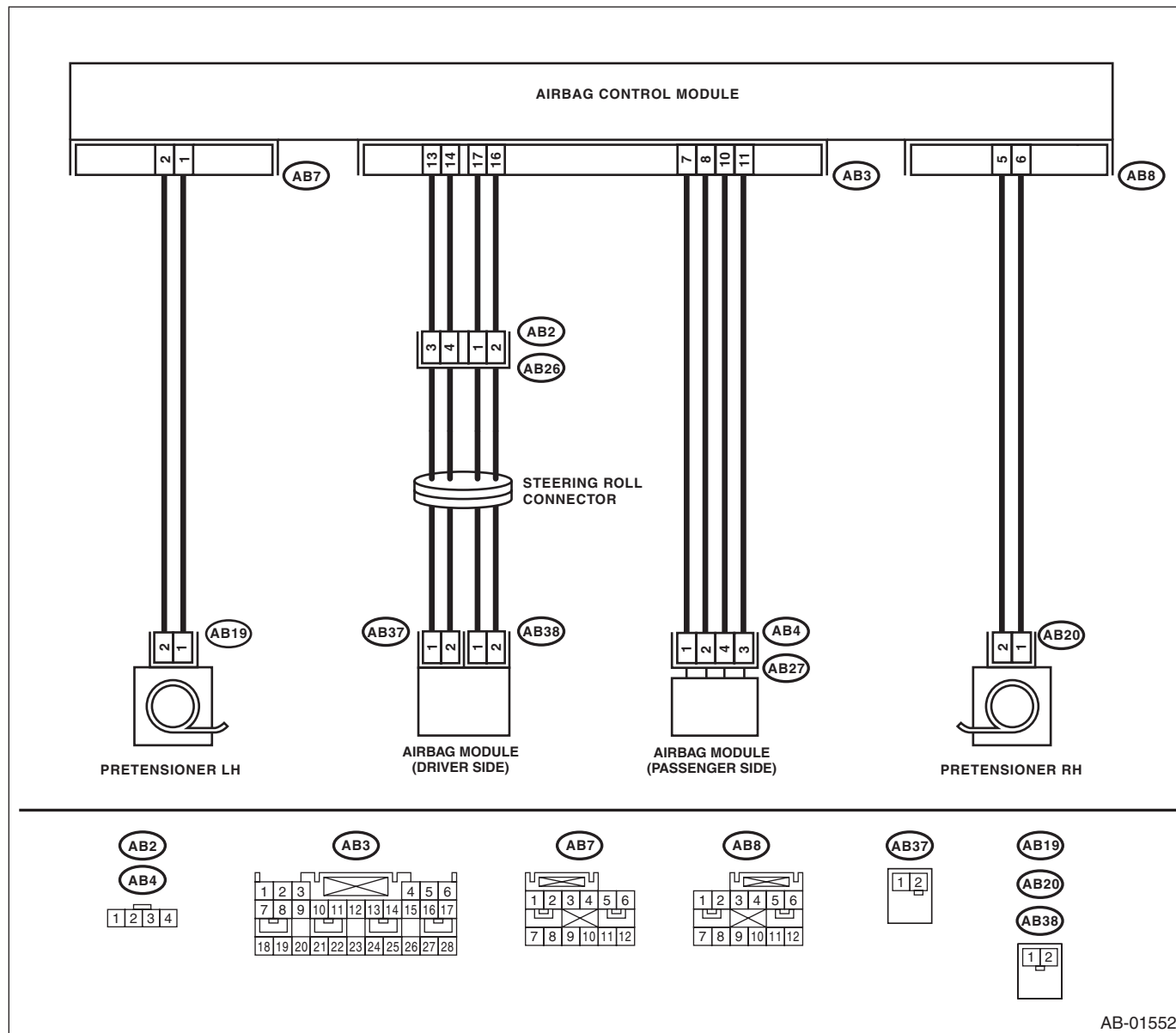
	Step	Check	Yes	No
1	CHECK WHETHER DTC 21 IS INDICATED. 1) Read the DTC. <Ref. to AB(diag)-29, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.> 2) Perform the Clear Memory Mode. <Ref. to AB(diag)-35, Clear Memory Mode.> 3) Read the DTC again.	Is DTC 21 displayed on Subaru Select Monitor?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Temporary poor contact occurs.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

F: DTC 22 FRONT AIRBAG FIRING OUTPUT

WIRING DIAGRAM:



AB-01552

This code is indicated when the front airbag and pretensioner activates.

Once this code is displayed, the memory cannot be cleared. Therefore replace the following parts.

- Airbag Control Module <Ref. to AB-18, Airbag Control Module.>
- Driver's airbag module <Ref. to AB-14, Driver's Airbag Module.>
- Passenger's airbag module <Ref. to AB-15, Passenger's Airbag Module.>
- Front sub sensor of both sides <Ref. to AB-21, Front Sub Sensor.>
- Front seat belt outer with pretensioner of both sides. <Ref. to SB-10, Front Seat Belt.>
- Steering roll connector <Ref. to AB-20, Roll Connector.>
- Occupant detection system (passenger's seat cushion & frame assembly) <Ref. to SE-14, PASSENGER'S SEAT, DISASSEMBLY, Front Seat.>

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

G: DTC 23 CONNECTOR TO AIRBAG ECM

DTC DETECTING CONDITION:

Improper connection of (AB3), (AB7) and (AB8) to airbag control module

CAUTION:

Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS (AB3), (AB7) AND (AB8). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connectors (AB3), (AB7) and (AB8) from the airbag control module.	Is there rust or damage on the harness connector and the control module connector?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>Replace the airbag main harness along with the body harness. Replace the side airbag main harness along with the body harness.	Go to step 2.
2 CHECK POOR CONTACT OF CONNECTORS (AB3), (AB7) AND (AB8). 1) Reconnect the connector securely. 2) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Go to step 3.	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>
3 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 4.
4 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

H: DTC 24 IG1 OPEN

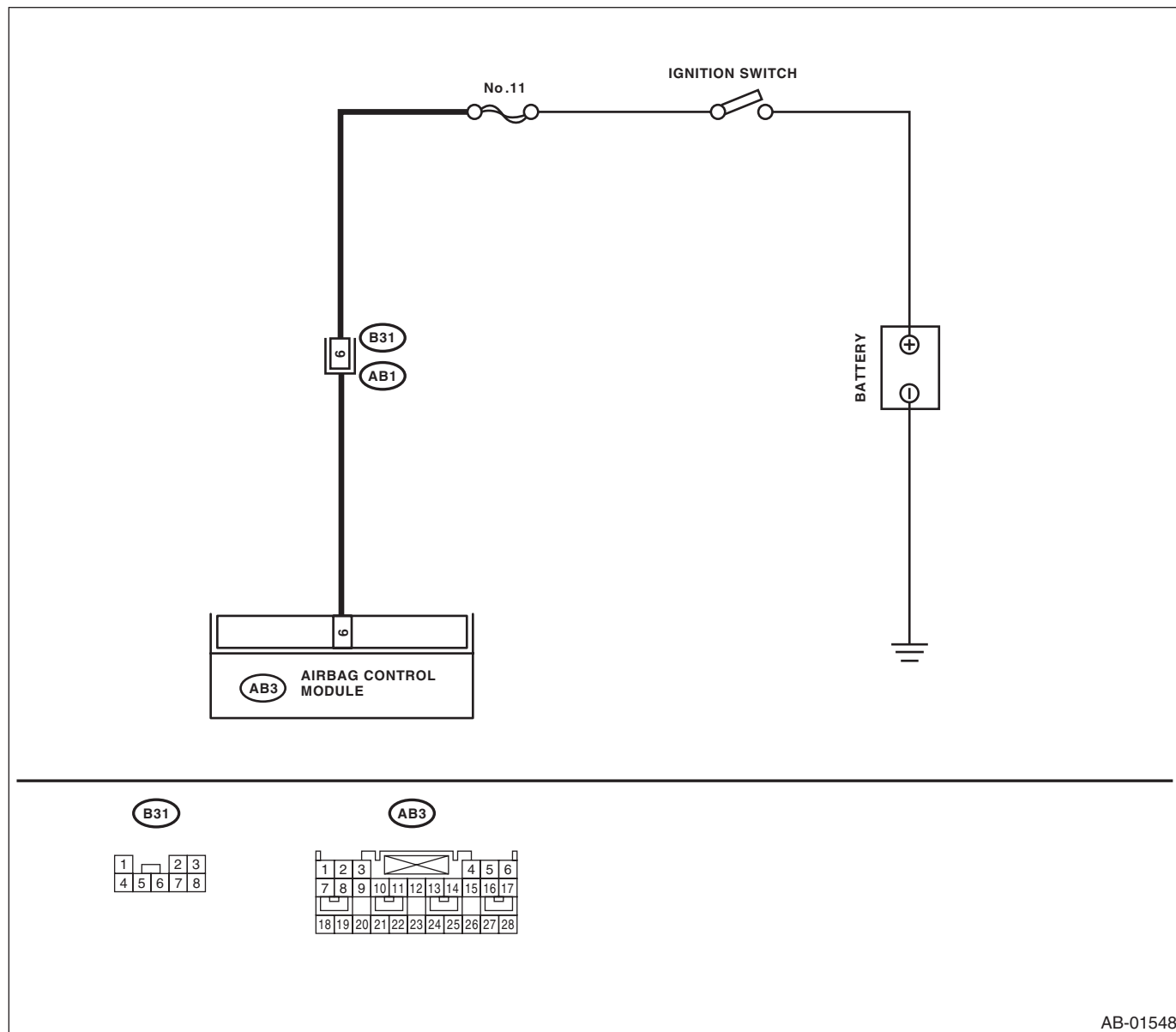
DTC DETECTING CONDITION:

- Airbag control module is faulty.
- Airbag main harness is open.
- Fuse No. 11 (in joint box) is blown.
- Body harness is open.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety.

WIRING DIAGRAM:



AB-01548

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK AIRBAG CONTROL MODULE. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect connector (AB3) from airbag control module. 3) Connect the connector (1R) in the test harness R to connector (AB3). 4) Connect the battery ground terminal and turn the ignition switch to ON. 5) Measure the voltage between connector (2R) in the test harness R and chassis ground. Connector & terminal (2R) No. 1 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 2.
2 CHECK FUSE NO. 11 (IN JOINT BOX). 1) Confirm that the ignition switch is turned to OFF. 2) Remove and visually check the fuse No. 11 (in the joint box).	Is the fuse (No. 11) blown out?	Replace the fuse No. 11. If fuse No. 11 is blown out again, repair the body harness. Replace the airbag main harness along with the body harness.	Go to step 3.
3 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 4.
4 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

I: DTC 25 IG2 OPEN

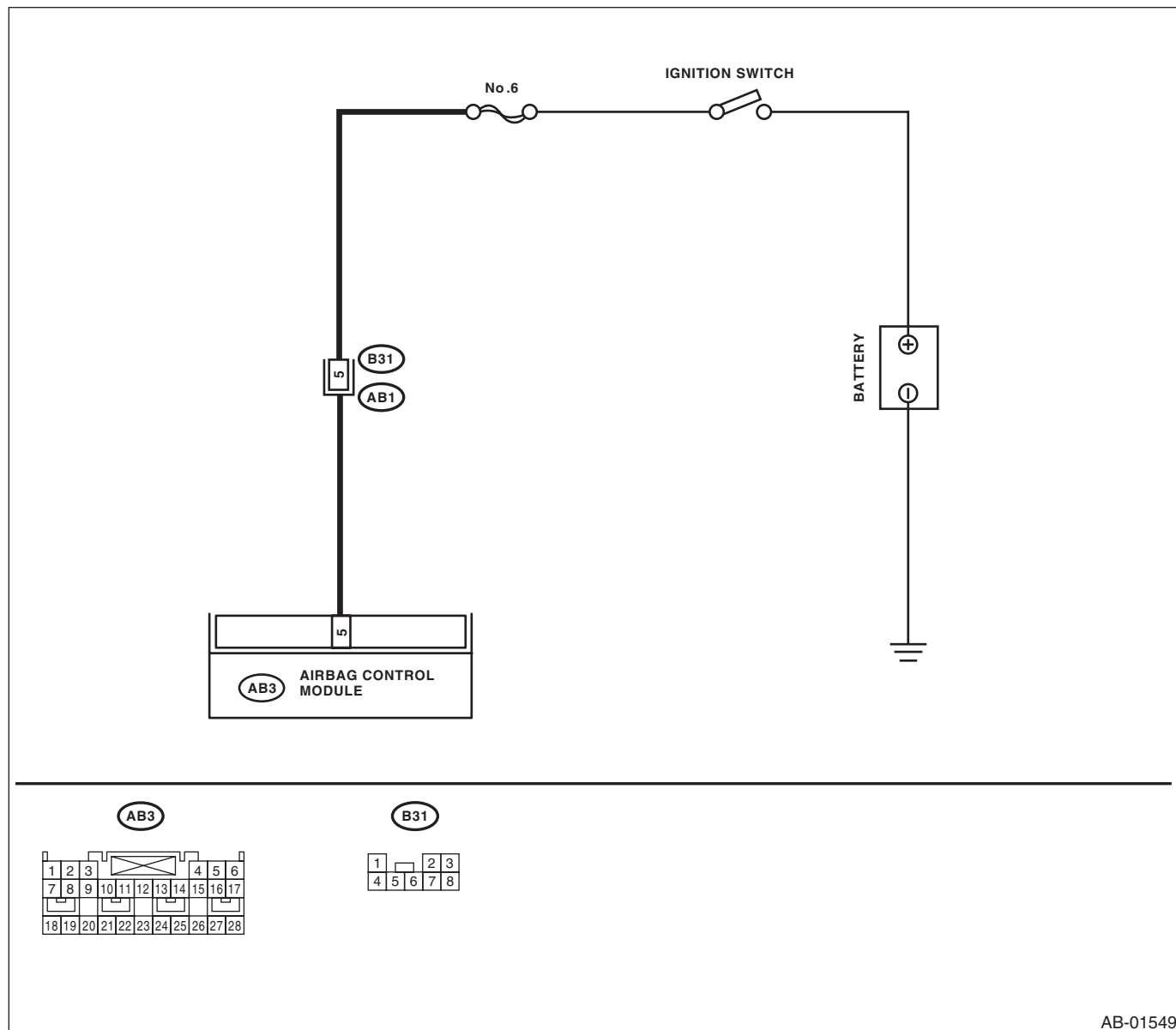
DTC DETECTING CONDITION:

- Airbag control module is faulty.
- Airbag harness is open.
- Fuse No. 6 (in joint box) is blown.
- Body harness is open.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety.

WIRING DIAGRAM:



AB-01549

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK AIRBAG CONTROL MODULE. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect connector (AB3) from airbag control module. 3) Connect the connector (1R) in the test harness R to connector (AB3). 4) Connect the battery ground terminal and turn the ignition switch to ON. 5) Measure the voltage between connector (2R) in the test harness R and chassis ground. Connector & terminal (2R) No. 6 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 2.
2 CHECK FUSE NO. 6 (IN JOINT BOX). 1) Confirm that the ignition switch is turned to OFF. 2) Remove and visually check the fuse No. 6 (in the joint box).	Is the fuse (No. 6) blown out?	Replace the fuse No. 6. If fuse No. 6 is blown out again, repair the body harness. Or replace the airbag main harness along with the body harness.	Go to step 3.
3 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 4.
4 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

J: DTC 26 PASSENGER'S AIRBAG INDICATOR FAILURE

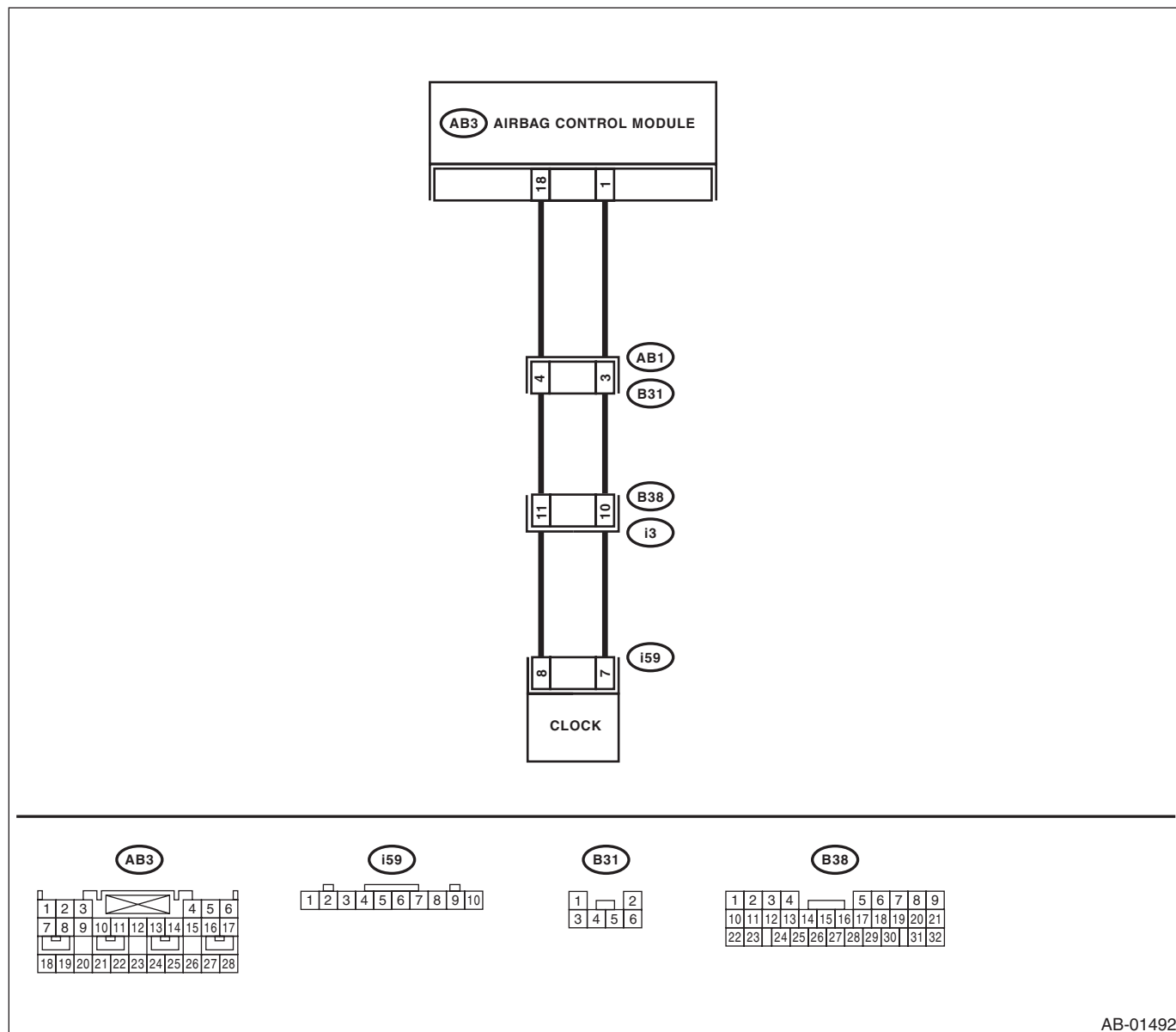
DTC DETECTING CONDITION:

- Passenger's airbag indicator is faulty.
- Airbag control module is faulty.
- Airbag main harness circuit is open.
- Body harness is open.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When replacing the airbag module, seat belt pretensioner, roll connector, control module and sensor, reconnect each part and check that the warning light operates properly.
- When inspecting the airbag harness, disconnect the airbag module connector and seat belt pretensioner for safety.

WIRING DIAGRAM:



AB-01492

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Confirm that firm contact is secured for the connector between the airbag control module and clock.	Is there poor contact in any connector?	Replace the airbag harness connector.	Go to step 2.
2 CHECK AIRBAG MAIN HARNESS. 1) Disconnect connector (AB3) from airbag control module. 2) Connect the battery ground terminal and turn the ignition switch to ON. NOTE: If normal, the indicator is not illuminated for both ON and OFF.	Is the passenger's airbag indicator turned on?	Go to step 3.	Go to step 4.
3 CHECK AIRBAG MAIN HARNESS. 1) Turn the ignition switch to OFF. 2) Remove the clock and then disconnect the connector (i59). 3) Connect the connector (1R) in the test harness R to connector (AB3). 4) Measure resistance between connectors (2R) and (4R) in the test harness R and chassis ground. <i>Connector & terminal</i> <i>(2R) No. 14 — (4R) No. 17:</i> <i>(2R) No. 14 — Chassis ground:</i> <i>(4R) No. 17 — Chassis ground:</i>	Is the resistance 1 M Ω or more?	Replace the clock. <Ref. to IDI-17, Clock.>	Repair the bulk-head harness. Or replace the airbag main harness along with the body harness.
4 CHECK AIRBAG HARNESS. 1) Turn the ignition switch to OFF. 2) Connect the connector (1R) in the test harness R to connector (AB3). 3) Measure resistance between connectors (2R) and (4R) in the test harness R and connector (i59). <i>Connector & terminal</i> <i>(2R) No. 14 — (i59) No. 7:</i> <i>(4R) No. 17 — (i59) No. 8:</i>	Is the resistance less than 10 Ω ?	Go to step 5.	Repair the bulk-head harness. Or replace the airbag main harness along with the body harness.
5 CHECK BODY HARNESS. 1) Turn the ignition switch to ON. 2) Measure the voltage between connector (i59) and chassis ground. <i>Connector & terminal</i> <i>(i59) No. 3 — Chassis ground:</i>	Is the voltage 10 V or more?	Replace the clock. <Ref. to IDI-17, Clock.>	Repair the clock power supply line.

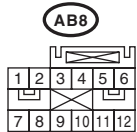
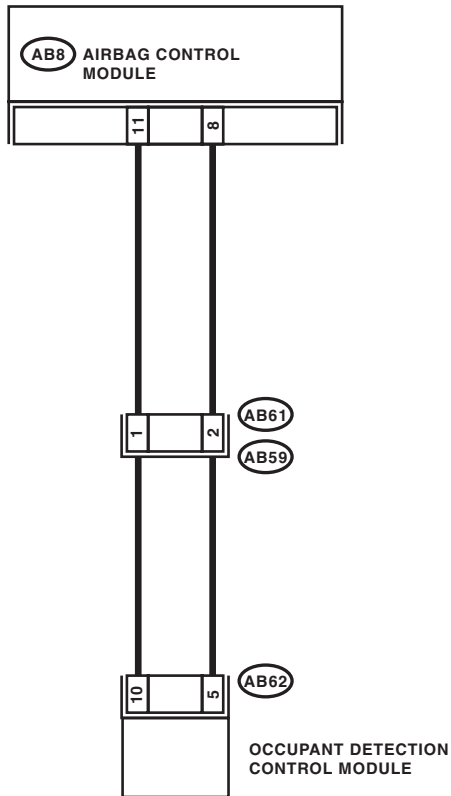
Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

K: DTC 27 ODS COMMUNICATION ERROR

DTC DETECTING CONDITION:

- Communication to the occupant detection control module is faulty.
- Occupant detection harness (seat harness) is faulty.
- Occupant detection system is faulty.
- Airbag control module is faulty.
- Airbag rear harness circuit is open, shorted or shorted to ground, or shorted to power supply.



AB-01550

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK AIRBAG HARNESS. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect connector (AB8) from airbag control module. 3) Disconnect connector (AB59) from the connector (AB61) on the lower side of passenger's seat. 4) Connect the connector (1R) in the test harness R to connector (AB8). 5) Connect the connector (1AB) in the test harness AB to connector (AB61). 6) Measure resistance between connector (4R) in the test harness R and connector (2AB) in the test harness AB. Connector & terminal (4R) No. 12 — (2AB) No. 1: (4R) No. 10 — (2AB) No. 2:	Is the resistance less than 10 Ω?	Go to step 2.	Replace the airbag rear harness (RH) along with the body harness.
2 CHECK AIRBAG HARNESS. Measure resistance between connector (4R) in the test harness R and chassis ground. Connector & terminal (4R) No. 12 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 3.	Replace the airbag rear harness (RH) along with the body harness.
3 CHECK OCCUPANT DETECTION SYSTEM. 1) Connect connector (AB8) to airbag control module. 2) Connect connector (AB61) and connector (AB59). 3) Connect the battery ground cable. 4) Check the occupant detection system. <Ref. to OD(diag)-2, Basic Diagnostic Procedure.>	Is there a malfunction in the occupant detection system?	Repair the occupant detection system. <Ref. to OD(diag)-2, Basic Diagnostic Procedure.>	Finish the diagnosis.

L: DTC 29 ODS FAILURE

NOTE:

Refer to "Occupant Detection System" for DTC 29. <Ref. to OD(diag)-28, DTC 29 ODS FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

M: DTC 2A ODS CALIBRATION ERROR

NOTE:

Refer to "Occupant Detection System" for DTC 2A. <Ref. to OD(diag)-25, DTC 2A ODS CALIBRATION ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

N: DTC 2B ODS SYSTEM WRONG PARTS

NOTE:

Refer to "Occupant Detection System" for DTC 2B. <Ref. to OD(diag)-25, DTC 2B ODS SYSTEM WRONG PARTS, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

O: DTC 2C BELT TENSION SENSOR FAILURE

NOTE:

Refer to "Occupant Detection System" for DTC 2C. <Ref. to OD(diag)-26, DTC 2C BELT TENSION SENSOR FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Chart with Trouble Code

P: DTC 31 FRONT SUB SENSOR RH FAILURE

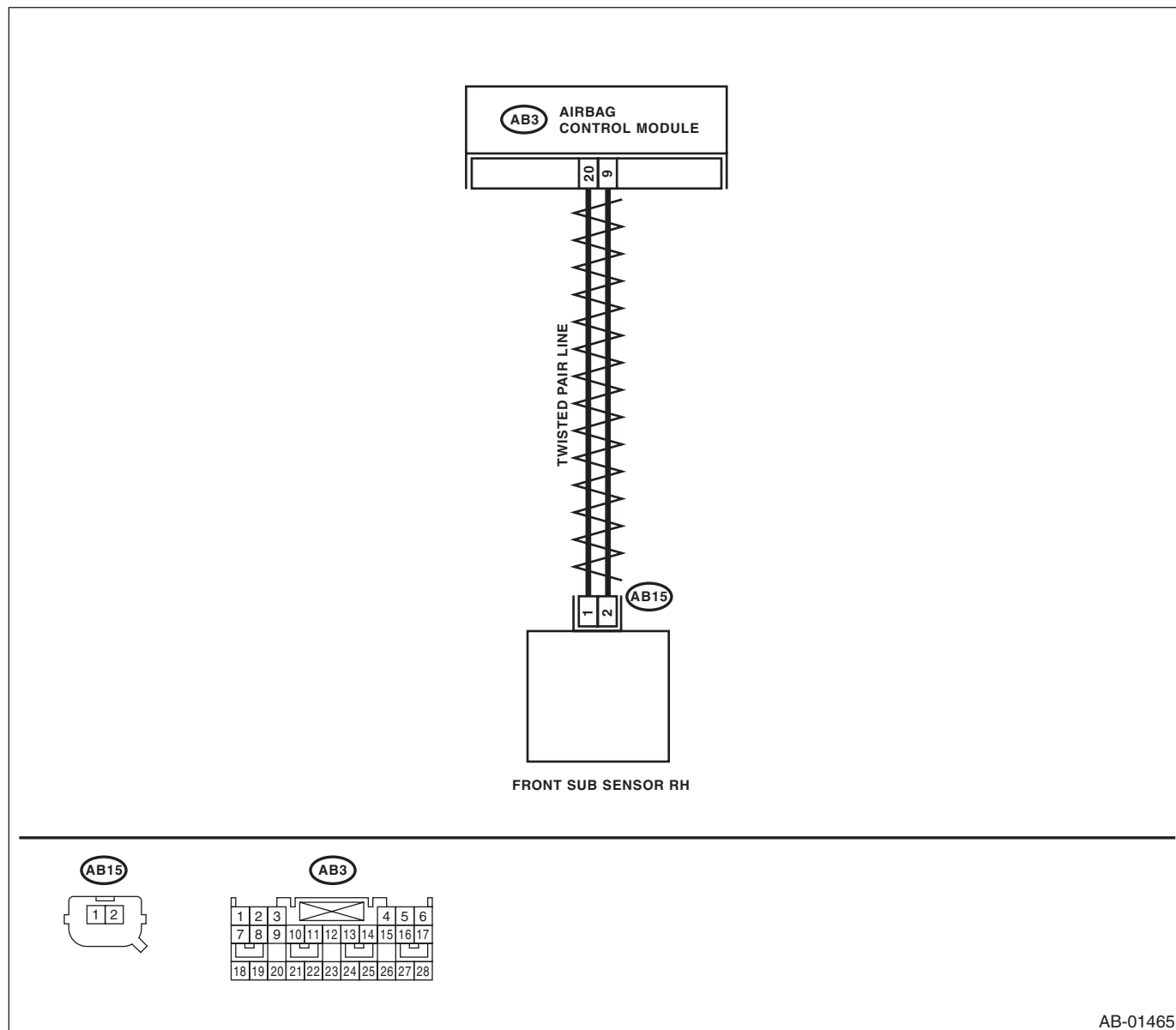
DTC DETECTING CONDITION:

- Front sub sensor harness (RH) is shorted, open or shorted to power supply.
- Airbag harness is shorted, open or shorted to power supply.
- Front sub sensor (RH) is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety.

WIRING DIAGRAM:



AB-01465

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module and the front sub sensor (RH).	Is there poor contact?	Repair the connector.	Go to step 2.
2 CHECK AIRBAG MAIN HARNESS AND FRONT SUB SENSOR HARNESS. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Remove the instrument panel lower cover, disconnect the connector (AB26) and (AB2). 3) Disconnect the connectors (AB27) and (AB4) of the passenger's airbag module. 4) Disconnect connector (AB3) from airbag control module. 5) Connect the connector (1R) in the test harness R to connector (AB3). 6) Disconnect the front sub sensor (RH), and connect the connector (1H) in test harness H to connector (AB15). 7) Measure resistance between connector (3R) in the test harness R and connector (3H) in the test harness H. <i>Connector & terminal</i> <i>(3R) No. 7 — (3H) No. 5:</i> <i>(3R) No. 9 — (3H) No. 6:</i>	Is the resistance less than 10 Ω ?	Go to step 3.	Replace the airbag main harness along with the body harness.
3 CHECK AIRBAG MAIN HARNESS (FRONT SUB SENSOR HARNESS RH). Measure resistance between connector (3R) in the test harness R and chassis ground. <i>Connector & terminal</i> <i>(3R) No. 7 — Chassis ground:</i> <i>(3R) No. 9 — Chassis ground:</i>	Is the resistance 1 M Ω or more?	Replace the front sub sensor (RH). <Ref. to AB-21, Front Sub Sensor.> Replace the airbag control module if not operating normally even after replacing the sensor. <Ref. to AB-18, Airbag Control Module.>	Go to step 4.
4 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 5.
5 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

Q: DTC 32 FRONT SUB SENSOR LH FAILURE

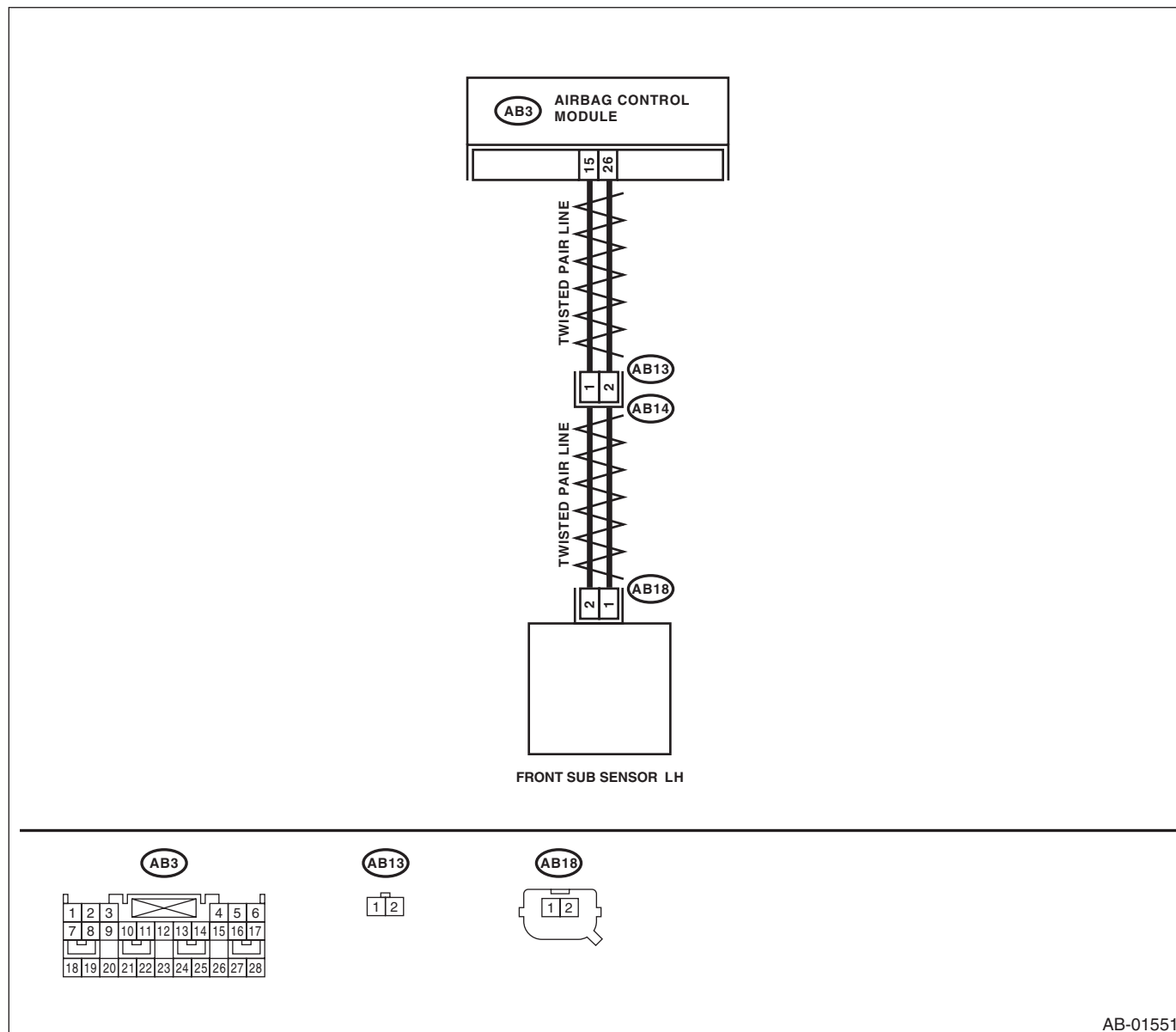
DTC DETECTING CONDITION:

- Front sub sensor harness (LH) is shorted, open or shorted to power supply.
- Airbag harness is shorted, open or shorted to power supply.
- Front sub sensor (LH) is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety.

WIRING DIAGRAM:



Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module and the front sub sensor (LH).	Is there poor contact?	Replace the airbag main harness along with the body harness.	Go to step 2.
2 CHECK AIRBAG MAIN HARNESS (FRONT SUB SENSOR HARNESS LH). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Remove the instrument panel lower cover, disconnect the connector (AB26) and (AB2). 3) Disconnect the connectors (AB27) and (AB4) of the passenger's airbag module. 4) Disconnect connector (AB3) from airbag control module. 5) Connect the connector (1R) in the test harness R to connector (AB3). 6) Disconnect the front sub sensor (LH), and connect the connector (1H) in test harness H to connector (AB18). 7) Measure resistance between connector (3R) in the test harness R and connector (3H) in the test harness H. <i>Connector & terminal</i> <i>(3R) No. 6 — (3H) No. 5:</i> <i>(3R) No. 8 — (3H) No. 6:</i>	Is the resistance less than 10 Ω?	Go to step 3.	Replace the airbag main harness along with the body harness.
3 CHECK AIRBAG MAIN HARNESS (FRONT SUB SENSOR HARNESS LH). Measure resistance between connector (3R) in the test harness R and chassis ground. <i>Connector & terminal</i> <i>(3R) No. 6 — Chassis ground:</i> <i>(3R) No. 8 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Replace the front sub sensor (LH). <Ref. to AB-21, Front Sub Sensor.> Replace the airbag control module if not operating normally even after replacing the sensor. <Ref. to AB-18, Airbag Control Module.>	Go to step 4.
4 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 5.
5 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

R: DTC 33 FRONT SUB SENSOR RH FAILURE

DTC DETECTING CONDITION:

Front sub sensor (RH) is faulty.

If the DTC 33 is displayed, the circuit within the front sub sensor (RH) is faulty. Replace the front sub sensor (RH). <Ref. to AB-21, Front Sub Sensor.>

S: DTC 34 FRONT SUB SENSOR LH FAILURE

DTC DETECTING CONDITION:

Front sub sensor (LH) is faulty.

If the DTC 34 is displayed, the circuit within the front sub sensor (LH) is faulty. Replace the front sub sensor (LH). <Ref. to AB-21, Front Sub Sensor.>

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

T: DTC 36 SEAT POSITION SENSOR LH FAILURE

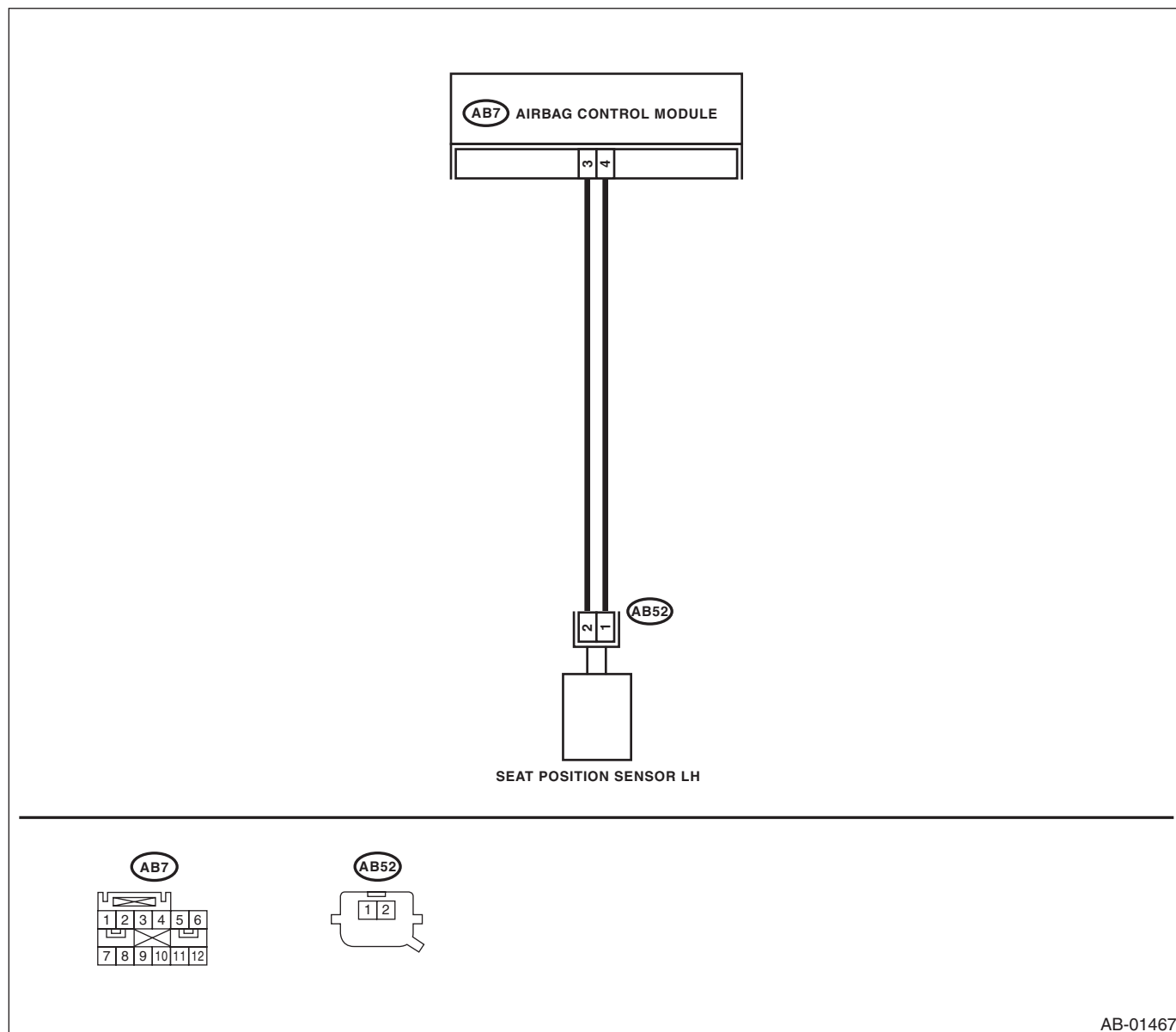
DTC DETECTING CONDITION:

- Driver's seat position sensor is faulty.
- Airbag control module is faulty.
- Airbag rear harness (LH) circuit is open, shorted or shorted to ground.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When replacing the airbag module, seat belt pretensioner, roll connector, control module and sensor, reconnect each part and check that the warning light operates properly.
- When inspecting the airbag harness, disconnect the airbag module connector and seat belt pretensioner for safety.

WIRING DIAGRAM:



AB-01467

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module and the driver's airbag module.	Is there poor contact?	Replace the airbag main harness.	Go to step 2.
2 CHECK SEAT POSITION SENSOR (LH). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect connector (AB52) from seat position sensor (LH). 3) Connect connector (2Y) in the test harness Y to connector (AB52). 4) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the seat position sensor (LH) along with the driver's slide rail assembly. <Ref. to SE-7, Front Seat.>	Go to step 3.
3 CHECK AIRBAG REAR HARNESS (SEAT POSITION SENSOR HARNESS (LH)). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB7) from airbag control module. 3) Connect the connector (1R) in the test harness R to connector (AB7). 4) Disconnect the seat position sensor (LH), and connect the connector (1H) in test harness H to connector (AB52). 5) Measure resistance between connector (3R) in the test harness R and connector (3H) in the test harness H. <i>Connector & terminal</i> <i>(3R) No. 1 — (3H) No. 5:</i> <i>(3R) No. 3 — (3H) No. 6:</i>	Is the resistance less than 10 Ω?	Go to step 4.	Replace the airbag rear harness (LH) along with the body harness.
4 CHECK AIRBAG REAR HARNESS. Measure resistance between connector (3R) in the test harness R and chassis ground. <i>Connector & terminal</i> <i>(3R) No. 1 — Chassis ground:</i>	Is the resistance less than 10 Ω?	Replace the airbag rear harness (LH) along with the body harness.	Go to step 5.
5 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 6.
6 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

U: DTC 37 BUCKLE SWITCH RH FAILURE

NOTE:

Refer to "Occupant Detection System" for DTC 37. <Ref. to OD(diag)-29, DTC 37 BUCKLE SWITCH RH FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

V: DTC 38 BUCKLE SWITCH LH FAILURE

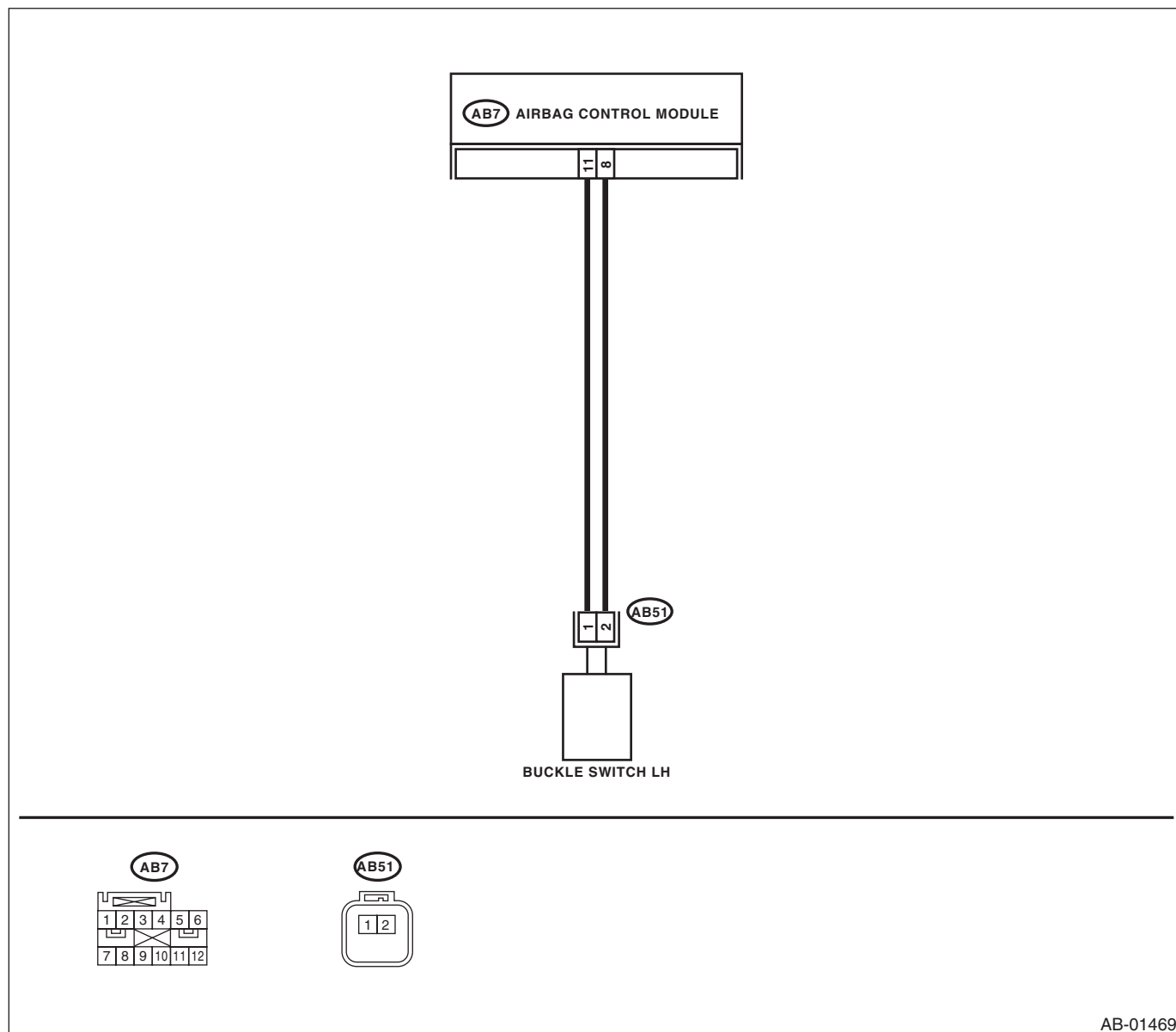
DTC DETECTING CONDITION:

- Driver's buckle switch circuit is open, shorted or shorted to ground.
- Airbag rear harness (LH) circuit is open, shorted or shorted to ground.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When replacing the airbag module, seat belt pretensioner, roll connector, control module and sensor, reconnect each part and check that the warning light operates properly.
- When inspecting the airbag harness, disconnect the airbag module connector and seat belt pretensioner for safety.

WIRING DIAGRAM:



AB-01469

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module and the driver's airbag module.	Is there poor contact?	Replace the airbag main harness.	Go to step 2.
2 CHECK SEAT BELT BUCKLE SWITCH (LH). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB51) from buckle switch (LH). 3) Connect connector (1Y) in the test harness Y to connector (AB51). 4) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the seat belt buckle switch (LH). <Ref. to SB-10, Front Seat Belt.>	Go to step 3.
3 CHECK AIRBAG REAR HARNESS (BUCKLE SWITCH HARNESS (LH)). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB7) from airbag control module. 3) Connect the connector (1R) in the test harness R to connector (AB7). 4) Disconnect the seat belt buckle switch (LH), and connect the connector (1D) in test harness D to connector (AB51). 5) Measure resistance between connector (4R) in the test harness R and connector (3D) in the test harness D. <i>Connector & terminal</i> <i>(4R) No. 11 — (3D) No. 3:</i> <i>(4R) No. 9 — (3D) No. 4:</i>	Is the resistance less than 10 Ω ?	Go to step 4.	Replace the airbag rear harness (LH) along with the body harness.
4 CHECK AIRBAG REAR HARNESS. Measure resistance between connector (4R) in the test harness R and chassis ground. <i>Connector & terminal</i> <i>(4R) No. 9 — Chassis ground:</i>	Is the resistance less than 10 Ω ?	Replace the airbag rear harness (LH) along with the body harness.	Go to step 5.
5 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 6.
6 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

W: DTC 41 SIDE AIRBAG RH FAILURE

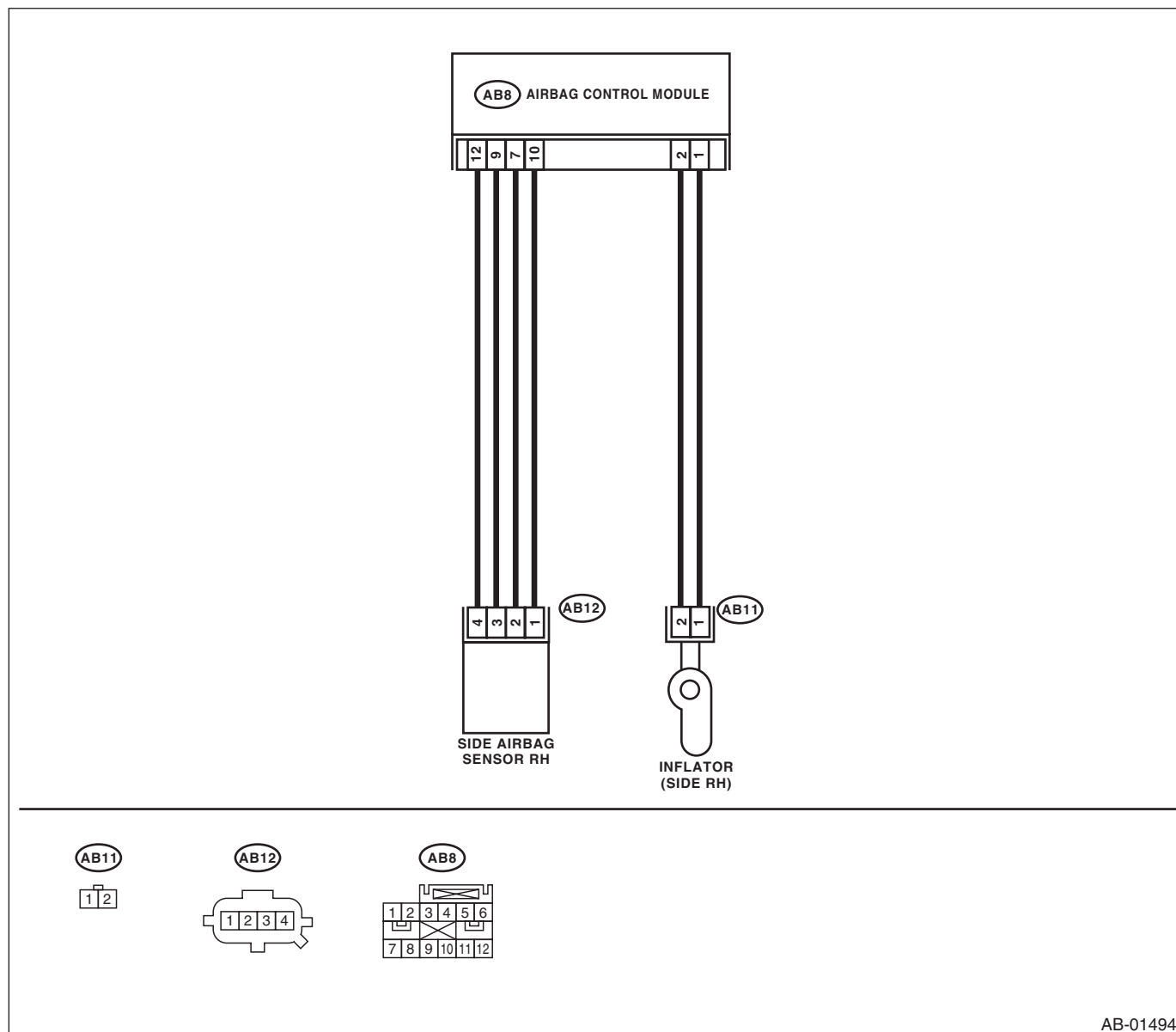
DTC DETECTING CONDITION:

- Side airbag harness (RH) is faulty.
- Side airbag module (RH) is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety.
- When inspecting the side airbag harness, disconnect the side airbag module connector, and seat belt pretensioner connector for safety.

WIRING DIAGRAM:



AB-01494

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module, side airbag module (RH) and the side airbag sensor (RH).	Is there poor contact?	Replace the airbag rear harness (RH) along with the body harness.	Go to step 2.
2 CHECK SIDE AIRBAG MODULE. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB11) from the side airbag module (RH), and connect the connector (1F) in test harness F to connector (AB11). 3) Connect airbag resistor to connector (3F) in the test harness F. 4) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the front seat along with side airbag module (RH). <Ref. to SE-7, Front Seat.>	Go to step 3.
3 CHECK SIDE AIRBAG HARNESS (RH). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB20) from the seat belt pretensioner (RH). 3) Disconnect the airbag resistor from test harness F. 4) Disconnect connector (AB8) from airbag control module. 5) Connect connector (1R) in the test harness R to the connector (AB8). 6) Measure resistance between connector (3R) in the test harness R and connector (3F) in the test harness F. <i>Connector & terminal</i> <i>(3R) No. 18 — (3F) No. 4:</i> <i>(3R) No. 20 — (3F) No. 3:</i>	Is the resistance less than 10 Ω?	Go to step 4.	Replace the side airbag harness along with the body harness.
4 CHECK SIDE AIRBAG HARNESS (RH). Measure resistance between connector (3R) terminals in the test harness R. <i>Connector & terminal</i> <i>(3R) No. 18 — (3R) No. 20:</i>	Is the resistance 1 MΩ or more?	Go to step 5.	Replace the side airbag harness along with the body harness.
5 CHECK SIDE AIRBAG HARNESS (RH). Measure resistance between the connector (3R) in the test harness R and chassis ground. <i>Connector & terminal</i> <i>(3R) No. 18 — Chassis ground:</i> <i>(3R) No. 20 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 6.	Replace the side airbag harness along with the body harness.
6 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 7.
7 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

X: DTC 42 SIDE AIRBAG LH FAILURE

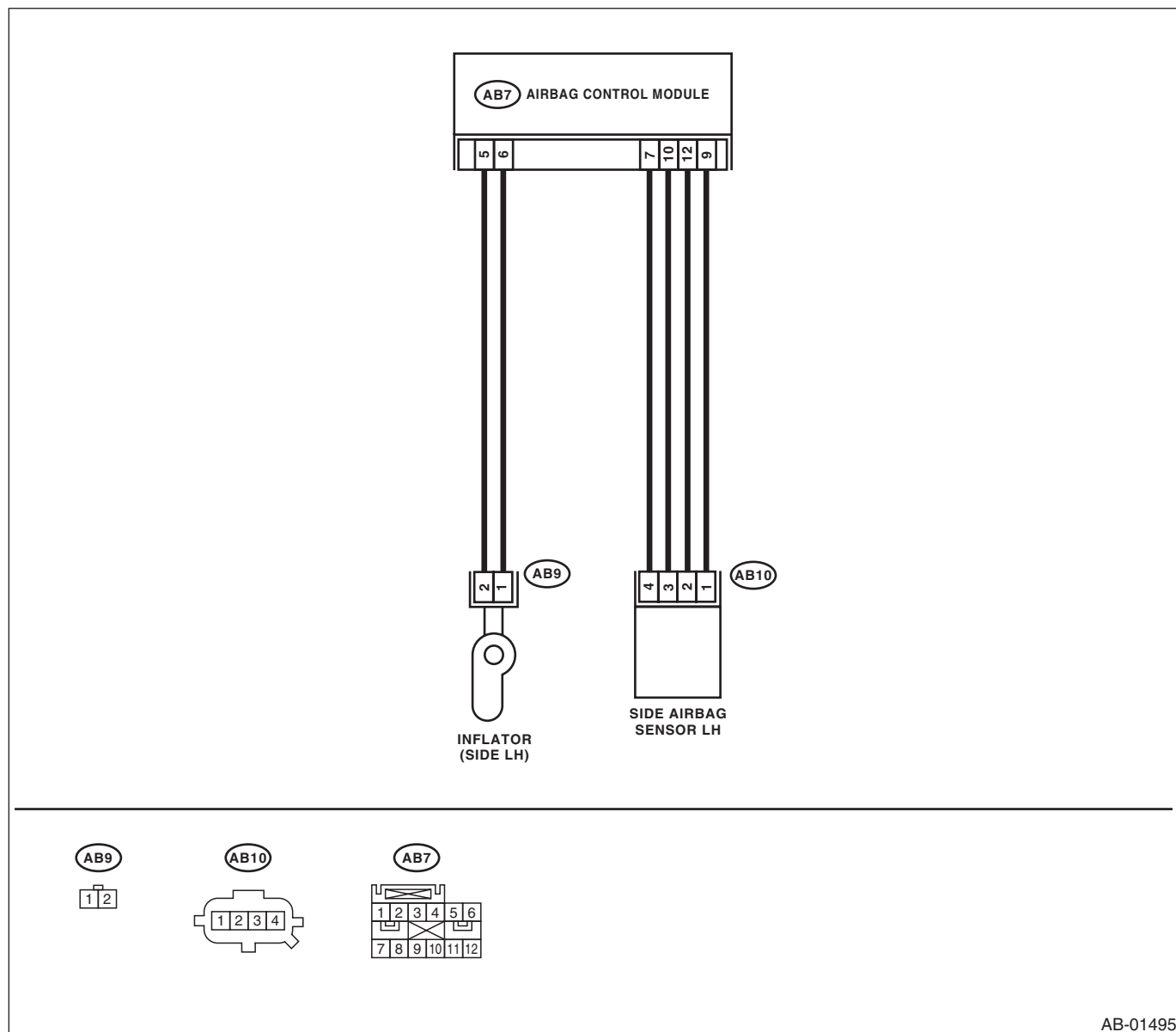
DTC DETECTING CONDITION:

- Side airbag harness (LH) is faulty.
- Side airbag module (LH) is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety.
- When inspecting the side airbag harness, disconnect the side airbag module connector, and seat belt pretensioner connector for safety.

WIRING DIAGRAM:



AB-01495

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module, side airbag module (LH) and the side airbag sensor (LH).	Is there poor contact?	Replace the airbag rear harness (LH) along with the body harness.	Go to step 2.
2 CHECK SIDE AIRBAG MODULE. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB9) from the side airbag module (LH), and connect the connector (1F) in test harness F to connector (AB9). 3) Connect airbag resistor to connector (3F) in the test harness F. 4) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the front seat along with side airbag module (LH). <Ref. to SE-7, Front Seat.>	Go to step 3.
3 CHECK SIDE AIRBAG HARNESS (LH). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB19) from the seat belt pretensioner (LH). 3) Disconnect the airbag resistor from test harness. 4) Disconnect connector (AB7) from airbag control module. 5) Connect connector (1R) in the test harness R to the connector (AB7). 6) Measure resistance between connector (3R) in the test harness R and connector (3F) in the test harness F. Connector & terminal (3R) No. 12 — (3F) No. 3: (3R) No. 10 — (3F) No. 4:	Is the resistance less than 10 Ω?	Go to step 4.	Replace the side airbag harness along with the body harness.
4 CHECK SIDE AIRBAG HARNESS (LH). Measure resistance between connector (3R) terminals in the test harness R. Connector & terminal (3R) No. 12 — (3R) No. 10:	Is the resistance 1 MΩ or more?	Go to step 5.	Replace the side airbag harness along with the body harness.
5 CHECK SIDE AIRBAG HARNESS (LH). Measure resistance between the connector (3R) in the test harness R and chassis ground. Connector & terminal (3R) No. 10 — Chassis ground: (3R) No. 12 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 6.	Replace the side airbag harness along with the body harness.
6 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 7.
7 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Y: DTC 45 SIDE AIRBAG RH FAILURE

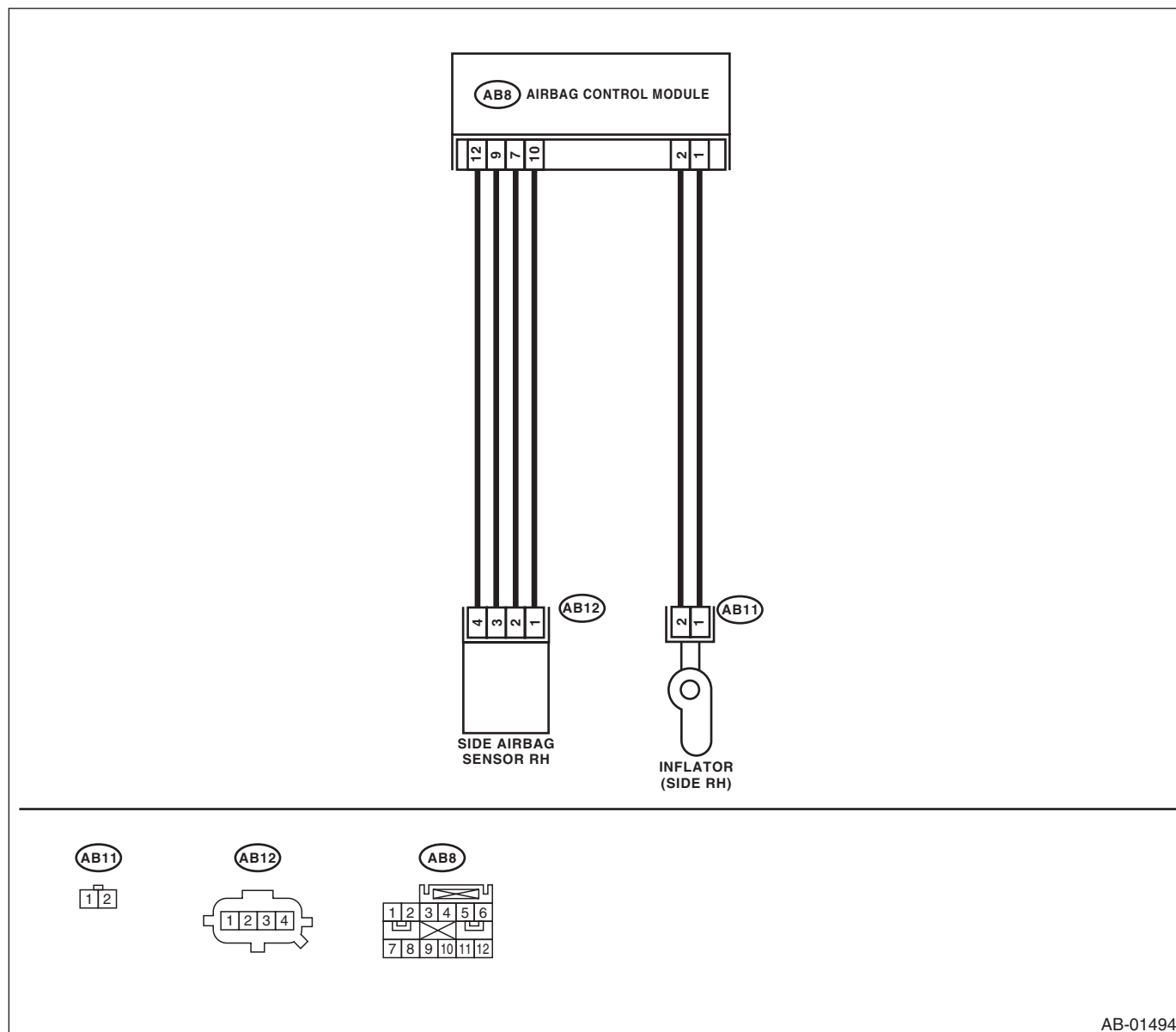
DTC DETECTING CONDITION:

- Side airbag harness is shorted to power supply.
- Side airbag module (RH) is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety.
- When inspecting the side airbag harness, disconnect the side airbag module connector, and seat belt pretensioner connector for safety.

WIRING DIAGRAM:



AB-01494

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module, side airbag module (RH) and the side airbag sensor (RH).	Is there poor contact?	Replace the airbag rear harness (RH) along with the body harness.	Go to step 2.
2 CHECK SIDE AIRBAG MODULE. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB11) from the side airbag module (RH), and connect the connector (1F) in test harness F to connector (AB11). 3) Connect airbag resistor to connector (3F) in the test harness F. 4) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the front seat along with side airbag module (RH). <Ref. to SE-7, Front Seat.>	Go to step 3.
3 CHECK SIDE AIRBAG HARNESS (RH). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB20) from the seat belt pretensioner (RH). 3) Disconnect the airbag resistor from test harness. 4) Disconnect connector (AB8) from airbag control module. 5) Connect connector (1R) in the test harness R to the connector (AB8). 6) Connect the battery ground terminal and turn the ignition switch to ON. 7) Measure the voltage between connector (3R) in the test harness R and chassis ground. Connector & terminal (3R) No. 18 (+) — Chassis ground (-): (3R) No. 20 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 4.	Replace the side airbag harness along with the body harness.
4 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 5.
5 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Z: DTC 46 SIDE AIRBAG LH FAILURE

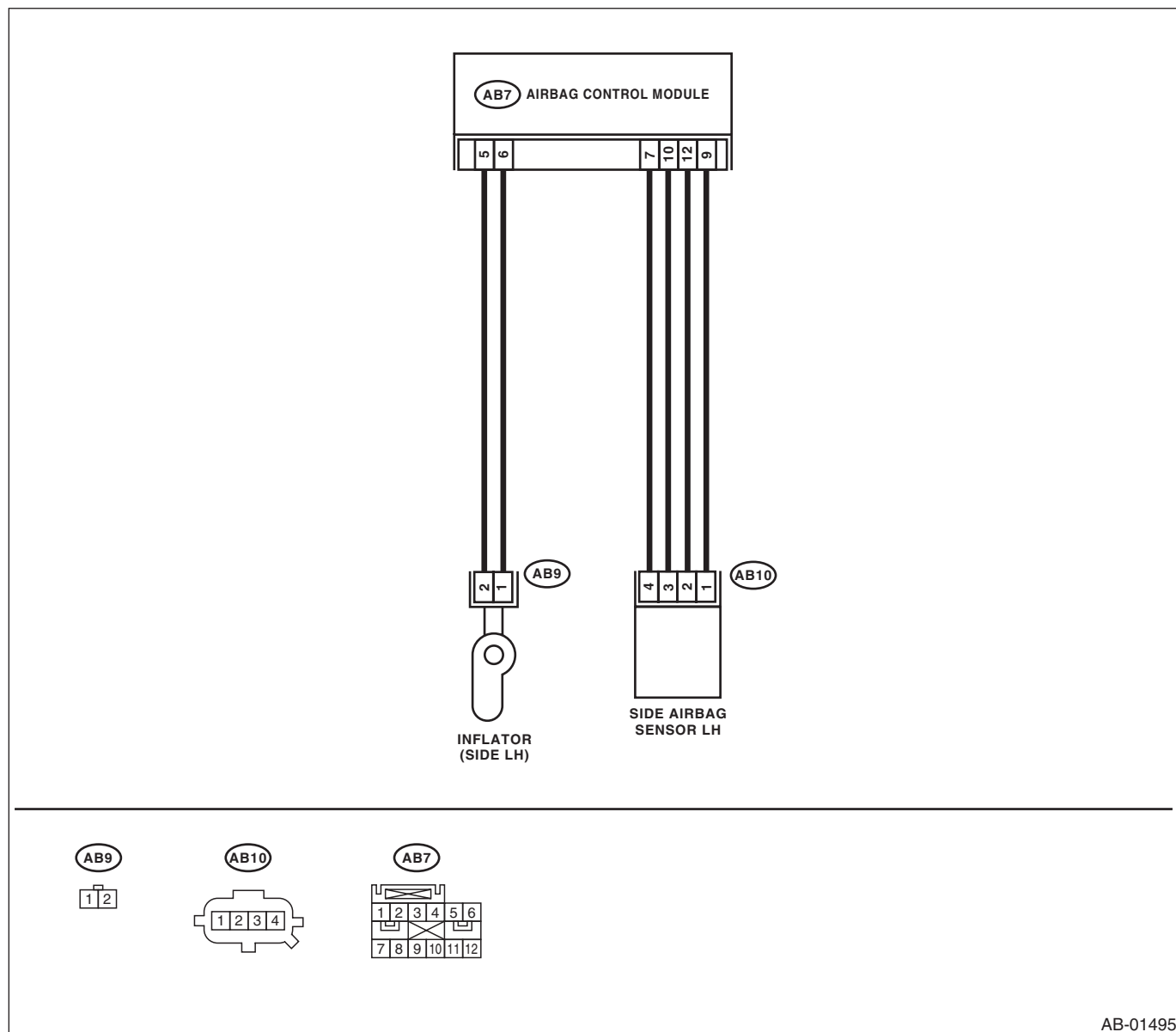
DTC DETECTING CONDITION:

- Side airbag harness is shorted to power supply.
- Side airbag module (LH) is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety.
- When inspecting the side airbag harness, disconnect the side airbag module connector, and seat belt pretensioner connector for safety.

WIRING DIAGRAM:



AB-01495

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module, side airbag module (LH) and the side airbag sensor (LH).	Is there poor contact?	Replace the airbag rear harness (LH) along with the body harness.	Go to step 2.
2 CHECK SIDE AIRBAG MODULE. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB9) from the side airbag module (LH), and connect the connector (1F) in test harness F to connector (AB9). 3) Connect airbag resistor to connector (3F) in the test harness F. 4) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the front seat along with side airbag module (LH). <Ref. to SE-7, Front Seat.>	Go to step 3.
3 CHECK SIDE AIRBAG HARNESS (LH). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB19) from the seat belt pretensioner (LH). 3) Disconnect the airbag resistor from test harness. 4) Disconnect connector (AB7) from airbag control module. 5) Connect connector (1R) in the test harness R to the connector (AB7). 6) Connect the battery ground terminal and turn the ignition switch to ON. 7) Measure the voltage between connector (3R) in the test harness R and chassis ground. Connector & terminal (3R) No. 10 (+) — Chassis ground (-): (3R) No. 12 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 4.	Replace the side airbag harness along with the body harness.
4 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 5.
5 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

AA:DTC 51 SIDE AIRBAG SENSOR RH FAILURE

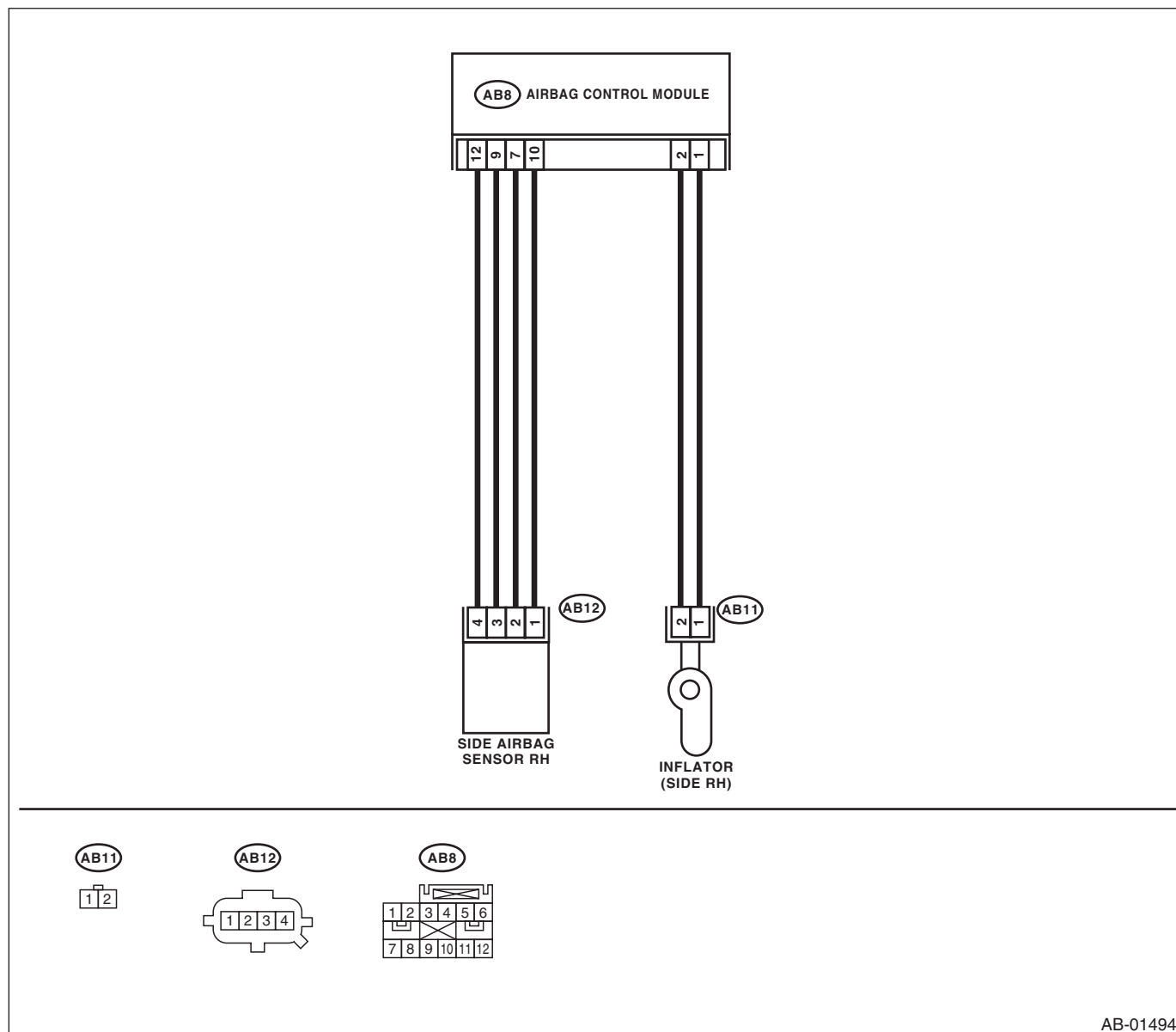
DTC DETECTING CONDITION:

- Side airbag sensor (RH) is faulty.
- Side airbag harness (RH) is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety.
- When inspecting the side airbag harness, disconnect the side airbag module connector, and seat belt pretensioner connector for safety.

WIRING DIAGRAM:



AB-01494

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module, side airbag module (RH) and the side airbag sensor (RH).	Is there poor contact?	Replace the airbag rear harness (RH) along with the body harness.	Go to step 2.
2 CHECK SIDE AIRBAG HARNESS (RH). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB20) from the seat belt pretensioner (RH). 3) Disconnect connector (AB11) from side airbag module (RH). 4) Disconnect connector (AB8) from airbag control module. 5) Connect connector (1R) in the test harness R to the connector (AB8). 6) Disconnect connector (AB12) from the side airbag sensor (RH), and connect connector (2V) in test harness V to connector (AB12). 7) Measure resistance between connector (4R) in the test harness R and connector (3V) in the test harness V. Connector & terminal (4R) No. 5 — (3V) No. 2: (4R) No. 6 — (3V) No. 4: (4R) No. 7 — (3V) No. 1: (4R) No. 8 — (3V) No. 5:	Is the resistance less than 10 Ω?	Go to step 3.	Replace the side airbag harness along with the body harness.
3 CHECK SIDE AIRBAG HARNESS. Measure resistance between connector (4R) in the test harness R, and the resistance between connector (4R) in the test harness R and chassis ground. Connector & terminal (4R) No. 5 — (4R) No. 7: (4R) No. 5 — (4R) No. 6: (4R) No. 5 — (4R) No. 8: (4R) No. 6 — (4R) No. 7: (4R) No. 6 — (4R) No. 8: (4R) No. 7 — (4R) No. 8: (4R) No. 5 — Chassis ground: (4R) No. 6 — Chassis ground: (4R) No. 7 — Chassis ground: (4R) No. 8 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 4.	Replace the side airbag harness along with the body harness.
4 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the side airbag sensor (RH). <Ref. to AB-19, Side Airbag Sensor.> Replace the airbag control module if not operating normally even after replacing the sensor. <Ref. to AB-18, Airbag Control Module.>	Go to step 5.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

	Step	Check	Yes	No
5	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

AB:DTC 52 SIDE AIRBAG SENSOR LH FAILURE

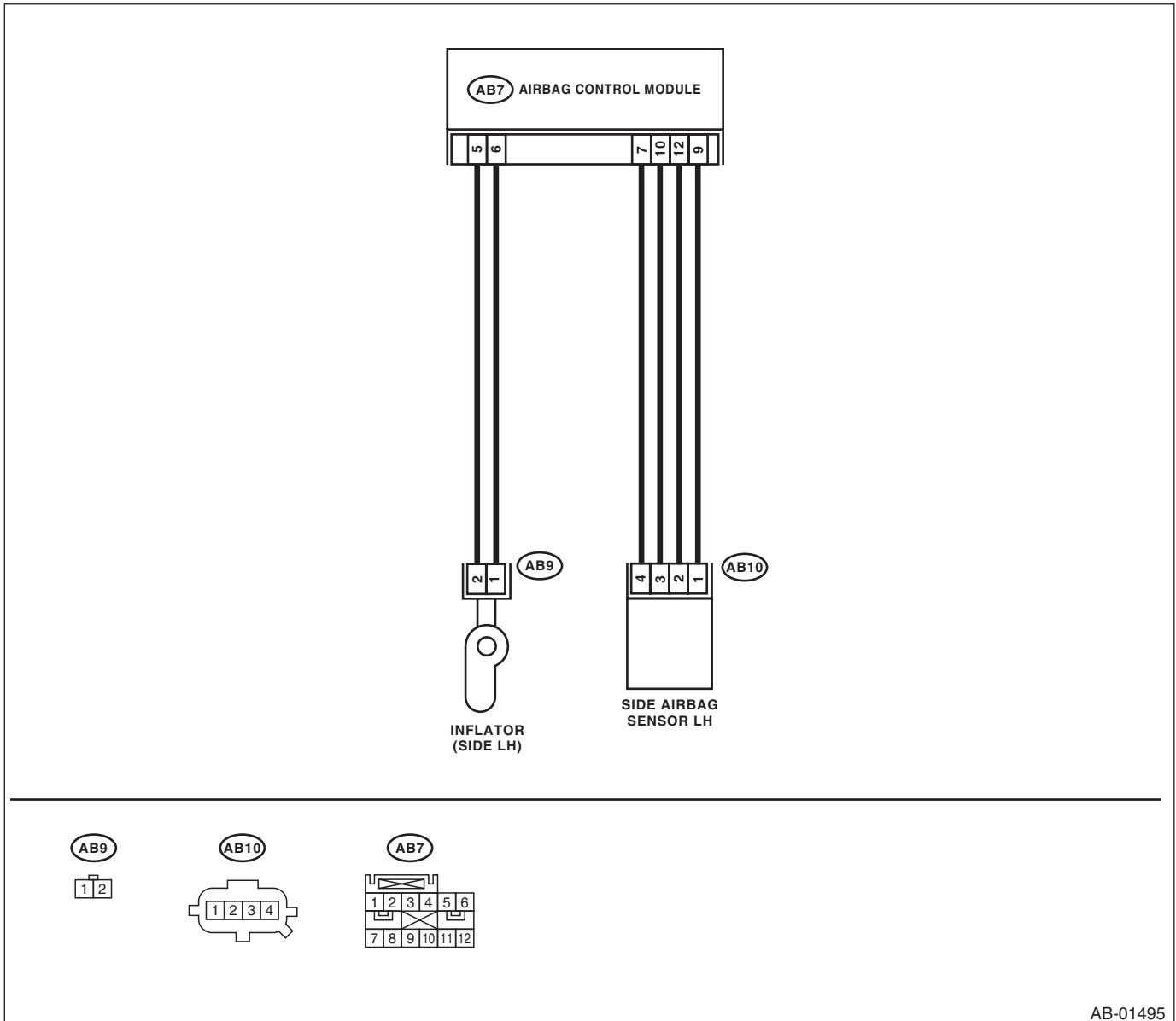
DTC DETECTING CONDITION:

- Side airbag sensor (LH) is faulty.
- Side airbag harness (LH) is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety.
- When inspecting the side airbag harness, disconnect the side airbag module connector, and seat belt pretensioner connector for safety.

WIRING DIAGRAM:



AB-01495

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module, side airbag module (LH) and the side airbag sensor (LH).	Is there poor contact?	Replace the airbag rear harness (LH) along with the body harness.	Go to step 2.
2 CHECK SIDE AIRBAG HARNESS (LH). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB19) from the seat belt pretensioner (LH). 3) Disconnect connector (AB9) from the side airbag module (LH). 4) Disconnect connector (AB7) from airbag control module. 5) Connect connector (1R) in the test harness R to the connector (AB7). 6) Disconnect connector (AB10) from the side airbag sensor (LH), and connect connector (2V) in test harness V to connector (AB10). 7) Measure resistance between connector (4R) in the test harness R and connector (3V) in the test harness V. Connector & terminal (4R) No. 4 — (3V) No. 2: (4R) No. 3 — (3V) No. 4: (4R) No. 2 — (3V) No. 1: (4R) No. 1 — (3V) No. 5:	Is the resistance less than 10 Ω?	Go to step 3.	Replace the side airbag harness along with the body harness.
3 CHECK SIDE AIRBAG HARNESS (LH). Measure resistance between connector (4R) in the test harness R, and the resistance between connector (4R) in the test harness R and chassis ground. Connector & terminal (4R) No. 4 — (4R) No. 3: (4R) No. 4 — (4R) No. 2: (4R) No. 4 — (4R) No. 1: (4R) No. 3 — (4R) No. 2: (4R) No. 3 — (4R) No. 1: (4R) No. 2 — (4R) No. 1: (4R) No. 4 — Chassis ground: (4R) No. 3 — Chassis ground: (4R) No. 2 — Chassis ground: (4R) No. 1 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 4.	Replace the side airbag harness along with the body harness.
4 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the side airbag sensor (LH). <Ref. to AB-19, Side Airbag Sensor.> Replace the airbag control module if not operating normally even after replacing the sensor. <Ref. to AB-18, Airbag Control Module.>	Go to step 5.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

AC:DTC 53 SIDE AIRBAG SENSOR RH FAILURE

DTC DETECTING CONDITION:

Side airbag sensor (RH) is faulty.

If the code 53 is displayed, the circuit within the side airbag sensor (RH) is faulty. Replace the side airbag sensor (RH).

<Ref. to AB-19, Side Airbag Sensor.>

AD:DTC 54 SIDE AIRBAG SENSOR LH FAILURE

DTC DETECTING CONDITION:

Side airbag sensor (LH) is faulty.

If the code 54 is displayed, the circuit within the side airbag sensor (LH) is faulty. Replace the side airbag sensor (LH).

<Ref. to AB-19, Side Airbag Sensor.>

AE:DTC 55 SIDE CURTAIN AIRBAG FIRING OUTPUT

This code is indicated when the side airbag and pretensioner activates.

When this code is displayed, the memory cannot be cleared. Replace the following parts.

- Airbag Control Module <Ref. to AB-18, Airbag Control Module.>
- Front seat with side airbag module (Operating side)<Ref. to SE-7, Front Seat.>
- Side airbag sensor (Operating side) <Ref. to AB-19, Side Airbag Sensor.>
- Front outer seat belt with pretensioner (Operating side)<Ref. to SB-10, Front Seat Belt.>

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

AF:DTC 61 BELT PRETENSIONER RH FAILURE

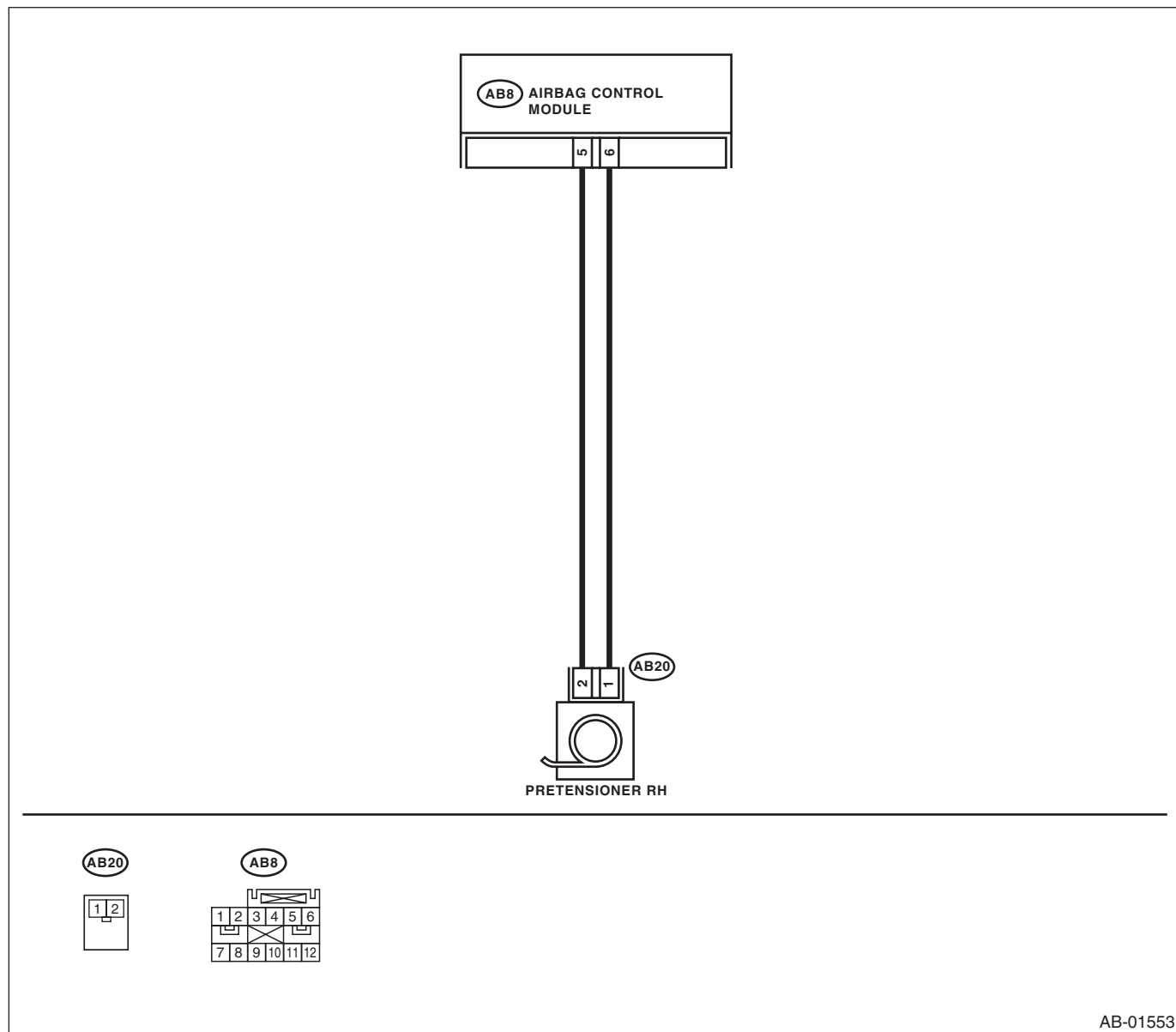
DTC DETECTING CONDITION:

- Seat belt pretensioner (RH) circuit is open, shorted or shorted to ground.
- Airbag control module is faulty.
- Pretensioner is faulty.
- Airbag harness is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the side airbag harness, disconnect the side airbag module connector, and seat belt pretensioner connector for safety.

WIRING DIAGRAM:



AB-01553

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module and the seat belt pretensioner (RH).	Is there poor contact?	Replace the airbag rear harness (RH) along with the body harness.	Go to step 2.
2 CHECK SEAT BELT PRETENSIONER. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB20) from the seat belt pretensioner (RH). 3) Connect connector (1N) in the test harness N to the connector (AB20). 4) Connect airbag resistor to connector (2N) in the test harness N. 5) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the seat belt pretensioner (RH). <Ref. to SB-10, Front Seat Belt.>	Go to step 3.
3 CHECK SIDE AIRBAG HARNESS (RH). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from test harness. 3) Disconnect connector (AB11) from side airbag module (RH). 4) Disconnect connectors (AB7) and (AB8) from airbag control module. 5) Connect connector (1R) in the test harness R to the connector (AB8). 6) Measure resistance between connector (3R) in the test harness R and connector (2N) in the test harness N. <i>Connector & terminal</i> <i>(3R) No. 17 — (2N) No. 1:</i> <i>(3R) No. 19 — (2N) No. 2:</i>	Is the resistance less than 10 Ω?	Go to step 4.	Replace the side airbag harness along with the body harness.
4 CHECK SIDE AIRBAG HARNESS (RH). Measure resistance between connector (3R) terminals in the test harness R. <i>Connector & terminal</i> <i>(3R) No. 17 — (3R) No. 19:</i>	Is the resistance 1 MΩ or more?	Go to step 5.	Replace the side airbag harness along with the body harness.
5 CHECK SIDE AIRBAG HARNESS (RH). Measure resistance between the connector (3R) in the test harness R and chassis ground. <i>Connector & terminal</i> <i>(3R) No. 17 — Chassis ground:</i> <i>(3R) No. 19 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 6.	Replace the side airbag harness along with the body harness.
6 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 7.
7 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

AG:DTC 62 BELT PRETENSIONER LH FAILURE

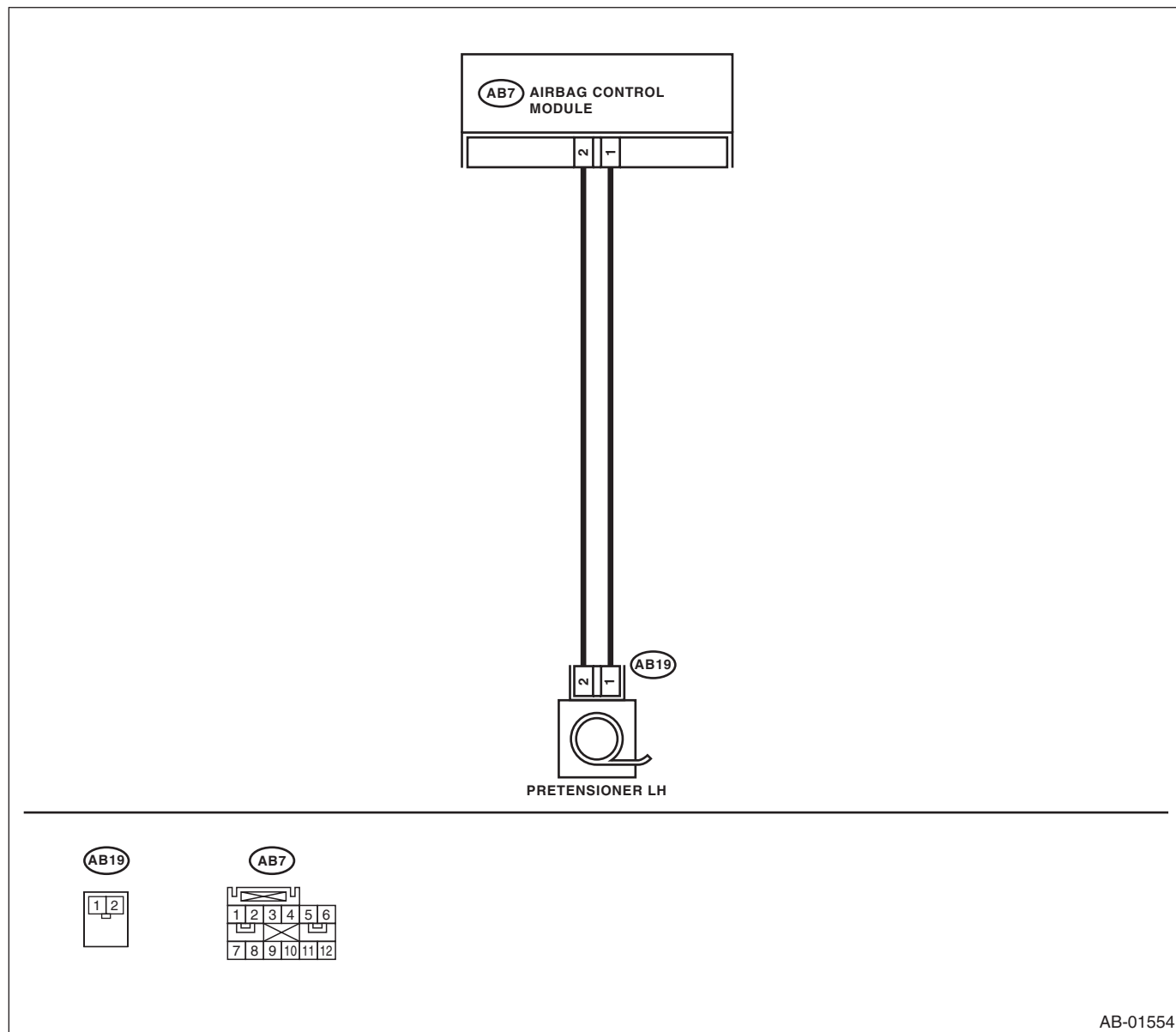
DTC DETECTING CONDITION:

- Seat belt pretensioner (LH) circuit is open, shorted or shorted to ground.
- Airbag control module is faulty.
- Pretensioner is faulty.
- Airbag harness is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the side airbag harness, disconnect the side airbag module connector, and seat belt pretensioner connector for safety.

WIRING DIAGRAM:



Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module and the seat belt pretensioner (LH).	Is there poor contact?	Replace the airbag rear harness (LH) along with the body harness.	Go to step 2.
2 CHECK SEAT BELT PRETENSIONER. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB19) from the seat belt pretensioner (LH). 3) Connect connector (1N) in the test harness N to the connector (AB19). 4) Connect airbag resistor to connector (2N) in the test harness N. 5) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the seat belt pretensioner (LH). <Ref. to SB-10, Front Seat Belt.>	Go to step 3.
3 CHECK SIDE AIRBAG HARNESS (LH). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from test harness. 3) Disconnect connector (AB9) from the side airbag module (LH). 4) Disconnect connectors (AB7) and (AB8) from airbag control module. 5) Connect connector (1R) in the test harness R to the connector (AB7). 6) Measure resistance between connector (3R) in the test harness R and connector (2N) in the test harness N. <i>Connector & terminal</i> <i>(3R) No. 11 — (2N) No. 1:</i> <i>(3R) No. 13 — (2N) No. 2:</i>	Is the resistance less than 10 Ω?	Go to step 4.	Replace the side airbag harness along with the body harness.
4 CHECK SIDE AIRBAG HARNESS (LH). Measure resistance between connector (3R) terminals in the test harness R. <i>Connector & terminal</i> <i>(3R) No. 11 — (3R) No. 13:</i>	Is the resistance 1 MΩ or more?	Go to step 5.	Replace the side airbag harness along with the body harness.
5 CHECK SIDE AIRBAG HARNESS (LH). Measure resistance between the connector (3R) in the test harness R and chassis ground. <i>Connector & terminal</i> <i>(3R) No. 11 — Chassis ground:</i> <i>(3R) No. 13 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 6.	Replace the side airbag harness along with the body harness.
6 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 7.
7 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

AH:DTC 65 BELT PRETENSIONER RH FAILURE

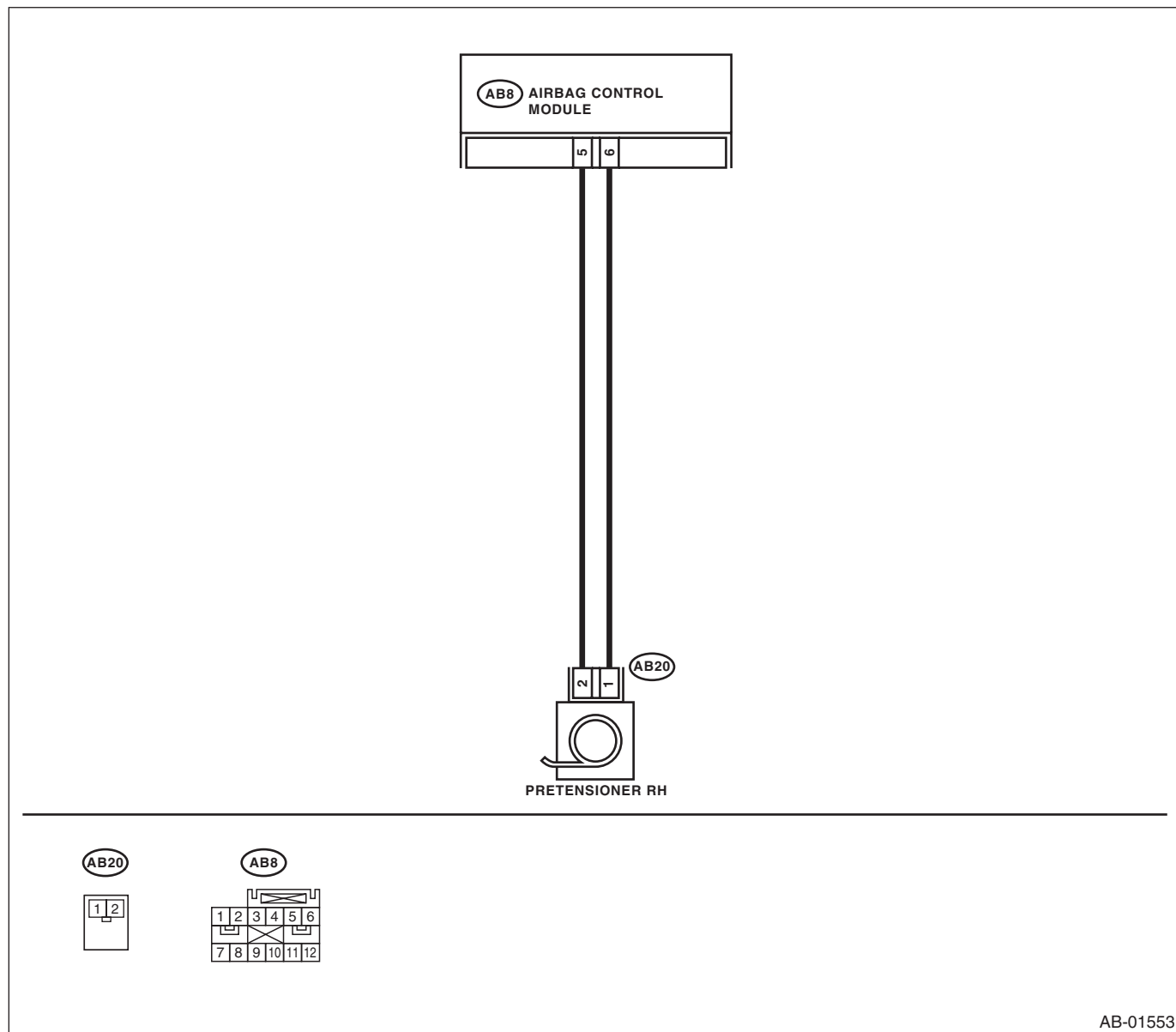
DTC DETECTING CONDITION:

- Seat belt pretensioner (RH) circuit is shorted to power supply.
- Pretensioner is faulty.
- Airbag harness is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the side airbag harness, disconnect the side airbag module connector, and seat belt pretensioner connector for safety.

WIRING DIAGRAM:



AB-01553

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module and the seat belt pretensioner (RH).	Is there poor contact?	Replace the airbag rear harness (RH) along with the body harness.	Go to step 2.
2 CHECK SEAT BELT PRETENSIONER. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB20) from the seat belt pretensioner (RH). 3) Connect connector (1N) in the test harness N to the connector (AB20). 4) Connect airbag resistor to connector (2N) in the test harness N. 5) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the seat belt pretensioner (RH). <Ref. to SB-10, Front Seat Belt.>	Go to step 3.
3 CHECK SIDE AIRBAG HARNESS (RH). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from test harness. 3) Disconnect connector (AB11) from side airbag module (RH). 4) Disconnect connectors (AB7) and (AB8) from airbag control module. 5) Connect connector (1R) in the test harness R to the connector (AB8). 6) Connect the battery ground terminal and turn the ignition switch to ON. 7) Measure the voltage between connector (3R) in the test harness R and chassis ground. Connector & terminal (3R) No. 17 (+) — Chassis ground (-): (3R) No. 19 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 4.	Replace the side airbag harness along with the body harness.
4 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 5.
5 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

AI: DTC 66 BELT PRETENSIONER LH FAILURE

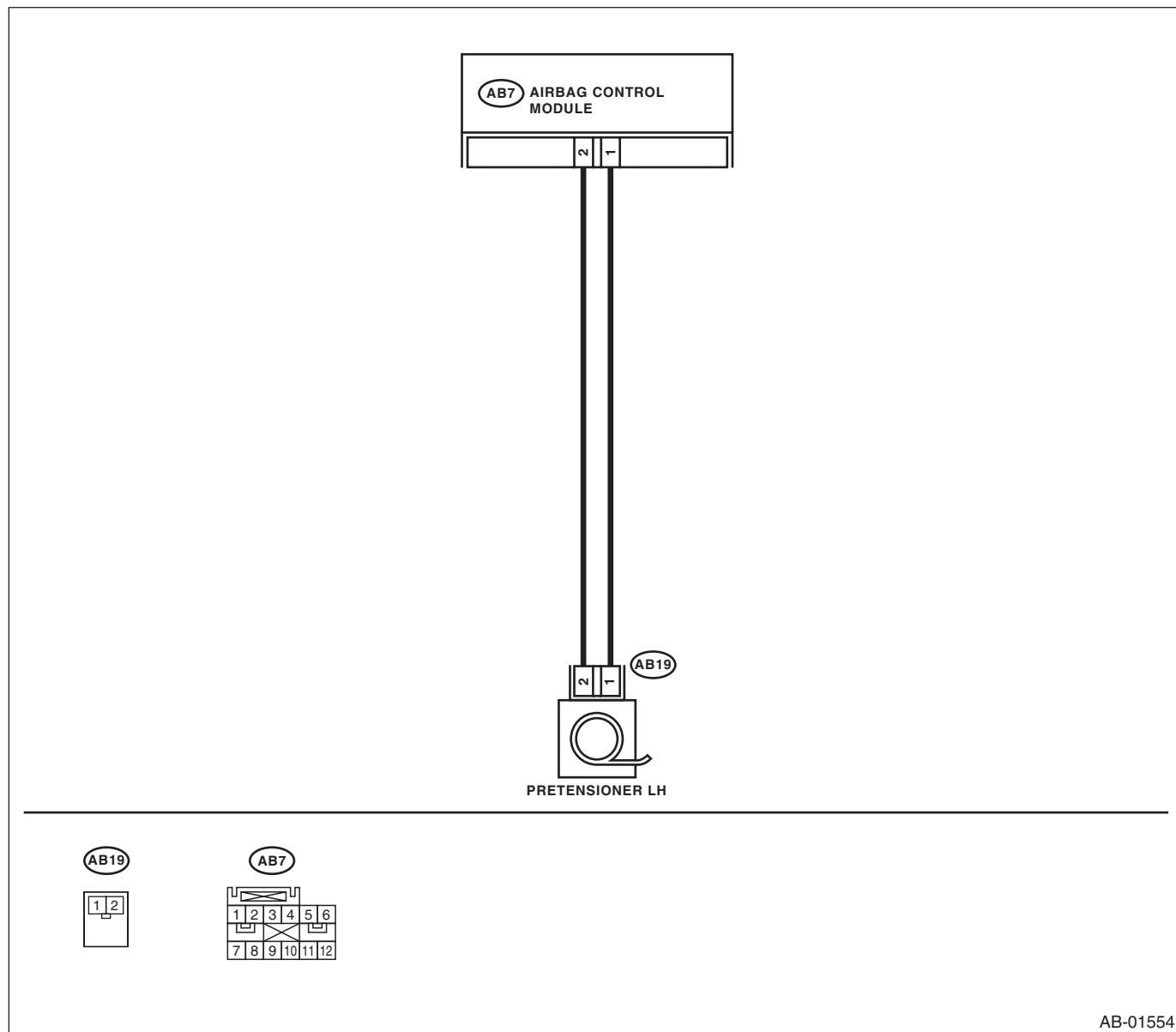
DTC DETECTING CONDITION:

- Seat belt pretensioner (LH) circuit is shorted to power supply.
- Pretensioner is faulty.
- Airbag harness is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the side airbag harness, disconnect the side airbag module connector, and seat belt pretensioner connector for safety.

WIRING DIAGRAM:



Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module and the seat belt pretensioner (LH).	Is there poor contact?	Replace the airbag rear harness (LH) along with the body harness.	Go to step 2.
2 CHECK SEAT BELT PRETENSIONER. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB19) from the seat belt pretensioner (LH). 3) Connect connector (1N) in the test harness N to the connector (AB19). 4) Connect airbag resistor to connector (2N) in the test harness N. 5) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the seat belt pretensioner (LH). <Ref. to SB-10, Front Seat Belt.>	Go to step 3.
3 CHECK SIDE AIRBAG HARNESS (LH). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from test harness. 3) Disconnect connector (AB9) from the side airbag module (LH). 4) Disconnect connectors (AB7) and (AB8) from airbag control module. 5) Connect connector (1R) in the test harness R to the connector (AB7). 6) Connect the battery ground terminal and turn the ignition switch to ON. 7) Measure the voltage between connector (3R) in the test harness R and chassis ground. Connector & terminal (3R) No. 11 (+) — Chassis ground (-): (3R) No. 13 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 4.	Replace the side airbag harness along with the body harness.
4 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 5.
5 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

AJ:DTC 71 DRIVER'S AIRBAG FAILURE

DTC DETECTING CONDITION:

- Airbag main harness circuit is open, shorted or shorted to ground.
- Airbag module harness (driver's side) circuit is open, shorted or shorted to ground.
- Roll connector circuit is open, shorted or shorted to ground.
- Driver's airbag module is faulty.
- Airbag control module is faulty.

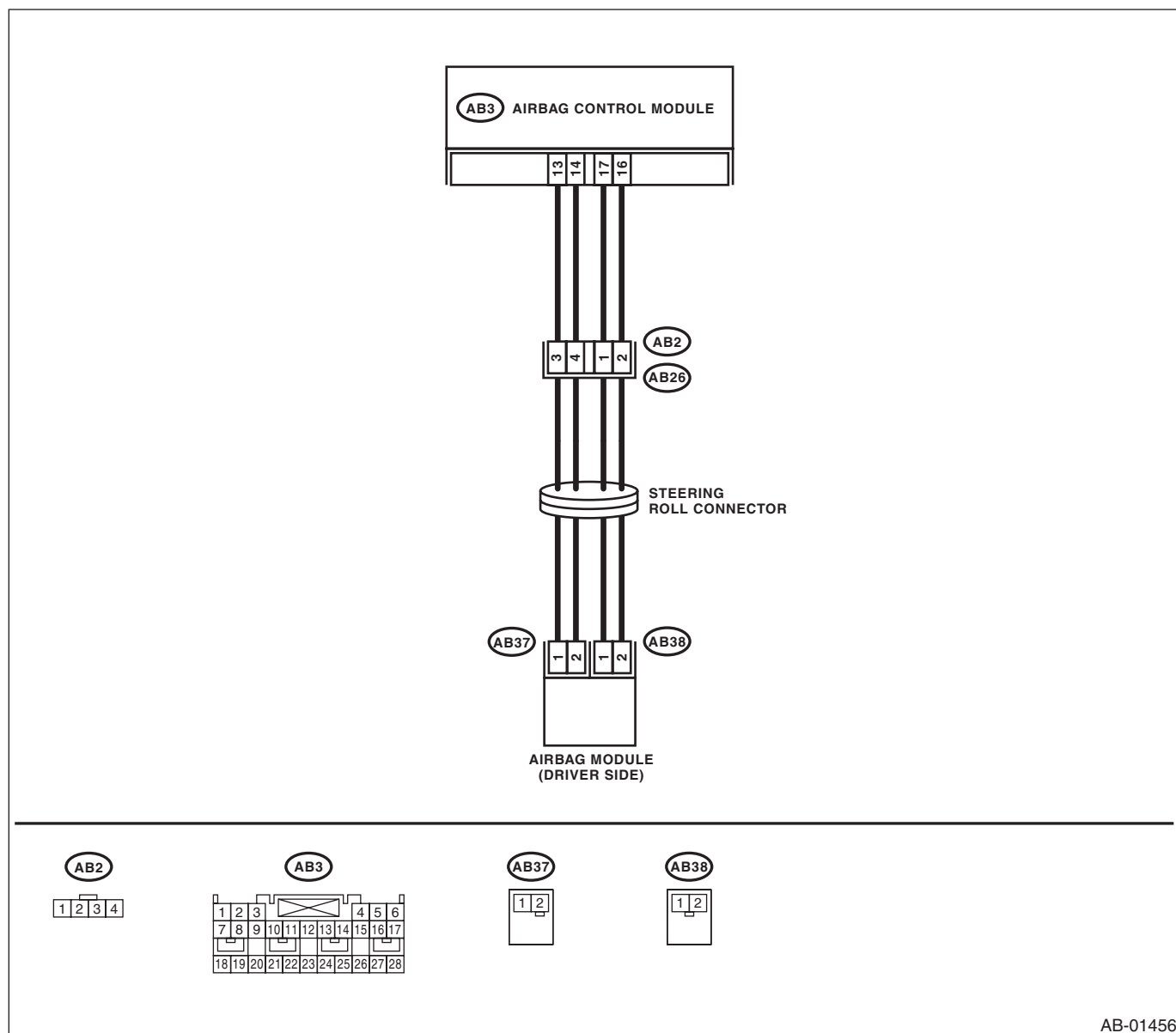
CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When replacing the airbag module, seat belt pretensioner, roll connector, control module and sensor, reconnect each part and check that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the airbag module connectors and seat belt pretensioner of the driver's and passenger's seats for safety.

NOTE:

Prior to starting diagnosis, prepare two airbag resistors (98299PA040).

WIRING DIAGRAM:



AB-01456

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module and the driver's airbag module.	Is there poor contact?	Replace the airbag main harness along with the body harness.	Go to step 2.
2 CHECK DRIVER'S AIRBAG MODULE. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Remove the driver's airbag module. 3) Connect connector (1N) in the test harness N to the connector (AB38). 4) Connect the airbag resistor to the connector (2N) in the test harness N. 5) Connector (1Q) in the test harness Q to connector (AB37). 6) Connect the airbag resistor to the connector (2Q) in the test harness Q. 7) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the driver's airbag module. <Ref. to AB-14, Driver's Airbag Module.>	Go to step 3.
3 CHECK ROLL CONNECTOR. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the test harness N from connector (AB38). 3) Disconnect the test harness Q from connector (AB37). 4) Remove the instrument panel lower cover, disconnect the connector (AB26) from (AB2). 5) Connect the connector (1P) in the test harness P to connector (AB2). 6) Connect the airbag resistor to the connectors (2P) and (3P) in the test harness P. 7) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the roll connector. <Ref. to AB-20, Roll Connector.>	Go to step 4.
4 CHECK AIRBAG MAIN HARNESS (DRIVER'S AIRBAG HARNESS). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the connectors (2P) and (3P) in the test harness P. 3) Disconnect the connectors (AB27) and (AB4) of the passenger's airbag module. 4) Disconnect the connector (AB3) from airbag control module, and connect the connector (1R) in the test harness R. 5) Measure resistance between connector (2R) in the test harness R and connector (2P) and (3P) in the test harness P. Connector & terminal (2R) No. 2 — (2P) No. 1: (2R) No. 4 — (2P) No. 2: (2R) No. 8 — (3P) No. 3: (2R) No. 12 — (3P) No. 4:	Is the resistance less than 10 Ω ?	Go to step 5.	Replace the airbag main harness along with the body harness.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK AIRBAG MAIN HARNESS (DRIVER'S AIRBAG HARNESS). Measure resistance between connector (2R) in the test harness R and chassis ground. <i>Connector & terminal</i> <i>(2R) No. 2 — (2P) No. 4:</i> <i>(2R) No. 4 — Chassis ground:</i> <i>(2R) No. 2 — Chassis ground:</i> <i>(2R) No. 8 — (2P) No. 12:</i> <i>(2R) No. 8 — Chassis ground:</i> <i>(2R) No. 12 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 6.	Replace the airbag main harness along with the body harness.
6 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 7.
7 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

13. Diagnostic Chart with Trouble Code

A: DTC 11 DRIVER'S AIRBAG FAILURE

DTC DETECTING CONDITION:

- Airbag harness is open, shorted or shorted to ground.
- Airbag module harness (driver's side) is open, shorted or shorted to ground.
- Roll connector circuit is open, shorted or shorted to ground.
- Driver's airbag module is faulty.
- Airbag control module is faulty.

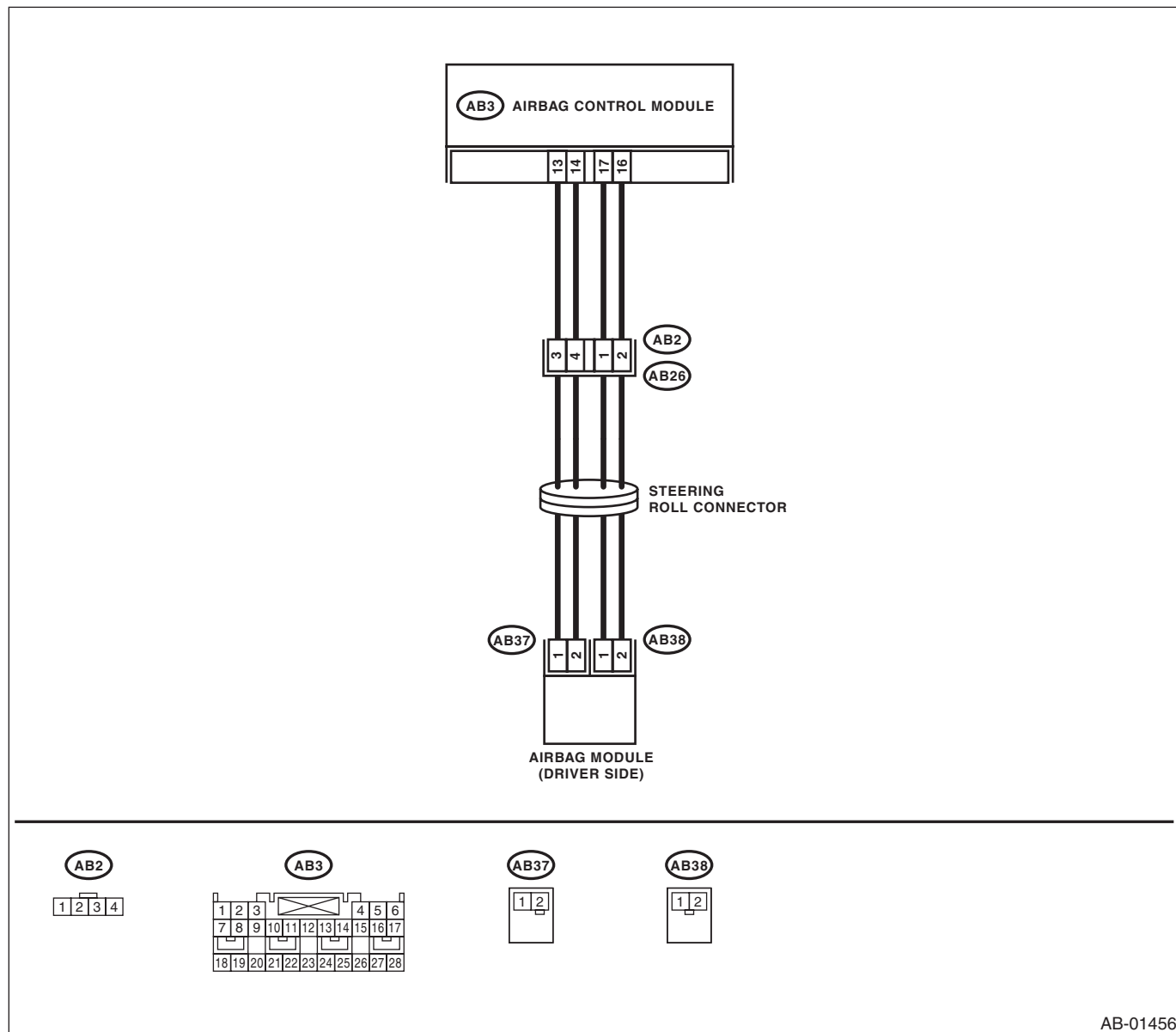
CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety.

NOTE:

Before diagnosing, prepare the two airbag resistors (98299PA040).

WIRING DIAGRAM:



AB-01456

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module and the driver's airbag module.	Is there poor contact?	Replace the airbag harness.	Go to step 2.
2 CHECK DRIVER'S AIRBAG MODULE. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Remove the driver's airbag module. 3) Connect connector (1N) in the test harness N to the connector (AB38). 4) Connect the airbag resistor to the connector (2N) in the test harness N. 5) Connect the connector (1Q) in the test harness Q to connector (AB37). 6) Connect the airbag resistor to the connector (2Q) in the test harness Q. 7) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the driver's airbag module. <Ref. to AB-14, Driver's Airbag Module.>	Go to step 3.
3 CHECK ROLL CONNECTOR. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the test harness N from connector (AB38). 3) Disconnect the test harness Q from connector (AB37). 4) Remove the instrument panel lower cover, disconnect the connector (AB26) from (AB2). 5) Connect the connector (1P) in the test harness P to connector (AB2). 6) Connect the airbag resistor to the connectors (2P) and (3P) in the test harness P. 7) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the roll connector. <Ref. to AB-20, Roll Connector.>	Go to step 4.
4 CHECK AIRBAG MAIN HARNESS (DRIVER'S AIRBAG HARNESS). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the connectors (2P) and (3P) in the test harness P. 3) Disconnect the connectors (AB4) and (AB27) from the passenger's airbag module. 4) Disconnect the connector (AB3) from airbag control module, and connect the connector (1R) in the test harness R. 5) Measure resistance between connector (2R) in the test harness R and connector (2P) and (3P) in the test harness P. Connector & terminal (2R) No. 2 — (2P) No. 1: (2R) No. 4 — (2P) No. 2: (2R) No. 8 — (3P) No. 3: (2R) No. 12 — (3P) No. 4:	Is the resistance less than 10 Ω ?	Go to step 5.	Replace the airbag main harness along with the body harness.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK AIRBAG MAIN HARNESS (DRIVER'S AIRBAG HARNESS). Measure resistance between connector (2R) terminals in the test harness R. <i>Connector & terminal</i> <i>(2R) No. 2 — (2R) No. 4:</i> <i>(2R) No. 4 — Chassis ground:</i> <i>(2R) No. 2 — Chassis ground:</i> <i>(2R) No. 8 — (2R) No. 12:</i> <i>(2R) No. 8 — Chassis ground:</i> <i>(2R) No. 12 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 6.	Replace the airbag main harness along with the body harness.
6 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 7.
7 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

B: DTC 12 PASSENGER'S AIRBAG FAILURE

DTC DETECTING CONDITION:

- Airbag harness is open, shorted or shorted to ground.
- Airbag module harness (passenger's side) is open, shorted or shorted to ground.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

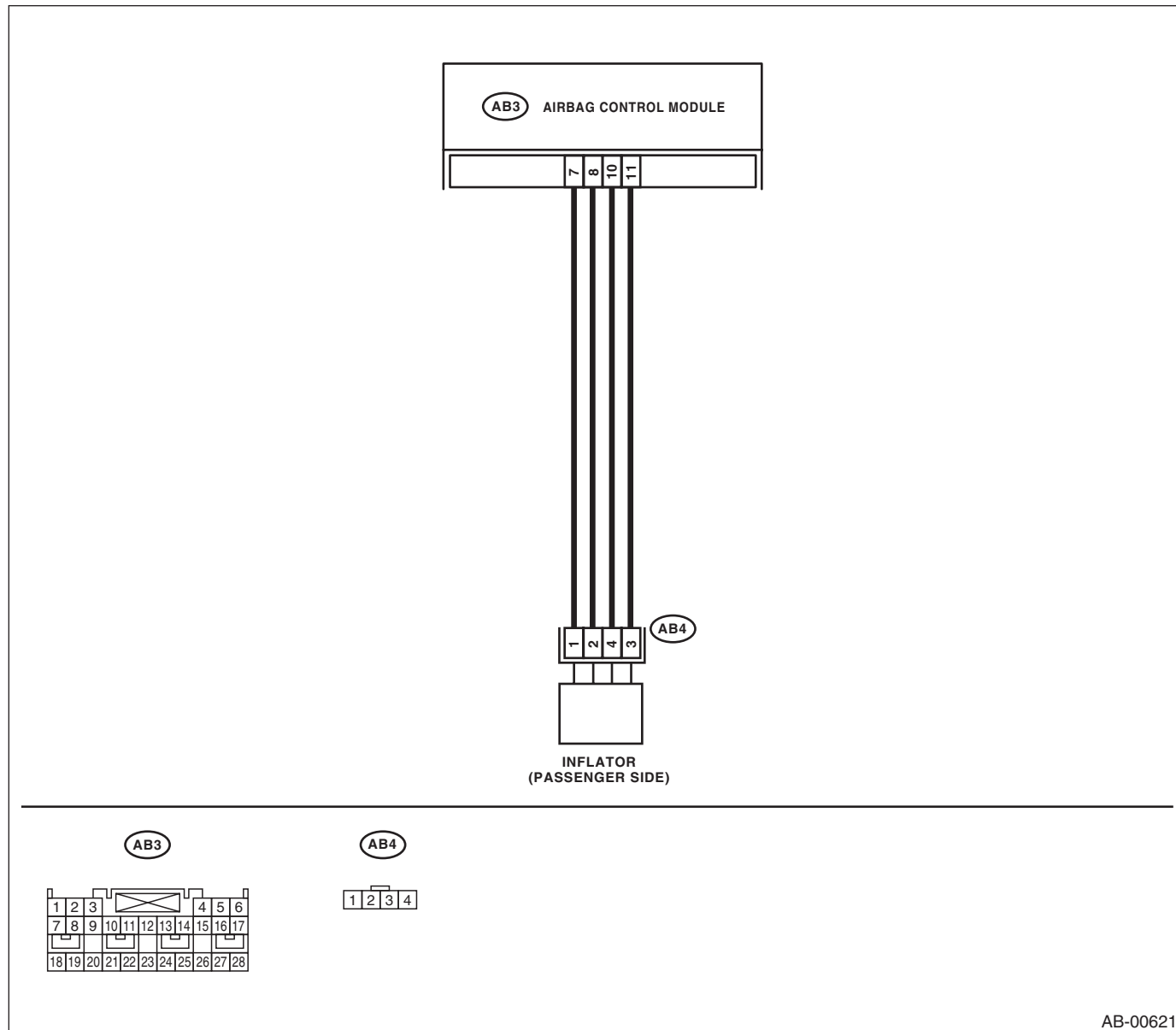
CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the airbag module connectors of the driver's and passenger's seats for safety.

NOTE:

Before diagnosing, prepare the two airbag resistors (98299PA040).

WIRING DIAGRAM:



Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module and the passenger's airbag module.	Is there poor contact?	Replace the airbag harness.	Go to step 2.
2 CHECK PASSENGER'S AIRBAG MODULE. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connectors (AB27) from (AB4) of the passenger's airbag module. 3) Connect connector (1P) in the test harness P to connector (AB4). 4) Connect the airbag resistor to the connectors (2P) and (3P) in the test harness P. 5) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the passenger's airbag module. <Ref. to AB-15, Passenger's Airbag Module.>	Go to step 3.
3 CHECK AIRBAG MAIN HARNESS (PASSENGER'S AIRBAG HARNESS). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the connectors (2P) and (3P) in the test harness P. 3) Remove the instrument panel lower cover, disconnect the connector (AB26) from (AB2). 4) Disconnect the connector (AB3) from airbag control module, and connect the connector (1R) in the test harness R. 5) Measure resistance between connector (2R) in the test harness R and connector (2P) and (3P) in the test harness P. <i>Connector & terminal</i> <i>(2R) No. 3 — (2P) No. 1:</i> <i>(2R) No. 5 — (2P) No. 2:</i> <i>(2R) No. 9 — (3P) No. 3:</i> <i>(2R) No. 13 — (3P) No. 4:</i>	Is the resistance less than 10 Ω?	Go to step 4.	Replace the airbag main harness along with the body harness.
4 CHECK AIRBAG MAIN HARNESS (PASSENGER'S AIRBAG HARNESS). Measure resistance between connector (2R) in the test harness R and chassis ground. <i>Connector & terminal</i> <i>(2R) No. 3 — (2R) No. 5:</i> <i>(2R) No. 3 — Chassis ground:</i> <i>(2R) No. 5 — Chassis ground:</i> <i>(2R) No. 9 — (2R) No. 13:</i> <i>(2R) No. 9 — Chassis ground:</i> <i>(2R) No. 13 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 5.	Replace the airbag main harness along with the body harness.
5 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 6.
6 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

C: DTC 15 DRIVER'S AIRBAG FAILURE

DTC DETECTING CONDITION:

- Airbag harness (driver's side) is shorted to power supply.
- Airbag module harness (driver's side) is shorted to power supply.
- Roll connector is shorted to power supply.
- Driver's airbag module is faulty.
- Airbag control module is faulty.

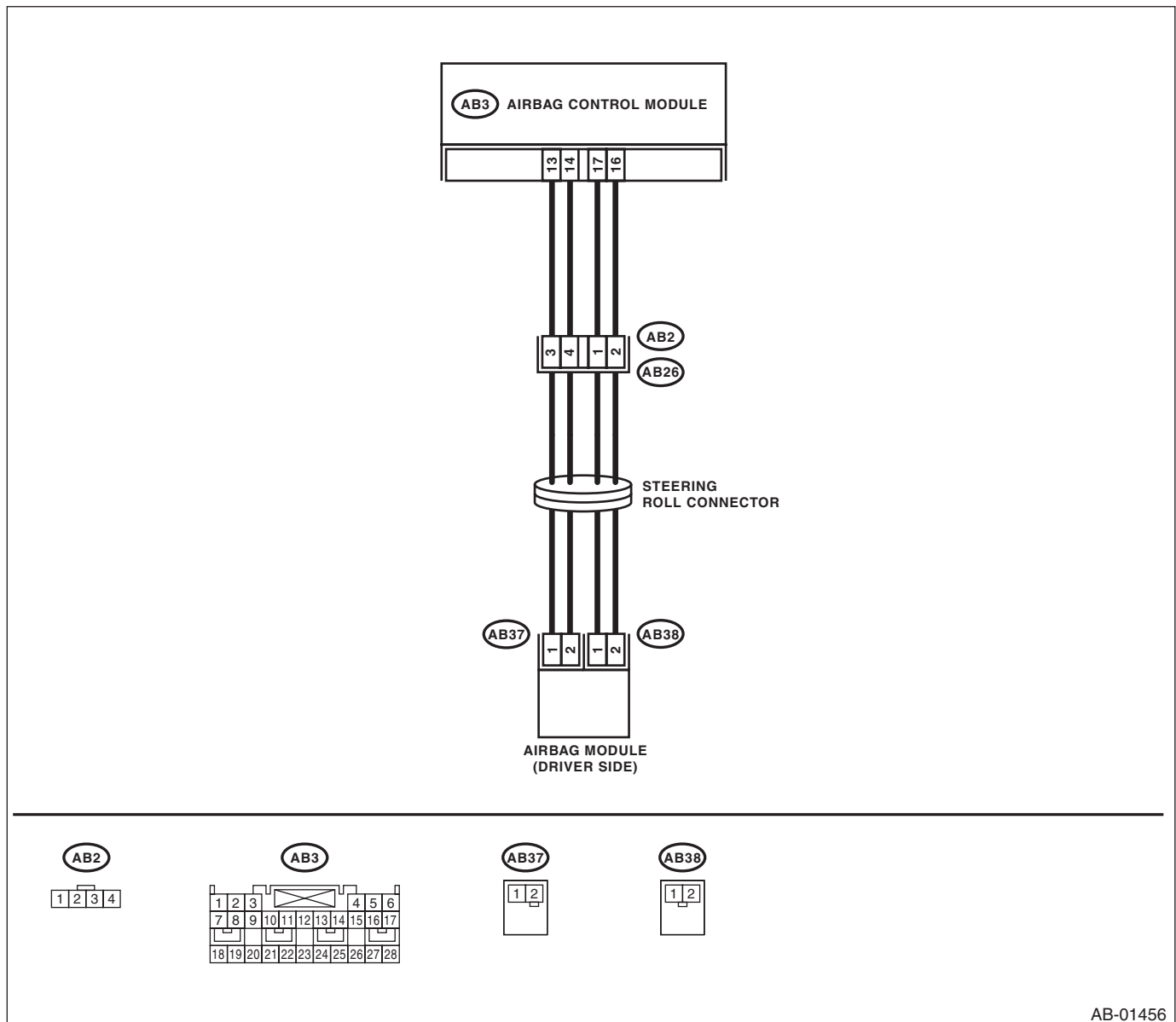
CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety.

NOTE:

Before diagnosing, prepare the two airbag resistors (98299PA040).

WIRING DIAGRAM:



AB-01456

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module and the driver's airbag module.	Is there poor contact?	Replace the airbag harness.	Go to step 2.
2 CHECK DRIVER'S AIRBAG MODULE. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Remove the driver's airbag module. 3) Connect the connector (AB38) to the connector (1N) in the test harness N. 4) Connect the airbag resistor to the connector (2N) in the test harness N. 5) Connect the connector (1Q) in the test harness Q to connector (AB37). 6) Connect the airbag resistor to the connector (2Q) in the test harness Q. 7) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the driver's airbag module. <Ref. to AB-14, Driver's Airbag Module.>	Go to step 3.
3 CHECK ROLL CONNECTOR. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the test harness N from connector (AB38). 3) Disconnect the test harness Q from connector (AB37). 4) Remove the instrument panel lower cover, disconnect the connector (AB26) from (AB2). 5) Connect the connector (1P) in the test harness P to connector (AB2). 6) Connect the airbag resistor to the connectors (2P) and (3P) in the test harness P. 7) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the roll connector. <Ref. to AB-20, Roll Connector.>	Go to step 4.
4 CHECK AIRBAG MAIN HARNESS (DRIVER'S AIRBAG HARNESS). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the connectors (2P) and (3P) in the test harness P. 3) Disconnect the connectors (AB27) and (AB4) of the passenger's airbag module. 4) Disconnect the connector (AB3) from airbag control module, and connect the connector (1R) in the test harness R. 5) Connect the battery ground terminal and turn the ignition switch to ON. (engine OFF) 6) Measure the voltage between connector (2R) in the test harness R and chassis ground. Connector & terminal (2R) No. 4 (+) — Chassis ground (-): (2R) No. 2 (+) — Chassis ground (-): (2R) No. 8 (+) — Chassis ground (-): (2R) No. 12 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 5.	Replace the airbag main harness along with the body harness.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 6.
6 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

D: DTC 16 PASSENGER'S AIRBAG FAILURE

DTC DETECTING CONDITION:

- Airbag harness (Passenger's side) is shorted to power supply.
- Airbag module harness (passenger's side) is shorted to power supply.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

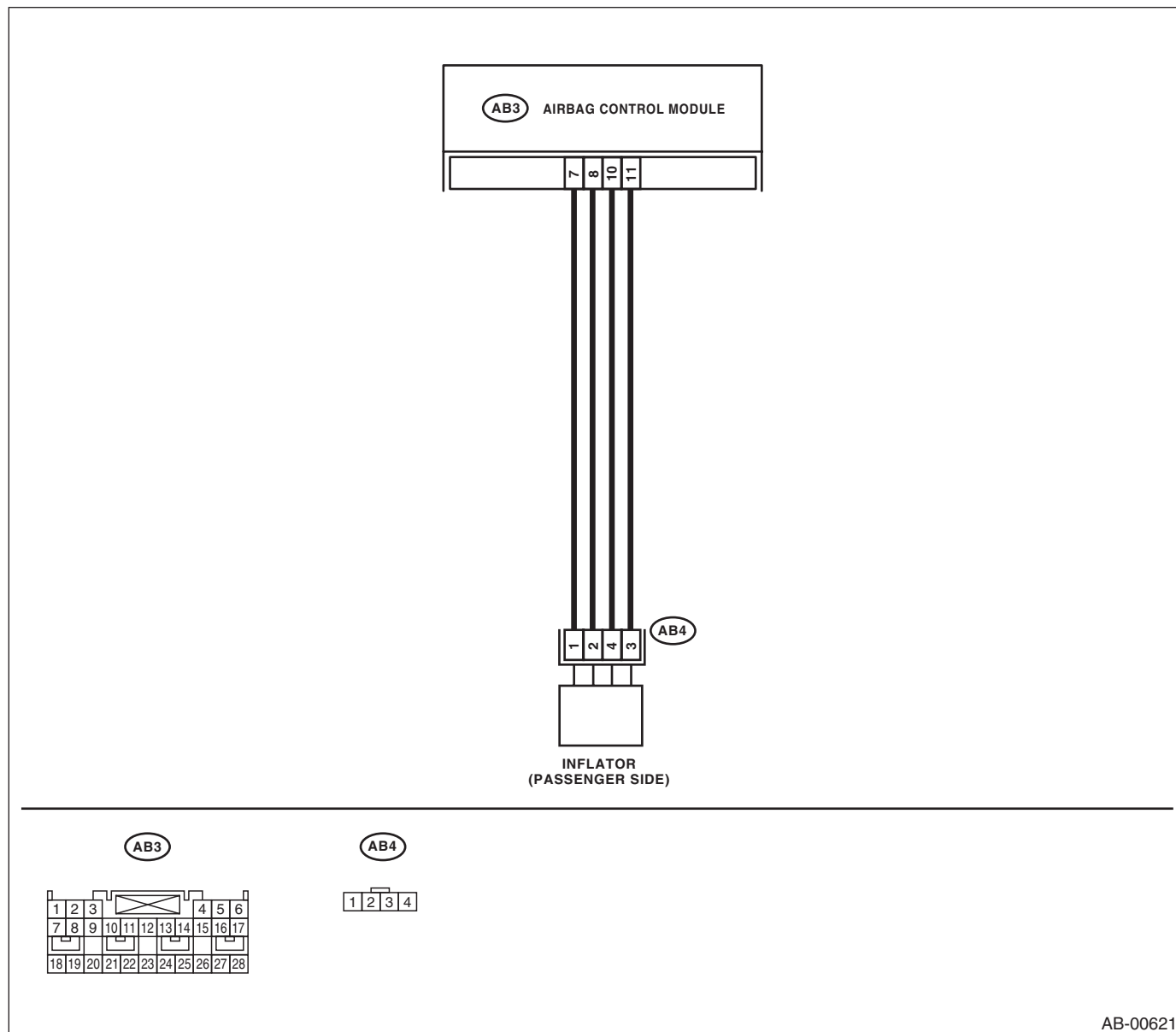
CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the airbag module connectors of the driver's and passenger's seats for safety.

NOTE:

Before diagnosing, prepare the two airbag resistors (98299PA040).

WIRING DIAGRAM:



AB-00621

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module and the passenger's airbag module.	Is there poor contact?	Replace the airbag harness along with the body harness.	Go to step 2.
2 CHECK PASSENGER'S AIRBAG MODULE. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connectors (AB27) from (AB4) of the passenger's airbag module. 3) Connect connector (1P) in the test harness P to connector (AB4). 4) Connect the airbag resistor to the connectors (2P) and (3P) in the test harness P. 5) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the passenger's airbag module. <Ref. to AB-15, Passenger's Airbag Module.>	Go to step 3.
3 CHECK AIRBAG MAIN HARNESS (PASSENGER'S AIRBAG HARNESS). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the connectors (2P) and (3P) in the test harness P. 3) Remove the instrument panel lower cover, disconnect the connector (AB26) from (AB2). 4) Disconnect the connector (AB3) from airbag control module, and connect the connector (1R) in the test harness R. 5) Measure the voltage between connector (2R) in the test harness R and chassis ground. Connector & terminal <i>(2R) No. 3 (+) — Chassis ground (-):</i> <i>(2R) No. 5 (+) — Chassis ground (-):</i> <i>(2R) No. 9 (+) — Chassis ground (-):</i> <i>(2R) No. 13 (+) — Chassis ground (-):</i>	Is the voltage less than 1 V?	Go to step 4.	Replace the airbag main harness along with the body harness.
4 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 5.
5 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

E: DTC 21 AIRBAG ECM FAILURE

DTC DETECTING CONDITION:

Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When replacing the airbag module, seat belt pretensioner, roll connector, control module and sensor, reconnect each part and check that the warning light operates properly.

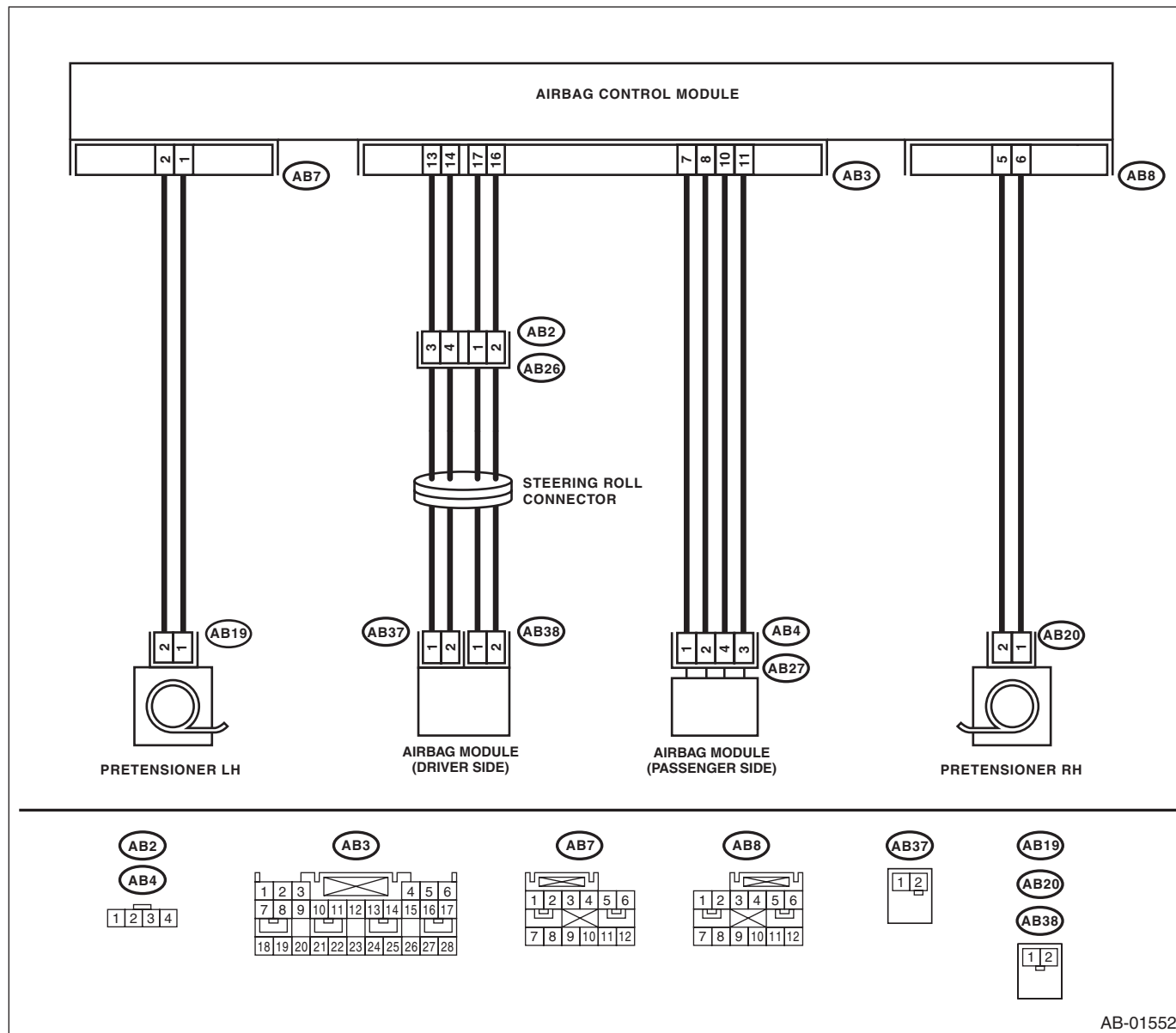
	Step	Check	Yes	No
1	CHECK WHETHER DTC 21 IS INDICATED. 1) Read the DTC. <Ref. to AB(diag)-29, READ DIAGNOSTIC TROUBLE CODE (DTC), OPERATION, Subaru Select Monitor.> 2) Perform the Clear Memory Mode. <Ref. to AB(diag)-35, Clear Memory Mode.> 3) Read the DTC again.	Is DTC 21 displayed on Subaru Select Monitor?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Temporary poor contact occurs.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

F: DTC 22 FRONT AIRBAG FIRING OUTPUT

WIRING DIAGRAM:



AB-01552

This code is indicated when the front airbag and pretensioner activates.

Once this code is displayed, the memory cannot be cleared. Therefore replace the following parts.

- Airbag Control Module <Ref. to AB-18, Airbag Control Module.>
- Driver's airbag module <Ref. to AB-14, Driver's Airbag Module.>
- Passenger's airbag module <Ref. to AB-15, Passenger's Airbag Module.>
- Front sub sensor of both sides <Ref. to AB-21, Front Sub Sensor.>
- Front seat belt outer with pretensioner of both sides. <Ref. to SB-10, Front Seat Belt.>
- Steering roll connector <Ref. to AB-20, Roll Connector.>
- Occupant detection system (passenger's seat cushion & frame assembly) <Ref. to SE-14, PASSENGER'S SEAT, DISASSEMBLY, Front Seat.>

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

G: DTC 23 CONNECTOR TO AIRBAG ECM

DTC DETECTING CONDITION:

Improper connection of (AB3), (AB7) and (AB8) to airbag control module

CAUTION:

Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS (AB3), (AB7) AND (AB8). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connectors (AB3), (AB7) and (AB8) from the airbag control module.	Is there rust or damage on the harness connector and the control module connector?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>Replace the airbag main harness along with the body harness. Replace the side airbag main harness along with the body harness.	Go to step 2.
2 CHECK POOR CONTACT OF CONNECTORS (AB3), (AB7) AND (AB8). 1) Reconnect the connector securely. 2) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Go to step 3.	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>
3 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 4.
4 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

H: DTC 24 IG1 OPEN

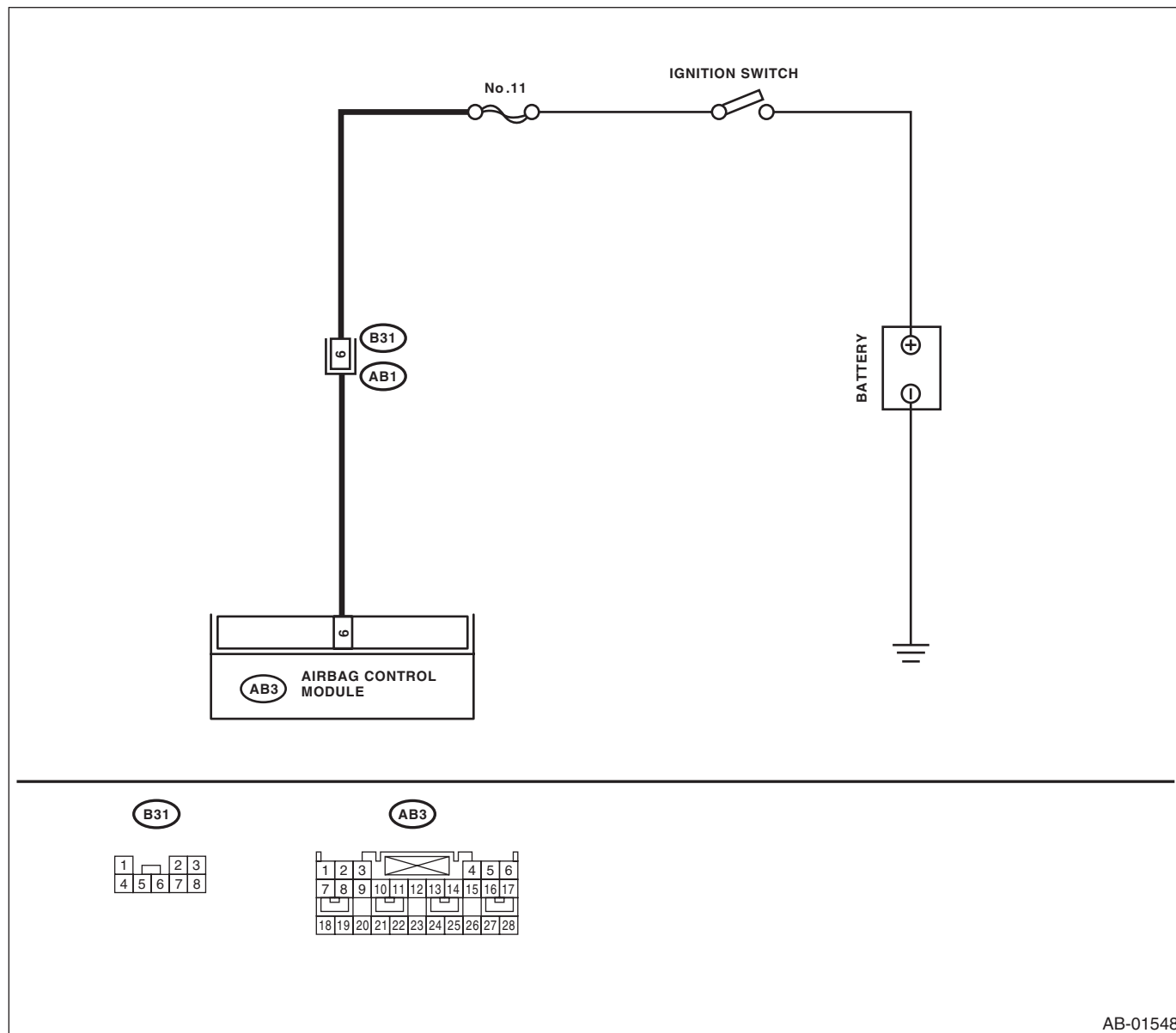
DTC DETECTING CONDITION:

- Airbag control module is faulty.
- Airbag main harness is open.
- Fuse No. 11 (in joint box) is blown.
- Body harness is open.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety.

WIRING DIAGRAM:



AB-01548

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK AIRBAG CONTROL MODULE. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect connector (AB3) from airbag control module. 3) Connect the connector (1R) in the test harness R to connector (AB3). 4) Connect the battery ground terminal and turn the ignition switch to ON. 5) Measure the voltage between connector (2R) in the test harness R and chassis ground. Connector & terminal (2R) No. 1 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 2.
2 CHECK FUSE NO. 11 (IN JOINT BOX). 1) Confirm that the ignition switch is turned to OFF. 2) Remove and visually check the fuse No. 11 (in the joint box).	Is the fuse (No. 11) blown out?	Replace the fuse No. 11. If fuse No. 11 is blown out again, repair the body harness. Replace the airbag main harness along with the body harness.	Go to step 3.
3 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 4.
4 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

I: DTC 25 IG2 OPEN

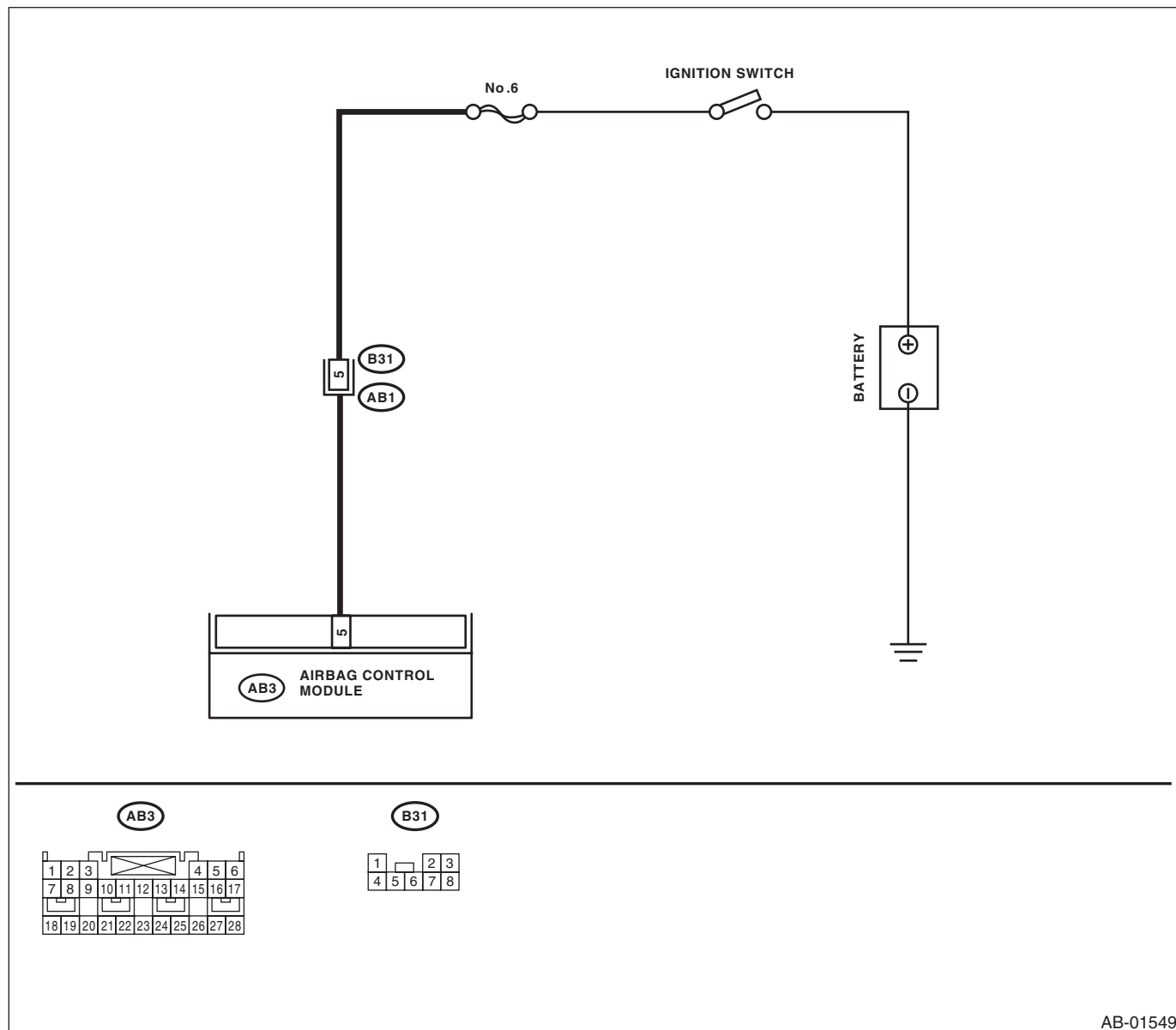
DTC DETECTING CONDITION:

- Airbag control module is faulty.
- Airbag harness is open.
- Fuse No. 6 (in joint box) is blown.
- Body harness is open.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety.

WIRING DIAGRAM:



AB-01549

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK AIRBAG CONTROL MODULE. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect connector (AB3) from airbag control module. 3) Connect the connector (1R) in the test harness R to connector (AB3). 4) Connect the battery ground terminal and turn the ignition switch to ON. 5) Measure the voltage between connector (2R) in the test harness R and chassis ground. Connector & terminal (2R) No. 6 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 2.
2 CHECK FUSE NO. 6 (IN JOINT BOX). 1) Confirm that the ignition switch is turned to OFF. 2) Remove and visually check the fuse No. 6 (in the joint box).	Is the fuse (No. 6) blown out?	Replace the fuse No. 6. If fuse No. 6 is blown out again, repair the body harness. Or replace the airbag main harness along with the body harness.	Go to step 3.
3 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 4.
4 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

J: DTC 26 PASSENGER'S AIRBAG INDICATOR FAILURE

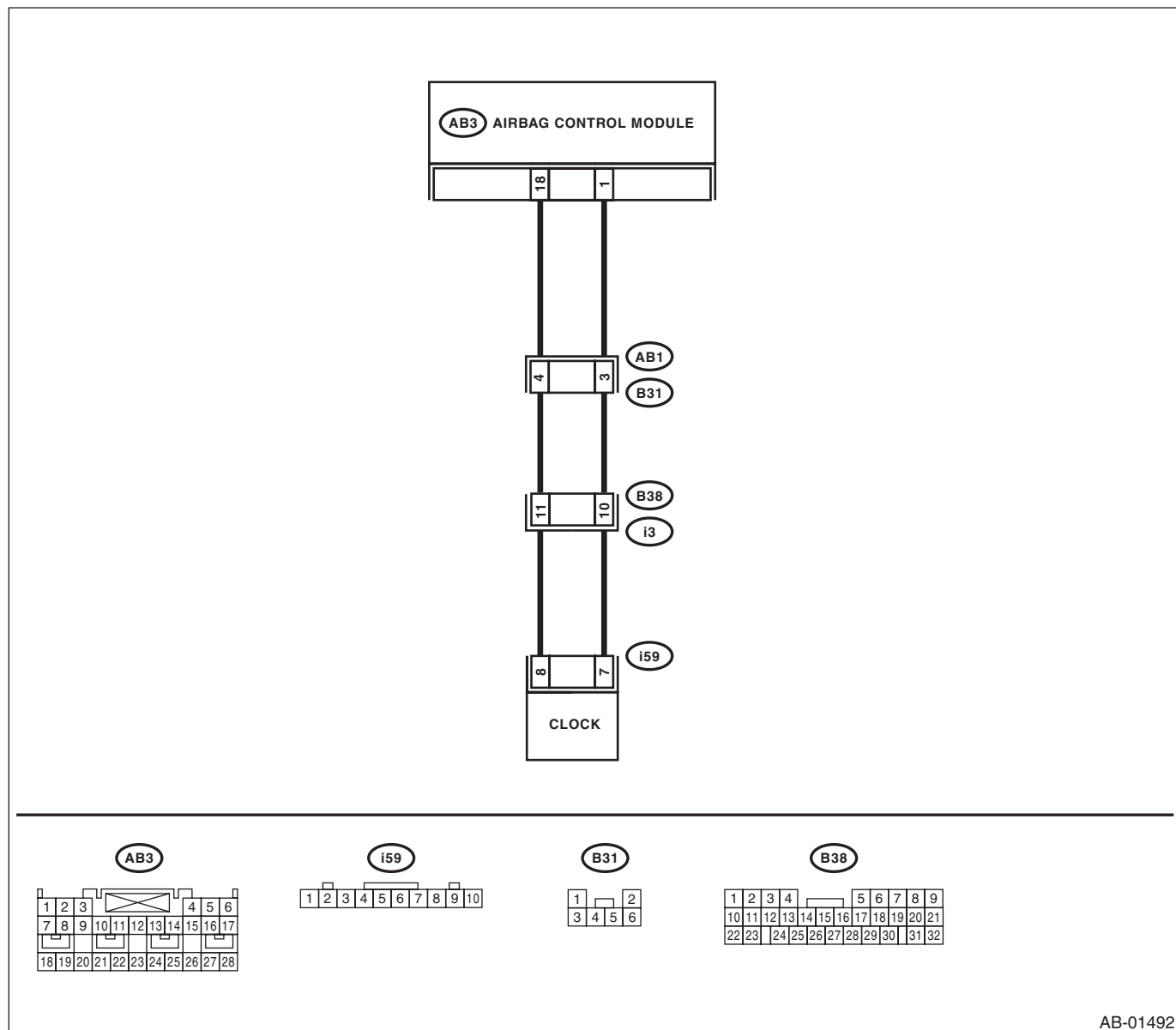
DTC DETECTING CONDITION:

- Passenger's airbag indicator is faulty.
- Airbag control module is faulty.
- Airbag main harness circuit is open.
- Body harness is open.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When replacing the airbag module, seat belt pretensioner, roll connector, control module and sensor, reconnect each part and check that the warning light operates properly.
- When inspecting the airbag harness, disconnect the airbag module connector and seat belt pretensioner for safety.

WIRING DIAGRAM:



AB-01492

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Confirm that firm contact is secured for the connector between the airbag control module and clock.	Is there poor contact in any connector?	Replace the airbag harness connector.	Go to step 2.
2 CHECK AIRBAG MAIN HARNESS. 1) Disconnect connector (AB3) from airbag control module. 2) Connect the battery ground terminal and turn the ignition switch to ON. NOTE: If normal, the indicator is not illuminated for both ON and OFF.	Is the passenger's airbag indicator turned on?	Go to step 3.	Go to step 4.
3 CHECK AIRBAG MAIN HARNESS. 1) Turn the ignition switch to OFF. 2) Remove the clock and then disconnect the connector (i59). 3) Connect the connector (1R) in the test harness R to connector (AB3). 4) Measure resistance between connectors (2R) and (4R) in the test harness R and chassis ground. <i>Connector & terminal</i> <i>(2R) No. 14 — (4R) No. 17:</i> <i>(2R) No. 14 — Chassis ground:</i> <i>(4R) No. 17 — Chassis ground:</i>	Is the resistance 1 M Ω or more?	Replace the clock. <Ref. to IDI-17, Clock.>	Repair the bulkhead harness. Or replace the airbag main harness along with the body harness.
4 CHECK AIRBAG HARNESS. 1) Turn the ignition switch to OFF. 2) Connect the connector (1R) in the test harness R to connector (AB3). 3) Measure resistance between connectors (2R) and (4R) in the test harness R and connector (i59). <i>Connector & terminal</i> <i>(2R) No. 14 — (i59) No. 7:</i> <i>(4R) No. 17 — (i59) No. 8:</i>	Is the resistance less than 10 Ω ?	Go to step 5.	Repair the bulkhead harness. Or replace the airbag main harness along with the body harness.
5 CHECK BODY HARNESS. 1) Turn the ignition switch to ON. 2) Measure the voltage between connector (i59) and chassis ground. <i>Connector & terminal</i> <i>(i59) No. 3 — Chassis ground:</i>	Is the voltage 10 V or more?	Replace the clock. <Ref. to IDI-17, Clock.>	Repair the clock power supply line.

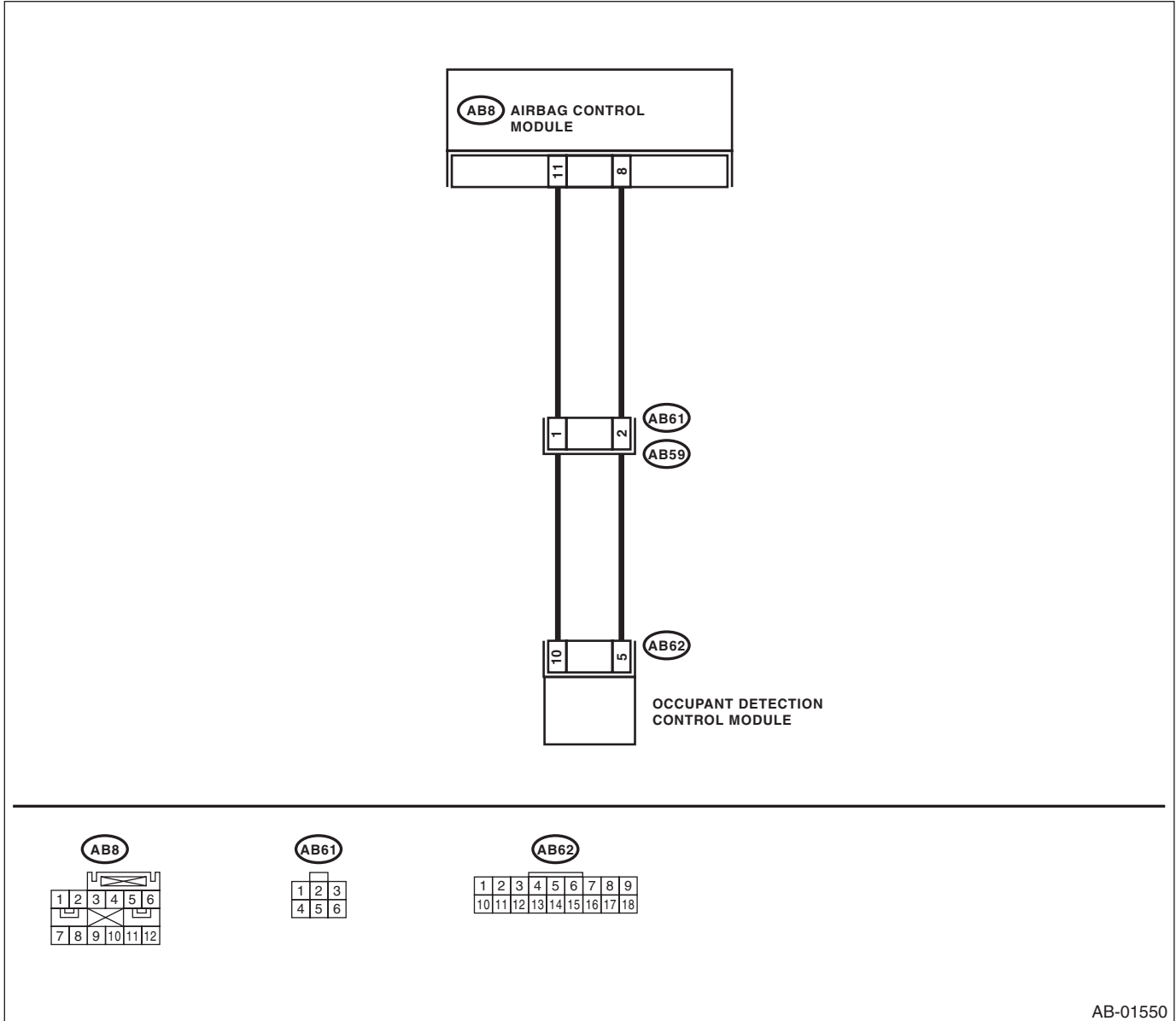
Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

K: DTC 27 ODS COMMUNICATION ERROR

DTC DETECTING CONDITION:

- Communication to the occupant detection control module is faulty.
- Occupant detection harness (seat harness) is faulty.
- Occupant detection system is faulty.
- Airbag control module is faulty.
- Airbag rear harness circuit is open, shorted or shorted to ground, or shorted to power supply.



AB-01550

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK AIRBAG HARNESS. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect connector (AB8) from airbag control module. 3) Disconnect connector (AB59) from the connector (AB61) on the lower side of passenger's seat. 4) Connect the connector (1R) in the test harness R to connector (AB8). 5) Connect the connector (1AB) in the test harness AB to connector (AB61). 6) Measure resistance between connector (4R) in the test harness R and connector (2AB) in the test harness AB. Connector & terminal (4R) No. 12 — (2AB) No. 1: (4R) No. 10 — (2AB) No. 2:	Is the resistance less than 10 Ω?	Go to step 2.	Replace the airbag rear harness (RH) along with the body harness.
2 CHECK AIRBAG HARNESS. Measure resistance between connector (4R) in the test harness R and chassis ground. Connector & terminal (4R) No. 12 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 3.	Replace the airbag rear harness (RH) along with the body harness.
3 CHECK OCCUPANT DETECTION SYSTEM. 1) Connect connector (AB8) to airbag control module. 2) Connect connector (AB61) and connector (AB59). 3) Connect the battery ground cable. 4) Check the occupant detection system. <Ref. to OD(diag)-2, Basic Diagnostic Procedure.>	Is there a malfunction in the occupant detection system?	Repair the occupant detection system. <Ref. to OD(diag)-2, Basic Diagnostic Procedure.>	Finish the diagnosis.

L: DTC 29 ODS FAILURE

NOTE:

Refer to "Occupant Detection System" for DTC 29. <Ref. to OD(diag)-28, DTC 29 ODS FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

M: DTC 2A ODS CALIBRATION ERROR

NOTE:

Refer to "Occupant Detection System" for DTC 2A. <Ref. to OD(diag)-25, DTC 2A ODS CALIBRATION ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

N: DTC 2B ODS SYSTEM WRONG PARTS

NOTE:

Refer to "Occupant Detection System" for DTC 2B. <Ref. to OD(diag)-25, DTC 2B ODS SYSTEM WRONG PARTS, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

O: DTC 2C BELT TENSION SENSOR FAILURE

NOTE:

Refer to "Occupant Detection System" for DTC 2C. <Ref. to OD(diag)-26, DTC 2C BELT TENSION SENSOR FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Chart with Trouble Code

P: DTC 31 FRONT SUB SENSOR RH FAILURE

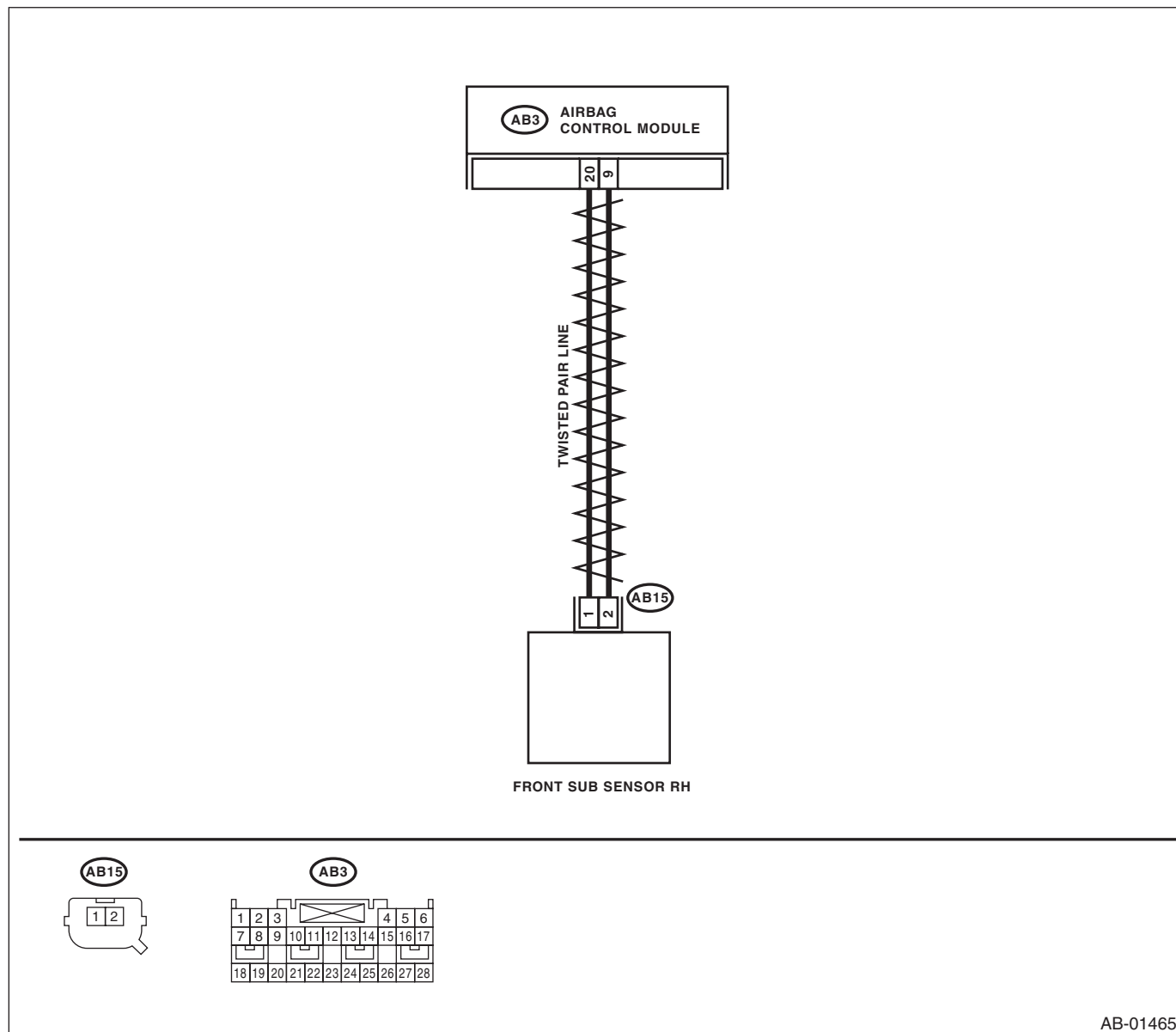
DTC DETECTING CONDITION:

- Front sub sensor harness (RH) is shorted, open or shorted to power supply.
- Airbag harness is shorted, open or shorted to power supply.
- Front sub sensor (RH) is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety.

WIRING DIAGRAM:



AB-01465

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module and the front sub sensor (RH).	Is there poor contact?	Repair the connector.	Go to step 2.
2 CHECK AIRBAG MAIN HARNESS AND FRONT SUB SENSOR HARNESS. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Remove the instrument panel lower cover, disconnect the connector (AB26) and (AB2). 3) Disconnect the connectors (AB27) and (AB4) of the passenger's airbag module. 4) Disconnect connector (AB3) from airbag control module. 5) Connect the connector (1R) in the test harness R to connector (AB3). 6) Disconnect the front sub sensor (RH), and connect the connector (1H) in test harness H to connector (AB15). 7) Measure resistance between connector (3R) in the test harness R and connector (3H) in the test harness H. <i>Connector & terminal</i> <i>(3R) No. 7 — (3H) No. 5:</i> <i>(3R) No. 9 — (3H) No. 6:</i>	Is the resistance less than 10 Ω ?	Go to step 3.	Replace the airbag main harness along with the body harness.
3 CHECK AIRBAG MAIN HARNESS (FRONT SUB SENSOR HARNESS RH). Measure resistance between connector (3R) in the test harness R and chassis ground. <i>Connector & terminal</i> <i>(3R) No. 7 — Chassis ground:</i> <i>(3R) No. 9 — Chassis ground:</i>	Is the resistance 1 M Ω or more?	Replace the front sub sensor (RH). <Ref. to AB-21, Front Sub Sensor.> Replace the airbag control module if not operating normally even after replacing the sensor. <Ref. to AB-18, Airbag Control Module.>	Go to step 4.
4 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 5.
5 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Q: DTC 32 FRONT SUB SENSOR LH FAILURE

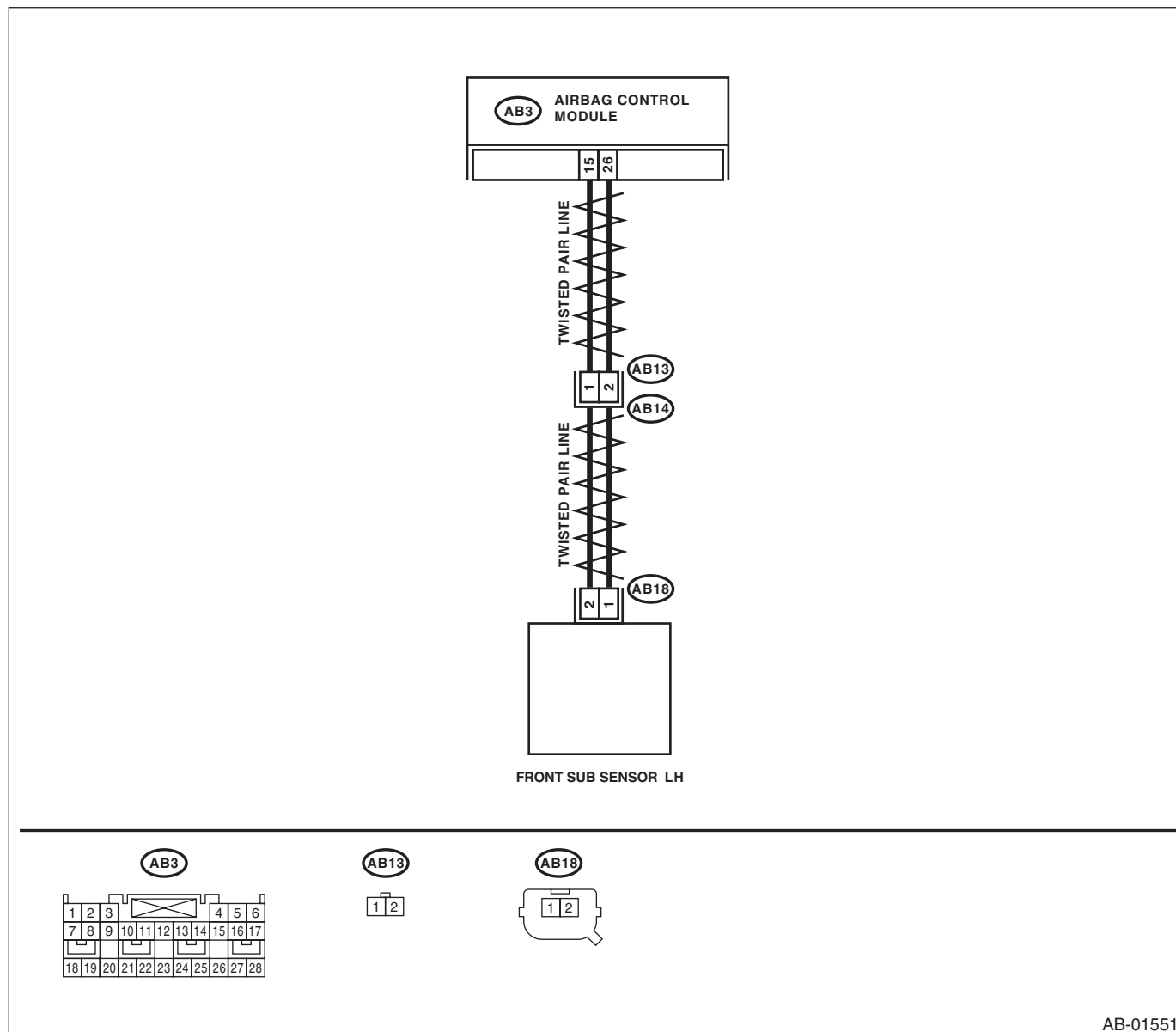
DTC DETECTING CONDITION:

- Front sub sensor harness (LH) is shorted, open or shorted to power supply.
- Airbag harness is shorted, open or shorted to power supply.
- Front sub sensor (LH) is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety.

WIRING DIAGRAM:



Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module and the front sub sensor (LH).	Is there poor contact?	Replace the airbag main harness along with the body harness.	Go to step 2.
2 CHECK AIRBAG MAIN HARNESS (FRONT SUB SENSOR HARNESS LH). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Remove the instrument panel lower cover, disconnect the connector (AB26) and (AB2). 3) Disconnect the connectors (AB27) and (AB4) of the passenger's airbag module. 4) Disconnect connector (AB3) from airbag control module. 5) Connect the connector (1R) in the test harness R to connector (AB3). 6) Disconnect the front sub sensor (LH), and connect the connector (1H) in test harness H to connector (AB18). 7) Measure resistance between connector (3R) in the test harness R and connector (3H) in the test harness H. <i>Connector & terminal</i> <i>(3R) No. 6 — (3H) No. 5:</i> <i>(3R) No. 8 — (3H) No. 6:</i>	Is the resistance less than 10 Ω?	Go to step 3.	Replace the airbag main harness along with the body harness.
3 CHECK AIRBAG MAIN HARNESS (FRONT SUB SENSOR HARNESS LH). Measure resistance between connector (3R) in the test harness R and chassis ground. <i>Connector & terminal</i> <i>(3R) No. 6 — Chassis ground:</i> <i>(3R) No. 8 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Replace the front sub sensor (LH). <Ref. to AB-21, Front Sub Sensor.> Replace the airbag control module if not operating normally even after replacing the sensor. <Ref. to AB-18, Airbag Control Module.>	Go to step 4.
4 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 5.
5 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

R: DTC 33 FRONT SUB SENSOR RH FAILURE

DTC DETECTING CONDITION:

Front sub sensor (RH) is faulty.

If the DTC 33 is displayed, the circuit within the front sub sensor (RH) is faulty. Replace the front sub sensor (RH). <Ref. to AB-21, Front Sub Sensor.>

S: DTC 34 FRONT SUB SENSOR LH FAILURE

DTC DETECTING CONDITION:

Front sub sensor (LH) is faulty.

If the DTC 34 is displayed, the circuit within the front sub sensor (LH) is faulty. Replace the front sub sensor (LH). <Ref. to AB-21, Front Sub Sensor.>

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

T: DTC 36 SEAT POSITION SENSOR LH FAILURE

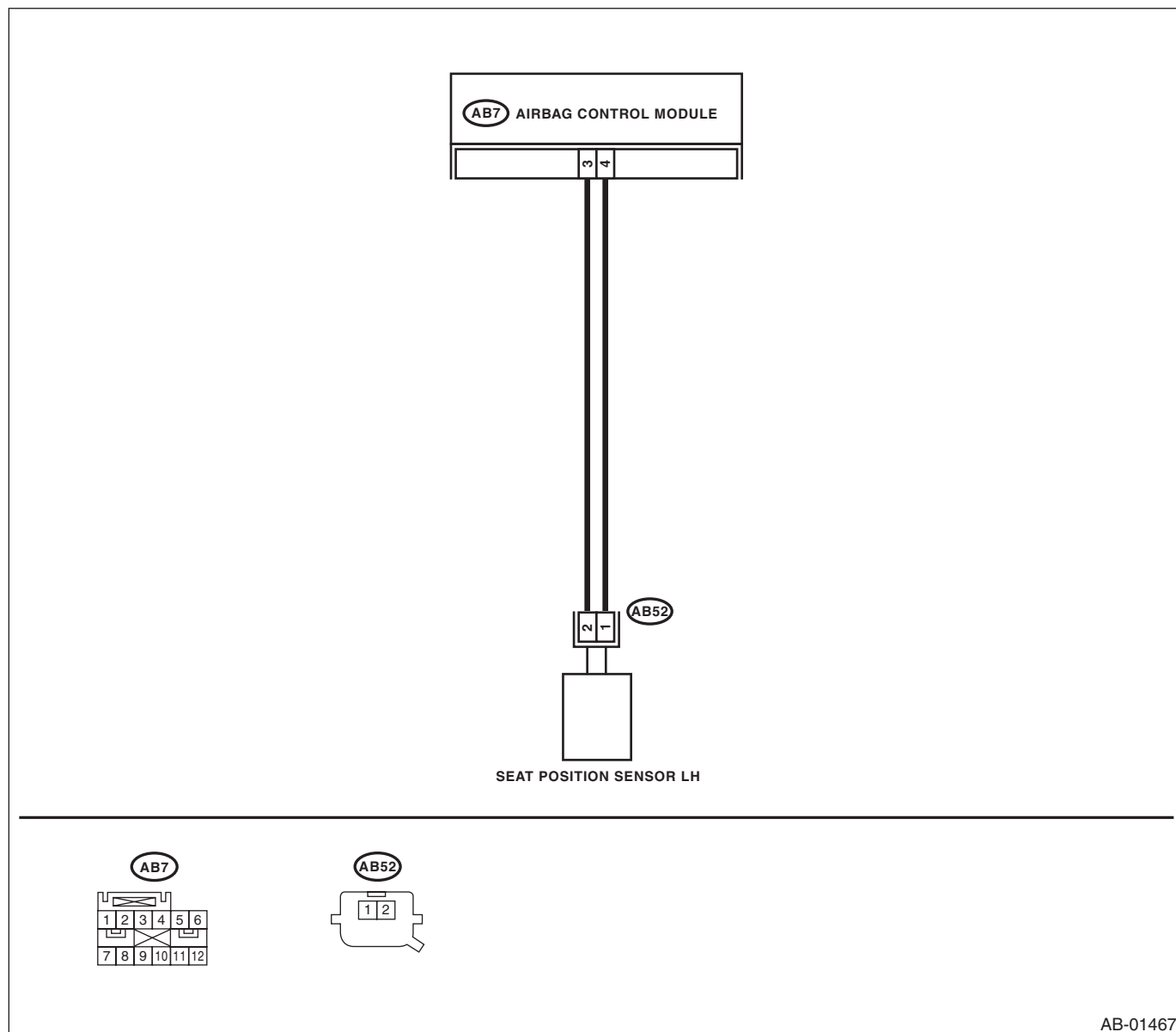
DTC DETECTING CONDITION:

- Driver's seat position sensor is faulty.
- Airbag control module is faulty.
- Airbag rear harness (LH) circuit is open, shorted or shorted to ground.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When replacing the airbag module, seat belt pretensioner, roll connector, control module and sensor, reconnect each part and check that the warning light operates properly.
- When inspecting the airbag harness, disconnect the airbag module connector and seat belt pretensioner for safety.

WIRING DIAGRAM:



AB-01467

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module and the driver's airbag module.	Is there poor contact?	Replace the airbag main harness.	Go to step 2.
2 CHECK SEAT POSITION SENSOR (LH). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect connector (AB52) from seat position sensor (LH). 3) Connect connector (2Y) in the test harness Y to connector (AB52). 4) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the seat position sensor (LH) along with the driver's slide rail assembly. <Ref. to SE-7, Front Seat.>	Go to step 3.
3 CHECK AIRBAG REAR HARNESS (SEAT POSITION SENSOR HARNESS (LH)). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB7) from airbag control module. 3) Connect the connector (1R) in the test harness R to connector (AB7). 4) Disconnect the seat position sensor (LH), and connect the connector (1H) in test harness H to connector (AB52). 5) Measure resistance between connector (3R) in the test harness R and connector (3H) in the test harness H. <i>Connector & terminal</i> <i>(3R) No. 1 — (3H) No. 5:</i> <i>(3R) No. 3 — (3H) No. 6:</i>	Is the resistance less than 10 Ω ?	Go to step 4.	Replace the airbag rear harness (LH) along with the body harness.
4 CHECK AIRBAG REAR HARNESS. Measure resistance between connector (3R) in the test harness R and chassis ground. <i>Connector & terminal</i> <i>(3R) No. 1 — Chassis ground:</i>	Is the resistance less than 10 Ω ?	Replace the airbag rear harness (LH) along with the body harness.	Go to step 5.
5 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 6.
6 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

U: DTC 37 BUCKLE SWITCH RH FAILURE

NOTE:

Refer to "Occupant Detection System" for DTC 37. <Ref. to OD(diag)-29, DTC 37 BUCKLE SWITCH RH FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

V: DTC 38 BUCKLE SWITCH LH FAILURE

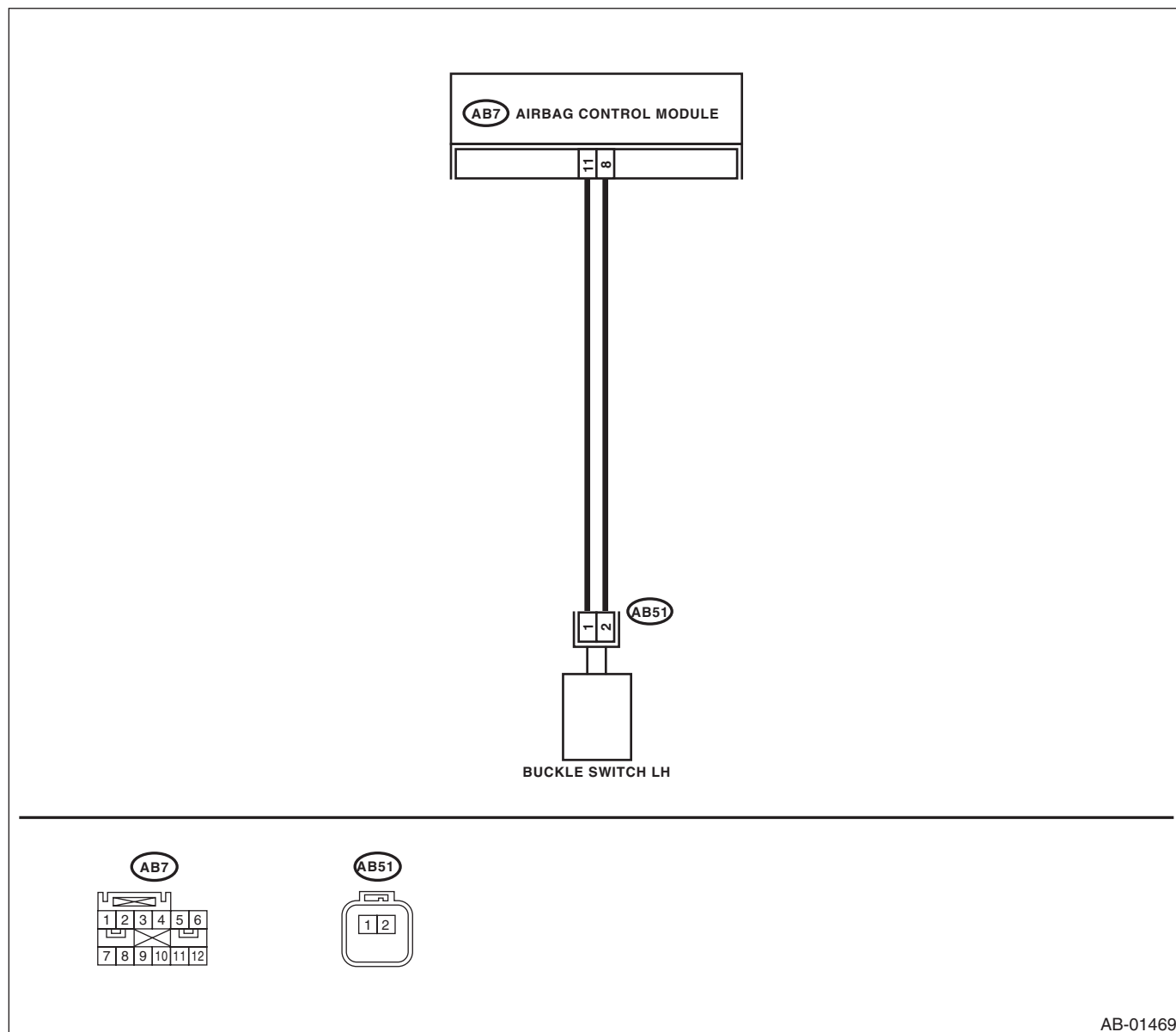
DTC DETECTING CONDITION:

- Driver's buckle switch circuit is open, shorted or shorted to ground.
- Airbag rear harness (LH) circuit is open, shorted or shorted to ground.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When replacing the airbag module, seat belt pretensioner, roll connector, control module and sensor, reconnect each part and check that the warning light operates properly.
- When inspecting the airbag harness, disconnect the airbag module connector and seat belt pretensioner for safety.

WIRING DIAGRAM:



AB-01469

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module and the driver's airbag module.	Is there poor contact?	Replace the airbag main harness.	Go to step 2.
2 CHECK SEAT BELT BUCKLE SWITCH (LH). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB51) from buckle switch (LH). 3) Connect connector (1Y) in the test harness Y to connector (AB51). 4) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the seat belt buckle switch (LH). <Ref. to SB-10, Front Seat Belt.>	Go to step 3.
3 CHECK AIRBAG REAR HARNESS (BUCKLE SWITCH HARNESS (LH)). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB7) from airbag control module. 3) Connect the connector (1R) in the test harness R to connector (AB7). 4) Disconnect the seat belt buckle switch (LH), and connect the connector (1D) in test harness D to connector (AB51). 5) Measure resistance between connector (4R) in the test harness R and connector (3D) in the test harness D. <i>Connector & terminal</i> <i>(4R) No. 11 — (3D) No. 3:</i> <i>(4R) No. 9 — (3D) No. 4:</i>	Is the resistance less than 10 Ω?	Go to step 4.	Replace the airbag rear harness (LH) along with the body harness.
4 CHECK AIRBAG REAR HARNESS. Measure resistance between connector (4R) in the test harness R and chassis ground. <i>Connector & terminal</i> <i>(4R) No. 9 — Chassis ground:</i>	Is the resistance less than 10 Ω?	Replace the airbag rear harness (LH) along with the body harness.	Go to step 5.
5 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 6.
6 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

W: DTC 41 SIDE AIRBAG RH FAILURE

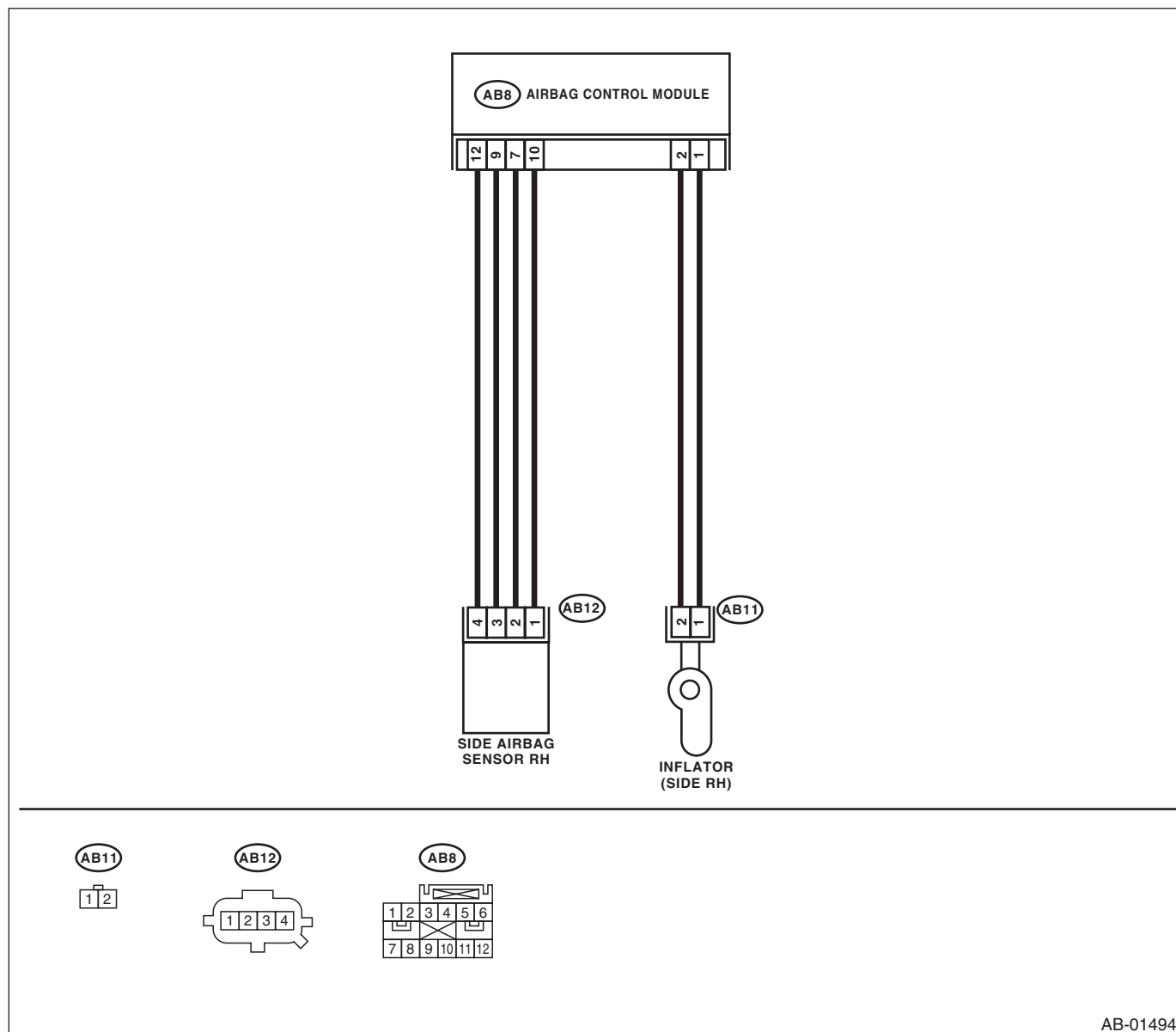
DTC DETECTING CONDITION:

- Side airbag harness (RH) is faulty.
- Side airbag module (RH) is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety.
- When inspecting the side airbag harness, disconnect the side airbag module connector, and seat belt pretensioner connector for safety.

WIRING DIAGRAM:



AB-01494

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module, side airbag module (RH) and the side airbag sensor (RH).	Is there poor contact?	Replace the airbag rear harness (RH) along with the body harness.	Go to step 2.
2 CHECK SIDE AIRBAG MODULE. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB11) from the side airbag module (RH), and connect the connector (1F) in test harness F to connector (AB11). 3) Connect airbag resistor to connector (3F) in the test harness F. 4) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the front seat along with side airbag module (RH). <Ref. to SE-7, Front Seat.>	Go to step 3.
3 CHECK SIDE AIRBAG HARNESS (RH). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB20) from the seat belt pretensioner (RH). 3) Disconnect the airbag resistor from test harness F. 4) Disconnect connector (AB8) from airbag control module. 5) Connect connector (1R) in the test harness R to the connector (AB8). 6) Measure resistance between connector (3R) in the test harness R and connector (3F) in the test harness F. Connector & terminal (3R) No. 18 — (3F) No. 4: (3R) No. 20 — (3F) No. 3:	Is the resistance less than 10 Ω?	Go to step 4.	Replace the side airbag harness along with the body harness.
4 CHECK SIDE AIRBAG HARNESS (RH). Measure resistance between connector (3R) terminals in the test harness R. Connector & terminal (3R) No. 18 — (3R) No. 20:	Is the resistance 1 MΩ or more?	Go to step 5.	Replace the side airbag harness along with the body harness.
5 CHECK SIDE AIRBAG HARNESS (RH). Measure resistance between the connector (3R) in the test harness R and chassis ground. Connector & terminal (3R) No. 18 — Chassis ground: (3R) No. 20 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 6.	Replace the side airbag harness along with the body harness.
6 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 7.
7 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

X: DTC 42 SIDE AIRBAG LH FAILURE

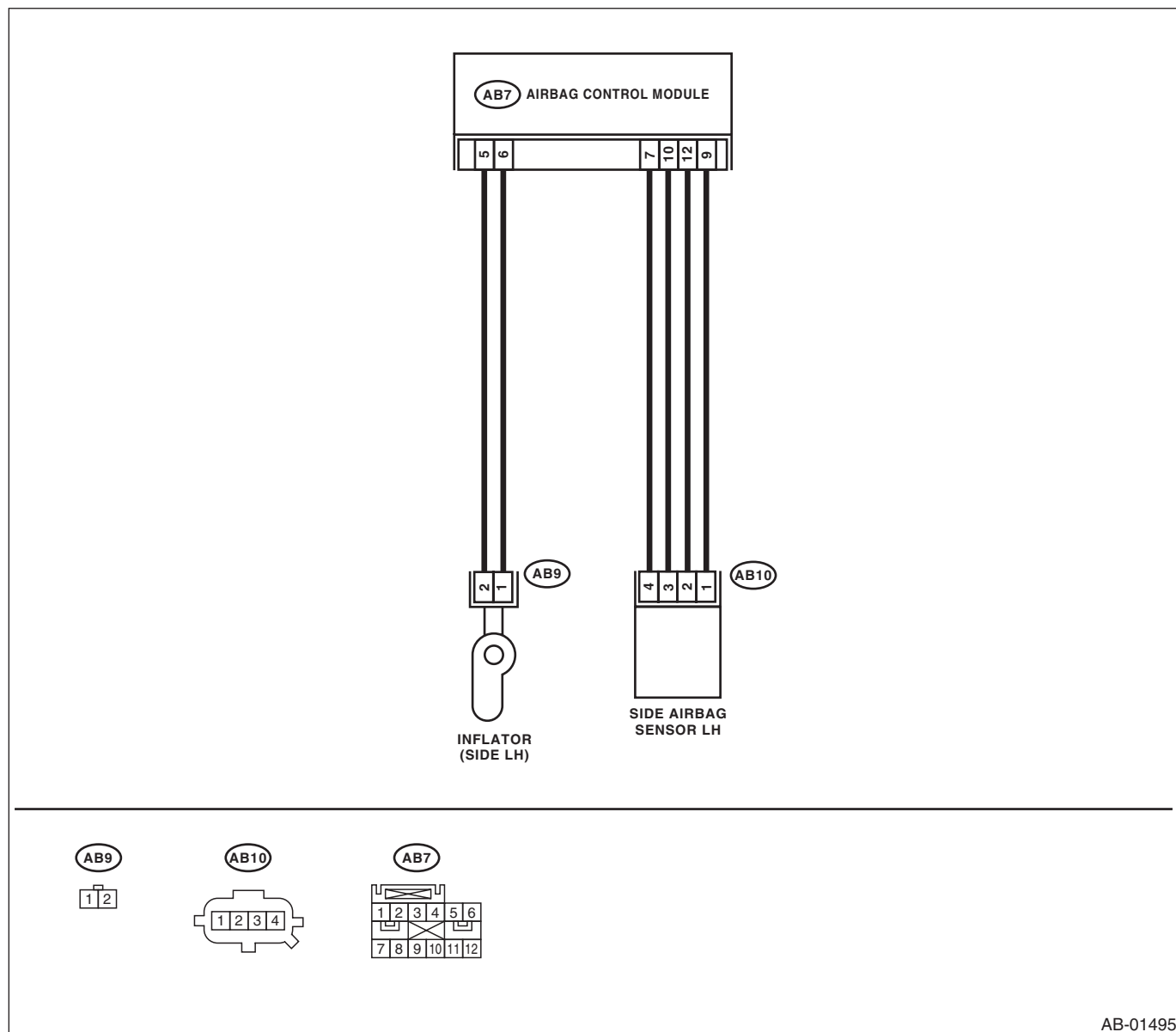
DTC DETECTING CONDITION:

- Side airbag harness (LH) is faulty.
- Side airbag module (LH) is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety.
- When inspecting the side airbag harness, disconnect the side airbag module connector, and seat belt pretensioner connector for safety.

WIRING DIAGRAM:



AB-01495

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module, side airbag module (LH) and the side airbag sensor (LH).	Is there poor contact?	Replace the airbag rear harness (LH) along with the body harness.	Go to step 2.
2 CHECK SIDE AIRBAG MODULE. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB9) from the side airbag module (LH), and connect the connector (1F) in test harness F to connector (AB9). 3) Connect airbag resistor to connector (3F) in the test harness F. 4) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the front seat along with side airbag module (LH). <Ref. to SE-7, Front Seat.>	Go to step 3.
3 CHECK SIDE AIRBAG HARNESS (LH). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB19) from the seat belt pretensioner (LH). 3) Disconnect the airbag resistor from test harness. 4) Disconnect connector (AB7) from airbag control module. 5) Connect connector (1R) in the test harness R to the connector (AB7). 6) Measure resistance between connector (3R) in the test harness R and connector (3F) in the test harness F. Connector & terminal (3R) No. 12 — (3F) No. 3: (3R) No. 10 — (3F) No. 4:	Is the resistance less than 10 Ω?	Go to step 4.	Replace the side airbag harness along with the body harness.
4 CHECK SIDE AIRBAG HARNESS (LH). Measure resistance between connector (3R) terminals in the test harness R. Connector & terminal (3R) No. 12 — (3R) No. 10:	Is the resistance 1 MΩ or more?	Go to step 5.	Replace the side airbag harness along with the body harness.
5 CHECK SIDE AIRBAG HARNESS (LH). Measure resistance between the connector (3R) in the test harness R and chassis ground. Connector & terminal (3R) No. 10 — Chassis ground: (3R) No. 12 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 6.	Replace the side airbag harness along with the body harness.
6 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 7.
7 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Y: DTC 45 SIDE AIRBAG RH FAILURE

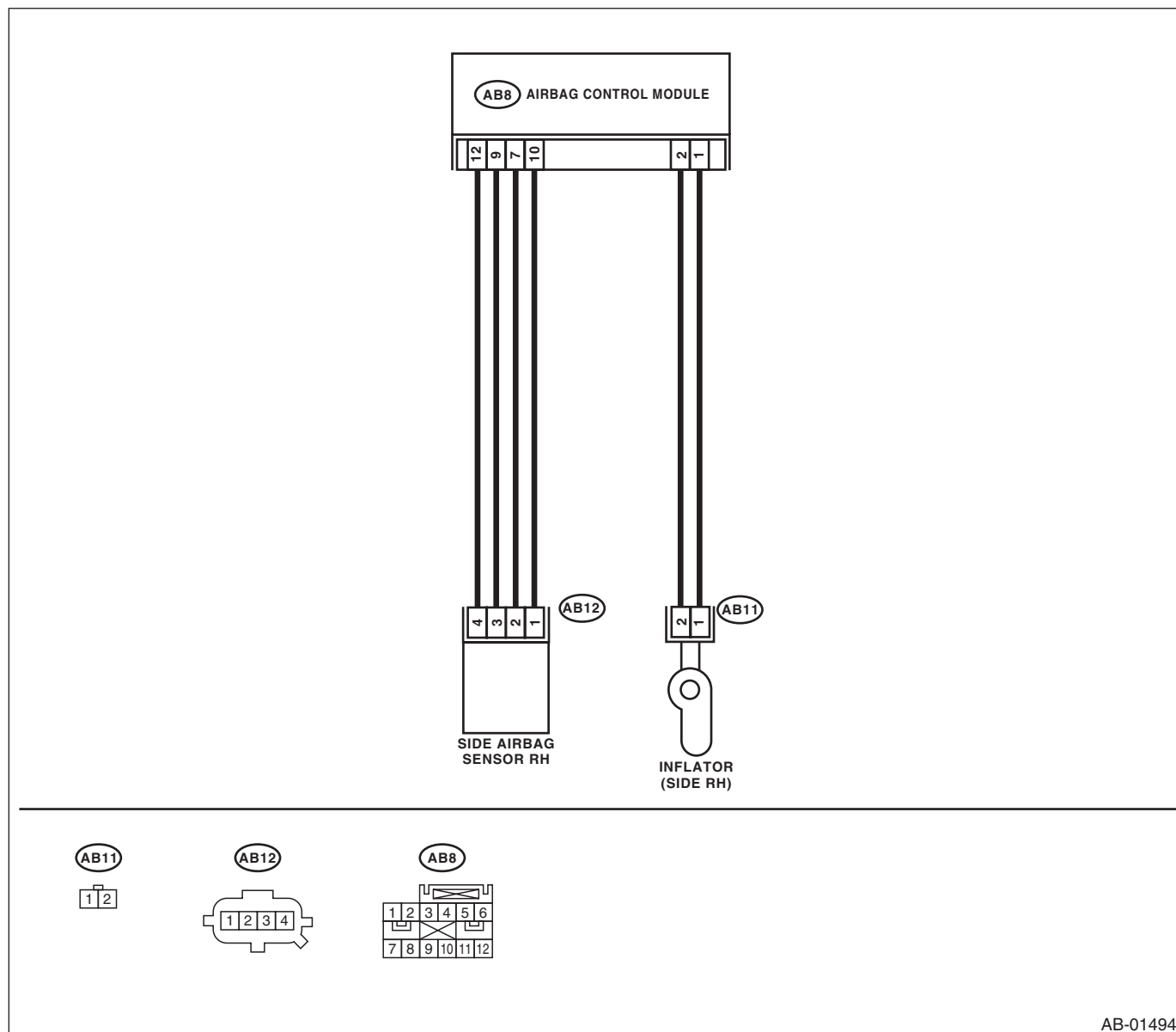
DTC DETECTING CONDITION:

- Side airbag harness is shorted to power supply.
- Side airbag module (RH) is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety.
- When inspecting the side airbag harness, disconnect the side airbag module connector, and seat belt pretensioner connector for safety.

WIRING DIAGRAM:



AB-01494

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module, side airbag module (RH) and the side airbag sensor (RH).	Is there poor contact?	Replace the airbag rear harness (RH) along with the body harness.	Go to step 2.
2 CHECK SIDE AIRBAG MODULE. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB11) from the side airbag module (RH), and connect the connector (1F) in test harness F to connector (AB11). 3) Connect airbag resistor to connector (3F) in the test harness F. 4) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the front seat along with side airbag module (RH). <Ref. to SE-7, Front Seat.>	Go to step 3.
3 CHECK SIDE AIRBAG HARNESS (RH). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB20) from the seat belt pretensioner (RH). 3) Disconnect the airbag resistor from test harness. 4) Disconnect connector (AB8) from airbag control module. 5) Connect connector (1R) in the test harness R to the connector (AB8). 6) Connect the battery ground terminal and turn the ignition switch to ON. 7) Measure the voltage between connector (3R) in the test harness R and chassis ground. Connector & terminal (3R) No. 18 (+) — Chassis ground (-): (3R) No. 20 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 4.	Replace the side airbag harness along with the body harness.
4 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 5.
5 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Z: DTC 46 SIDE AIRBAG LH FAILURE

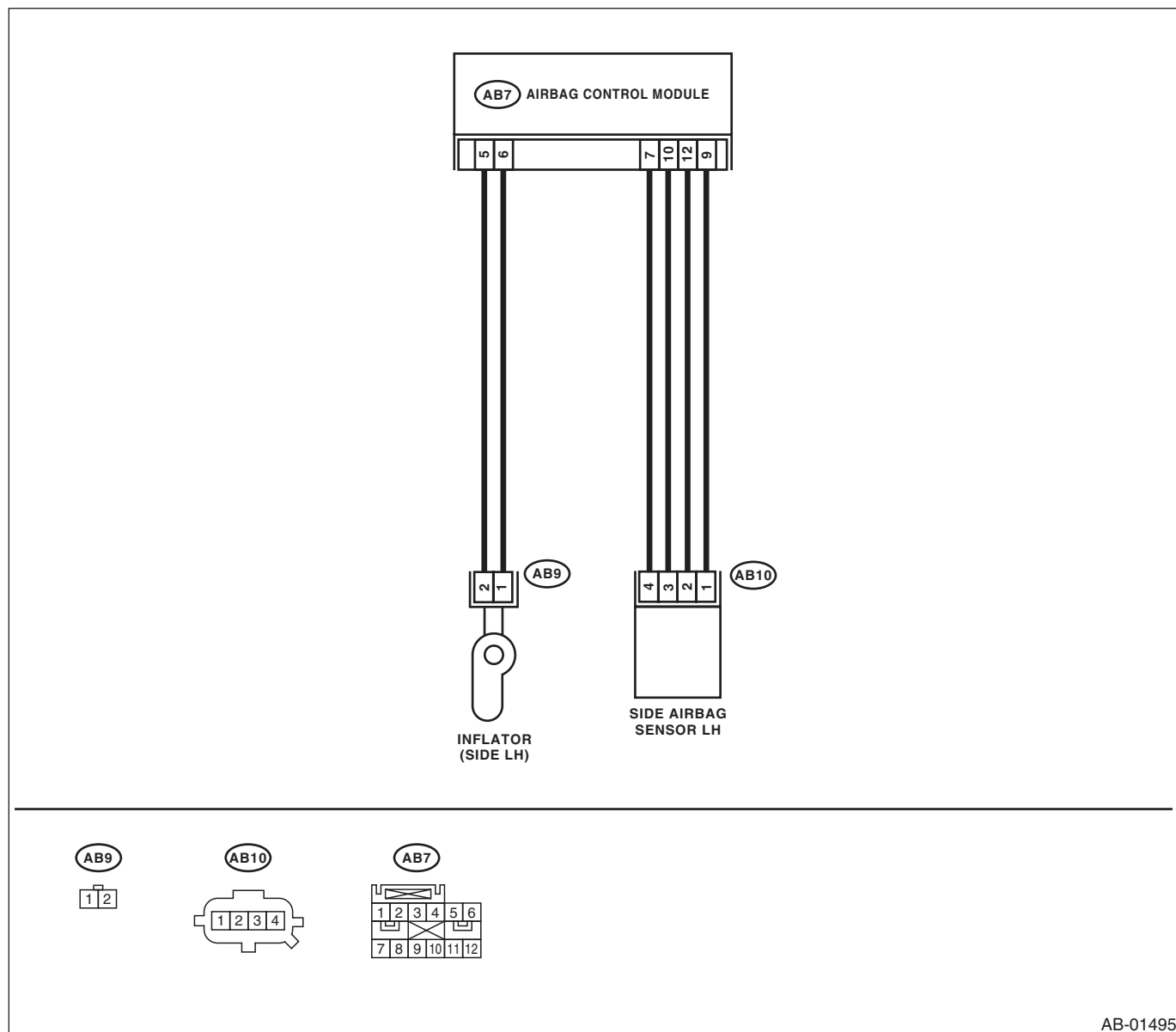
DTC DETECTING CONDITION:

- Side airbag harness is shorted to power supply.
- Side airbag module (LH) is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety.
- When inspecting the side airbag harness, disconnect the side airbag module connector, and seat belt pretensioner connector for safety.

WIRING DIAGRAM:



AB-01495

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module, side airbag module (LH) and the side airbag sensor (LH).	Is there poor contact?	Replace the airbag rear harness (LH) along with the body harness.	Go to step 2.
2 CHECK SIDE AIRBAG MODULE. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB9) from the side airbag module (LH), and connect the connector (1F) in test harness F to connector (AB9). 3) Connect airbag resistor to connector (3F) in the test harness F. 4) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the front seat along with side airbag module (LH). <Ref. to SE-7, Front Seat.>	Go to step 3.
3 CHECK SIDE AIRBAG HARNESS (LH). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB19) from the seat belt pretensioner (LH). 3) Disconnect the airbag resistor from test harness. 4) Disconnect connector (AB7) from airbag control module. 5) Connect connector (1R) in the test harness R to the connector (AB7). 6) Connect the battery ground terminal and turn the ignition switch to ON. 7) Measure the voltage between connector (3R) in the test harness R and chassis ground. Connector & terminal (3R) No. 10 (+) — Chassis ground (-): (3R) No. 12 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 4.	Replace the side airbag harness along with the body harness.
4 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 5.
5 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

AA:DTC 51 SIDE AIRBAG SENSOR RH FAILURE

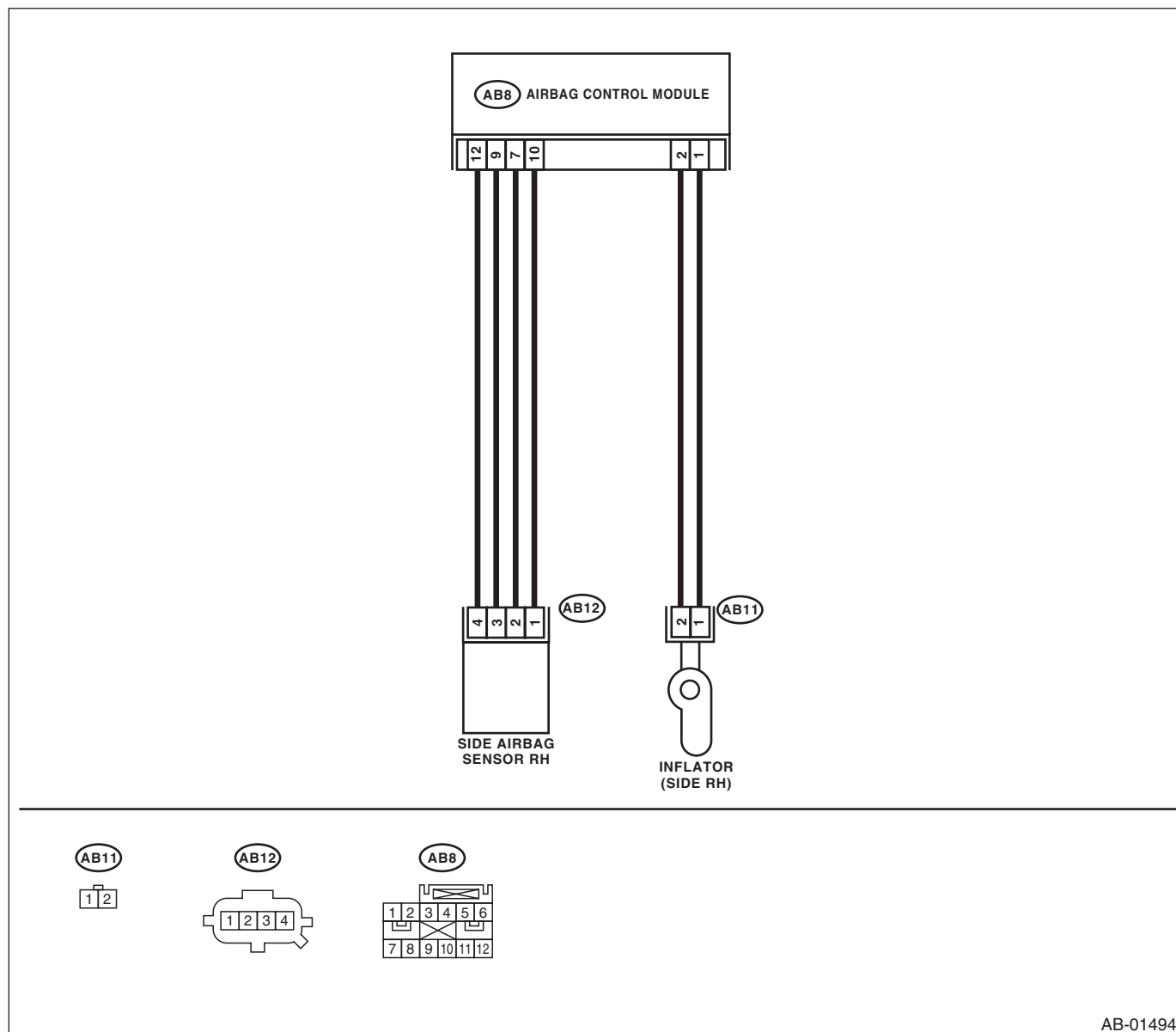
DTC DETECTING CONDITION:

- Side airbag sensor (RH) is faulty.
- Side airbag harness (RH) is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety.
- When inspecting the side airbag harness, disconnect the side airbag module connector, and seat belt pretensioner connector for safety.

WIRING DIAGRAM:



AB-01494

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module, side airbag module (RH) and the side airbag sensor (RH).	Is there poor contact?	Replace the airbag rear harness (RH) along with the body harness.	Go to step 2.
2 CHECK SIDE AIRBAG HARNESS (RH). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB20) from the seat belt pretensioner (RH). 3) Disconnect connector (AB11) from side airbag module (RH). 4) Disconnect connector (AB8) from airbag control module. 5) Connect connector (1R) in the test harness R to the connector (AB8). 6) Disconnect connector (AB12) from the side airbag sensor (RH), and connect connector (2V) in test harness V to connector (AB12). 7) Measure resistance between connector (4R) in the test harness R and connector (3V) in the test harness V. <i>Connector & terminal</i> (4R) No. 5 — (3V) No. 2: (4R) No. 6 — (3V) No. 4: (4R) No. 7 — (3V) No. 1: (4R) No. 8 — (3V) No. 5:	Is the resistance less than 10 Ω?	Go to step 3.	Replace the side airbag harness along with the body harness.
3 CHECK SIDE AIRBAG HARNESS. Measure resistance between connector (4R) in the test harness R, and the resistance between connector (4R) in the test harness R and chassis ground. <i>Connector & terminal</i> (4R) No. 5 — (4R) No. 7: (4R) No. 5 — (4R) No. 6: (4R) No. 5 — (4R) No. 8: (4R) No. 6 — (4R) No. 7: (4R) No. 6 — (4R) No. 8: (4R) No. 7 — (4R) No. 8: (4R) No. 5 — Chassis ground: (4R) No. 6 — Chassis ground: (4R) No. 7 — Chassis ground: (4R) No. 8 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 4.	Replace the side airbag harness along with the body harness.
4 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the side airbag sensor (RH). <Ref. to AB-19, Side Airbag Sensor.> Replace the airbag control module if not operating normally even after replacing the sensor. <Ref. to AB-18, Airbag Control Module.>	Go to step 5.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

	Step	Check	Yes	No
5	CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

AB:DTC 52 SIDE AIRBAG SENSOR LH FAILURE

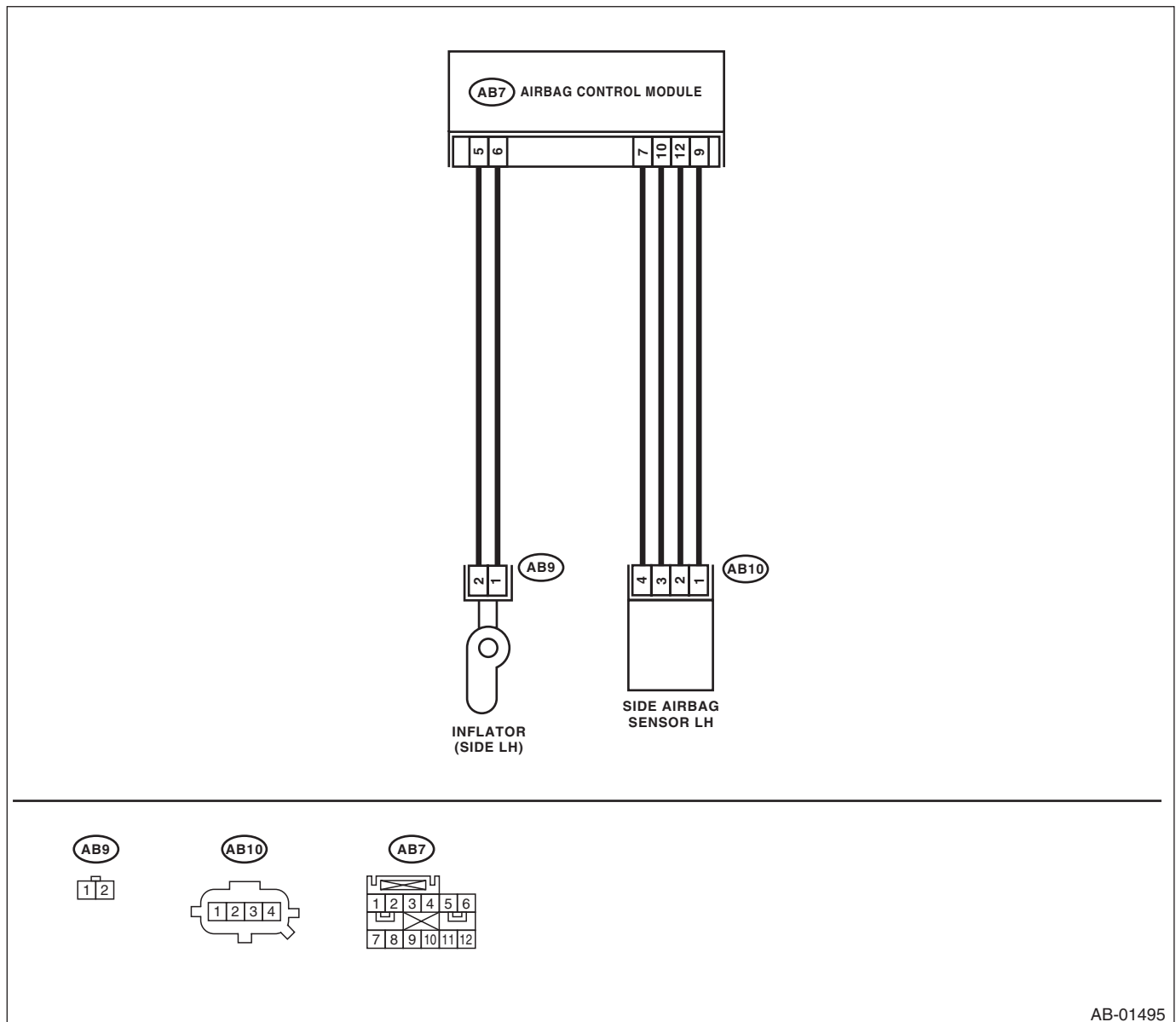
DTC DETECTING CONDITION:

- Side airbag sensor (LH) is faulty.
- Side airbag harness (LH) is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the driver's airbag module and passenger's airbag module connectors for safety.
- When inspecting the side airbag harness, disconnect the side airbag module connector, and seat belt pretensioner connector for safety.

WIRING DIAGRAM:



AB-01495

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module, side airbag module (LH) and the side airbag sensor (LH).	Is there poor contact?	Replace the airbag rear harness (LH) along with the body harness.	Go to step 2.
2 CHECK SIDE AIRBAG HARNESS (LH). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB19) from the seat belt pretensioner (LH). 3) Disconnect connector (AB9) from the side airbag module (LH). 4) Disconnect connector (AB7) from airbag control module. 5) Connect connector (1R) in the test harness R to the connector (AB7). 6) Disconnect connector (AB10) from the side airbag sensor (LH), and connect connector (2V) in test harness V to connector (AB10). 7) Measure resistance between connector (4R) in the test harness R and connector (3V) in the test harness V. Connector & terminal (4R) No. 4 — (3V) No. 2: (4R) No. 3 — (3V) No. 4: (4R) No. 2 — (3V) No. 1: (4R) No. 1 — (3V) No. 5:	Is the resistance less than 10 Ω?	Go to step 3.	Replace the side airbag harness along with the body harness.
3 CHECK SIDE AIRBAG HARNESS (LH). Measure resistance between connector (4R) in the test harness R, and the resistance between connector (4R) in the test harness R and chassis ground. Connector & terminal (4R) No. 4 — (4R) No. 3: (4R) No. 4 — (4R) No. 2: (4R) No. 4 — (4R) No. 1: (4R) No. 3 — (4R) No. 2: (4R) No. 3 — (4R) No. 1: (4R) No. 2 — (4R) No. 1: (4R) No. 4 — Chassis ground: (4R) No. 3 — Chassis ground: (4R) No. 2 — Chassis ground: (4R) No. 1 — Chassis ground:	Is the resistance 1 MΩ or more?	Go to step 4.	Replace the side airbag harness along with the body harness.
4 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the side airbag sensor (LH). <Ref. to AB-19, Side Airbag Sensor.> Replace the airbag control module if not operating normally even after replacing the sensor. <Ref. to AB-18, Airbag Control Module.>	Go to step 5.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

AC:DTC 53 SIDE AIRBAG SENSOR RH FAILURE

DTC DETECTING CONDITION:

Side airbag sensor (RH) is faulty.

If the code 53 is displayed, the circuit within the side airbag sensor (RH) is faulty. Replace the side airbag sensor (RH).

<Ref. to AB-19, Side Airbag Sensor.>

AD:DTC 54 SIDE AIRBAG SENSOR LH FAILURE

DTC DETECTING CONDITION:

Side airbag sensor (LH) is faulty.

If the code 54 is displayed, the circuit within the side airbag sensor (LH) is faulty. Replace the side airbag sensor (LH).

<Ref. to AB-19, Side Airbag Sensor.>

AE:DTC 55 SIDE CURTAIN AIRBAG FIRING OUTPUT

This code is indicated when the side airbag and pretensioner activates.

When this code is displayed, the memory cannot be cleared. Replace the following parts.

- Airbag Control Module <Ref. to AB-18, Airbag Control Module.>
- Front seat with side airbag module (Operating side)<Ref. to SE-7, Front Seat.>
- Side airbag sensor (Operating side) <Ref. to AB-19, Side Airbag Sensor.>
- Front outer seat belt with pretensioner (Operating side)<Ref. to SB-10, Front Seat Belt.>

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

AF:DTC 61 BELT PRETENSIONER RH FAILURE

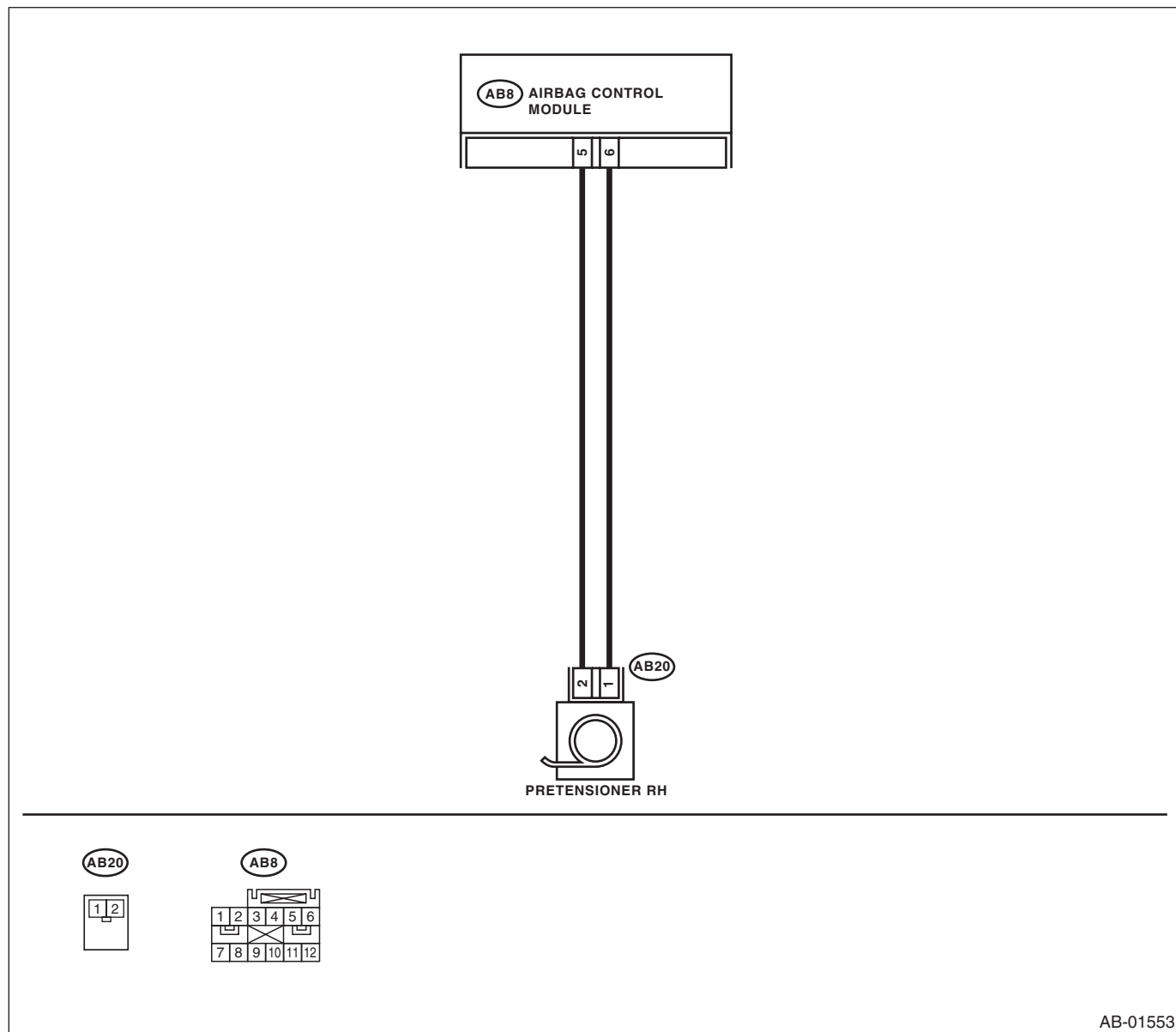
DTC DETECTING CONDITION:

- Seat belt pretensioner (RH) circuit is open, shorted or shorted to ground.
- Airbag control module is faulty.
- Pretensioner is faulty.
- Airbag harness is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the side airbag harness, disconnect the side airbag module connector, and seat belt pretensioner connector for safety.

WIRING DIAGRAM:



AB-01553

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module and the seat belt pretensioner (RH).	Is there poor contact?	Replace the airbag rear harness (RH) along with the body harness.	Go to step 2.
2 CHECK SEAT BELT PRETENSIONER. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB20) from the seat belt pretensioner (RH). 3) Connect connector (1N) in the test harness N to the connector (AB20). 4) Connect airbag resistor to connector (2N) in the test harness N. 5) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the seat belt pretensioner (RH). <Ref. to SB-10, Front Seat Belt.>	Go to step 3.
3 CHECK SIDE AIRBAG HARNESS (RH). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from test harness. 3) Disconnect connector (AB11) from side airbag module (RH). 4) Disconnect connectors (AB7) and (AB8) from airbag control module. 5) Connect connector (1R) in the test harness R to the connector (AB8). 6) Measure resistance between connector (3R) in the test harness R and connector (2N) in the test harness N. <i>Connector & terminal</i> <i>(3R) No. 17 — (2N) No. 1:</i> <i>(3R) No. 19 — (2N) No. 2:</i>	Is the resistance less than 10 Ω?	Go to step 4.	Replace the side airbag harness along with the body harness.
4 CHECK SIDE AIRBAG HARNESS (RH). Measure resistance between connector (3R) terminals in the test harness R. <i>Connector & terminal</i> <i>(3R) No. 17 — (3R) No. 19:</i>	Is the resistance 1 MΩ or more?	Go to step 5.	Replace the side airbag harness along with the body harness.
5 CHECK SIDE AIRBAG HARNESS (RH). Measure resistance between the connector (3R) in the test harness R and chassis ground. <i>Connector & terminal</i> <i>(3R) No. 17 — Chassis ground:</i> <i>(3R) No. 19 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 6.	Replace the side airbag harness along with the body harness.
6 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 7.
7 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

AG:DTC 62 BELT PRETENSIONER LH FAILURE

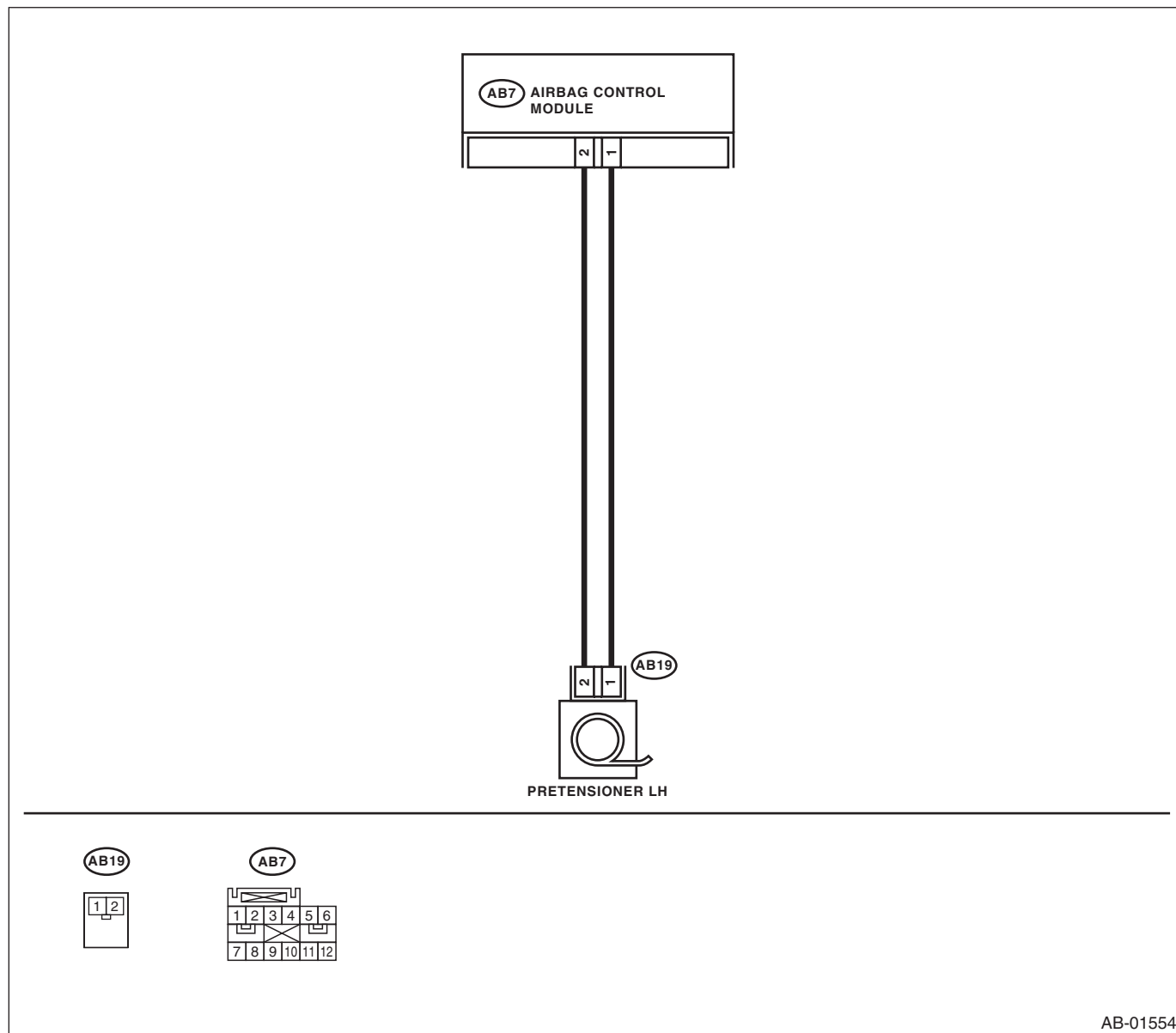
DTC DETECTING CONDITION:

- Seat belt pretensioner (LH) circuit is open, shorted or shorted to ground.
- Airbag control module is faulty.
- Pretensioner is faulty.
- Airbag harness is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the side airbag harness, disconnect the side airbag module connector, and seat belt pretensioner connector for safety.

WIRING DIAGRAM:



Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module and the seat belt pretensioner (LH).	Is there poor contact?	Replace the airbag rear harness (LH) along with the body harness.	Go to step 2.
2 CHECK SEAT BELT PRETENSIONER. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB19) from the seat belt pretensioner (LH). 3) Connect connector (1N) in the test harness N to the connector (AB19). 4) Connect airbag resistor to connector (2N) in the test harness N. 5) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the seat belt pretensioner (LH). <Ref. to SB-10, Front Seat Belt.>	Go to step 3.
3 CHECK SIDE AIRBAG HARNESS (LH). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from test harness. 3) Disconnect connector (AB9) from the side airbag module (LH). 4) Disconnect connectors (AB7) and (AB8) from airbag control module. 5) Connect connector (1R) in the test harness R to the connector (AB7). 6) Measure resistance between connector (3R) in the test harness R and connector (2N) in the test harness N. <i>Connector & terminal</i> <i>(3R) No. 11 — (2N) No. 1:</i> <i>(3R) No. 13 — (2N) No. 2:</i>	Is the resistance less than 10 Ω?	Go to step 4.	Replace the side airbag harness along with the body harness.
4 CHECK SIDE AIRBAG HARNESS (LH). Measure resistance between connector (3R) terminals in the test harness R. <i>Connector & terminal</i> <i>(3R) No. 11 — (3R) No. 13:</i>	Is the resistance 1 MΩ or more?	Go to step 5.	Replace the side airbag harness along with the body harness.
5 CHECK SIDE AIRBAG HARNESS (LH). Measure resistance between the connector (3R) in the test harness R and chassis ground. <i>Connector & terminal</i> <i>(3R) No. 11 — Chassis ground:</i> <i>(3R) No. 13 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 6.	Replace the side airbag harness along with the body harness.
6 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 7.
7 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using “List of Diagnostic Trouble Code (DTC)”. <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

AH:DTC 65 BELT PRETENSIONER RH FAILURE

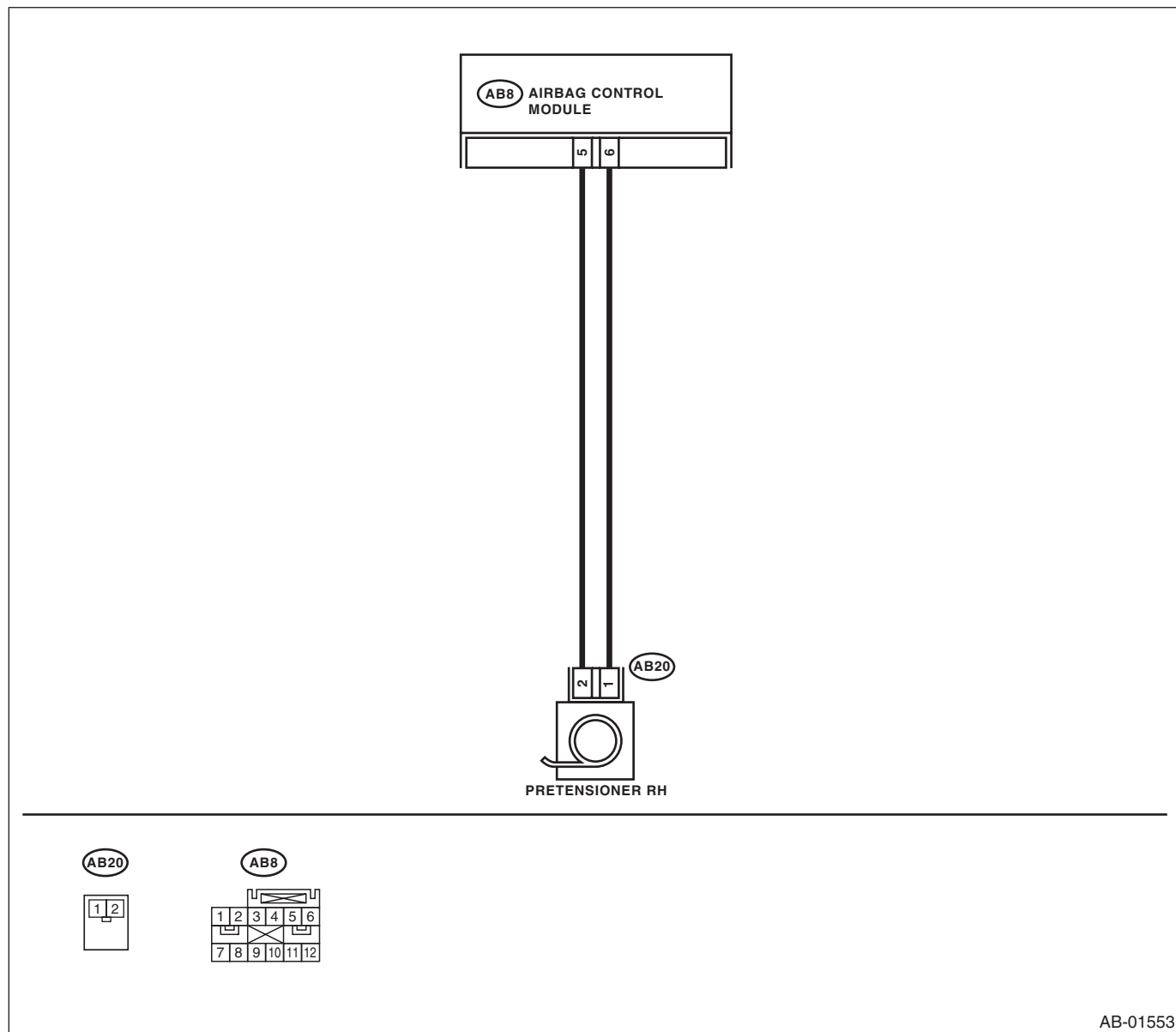
DTC DETECTING CONDITION:

- Seat belt pretensioner (RH) circuit is shorted to power supply.
- Pretensioner is faulty.
- Airbag harness is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the side airbag harness, disconnect the side airbag module connector, and seat belt pretensioner connector for safety.

WIRING DIAGRAM:



AB-01553

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module and the seat belt pretensioner (RH).	Is there poor contact?	Replace the airbag rear harness (RH) along with the body harness.	Go to step 2.
2 CHECK SEAT BELT PRETENSIONER. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB20) from the seat belt pretensioner (RH). 3) Connect connector (1N) in the test harness N to the connector (AB20). 4) Connect airbag resistor to connector (2N) in the test harness N. 5) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the seat belt pretensioner (RH). <Ref. to SB-10, Front Seat Belt.>	Go to step 3.
3 CHECK SIDE AIRBAG HARNESS (RH). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from test harness. 3) Disconnect connector (AB11) from side airbag module (RH). 4) Disconnect connectors (AB7) and (AB8) from airbag control module. 5) Connect connector (1R) in the test harness R to the connector (AB8). 6) Connect the battery ground terminal and turn the ignition switch to ON. 7) Measure the voltage between connector (3R) in the test harness R and chassis ground. Connector & terminal (3R) No. 17 (+) — Chassis ground (-): (3R) No. 19 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 4.	Replace the side airbag harness along with the body harness.
4 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 5.
5 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

AI: DTC 66 BELT PRETENSIONER LH FAILURE

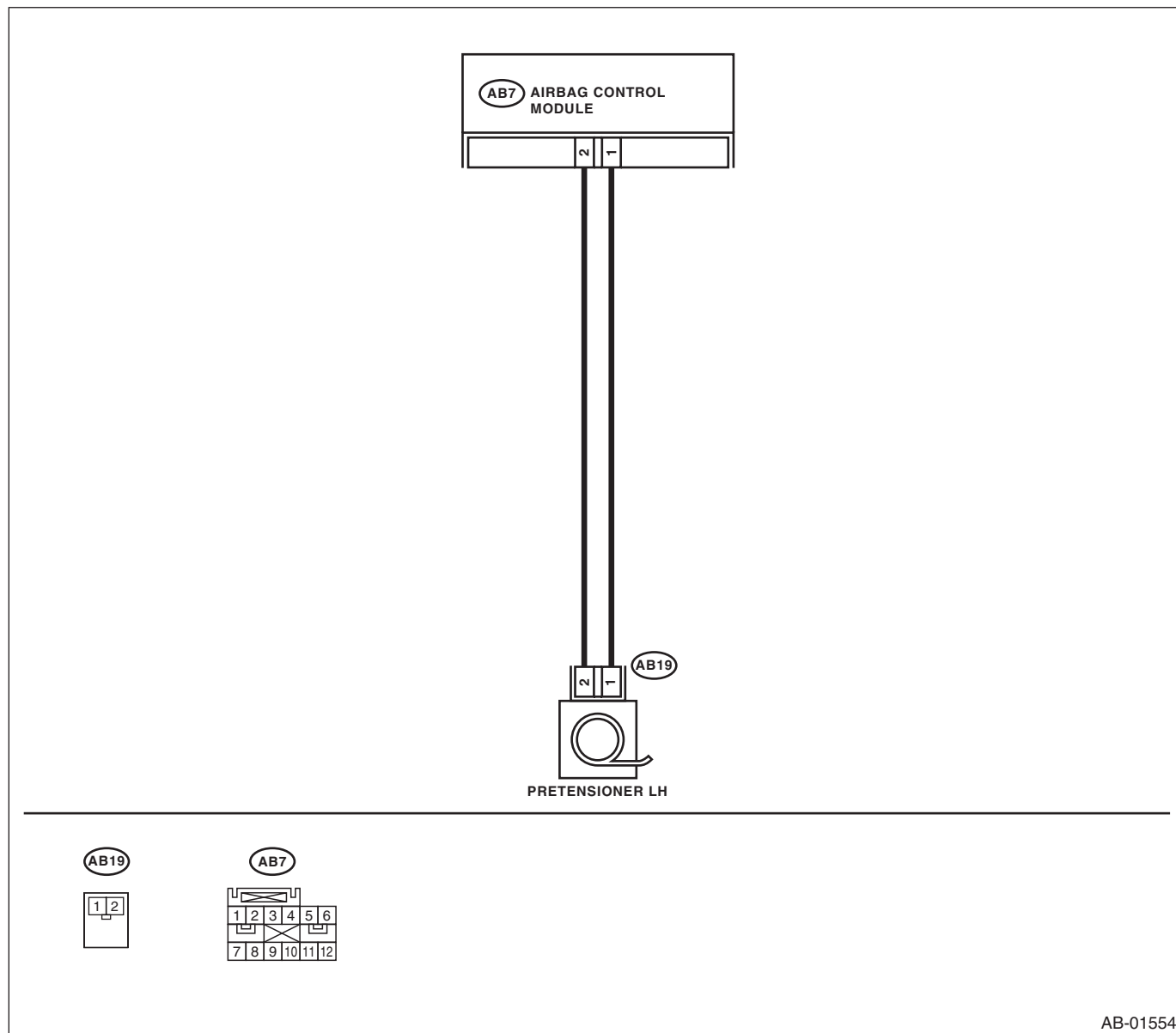
DTC DETECTING CONDITION:

- Seat belt pretensioner (LH) circuit is shorted to power supply.
- Pretensioner is faulty.
- Airbag harness is faulty.
- Airbag control module is faulty.

CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the side airbag harness, disconnect the side airbag module connector, and seat belt pretensioner connector for safety.

WIRING DIAGRAM:



Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module and the seat belt pretensioner (LH).	Is there poor contact?	Replace the airbag rear harness (LH) along with the body harness.	Go to step 2.
2 CHECK SEAT BELT PRETENSIONER. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the connector (AB19) from the seat belt pretensioner (LH). 3) Connect connector (1N) in the test harness N to the connector (AB19). 4) Connect airbag resistor to connector (2N) in the test harness N. 5) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the seat belt pretensioner (LH). <Ref. to SB-10, Front Seat Belt.>	Go to step 3.
3 CHECK SIDE AIRBAG HARNESS (LH). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from test harness. 3) Disconnect connector (AB9) from the side airbag module (LH). 4) Disconnect connectors (AB7) and (AB8) from airbag control module. 5) Connect connector (1R) in the test harness R to the connector (AB7). 6) Connect the battery ground terminal and turn the ignition switch to ON. 7) Measure the voltage between connector (3R) in the test harness R and chassis ground. Connector & terminal (3R) No. 11 (+) — Chassis ground (-): (3R) No. 13 (+) — Chassis ground (-):	Is the voltage less than 1 V?	Go to step 4.	Replace the side airbag harness along with the body harness.
4 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 5.
5 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

AJ:DTC 71 DRIVER'S AIRBAG FAILURE

DTC DETECTING CONDITION:

- Airbag main harness circuit is open, shorted or shorted to ground.
- Airbag module harness (driver's side) circuit is open, shorted or shorted to ground.
- Roll connector circuit is open, shorted or shorted to ground.
- Driver's airbag module is faulty.
- Airbag control module is faulty.

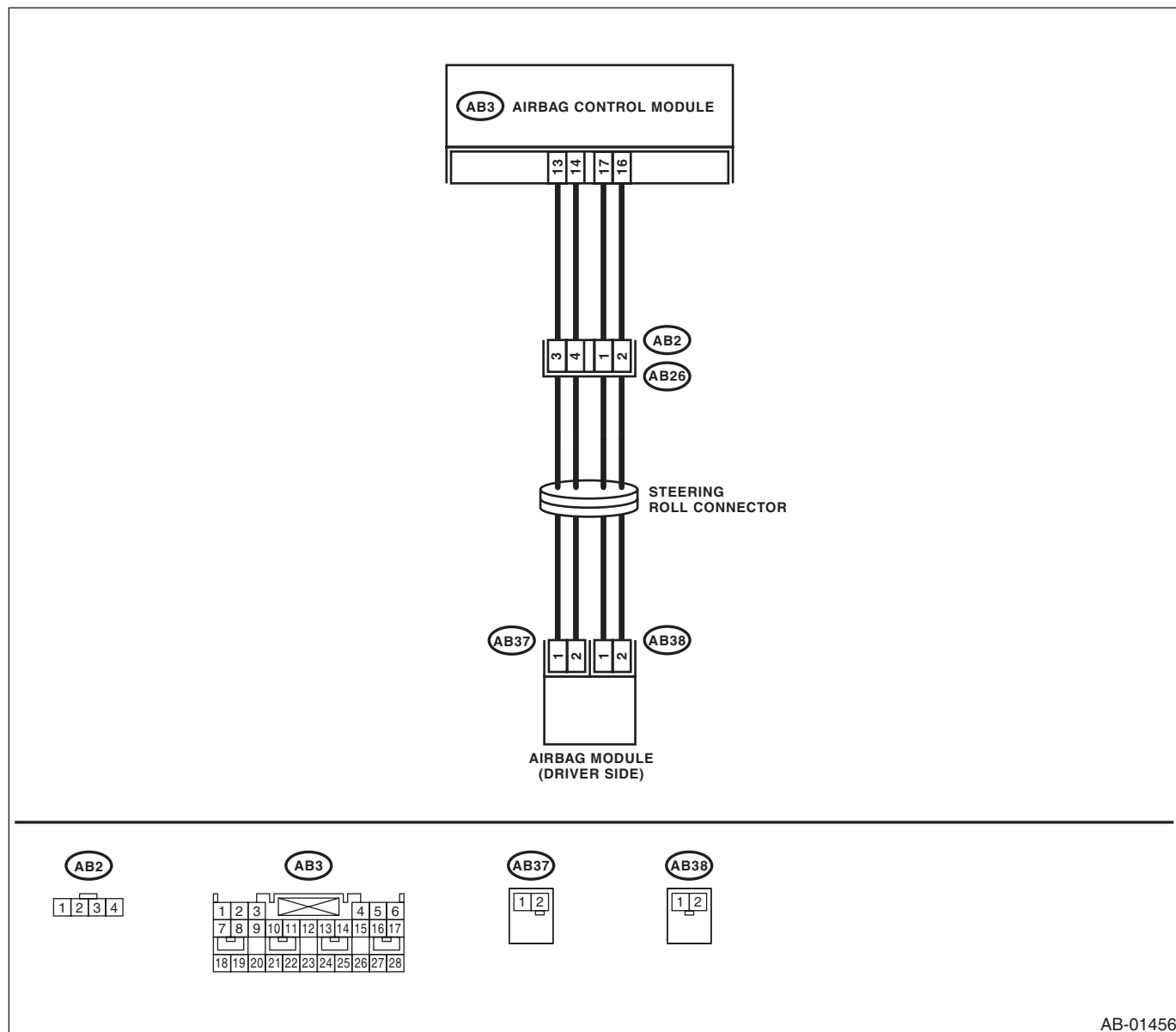
CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When replacing the airbag module, seat belt pretensioner, roll connector, control module and sensor, reconnect each part and check that the warning light operates properly.
- When inspecting the airbag main harness, disconnect the airbag module connectors and seat belt pretensioner of the driver's and passenger's seats for safety.

NOTE:

Prior to starting diagnosis, prepare two airbag resistors (98299PA040).

WIRING DIAGRAM:



AB-01456

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the airbag control module and the driver's airbag module.	Is there poor contact?	Replace the airbag main harness along with the body harness.	Go to step 2.
2 CHECK DRIVER'S AIRBAG MODULE. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Remove the driver's airbag module. 3) Connect connector (1N) in the test harness N to the connector (AB38). 4) Connect the airbag resistor to the connector (2N) in the test harness N. 5) Connector (1Q) in the test harness Q to connector (AB37). 6) Connect the airbag resistor to the connector (2Q) in the test harness Q. 7) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the driver's airbag module. <Ref. to AB-14, Driver's Airbag Module.>	Go to step 3.
3 CHECK ROLL CONNECTOR. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the test harness N from connector (AB38). 3) Disconnect the test harness Q from connector (AB37). 4) Remove the instrument panel lower cover, disconnect the connector (AB26) from (AB2). 5) Connect the connector (1P) in the test harness P to connector (AB2). 6) Connect the airbag resistor to the connectors (2P) and (3P) in the test harness P. 7) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds then turn off?	Replace the roll connector. <Ref. to AB-20, Roll Connector.>	Go to step 4.
4 CHECK AIRBAG MAIN HARNESS (DRIVER'S AIRBAG HARNESS). 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the airbag resistor from the connectors (2P) and (3P) in the test harness P. 3) Disconnect the connectors (AB27) and (AB4) of the passenger's airbag module. 4) Disconnect the connector (AB3) from airbag control module, and connect the connector (1R) in the test harness R. 5) Measure resistance between connector (2R) in the test harness R and connector (2P) and (3P) in the test harness P. Connector & terminal (2R) No. 2 — (2P) No. 1: (2R) No. 4 — (2P) No. 2: (2R) No. 8 — (3P) No. 3: (2R) No. 12 — (3P) No. 4:	Is the resistance less than 10 Ω ?	Go to step 5.	Replace the airbag main harness along with the body harness.

Diagnostic Chart with Trouble Code

AIRBAG SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK AIRBAG MAIN HARNESS (DRIVER'S AIRBAG HARNESS). Measure resistance between connector (2R) in the test harness R and chassis ground. <i>Connector & terminal</i> <i>(2R) No. 2 — (2P) No. 4:</i> <i>(2R) No. 4 — Chassis ground:</i> <i>(2R) No. 2 — Chassis ground:</i> <i>(2R) No. 8 — (2P) No. 12:</i> <i>(2R) No. 8 — Chassis ground:</i> <i>(2R) No. 12 — Chassis ground:</i>	Is the resistance 1 MΩ or more?	Go to step 6.	Replace the airbag main harness along with the body harness.
6 CHECK AIRBAG CONTROL MODULE. 1) Connect all the connectors. 2) Erase the memory. 3) Perform the Inspection Mode. 4) Read the DTC.	Is the same DTC displayed?	Replace the airbag control module. <Ref. to AB-18, Airbag Control Module.>	Go to step 7.
7 CHECK ANY OTHER DTC ON DISPLAY.	Is any other DTC displayed?	Check DTC using "List of Diagnostic Trouble Code (DTC)". <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

Diagnostic Chart with Trouble Code

AK:DTC 72 PASSENGER'S AIRBAG FAILURE

DTC DETECTING CONDITION:

- Airbag harness circuit is open, shorted or shorted to ground.
- Airbag module (passenger's side) circuit is open, shorted or shorted to ground.
- Passenger's airbag module is faulty.
- Airbag control module is faulty.

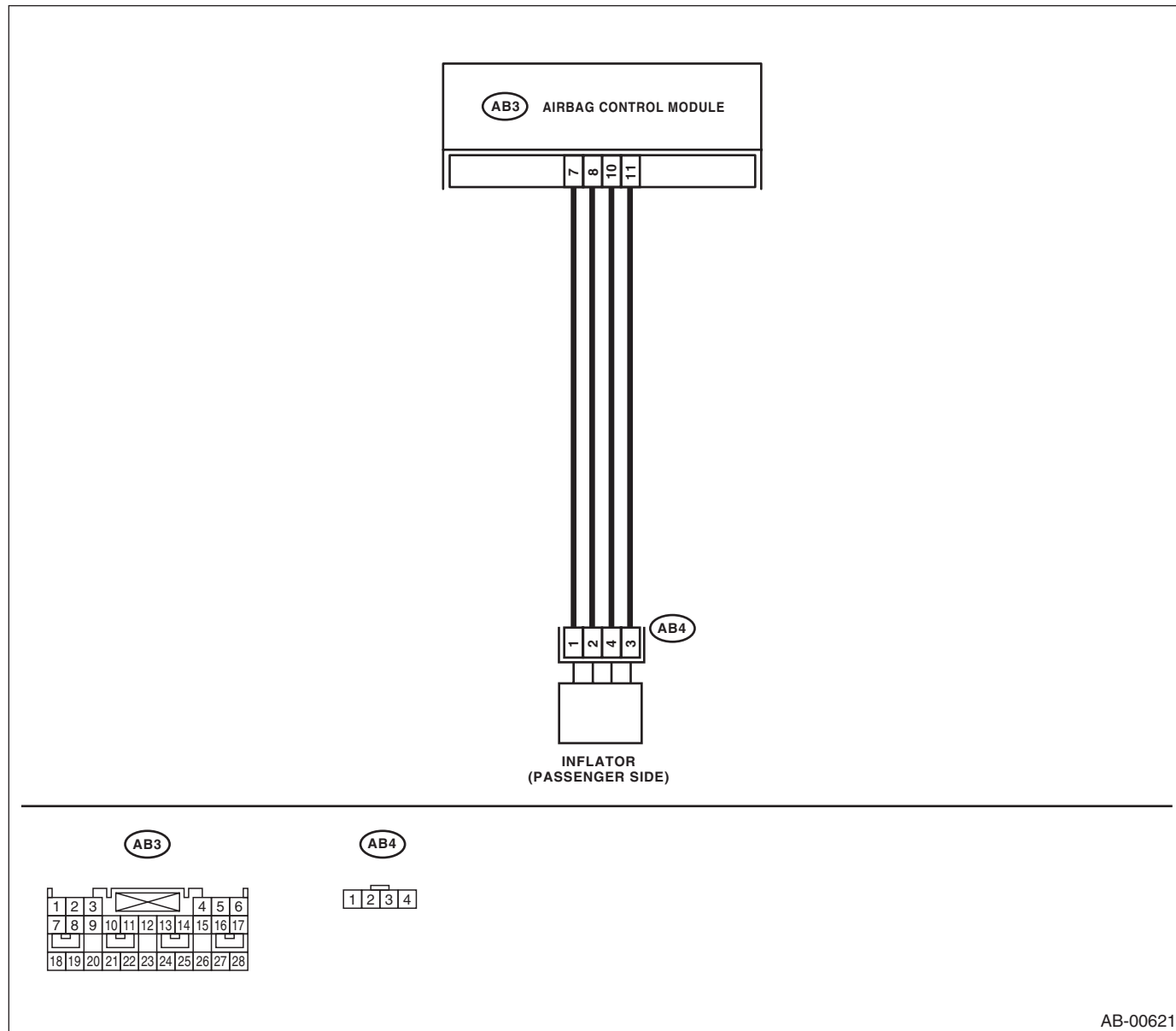
CAUTION:

- Before diagnosing the airbag system, be sure to turn the ignition switch to OFF, disconnect the ground terminal from battery, and wait more than 20 seconds before starting to work.
- When inspecting the airbag main harness, disconnect the airbag modules of the driver's and the passenger's seats for safety.

NOTE:

Before diagnosing, prepare the two airbag resistors (98299PA040).

WIRING DIAGRAM:



Basic Diagnostic Procedure

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Check	Yes	No
1	CHECK WARNING LIGHT. Check whether the airbag warning light in combination meter illuminates.	Does the airbag warning light illuminate?	Go to step 2.	Perform the diagnosis according to DTC.
2	CHECK INDICATION OF DTC. 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to the data link connector. 3) Turn the ignition switch to ON and run the Subaru Select Monitor. 4) Read the DTC. <Ref. to OD(diag)-19, OPERATION, Read Diagnostic Trouble Code (DTC).> NOTE: If the communication function of the Subaru Select Monitor cannot be executed normally, check the communication circuit. <Ref. to OD(diag)-18, COMMUNICATION FOR INITIALIZING IMPOSSIBLE, INSPECTION, Subaru Select Monitor.> 5) Record all DTCs and freeze frame data.	Is DTC displayed?	Go to step 3.	<Ref. to AB(diag)-37, Airbag Warning Light Failure.> Go to "Airbag Warning Light Failure".
3	PERFORM DIAGNOSIS. 1) Judge the possible cause from "List of Diagnostic Trouble Code" <Ref. to OD(diag)-24, List of Diagnostic Trouble Code (DTC).> 2) Inspect the DTC using "Chart of Diagnostic Trouble Code (DTC)". 3) Correct the cause of trouble. 4) Perform the Clear Memory Mode. <Ref. to OD(diag)-21, OPERATION, Clear Memory Mode.> 5) Perform the Inspection Mode. <Ref. to OD(diag)-20, PROCEDURE, Inspection Mode.> 6) Read any other DTCs displayed.	Is DTC displayed?	Perform the procedure 1) to 5) in step 3.	Finish the diagnosis.

General Description

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

2. General Description

A: CAUTION

1) If the seat cushion cover is removed or replaced, make sure to perform occupant detection system adjustment after installing the seat to the vehicle. <Ref. to OD(diag)-17, SYSTEM CALIBRATION (REZEROING), OPERATION, Subaru Select Monitor.>

Failure to do so may cause improper operation of the occupant detection system.

2) As the occupant detection control module and the occupant detection sensor of occupant detection system (passenger's seat only) is securely fixed to the seat cushion frame, never remove the occupant detection control module and pressure sensor from the seat cushion frame.

3) Do not replace the seat cushion pad by itself. Be sure to replace the seat cushion pad & frame assembly as a unit. The seat cushion pad and cushion frame are adjusted as a set at the time of manufacture. If parts from other vehicles or cushion pad and cushion frame of other set is used, the occupant detection system will not function properly.

4) If the seat cushion cover is removed, always replace the wires of the seat cushion cover with new wires.

5) Never connect the battery in reverse polarity. Failure to do so may immediately damage the occupant detection system.

6) Do not disconnect the battery terminals while the engine is running. A large counter electromotive force will be generated in the generator, and this voltage may damage electronic parts such as occupant detection control module etc.

7) Before disconnecting the connectors of each sensor and control module, be sure to turn the ignition switch to OFF and wait for 20 seconds or more. Occupant detection control module may be damaged.

8) Every part relating to occupant detection system is a precision part. Do not drop them.

CAUTION:

- **The connectors of airbag system are yellow. Do not use the electrical test equipment on these circuits.**

- **Be careful not to damage the airbag system wiring harness when servicing the occupant detection system.**

- **Refer to cautions on airbag system when repairing occupant detection system. <Ref. to AB-4, CAUTION, General Description.>**

B: INSPECTION

Measure the battery voltage and specific gravity of electrolyte, and check the electrolyte amount.

Standard voltage: 12 V or more

Specific gravity: 1.260 or more

Electrolyte: between the upper level and lower level

General Description

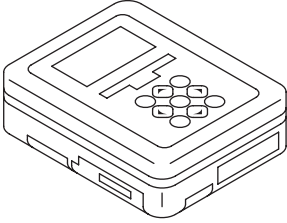
OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

C: PREPARATION TOOL

CAUTION:

To measure the voltage and resistance of airbag system component and occupant detection system component, be sure to use the specified test harness.

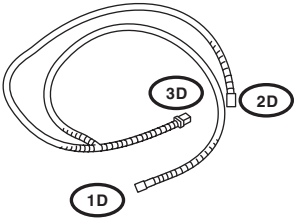
1. SPECIAL TOOL

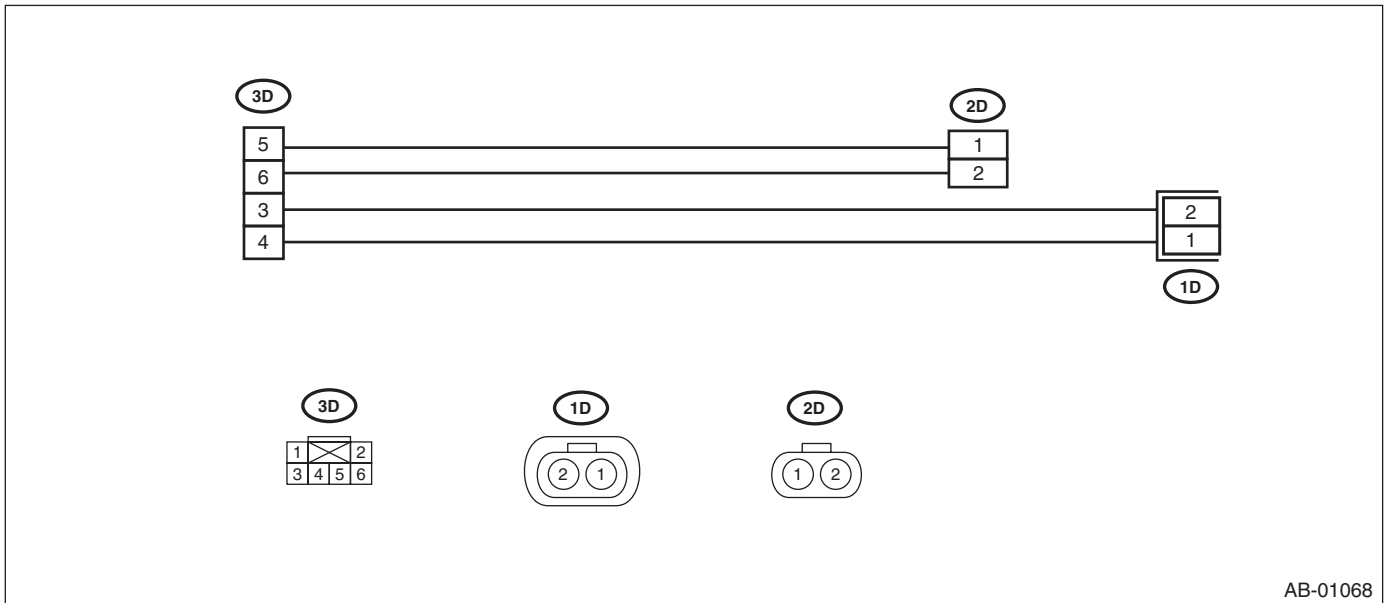
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B020XU0	1B020XU0	SUBARU SELECT MONITOR KIT	Used for troubleshooting the electrical system.

General Description

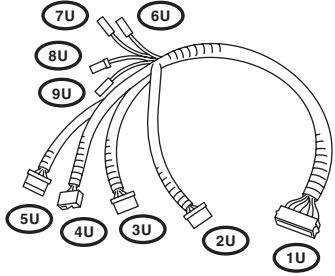
OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

TEST HARNESS D

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST98299AG060</p>	98299AG060	TEST HARNESS D	Used when measuring voltage and resistance of front seat belt buckle switch.

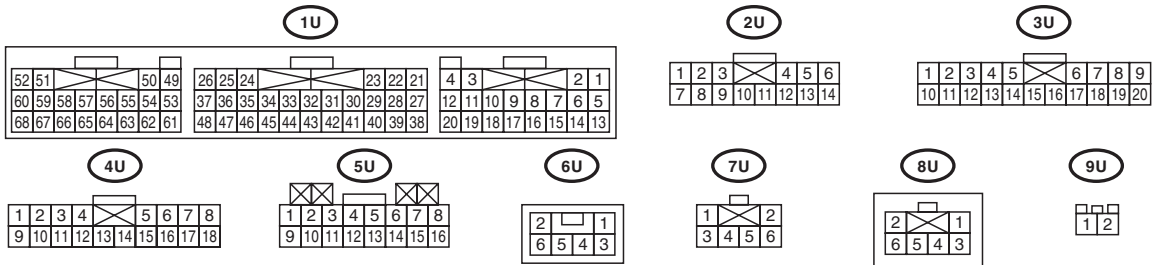
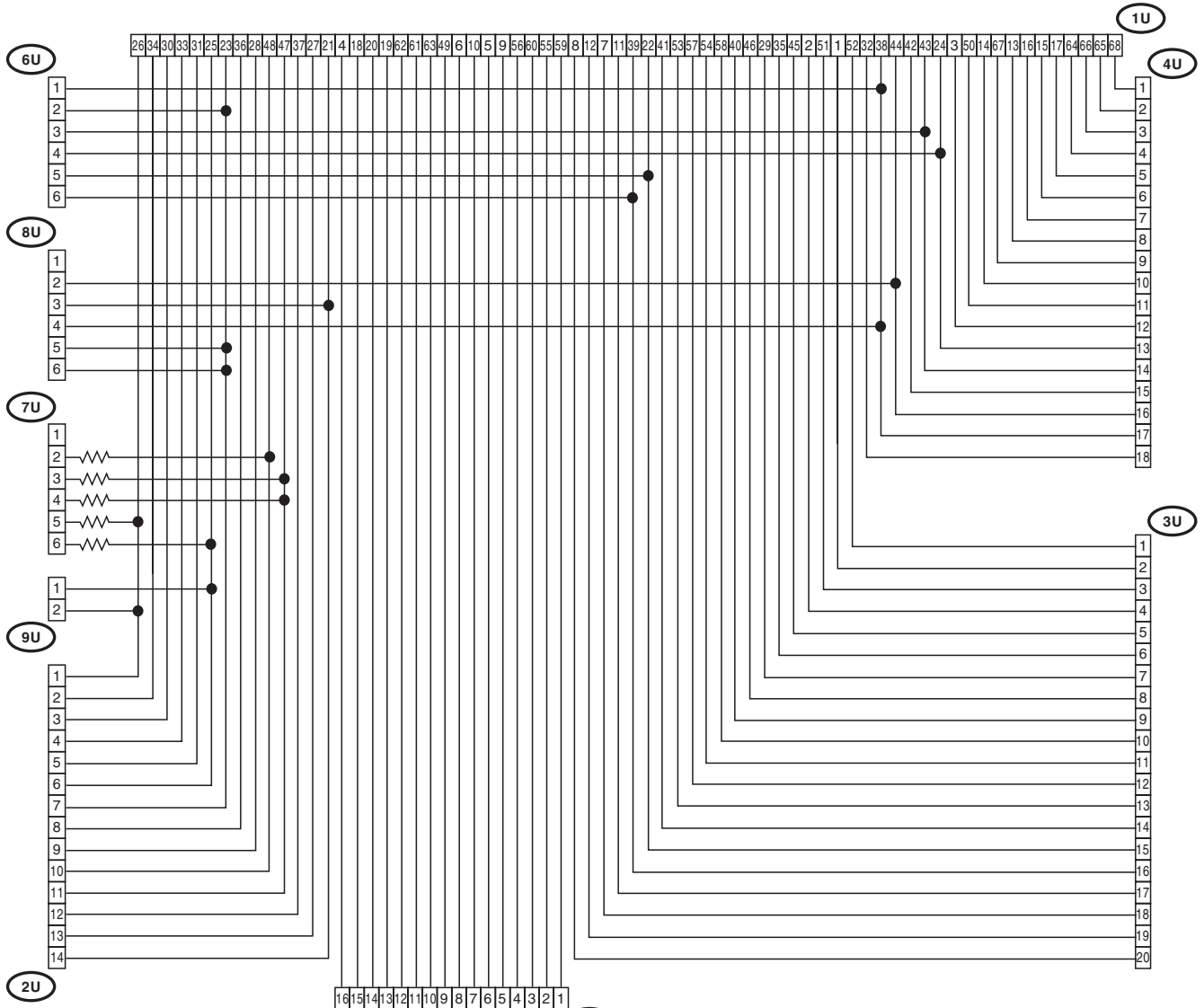


TEST HARNESS U

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST98299AG000</p>	98299AG000	TEST HARNESS U	Used when measuring voltage and resistance of airbag control module.

General Description

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

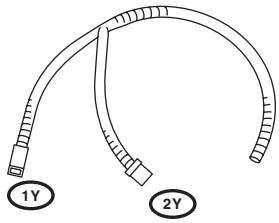


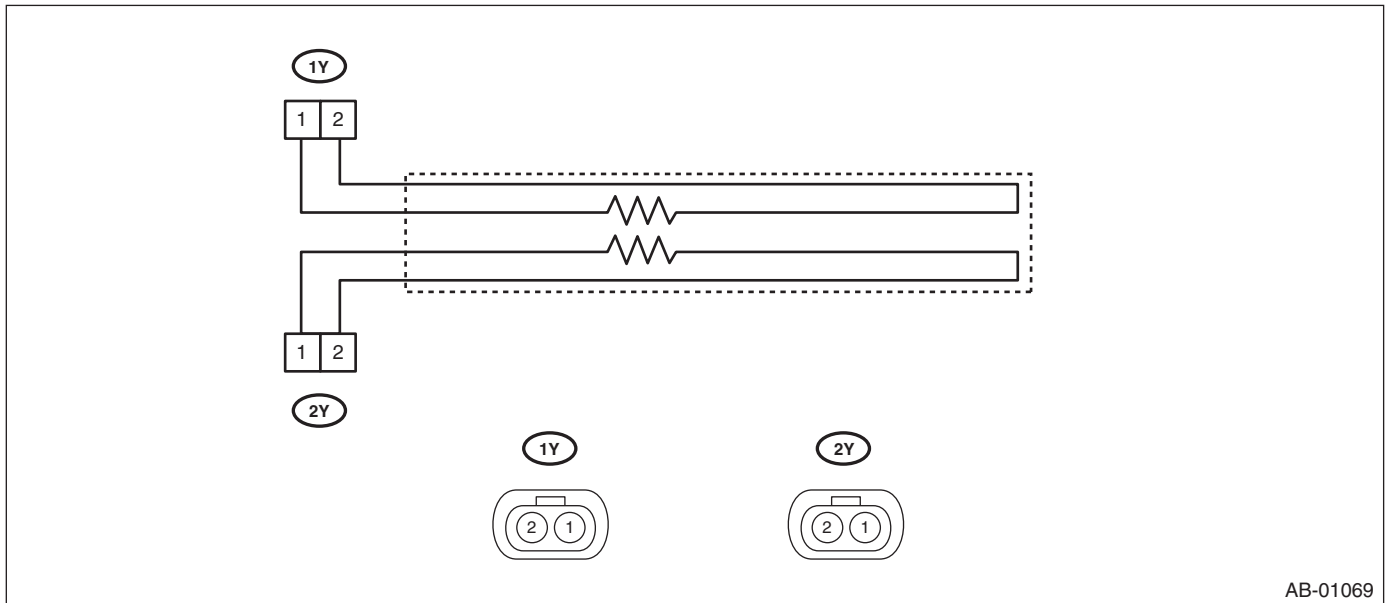
AB-00930

General Description

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

TEST HARNESS Y

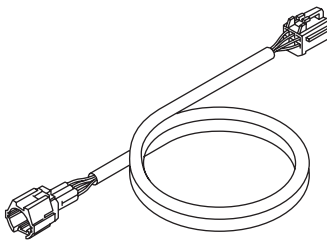
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST98299AG040</p>	98299AG040	TEST HARNESS Y	Used for diagnosing seat belt buckle switch.

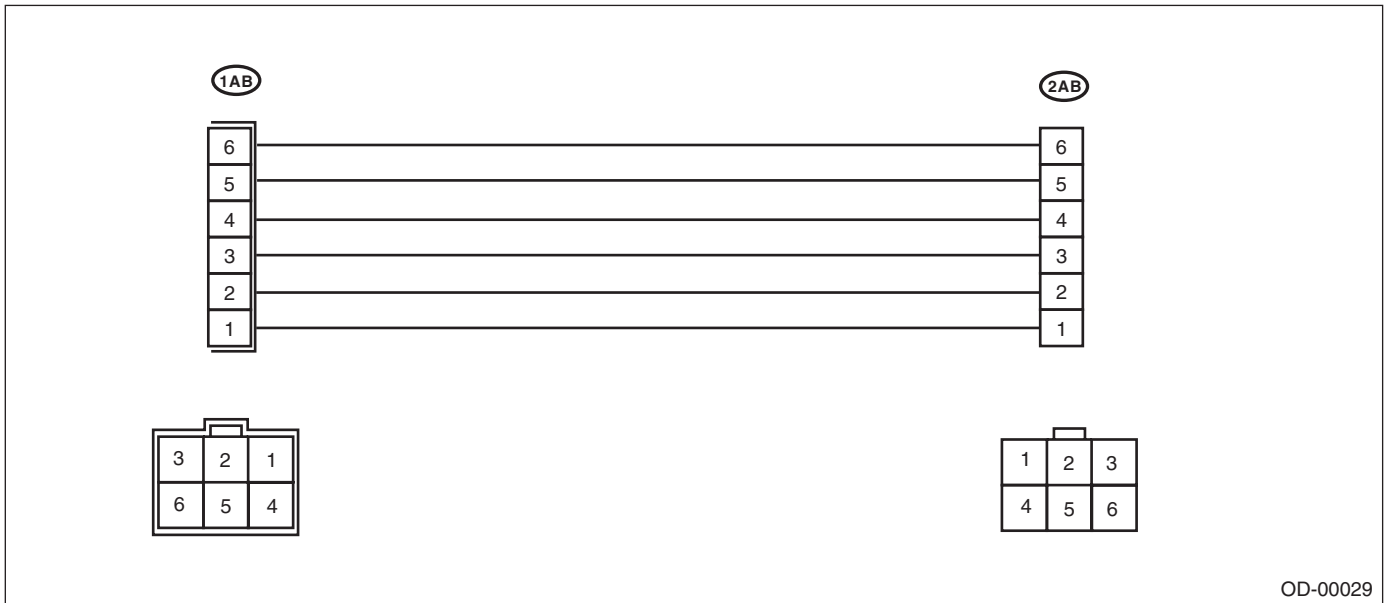


General Description

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

TEST HARNESS AB

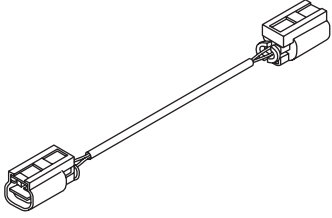
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center;">ST98299XA000</p>	98299XA000	TEST HARNESS AB	Used when measuring voltage and resistance of occupant detection system.

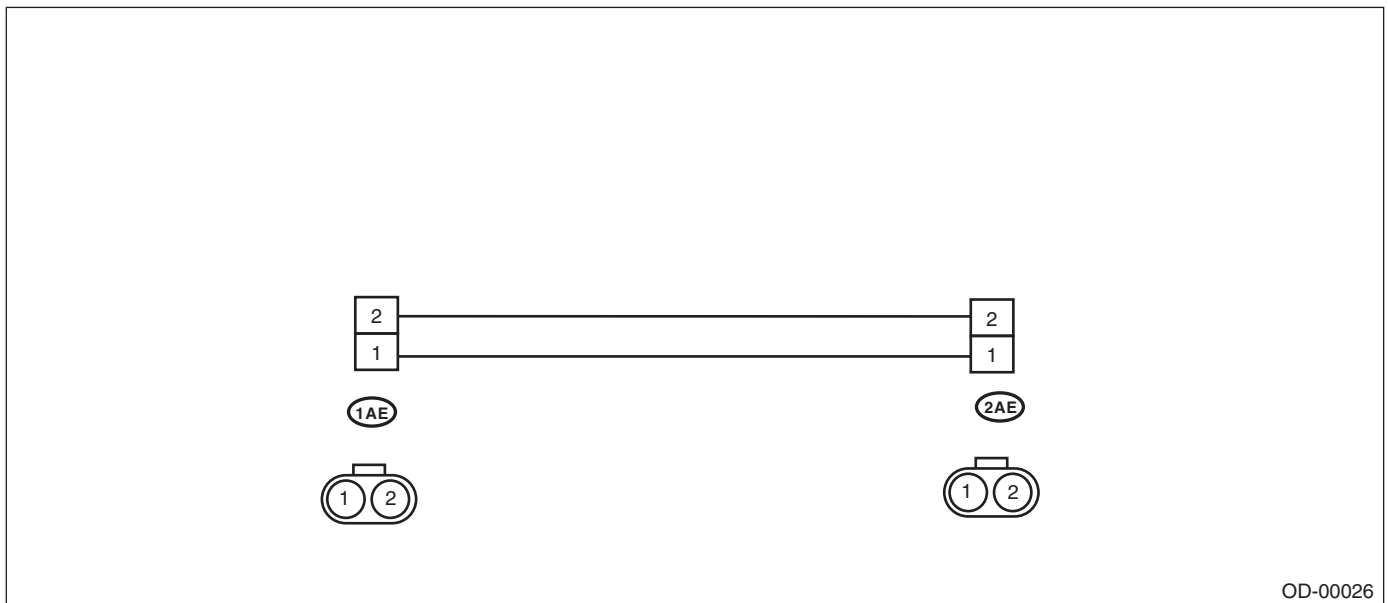


General Description

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

TEST HARNESS AE

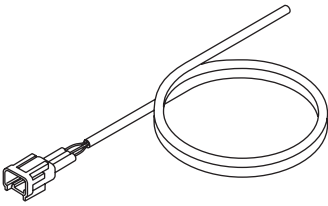
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299XA030	98299XA030	TEST HARNESS AE	Adapter harness of TEST HARNESS Y Used for diagnosing seat belt buckle switch.

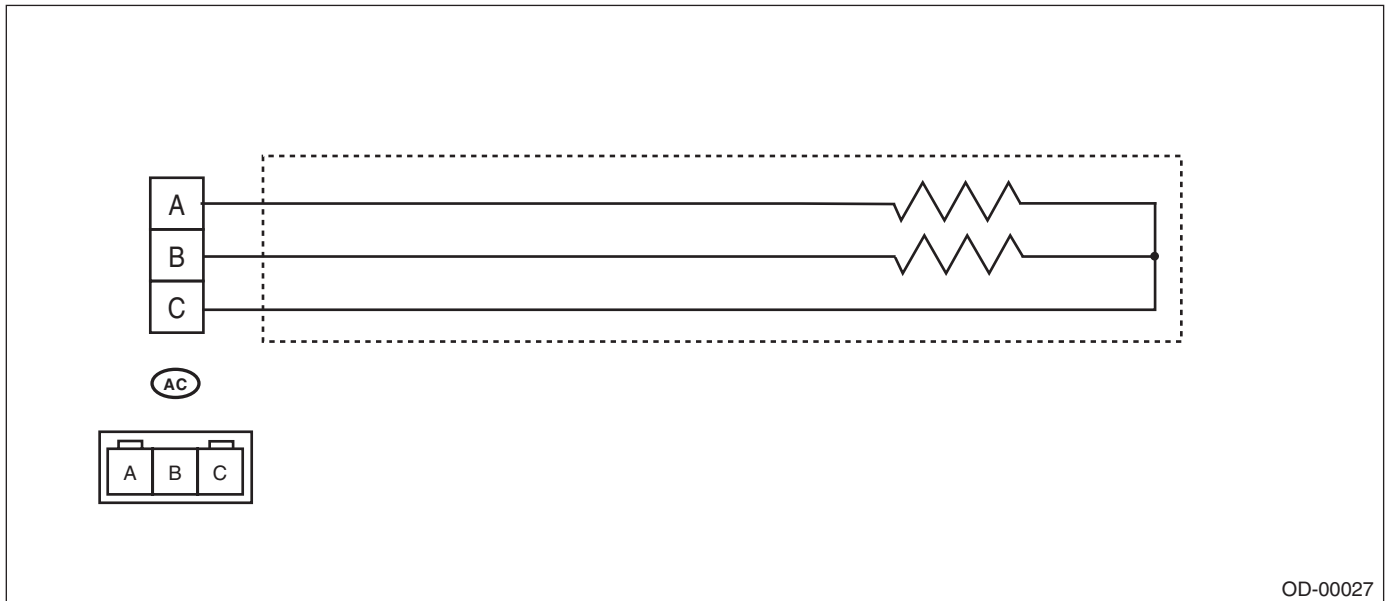


General Description

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

TEST HARNESS AC

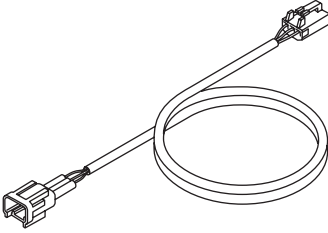
ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST98299XA010	98299XA010	TEST HARNESS AC	Used for diagnosing seat belt tension sensor.

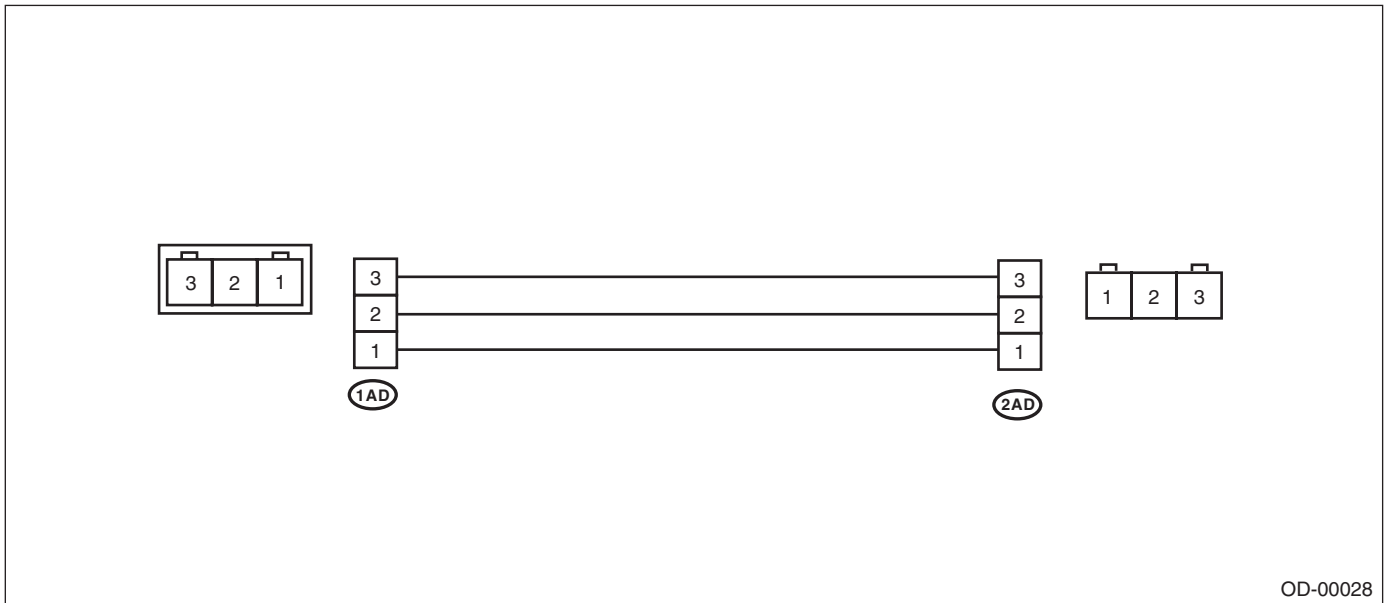


General Description

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

TEST HARNESS AD

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST98299XA020</p>	98299XA020	TEST HARNESS AD	Used for measuring voltage and resistance of seat belt tension sensor.



2. GENERAL TOOL

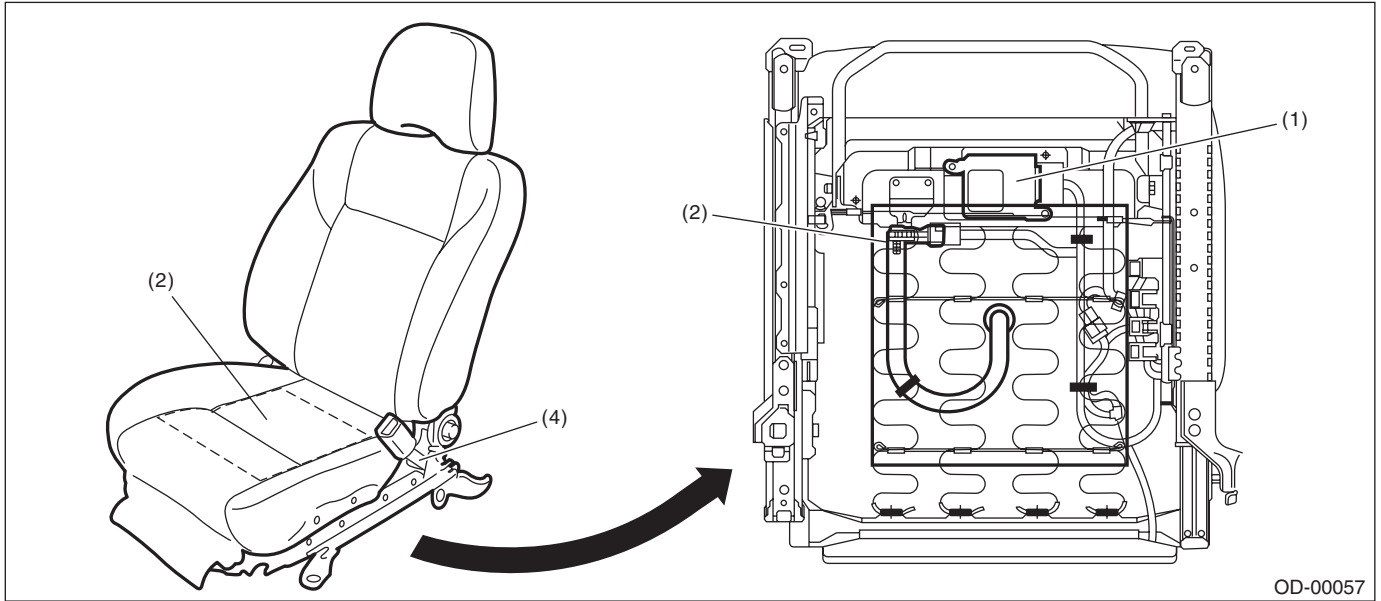
TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.

Electrical Component Location

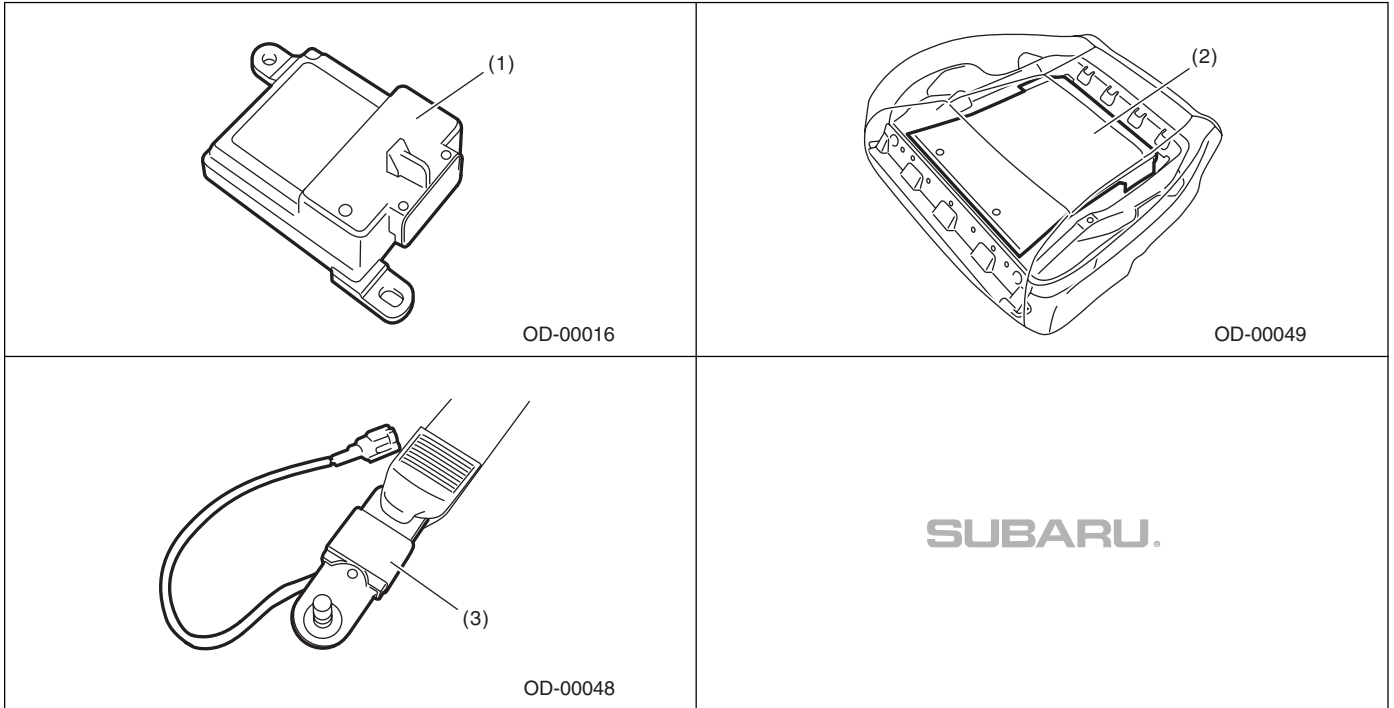
OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

3. Electrical Component Location

A: LOCATION

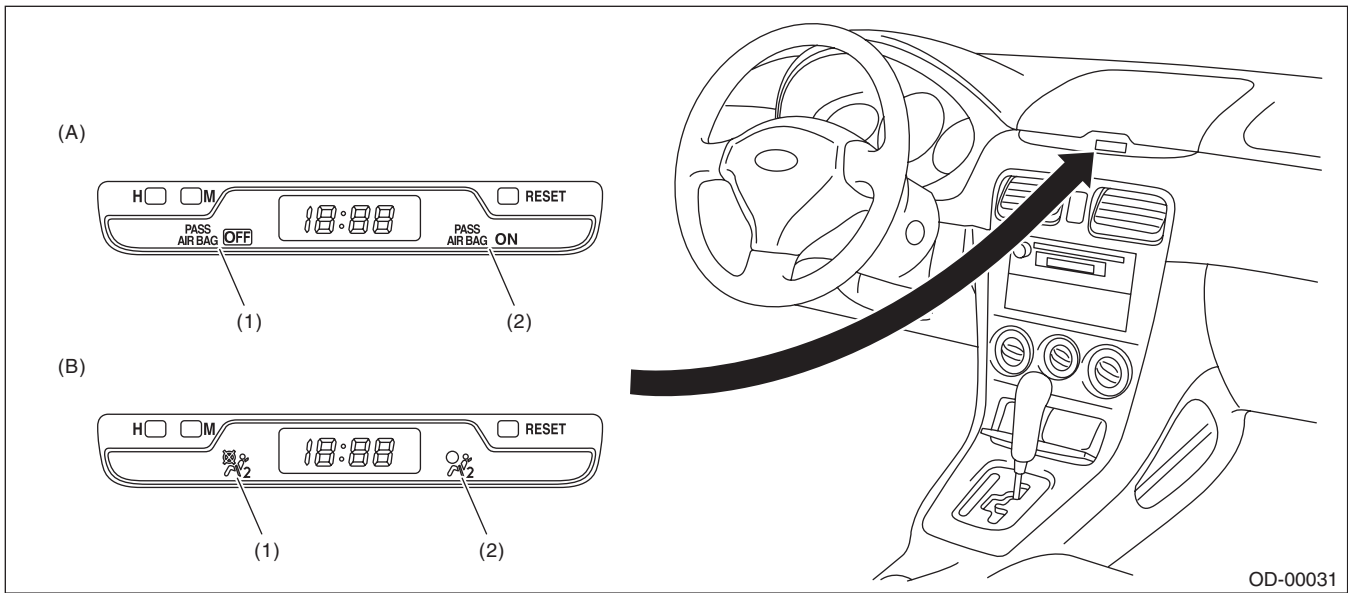


- (1) Occupant detection control module
- (2) Occupant detection sensor
- (3) Seat belt tension sensor
- (4) Buckle switch (Passenger's seat)



Electrical Component Location

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)



OD-00031

(A) For North America model

(B) For Canada model

(1) Passenger's airbag OFF indicator light

(2) Passenger's airbag ON indicator light

Airbag Connector

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

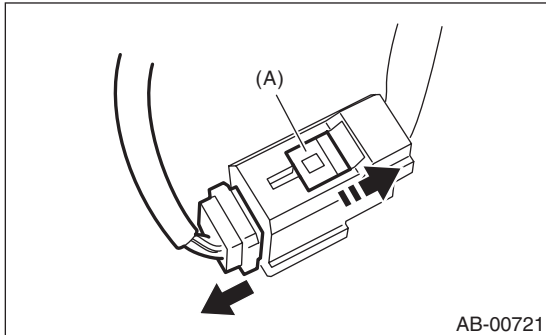
4. Airbag Connector

A: PROCEDURE

Buckle switch

1) How to disconnect

- (1) Move the slide lock (A) in the direction of arrow.
- (2) With the slide lock (A) moved, disconnect the connector.

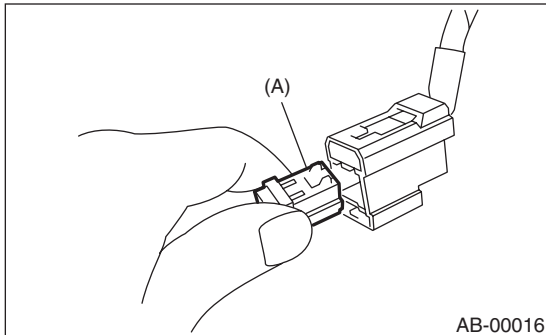


CAUTION:

When pulling the slide lock or disconnecting connector, be sure to hold the connector, not the harness.

2) How to connect

Holding the connector (A), and push it in carefully until a clicking sound is heard.



CAUTION:

Be sure to insert the connector in until it is locked. Then pull it gently to make sure that it is locked.

Control Module I/O Signal

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

5. Control Module I/O Signal

A: ELECTRICAL SPECIFICATION

CAUTION:

- Never remove the occupant detection control module, occupant detection sensor and seat frame. They are integrated into one unit.
- Because the measuring of the I/O signal of the occupant detection control module is prohibited, there is no list of terminal numbers.

Terminal name	Terminal No.	Input/Output value	Remarks	
IG – power supply	9	9 — 16 V	When ignition switch ON	
Airbag control module communication (COM)	10	Open collector terminal	Communication line	
Airbag control module communication (GND)	5	0 V	Ground	
Belt tension sensor	(Vcc)	4	0 — 5 V	Belt tension sensor power supply
	(Vout)	16	0.5 — 4.5 V	Sensor output voltage
	(GND)	14	0 V	Sensor ground
Occupant detection sensor	(Vcc)	6	0 — 5 V	Pressure sensor power supply
	(Vout)	7	0.5 — 4.5 V	Sensor output voltage
	(GND)	15	0 V	Sensor ground
Buckle switch	1	0 — IG voltage	IG voltage when the switch is ON	
Buckle switch (GND)	2	0 V	Switch ground	

B: WIRING DIAGRAM

Refer to the electrical wiring diagram. <Ref. to WI-85, Airbag System.>

Subaru Select Monitor

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

6. Subaru Select Monitor

A: OPERATION

1. READ DIAGNOSTIC TROUBLE CODE (DTC)

When malfunction of the airbag system and the occupant detection system occurs, the DTC stored in airbag control module will be read out.

Refer to DTC readout of airbag system (diagnosis). <Ref. to AB(diag)-29, OPERATION, Subaru Select Monitor.>

NOTE:

- For details concerning the operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.
- For details concerning DTCs, refer to List of Diagnostic Trouble Code (Airbag system, Occupant detection system). <Ref. to AB(diag)-42, List of Diagnostic Trouble Code (DTC).> <Ref. to OD(diag)-24, List of Diagnostic Trouble Code (DTC).>

2. DISPLAY OF STATUS INFORMATION

Check the operating condition of each sensor in the event of malfunction in the seat belt buckle switch and seat position sensor, or when the seat belt buckle switch and seat position sensor has been replaced.

- 1) On the «Main Menu» display screen, select the {Each System Check}.
- 2) On the «System Selection Menu» display screen, select the {Airbag System}.
- 3) On the «Airbag System» display screen, select the {Status Data}.

A list of the support data is shown in the following table.

Contents	Content of diagnosis
Seat position sensor LH	Front position ^{*1} /Rear position ^{*2} /Other ^{*3} /Initial Setting ^{*3} / — ^{*5}
Seat position sensor RH	— ^{*5}
Seat belt buckle switch LH	Belted ^{*6} /Unbelted ^{*7} /Other ^{*8} /Initial Setting ^{*4} / — ^{*9}
Seat belt buckle switch RH	Belted ^{*6} /Unbelted ^{*7} /Other ^{*8} /Initial Setting ^{*4} / — ^{*9}
Passenger's airbag control status	ON ^{*10} /OFF ^{*11} /Initial Setting ^{*4}

*1: Seat position is at the front end.

*2: Seat position is at the rear end.

*3: Displayed when data other than seat position (forward/rear) is entered (such as breakdown data).

*4: Displayed when it is initial.

*5: Seat position sensor not supported

*6: Seat belt fastened

*7: Seat belt not fastened

*8: Displayed when data other than belt fastened or not fastened, (such as breakdowns) is entered.

*9: Seat belt buckle switch not supported

*10: Passenger's seat airbag operating state

*11: Passenger's seat airbag non-operating state

NOTE:

For details concerning the operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

3. CLEAR MEMORY MODE

Clear the DTC stored in the airbag control module after repairing the airbag system and occupant detection system. (After the breakdown is recovered, the breakdown code for completed recoveries are read out when the next breakdown occurs if the memory clear work is not performed.)

- 1) On the «Main Menu» display screen, select the {Each System Check}.
- 2) On the «System Selection Menu» display screen, select the {Airbag System}.
- 3) On the {Airbag System} menu screen, select the {Clear Memory}.
- 4) When the “Clear Memory?” is shown on the screen, select the [OK].
- 5) When “Done” is displayed, close the Subaru Select Monitor.

NOTE:

For details concerning the operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

4. SYSTEM CALIBRATION (REZEROING)

NOTE:

When replacing the occupant detection system, or when removing and disassembling the passenger's seat cushion cover, always perform the system calibration after installing a seat in the vehicle.

CAUTION:

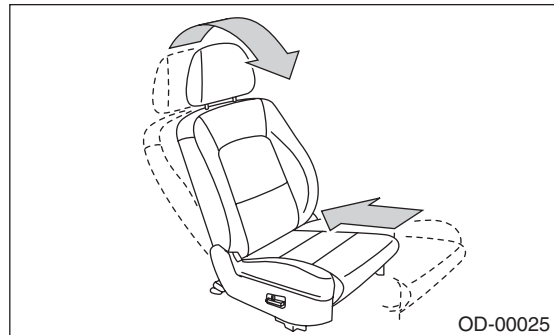
When trouble occurs in the system during calibration process, DTC 2A “OCCUPANT DETECTION CALIBRATION FAILURE” of the airbag system is detected and the airbag warning light lights. In this case, after turning the ignition switch to OFF once, redo the system calibration (Rezeroing), or after clearing the cause of the failure, perform the system calibration again.

- 1) Park empty vehicle on a level surface.
- 2) On the «Main Menu» display screen, select the {Each System Check}.
- 3) On the «System Selection Menu» display screen, select the {Occupant detection system}.
- 4) On the «Occupant Detection System» display screen, select the {Zero Point Adjustment}.

5) «See service manual. And check vehicle condition for successfully completing the rezeroing.» is displayed on the screen. Inspect the following items and adjust the vehicle condition.

- Adjust the seat backrest to the upright position.
- Adjust the slide to the rear end position.
- Do not place anything on the top of the seat cushion.
- Sit on the seat cushion to smooth the seat surface.
- Check that the passenger's seat belt is not inserted into the buckle, not tense, or not stuck.
- Check that ambient temperature is in a range from 0 — 40°C (32 — 104°F).

6) «Re-zeroing Adjust the passenger seat to the condition shown in service manual» is displayed on the screen. Slide the passenger's seat to the rear end, make sure that the backrest is adjusted to the most upright position, and select the [OK].



7) When the «Re-zeroing Unbelt the Passenger seatbelt Continue: OK, Quit: NO» is displayed, make sure the passenger's seatbelt is disconnected from the buckle, then select the [OK].

8) When the «Re-zeroing Empty the passenger seat Continue: OK, Quit: NO» is displayed, make sure that the passenger's seat is empty, airbag OFF indicator illuminates and airbag ON indicator does not illuminate, and then select the [OK].

NOTE:

- After selecting the [OK], «Now processing ... Wait for a while. Do not touch or give impact to vehicle and seat» is displayed. Do not touch or rock the vehicle while the message is displayed.
 - During the system calibration process, if the «Re-zeroing is unsuccessful See service manual Press OK to END» is displayed, go to step 10).
- 9) When the re-zeroing is normally completed, «Re-zeroing is successfully completed Press OK to END» is displayed. Select the [OK] and turn the ignition switch to OFF to complete.

Subaru Select Monitor

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

10) During the system calibration process, if «Re-zeroing is unsuccessful See service manual Press OK to END» is displayed, turn the ignition switch to OFF once and turn it ON again, then read the DTC of the airbag system. <Ref. to AB(diag)-29, OPERATION, Subaru Select Monitor.>

When DTC is input, fix the fault and then perform the system calibration. When DTC is not input, check the seat and vehicle status and then perform the system calibration again. <Ref. to OD(diag)-17, SYSTEM CALIBRATION (REZEROING), OPERATION, Subaru Select Monitor.>

NOTE:

When the re-zeroing is unsuccessful, there could be occupant detection system failure or the seat and the vehicle does not match. When the airbag warning light illuminates, read the DTC of the airbag system, and perform the diagnosis while referring to “List of Diagnostic Trouble Code”. <Ref. to AB(diag)-29, OPERATION, Subaru Select Monitor.> <Ref. to AB(diag)-42, LIST, List of Diagnostic Trouble Code (DTC).>

B: INSPECTION

1. COMMUNICATION FOR INITIALIZING IMPOSSIBLE

DETECTING CONDITION:

Defective harness connector

TROUBLE SYMPTOM:

Communication is impossible between the airbag control module and the Subaru Select Monitor.

Refer to “Initial Communication Impossible” in the DTC of the airbag system (diagnosis). <Ref. to AB(diag)-31, INSPECTION, Subaru Select Monitor.>

2. WITHOUT DTC

DETECTING CONDITION:

- Defective combination meter
- Open circuit of harness

TROUBLE SYMPTOM:

- Airbag warning light remains on.
- “NO TROUBLE CODE” will be displayed on the Subaru Select Monitor.

For detailed operation procedures, refer to “Airbag Warning Light Failure”. <Ref. to AB(diag)-37, Airbag Warning Light Failure.>

NOTE:

When the airbag warning light is OFF and “NO TROUBLE CODE” is displayed on Subaru Select Monitor, the system is operating properly.

Read Diagnostic Trouble Code (DTC)

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

7. Read Diagnostic Trouble Code (DTC)

A: OPERATION

For details about reading of DTCs, refer to “Subaru Select Monitor”. <Ref. to AB(diag)-29, Subaru Select Monitor.>

Inspection Mode

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

8. Inspection Mode

A: PROCEDURE

Recreate the circumstance by referring to the conditions described in the checklist.

9. Clear Memory Mode

A: OPERATION

Clear the memory in the following steps after the malfunction is repaired.

For details concerning DTC clear operation, refer to "Subaru Select Monitor". <Ref. to AB(diag)-29, Subaru Select Monitor.>

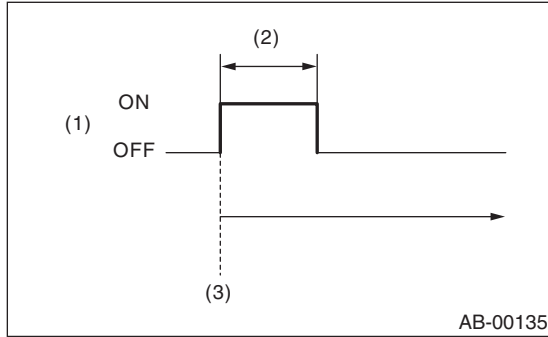
Airbag Warning Light Illumination Pattern

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

10. Airbag Warning Light Illumination Pattern

A: INSPECTION

Turn the ignition switch to ON, and confirm that the airbag warning light remains on for approx. 6 seconds then turns off afterwards.



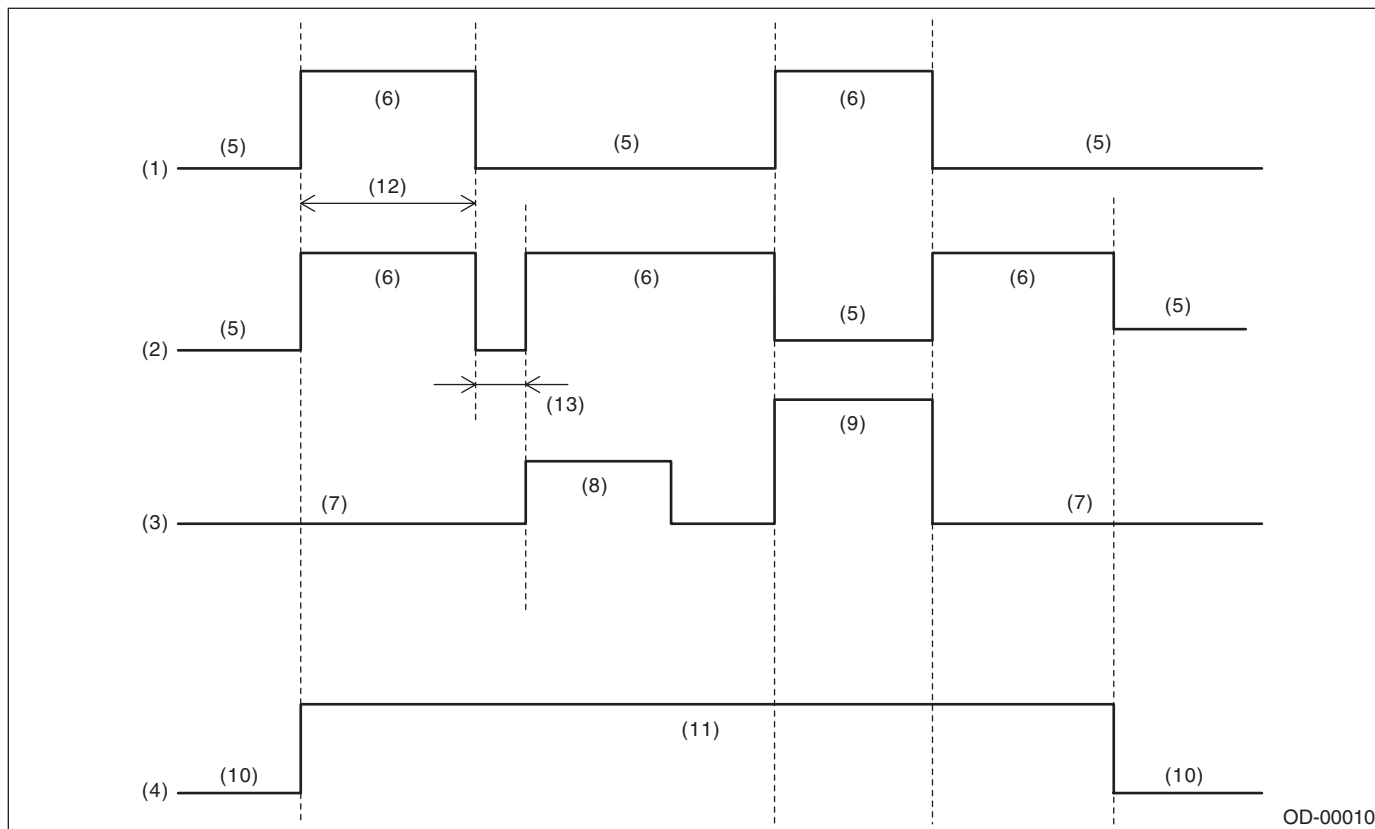
- (1) Airbag warning light
- (2) Approx. 6 sec.
- (3) Ignition switch ON

Passenger's Airbag ON/OFF Indicator Light Illumination Pattern

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

11. Passenger's Airbag ON/OFF Indicator Light Illumination Pattern

A: INSPECTION



OD-00010

- | | | |
|--|---------------------|---------------------|
| (1) Passenger's airbag ON indicator light | (4) Ignition switch | (9) Adult |
| (2) Passenger's airbag OFF indicator light | (5) Light OFF | (10) OFF |
| (3) Occupant seating | (6) Light ON | (11) ON |
| | (7) Empty | (12) Approx. 6 sec. |
| | (8) Child | (13) Approx. 2 sec. |

List of Diagnostic Trouble Code (DTC)

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

12. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Display	Content of diagnosis	Reference
2A	ODS Calibration Error	System calibration (Rezeroing) was not completed normally.	<Ref. to OD(diag)-25, DTC 2A ODS CALIBRATION ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
2B	ODS System Wrong Parts	<ul style="list-style-type: none"> • Wrong airbag control module was installed. • Wrong occupant detection system was installed. • Occupant detection system is faulty. 	<Ref. to OD(diag)-25, DTC 2B ODS SYSTEM WRONG PARTS, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
2C	Belt Tension Sensor Failure	<ul style="list-style-type: none"> • Passenger's seat belt tension sensor is faulty. • Airbag rear harness circuit is open or shorted. • Occupant detection system is faulty. • Occupant detection harness is faulty. 	<Ref. to OD(diag)-26, DTC 2C BELT TENSION SENSOR FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
27	Occupant Detection System Improper Communication	<ul style="list-style-type: none"> • Occupant detection control module and airbag control module communication is faulty. • Airbag rear harness circuit is open or shorted. <p>Short circuit to the ground or the power supply.</p> <ul style="list-style-type: none"> • Occupant detection harness is faulty. • Occupant detection system is faulty. • Airbag control module is faulty. 	<Ref. to OD(diag)-28, DTC 27 ODS COMMUNICATION ERROR, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
29	Occupant Detection System Failure	<ul style="list-style-type: none"> • Occupant detection sensor is faulty. • Occupant detection control module is faulty. • Occupant detection harness is faulty. • Fuse No. 6 (in joint box) is blown. 	<Ref. to OD(diag)-28, DTC 29 ODS FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
37	Buckle Switch RH Failure	<ul style="list-style-type: none"> • Passenger's buckle switch circuit is open, shorted or shorted to ground. • Occupant detection system is faulty. • Occupant detection harness is faulty. 	<Ref. to OD(diag)-29, DTC 37 BUCKLE SWITCH RH FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

13. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC 2A ODS CALIBRATION ERROR

DTC DETECTING CONDITION:

System calibration (Rezeroing) was not completed properly.

	Step	Check	Yes	No
1	PERFORM RE-ZEROING. Perform the system calibration using the Subaru Select Monitor. <Ref. to OD(diag)-16, OPERATION, Subaru Select Monitor.>	Is the system calibration completed correctly?	Finish the diagnosis.	Follow the system calibration procedures. <Ref. to OD(diag)-16, OPERATION, Subaru Select Monitor.>

B: DTC 2B ODS SYSTEM WRONG PARTS

DTC DETECTING CONDITION:

- Wrong airbag control module is installed.
- Wrong occupant detection system is installed.

	Step	Check	Yes	No
1	CHECK OCCUPANT DETECTION SYSTEM. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Replace the passenger's seat cushion pad and seat cushion frame assembly. <Ref. to SE-7, REMOVAL, Front Seat.> <Ref. to SE-9, DISASSEMBLY, Front Seat.> 3) Connect the battery ground cable. 4) Connect Subaru Select Monitor to the data link connector and perform the system calibration. <Ref. to OD(diag)-16, OPERATION, Subaru Select Monitor.>	Is the system calibration completed correctly?	Finish the diagnosis.	Go to step 2.
2	CHECK AIRBAG CONTROL SYSTEM. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Replace the airbag control module. <Ref. to AB-16, REMOVAL, Side Airbag Module.> 3) Connect the battery ground cable. 4) Connect Subaru Select Monitor to the data link connector and perform the system calibration. <Ref. to OD(diag)-16, OPERATION, Subaru Select Monitor.>	Is the system calibration completed correctly?	Finish the diagnosis.	Check between the occupant detection control module and airbag control module.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

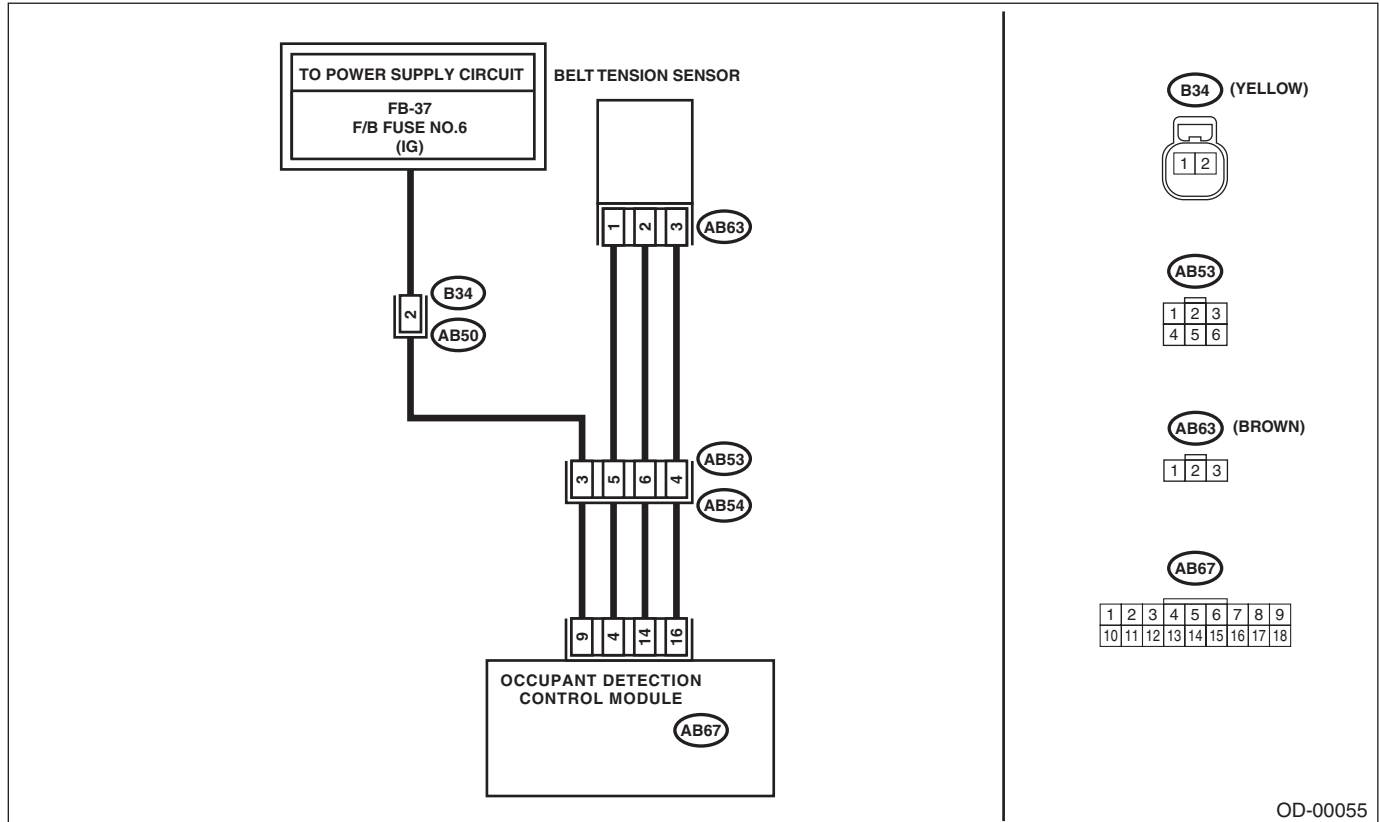
OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

C: DTC 2C BELT TENSION SENSOR FAILURE

DTC DETECTING CONDITION:

- Passenger's seat belt tension sensor is faulty.
- Airbag main harness circuit is open or shorted.
- Occupant detection control module is faulty.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

	Step	Check	Yes	No
1	<p>CHECK POOR CONTACT OF CONNECTORS. Check for poor contact of the connectors between the occupant detection control module and belt tension sensor.</p>	Is there poor contact?	Reconnect the connector. If the fault is not fixed, replace the airbag harness.	Go to step 2.
2	<p>CHECK BELT TENSION SENSOR. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the belt tension sensor connector (AB63) from the airbag harness. 3) Connect the test harness AC to the connector (AB63). 4) Connect the battery ground terminal and turn the ignition switch to ON.</p>	Does the airbag warning light illuminate for approximately 6 seconds and go off?	Replace the seat belt outer. <Ref. to SB-10, REMOVAL, Front Seat Belt.>	Go to step 3.
3	<p>CHECK AIRBAG HARNESS. 1) Turn ignition switch OFF, disconnect the battery ground cable, and wait more than 20 seconds. 2) Disconnect the test harness AC from the belt tension sensor connector (AB63). 3) Connect the test harness AD (1AD) to the connector (AB63). 4) Disconnect the airbag harness connector (AB62), and connect connector (1AB) of test harness AB. 5) Measure the resistance between test harness terminals. Connector & terminal (2AB) No. 5 — (2AD) No. 1: (2AB) No. 4 — (2AD) No. 3: (2AB) No. 6 — (2AD) No. 2:</p>	Is the resistance less than 10 Ω?	Go to step 4.	Replace the airbag harness.
4	<p>CHECK AIRBAG HARNESS. Measure the resistance between test harness terminals, and between test harness terminal and chassis ground. Connector & terminal (2AB) No. 4 — (2AD) No. 1: (2AB) No. 4 — (2AD) No. 2: (2AB) No. 4 — Chassis ground: (2AB) No. 5 — (2AD) No. 2: (2AB) No. 5 — Chassis ground:</p>	Is the resistance 1 MΩ or more?	Go to step 5.	Replace the airbag harness.
5	<p>CHECK AIRBAG HARNESS. 1) Connect the battery ground terminal and turn the ignition switch to ON. 2) Measure the voltage between test harness and chassis ground. Connector & terminal (2AD) No. 1 (+) — Chassis ground (-): (2AD) No. 3 (+) — Chassis ground (-):</p>	Is the voltage 1 V or less?	Replace the airbag harness.	Check the occupant detection harness, and if any fault is found, replace the occupant detection harness. If no fault is found in the occupant detection harness, replace the seat cushion frame assembly. <Ref. to SE-9, DISASSEMBLY, Front Seat.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

D: DTC 27 ODS COMMUNICATION ERROR

Perform the diagnosis by following diagnostic procedures for the airbag system. <Ref. to AB(diag)-65, DTC 27 ODS COMMUNICATION ERROR, Diagnostic Chart with Trouble Code.>

E: DTC 29 ODS FAILURE

DTC DETECTING CONDITION:

- Occupant detection sensor is faulty.
- Occupant detection control module is faulty.
- Occupant detection harness is faulty.
- Side airbag harness is faulty.
- Fuse No. 6 (in joint box) is blown.

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTOR. Check for poor contact of the connectors between the occupant detection control module and airbag control module.	Is there poor contact?	Reconnect the connector. If the fault is not fixed, replace the airbag harness.	Go to step 2.
2 CHECK DIAGNOSTIC TROUBLE CODE (DTC). Read diagnostic trouble code (DTC) for the airbag system.	Is "2C BELT TENSION SENSOR FAILURE or 37 BUCKLE SWITCH FAILURE" displayed as the diagnostics code?	Perform the diagnosis according to each DTC.	Check the occupant detection harness, and if any fault is found, replace the occupant detection harness. If the fault is not fixed, replace the occupant detection system. <Ref. to SE-9, DIS-ASSEMBLY, Front Seat.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

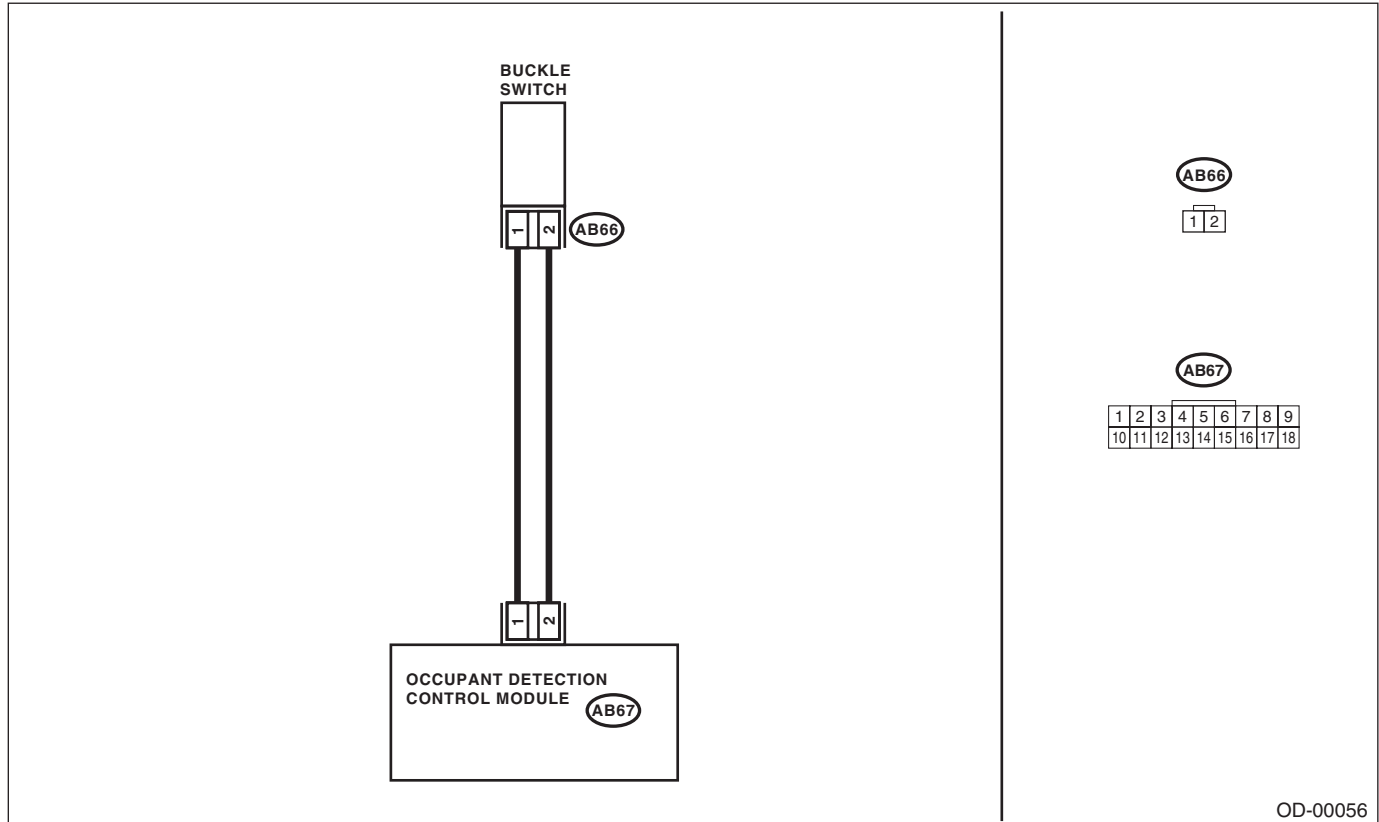
OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

F: DTC 37 BUCKLE SWITCH RH FAILURE

DTC DETECTING CONDITION:

- Passenger's seat buckle switch circuit is open, shorted or shorted to ground.
- Seat harness circuit is open, shorted or shorted to ground.
- Occupant detection control module is faulty.

WIRING DIAGRAM:



OD-00056

Step	Check	Yes	No
1 CHECK POOR CONTACT OF CONNECTOR. Check for poor contact of the connectors between the occupant detection control module and buckle switch.	Is there poor contact?	Reconnect the connector. If the fault is not fixed, replace the airbag harness.	Go to step 2.
2 CHECK BUCKLE SWITCH. 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait for more than 20 seconds. 2) Disconnect the buckle switch connector (AB66). 3) Connect the test harness AE (1AE) and test harness connector Y to the buckle switch connector (AB66). 4) Connect the battery ground terminal and turn the ignition switch to ON.	Does the airbag warning light illuminate for 6 seconds and go off?	Replace the buckle switch. <Ref. to SB-10, REMOVAL, Front Seat Belt.>	Check the occupant detection harness, and if any fault is found, replace the occupant detection harness. If the fault is not fixed, replace the occupant detection system.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

OCCUPANT DETECTION SYSTEM (DIAGNOSTICS)

General Description

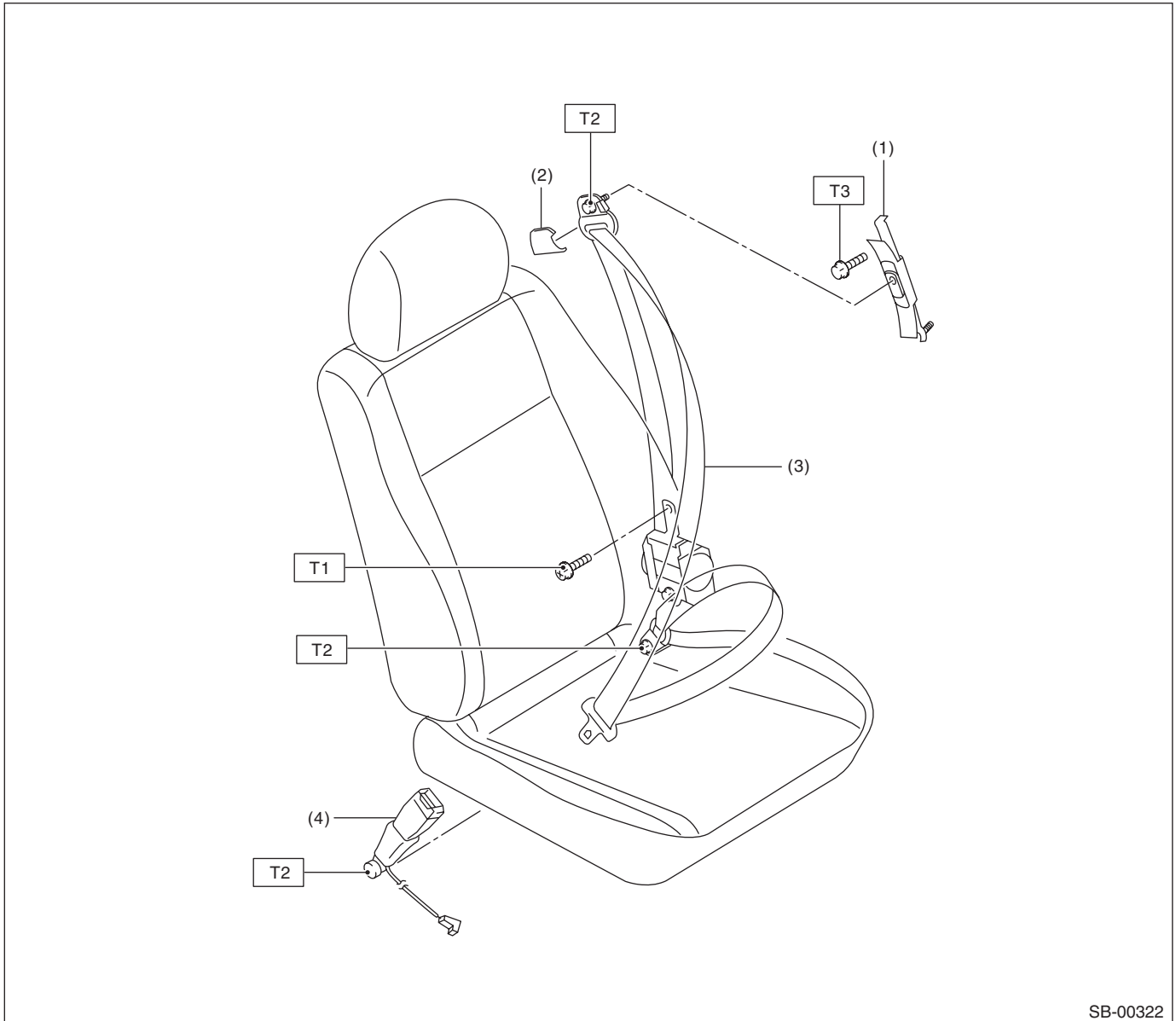
SEAT BELT SYSTEM

1. General Description

A: COMPONENT

1. FRONT SEAT BELT

- Driver's side



SB-00322

- (1) Adjustable anchor ASSY
- (2) Anchor cover

- (3) Outer belt ASSY
- (4) Inner seat belt ASSY

Tightening torque: N·m (kgf·m, ft·lb)

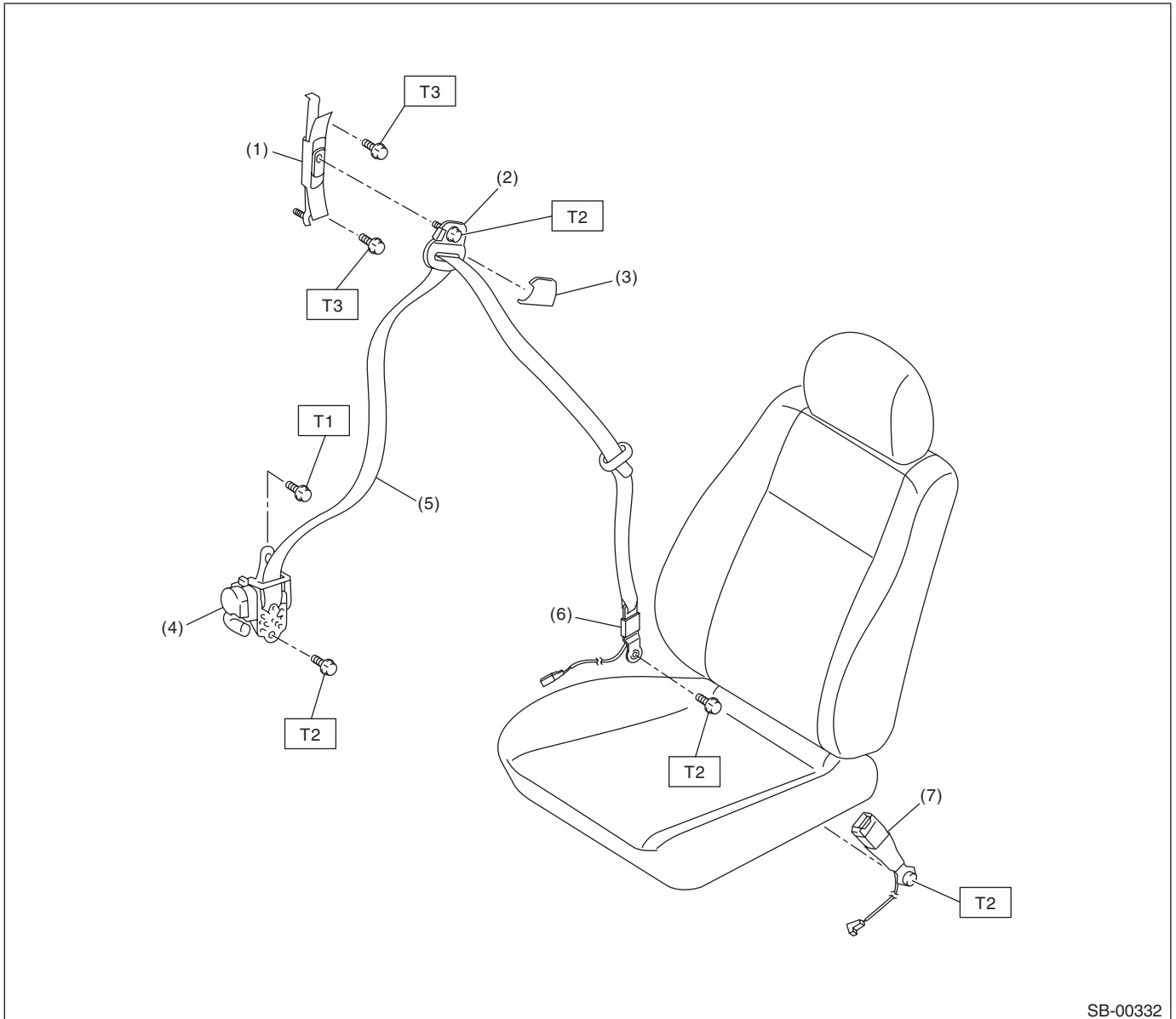
T1: 7.5 (0.76, 5.5)

T2: 30 (3.1, 22)

T3: 53 (5.4, 39)

General Description

• Passenger's side



- | | |
|----------------------------|--------------------------|
| (1) Adjustable anchor ASSY | (5) Outer belt ASSY |
| (2) Shoulder anchor | (6) Belt tension sensor |
| (3) Anchor cover | (7) Inner seat belt ASSY |
| (4) Seat belt retractor | |

Tightening torque: N-m (kgf-m, ft-lb)

T1: 7.5 (0.76, 5.5)

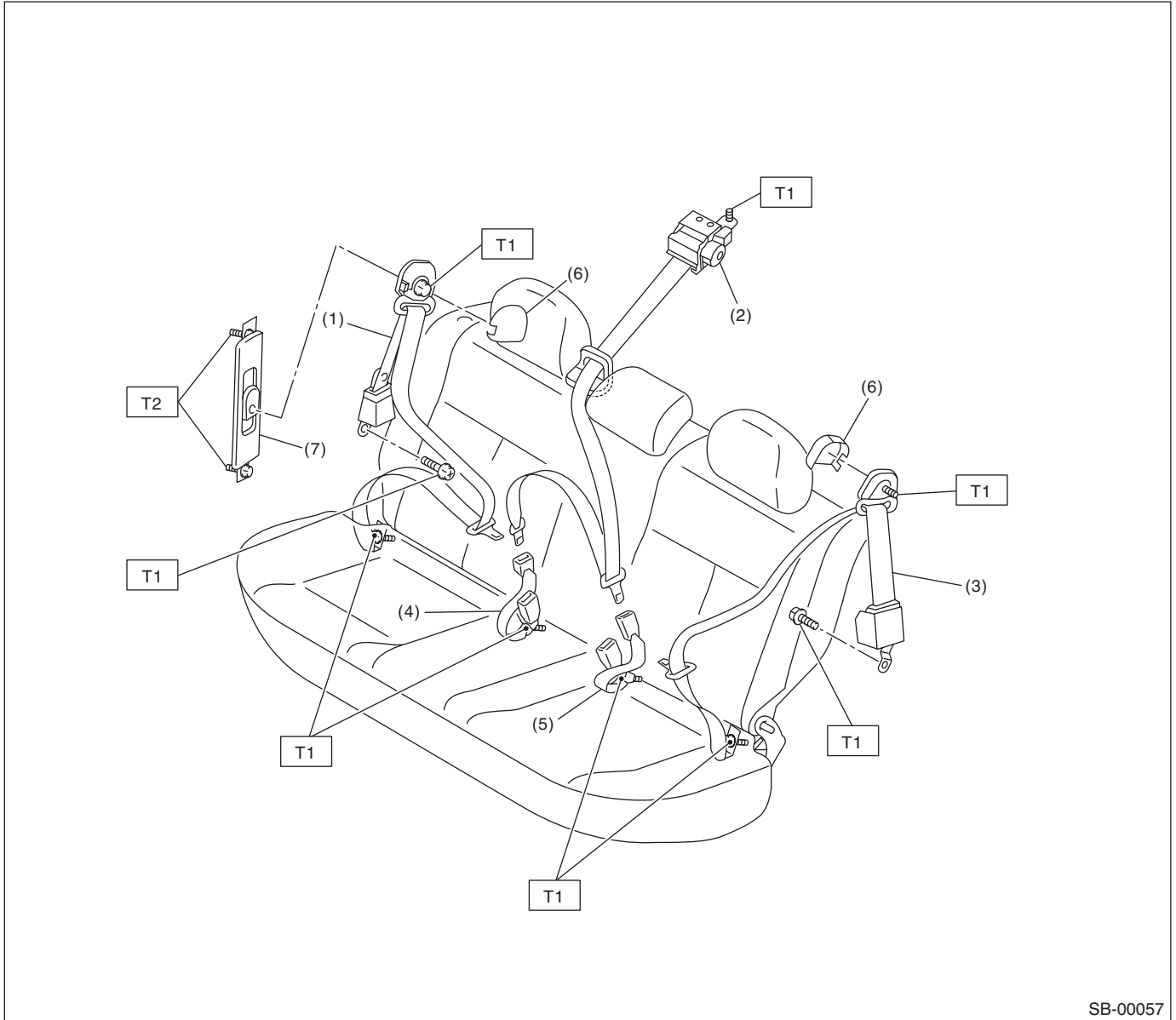
T2: 30 (3.1, 22)

T3: 53 (5.4, 39)

General Description

SEAT BELT SYSTEM

2. REAR SEAT BELT



SB-00057

- | | |
|----------------------------|----------------------------|
| (1) Outer seat belt RH | (5) Inner seat belt LH |
| (2) Outer seat belt center | (6) Anchor cover |
| (3) Outer seat belt LH | (7) Adjustable anchor ASSY |
| (4) Inner seat belt RH | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 30 (3.1, 22)

T2: 53 (5.4, 39)

B: CAUTION

- Before starting the work, turn the ignition switch to OFF, disconnect the battery ground cable and wait for 20 seconds or more.
- The pretensioner system has a backup power source. Be careful because the pretensioner might deploy if you do not wait for 20 seconds or more before starting work.
- Do not drop or apply any impact to the pretensioner.
- If oil, grease or water gets on the pretensioner, wipe it off immediately with a dry cloth.
- Do not expose the pretensioner to high temperature or flame.

- Do not allow current to flow through or voltage to reach the pretensioner. Do not use a circuit tester to check resistance of the pretensioner.
- Do not disassemble or attempt to repair the pretensioner. If it is dented, cracked or deformed, replace it with a new part.
- Do not use the airbag or pretensioner parts from other vehicles. Always replace the parts with new parts.
- When handling a seat belt with deployed pretensioner, wear gloves and goggles. Wash your hands afterwards.
- Do not reuse a seat belt with deployed pretensioner.
- If the material gets in your eyes or on your skin during deployment, wash it away with clean water, and then consult a doctor.

C: PREPARATION TOOL

1. GENERAL TOOL

TOOL NAME	REMARKS
TORX® T50	Used for removing and installing the inner seat belt assembly.

2. Pretensioner Connector

A: PROCEDURE

Refer to airbag connectors in the airbag section.
<Ref. to AB-8, PROCEDURE, Airbag Connector.>

3. Seat Belt Warning System

A: WIRING DIAGRAM

<Ref. to WI-103, WIRING DIAGRAM, Seat Belt Warning System.>

B: INSPECTION

TROUBLE SYMPTOM:

- Seat belt warning light does illuminate or it remains illuminating.
- Buzzer does not beep.

Step	Check	Yes	No
1 CHECK BODY INTEGRATED UNIT POWER SUPPLY. 1) Turn the ignition switch to ON. 2) Measure the voltage between body integrated unit connector and chassis ground. <i>Connector & terminal</i> <i>(B281) No. 19 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Go to step 2.	Check the harness between body integrated unit and battery.
2 CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND CHASSIS GROUND. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from body integrated unit. 3) Measure the resistance between body integrated unit harness connector and chassis ground. <i>Connector & terminal</i> <i>(B281) No. 8 — Chassis ground:</i>	Is the resistance less than 10 Ω ?	Go to step 3.	Check the harness between body integrated unit and chassis ground.
3 CHECK SEAT BELT SWITCH AND HARNESS. 1) Pull out the tongue plate from the driver's seat belt buckle. 2) Measure the resistance between body integrated unit harness connector and chassis ground. <i>Connector & terminal</i> <i>(B281) No. 3 — Chassis ground:</i>	Is the resistance 1 M Ω or more?	Go to step 4.	Check the harness between body integrated unit connector and chassis ground.
4 CHECK SEAT BELT SWITCH AND HARNESS. 1) Insert the tongue plate to the driver's seat belt buckle in the condition of step 3. 2) Measure the resistance between body integrated unit connector and chassis ground. <i>Connector & terminal</i> <i>(B281) No. 3 — Chassis ground:</i>	Is the resistance less than 10 Ω ?	Go to step 7.	Go to step 5.
5 CHECK HARNESS BETWEEN BODY INTEGRATED UNIT AND SEAT BELT SWITCH. Measure the resistance of harness between body integrated unit connector and seat belt switch. <i>Connector & terminal</i> <i>Without power seat</i> <i>(B281) No. 3 — (R8) No. 2:</i> <i>With power seat</i> <i>(B281) No. 3 — (R188) No. 8:</i>	Is the resistance less than 10 Ω ?	Go to step 6.	Check the harness between body integrated unit connector and seat belt switch.

Seat Belt Warning System

SEAT BELT SYSTEM

Step	Check	Yes	No
6 CHECK HARNESS BETWEEN SEAT BELT SWITCH AND CHASSIS GROUND. Measure the resistance of harness between seat belt switch and chassis ground. <i>Connector & terminal</i> <i>Without power seat</i> <i>(R8) No. 1 — Chassis ground:</i> <i>With power seat</i> <i>(R188) No. 4 — Chassis ground:</i>	Is the resistance less than 10 Ω ?	Go to step 7.	Check harness between seat belt switch and chassis ground.
7 CHECK SEAT BELT SWITCH. 1) Pull out the tongue plate from the driver's seat belt buckle. 2) Measure the resistance between seat belt switch terminals. <i>Connector & terminal</i> <i>Without power seat</i> <i>(R8) No. 1 — (R8) No. 2:</i> <i>With power seat</i> <i>(R188) No. 8 — (R188) No. 4:</i>	Is the resistance 1 M Ω or more?	Go to step 8.	Replace the inner seat belt assembly.
8 CHECK SEAT BELT SWITCH. 1) Insert the tongue plate to the driver's seat belt buckle. 2) Measure the resistance between seat belt switch terminals. <i>Connector & terminal</i> <i>Without power seat</i> <i>(R8) No. 1 — (R8) No. 2:</i> <i>With power seat</i> <i>(R188) No. 8 — (R188) No. 4:</i>	Is the resistance less than 10 Ω ?	Go to step 9.	Replace the inner seat belt assembly.
9 CHECK COMBINATION METER. 1) Turn the ignition switch to ON. 2) Measure the voltage between combination meter and chassis ground. <i>Connector & terminal</i> <i>(i10) No. 9 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Go to step 10.	Check wiring harness and combination meter, then repair or replace them.
10 CHECK POOR CONTACT. Check for poor contact in seat belt warning light circuit.	Is there poor contact?	Repair the poor contact.	Go to step 11.
11 CHECK THE BODY INTEGRATED UNIT. 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Pull out the tongue plate from the driver's seat belt buckle. 4) Check if the seat belt warning light illuminates.	Does the seat belt warning light illuminate?	Go to step 12.	Inspect the connector or harness. If not defective, replace the seat belt warning light bulb in the combination meter.
12 CHECK THE BODY INTEGRATED UNIT. 1) Connect all connectors. 2) Turn the ignition switch to ON. 3) Pull out the tongue plate from the driver's seat belt buckle. 4) Check if the seat belt warning light illuminates and the buzzer sounds.	Does the seat belt warning light illuminate and the buzzer sound for 6 seconds?	A temporary poor contact of connector or harness may be the cause. Check for poor contact.	Replace the body integrated unit.

4. Inspection Locations After a Collision

A: INSPECTION

Check for the following, and replace with new parts if necessary.

- Center pillar lower trim is discolored or cracked.
- Wiring harness and connector are damaged.

Front Seat Belt

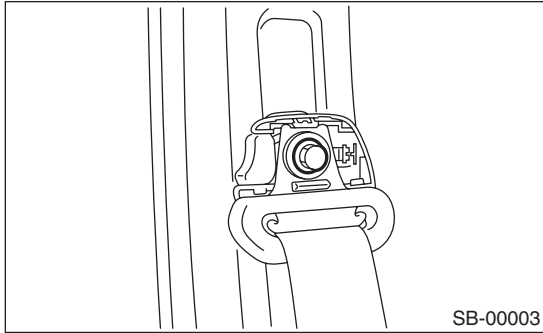
SEAT BELT SYSTEM

5. Front Seat Belt

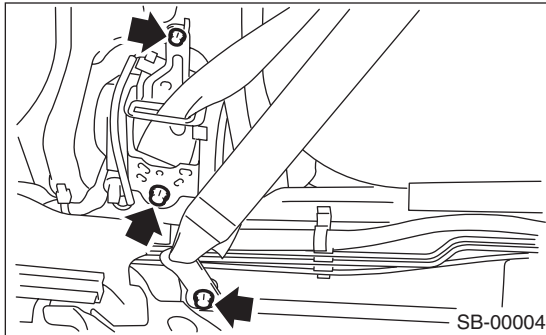
A: REMOVAL

1. FRONT OUTER BELT

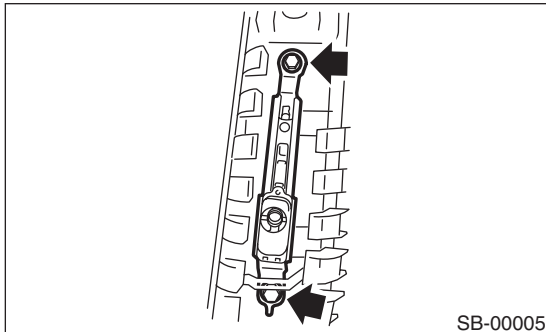
- 1) Fold the backrest all the way forward, and then move the front seat all the way forward.
- 2) Before working, turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.
- 3) Remove the center pillar lower trim. <Ref. to EI-43, REMOVAL, Lower Inner Trim.>
- 4) Remove the anchor cover. Loosen the shoulder anchor bolt, and then detach the shoulder anchor from center pillar.



- 5) Pull off the floor mat to remove the bolt.



- 6) Disconnect the connectors of pretensioner and belt tension sensor, and remove the front outer belt.
- 7) Remove the center pillar upper trim. <Ref. to EI-42, REMOVAL, Upper Inner Trim.>
- 8) Remove the two bolts to remove the adjustable anchor assembly.

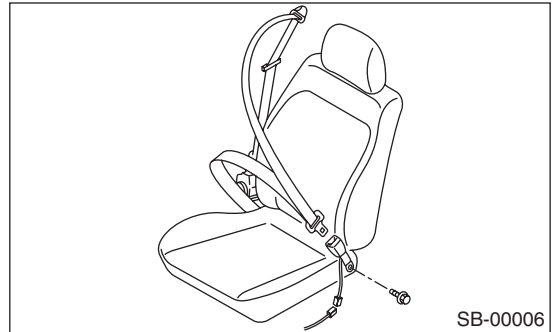


CAUTION:

- Do not drop or apply any impact to the pretensioner.
- Since the pretensioner and bracket are integrated as a unit, do not disassemble them.

2. FRONT INNER BELT

- 1) Turn the ignition switch to OFF, disconnect the battery ground cable, and wait more than 20 seconds.
- 2) Remove the console box. <Ref. to EI-38, REMOVAL, Console Box.>
- 3) Disconnect the seat belt warning light connector under the seat.
- 4) Remove the harness clips from the seat rail.
- 5) Remove the anchor bolt, and then detach the inner belt.



B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

- The parts on right and left are not identical. Before installation, make sure that the correct part is used.
- Be careful not to twist the belts during installation.

Tightening torque:

<Ref. to SB-2, FRONT SEAT BELT, COMPONENT, General Description.>

C: INSPECTION

Check for the following, and replace with new parts if necessary.

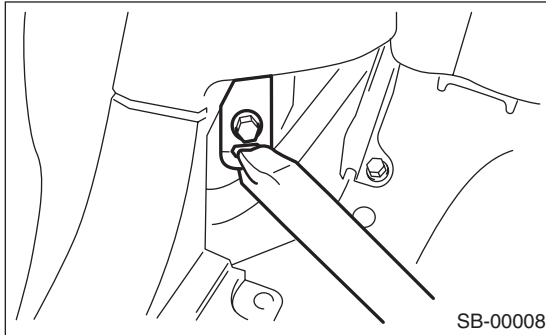
- Pretensioner is cracked or deformed.
- Seat belt is slackened, bent or worn. Seat belt is abnormally wound or extended.
- Inner belt is deformed or damaged.
- Seat belt buckle cannot be engaged properly.

6. Rear Seat Belt

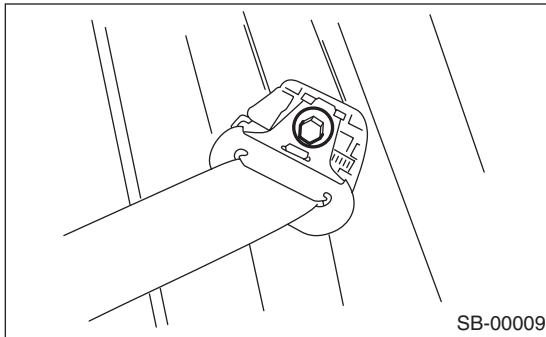
A: REMOVAL

1. OUTER BELT RH AND LH

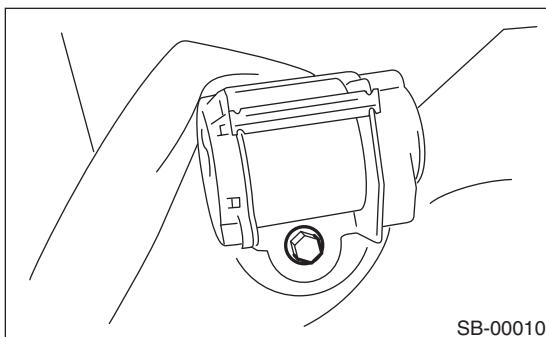
- 1) Remove the luggage floor mat. <Ref. to EI-49, REMOVAL, Luggage Floor Mat.>
- 2) Remove the rear seat. <Ref. to SE-17, REMOVAL, Rear Seat.>
- 3) Remove the rear quarter trim. <Ref. to EI-44, REMOVAL, Rear Quarter Trim.>
- 4) Remove the seat belt lower anchor bolt.



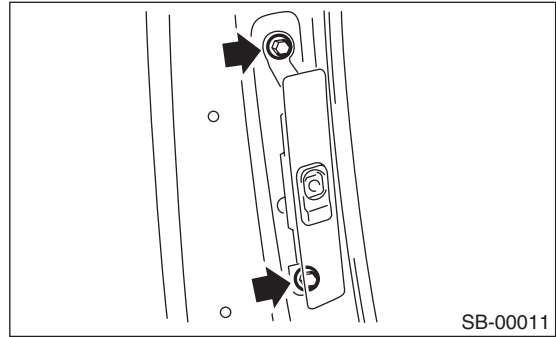
- 5) Remove the anchor cover. Remove the two bolts, and then remove the shoulder anchor from the pillar.



- 6) Remove the rear quarter trim. <Ref. to EI-44, REMOVAL, Rear Quarter Trim.>
- 7) Remove the bolts, and then detach the outer belt side.

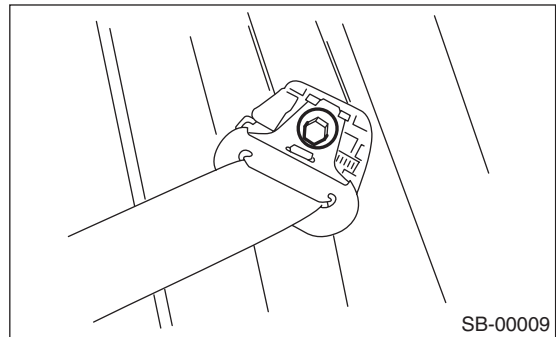


- 8) Remove the two bolts to remove the adjustable anchor assembly.

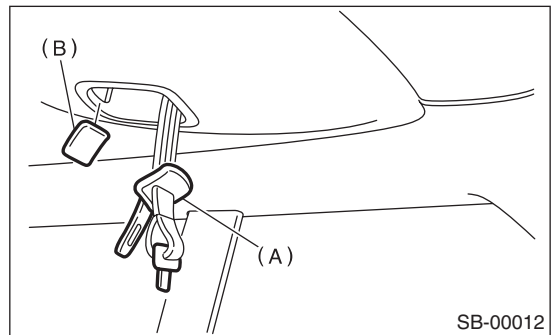


2. OUTER SEAT BELT CENTER

- 1) Remove the anchor cover. Remove the bolt, and then remove the shoulder anchor from the pillar.



- 2) Remove the strut cap. <Ref. to EI-44, REMOVAL, Rear Quarter Trim.>
- 3) Remove the rear rail trim. <Ref. to EI-44, REMOVAL, Rear Quarter Trim.>
- 4) Remove the rear pillar upper trim. <Ref. to EI-44, REMOVAL, Rear Quarter Trim.>
- 5) Remove the rear skirt trim. <Ref. to EI-44, REMOVAL, Rear Quarter Trim.>
- 6) Remove the rear quarter lower trim. <Ref. to EI-44, REMOVAL, Rear Quarter Trim.>
- 7) Remove the snap lock carefully, and then remove the cover (B). Pull the outer seat belt center tongue (A) from the hole to one side of the trim.

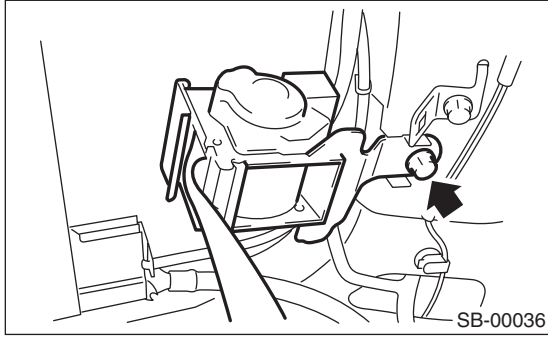


- 8) Remove the clips, and then hang the roof trim back end from the roof.

Rear Seat Belt

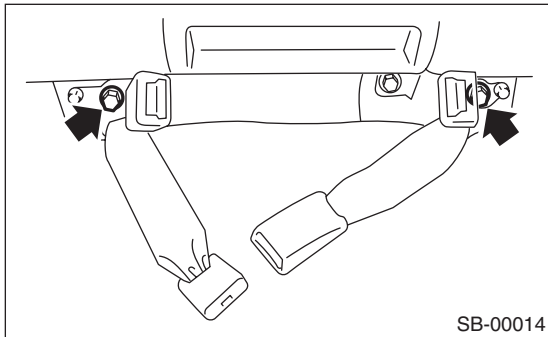
SEAT BELT SYSTEM

9) Disconnect the harness and connectors, and then remove the outer seat belt center assembly.



3. INNER BELT

- 1) Remove the rear cushion.
- 2) Remove the bolt, and then detach the inner belt.



B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

- During installation, make sure that the seat belts are not twisted.
- After installation, make sure that the seat belts are smoothly extended and wound.

Tightening torque:

<Ref. to SB-4, REAR SEAT BELT, COMPONENT, General Description.>

C: INSPECTION

Check for the following, and replace with new parts if necessary.

- Seat belt is slackened, bent or worn.
- Seat belt is abnormally wound or extended.
- Inner belt is deformed or damaged.
- Seat belt buckle cannot be engaged properly.

General Description

LIGHTING SYSTEM

1. General Description

A: SPECIFICATION

Headlight		12 V — 55 W/60 W (Halogen) D2R 35 W/60 W (HID)
Front turn signal light		12 V — 21 W
Clearance light		12 V — 5 W
Front side marker light		12 V — 5 W
Front fog light		12 V — 51 W
Rear combination light	Tail/stop light	12 V — 5/21 W
	Turn signal light	12 V — 21 W
	Back-up light	12 V — 16 W
License plate light		12 V — 5 W
High-mounted stop light	Standard type	12 V — 10 W
	Rear spoiler built-in type	12 V — 1.3 W
Room light		12 V — 8 W
Spot map light		12 V — 8 W
Luggage room light		12 V — 5 W

B: CAUTION

- Before removing or installing parts, always disconnect the battery ground cable from battery. When replacing the radio, control unit, and other parts provided with memory functions, record the memory contents before disconnecting the battery ground cable. Otherwise, the memory is cleared.
- Reassemble the parts in the reverse order of disassembly procedure unless otherwise indicated.
- Adjust parts to the given specifications.
- Connect the connectors and hoses securely during reassembly.
- After reassembly, make sure functional parts operate smoothly.

WARNING:

- **The airbag system wiring harness is routed near electrical parts and switches. All airbag system wiring harnesses and connectors are yellow. Do not use the electrical test equipment on these circuits.**
- **Be careful not to damage the airbag system wiring harness when servicing electrical parts and switches.**

C: PREPARATION TOOL

1. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.

2. Headlight and Tail Light System

A: WIRING DIAGRAM

1. HEADLIGHT

<Ref. to WI-105, WIRING DIAGRAM, Headlight System.>

2. CLEARANCE LIGHT AND ILLUMINATION LIGHT

<Ref. to WI-114, WIRING DIAGRAM, Clearance Light and Illumination Light System.>

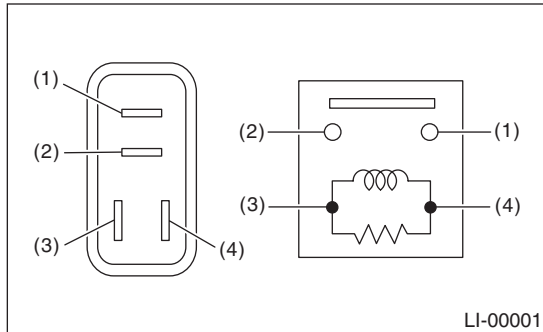
B: INSPECTION

1. HEADLIGHT SWITCH

<Ref. to LI-9, INSPECTION, Combination Switch (Light).>

2. HEADLIGHT RELAY

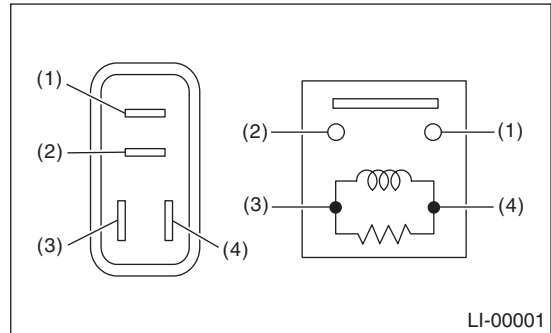
Measure the headlight relay resistance between terminals when connecting terminal No. 4 to the battery positive terminal and terminal No. 3 to the battery ground terminal.



Continuity	Terminal No.	Standard
Yes	1 and 2	Less than 1 Ω
No		1 MΩ or more

3. TAIL AND ILLUMINATION RELAY

Measure the resistance between tail and illumination relay terminals when connecting terminal No. 4 to the battery positive terminal and terminal No. 3 to the battery ground terminal.



Continuity	Terminal No.	Standard
Yes	1 and 2	Less than 1 Ω
No		1 MΩ or more

Front Fog Light System

LIGHTING SYSTEM

3. Front Fog Light System

A: WIRING DIAGRAM

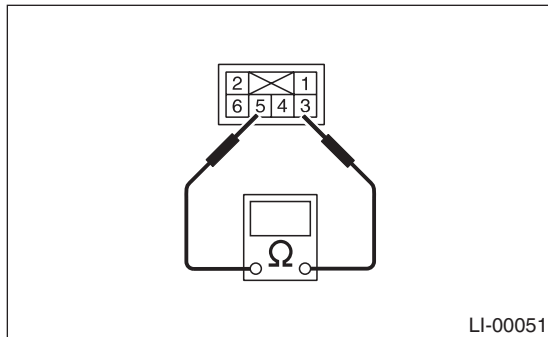
1. FRONT FOG LIGHT

<Ref. to WI-111, WIRING DIAGRAM, Front Fog Light System.>

B: INSPECTION

1. FRONT FOG LIGHT SWITCH

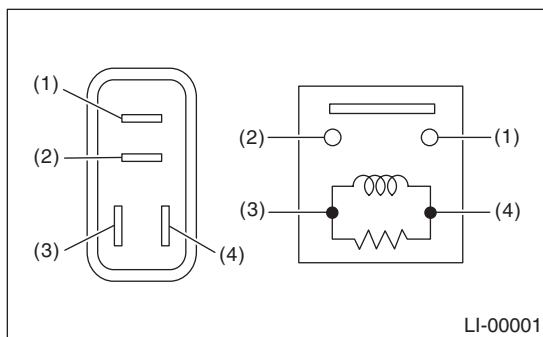
Measure the front fog light switch resistance.



Switch position	Terminal No.	Standard
OFF	3 and 5	1 MΩ or more
ON		Less than 1 Ω

2. FRONT FOG LIGHT RELAY

Connect terminal No. 4 to battery positive terminal and terminal No. 3 to battery ground terminal, and measure the front fog light relay resistance between terminals.



Continuity	Terminal No.	Standard
Yes	1 and 2	Less than 1 Ω
No		1 MΩ or more

4. Turn Signal Light and Hazard Light System

A: WIRING DIAGRAM

1. TURN SIGNAL LIGHT AND HAZARD LIGHT

<Ref. to WI-117, WIRING DIAGRAM, Turn Signal Light and Hazard Light System.>

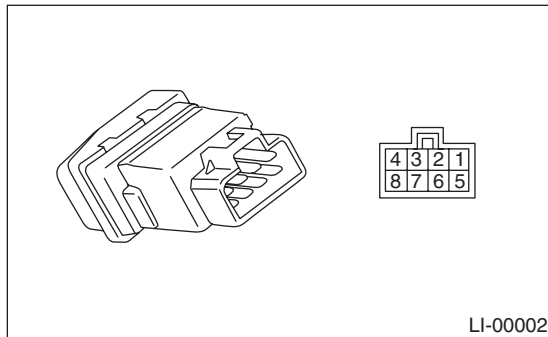
B: INSPECTION

1. TURN SIGNAL SWITCH

<Ref. to LI-9, INSPECTION, Combination Switch (Light).>

2. HAZARD SWITCH

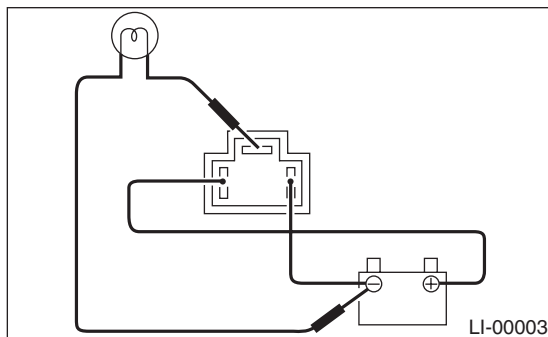
Measure the hazard switch resistance.



Switch position	Terminal No.	Standard
OFF	6 and 7	Less than 1 Ω
ON	1, 3 and 4	Less than 1 Ω
	7 and 8	Less than 1 Ω

3. TURN SIGNAL AND HAZARD MODULE

Connect the battery and the turn signal light bulb to the module, as shown in the figure. The module is properly functioning if it blinks when power is supplied to the circuit.



Back-up Light System

LIGHTING SYSTEM

5. Back-up Light System

A: WIRING DIAGRAM

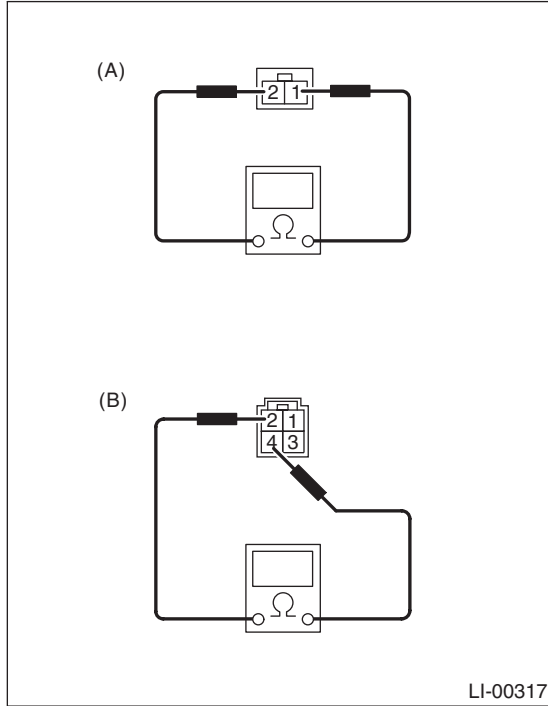
1. BACK-UP LIGHT

<Ref. to WI-112, WIRING DIAGRAM, Back-up Light System.>

B: INSPECTION

1. BACK-UP LIGHT SWITCH (MT MODEL)

Measure the back-up light switch resistance.



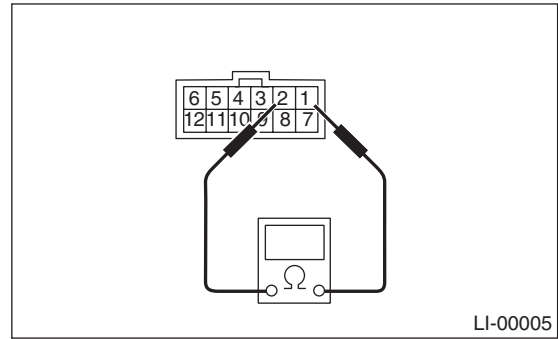
(A) Non-turbo model

(B) Turbo model

Switch position	Terminal No.	Standard
When shift lever is set in reverse position	Non-turbo model: 1 and 2 Turbo model: 2 and 4	Less than 1 Ω
Other positions		1 MΩ or more

2. INHIBITOR SWITCH (AT MODEL)

Measure the inhibitor switch resistance.



Switch position	Terminal No.	Standard
When the shift lever is in "R" range	1 and 2	Less than 1 Ω
Other positions		1 MΩ or more

6. Stop Light System

A: WIRING DIAGRAM

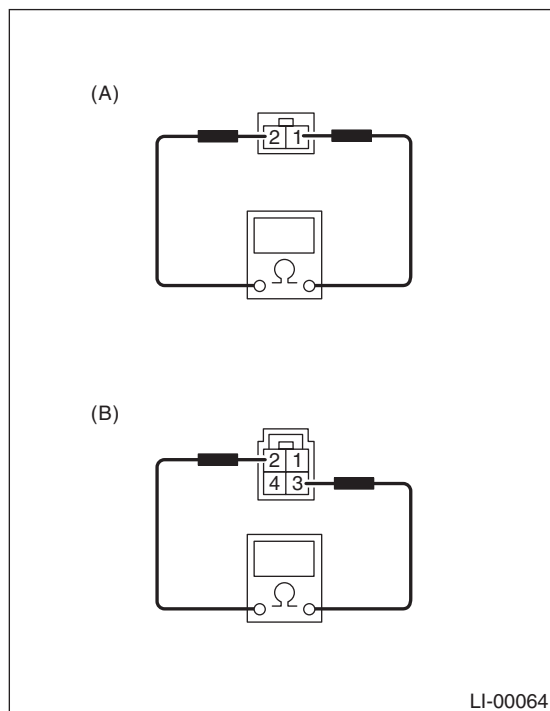
1. STOP LIGHT

<Ref. to WI-113, WIRING DIAGRAM, Stop Light System.>

B: INSPECTION

1. STOP LIGHT SWITCH

Measure the stop light switch resistance.



(A) Model without cruise control

(B) Model with cruise control

Switch position	Terminal No.	Standard
When brake pedal is depressed	1 and 2: Model without cruise control	Less than 1 Ω
When brake pedal is released	2 and 3: Model with cruise control	1 MΩ or more

Room Light System

LIGHTING SYSTEM

7. Room Light System

A: WIRING DIAGRAM

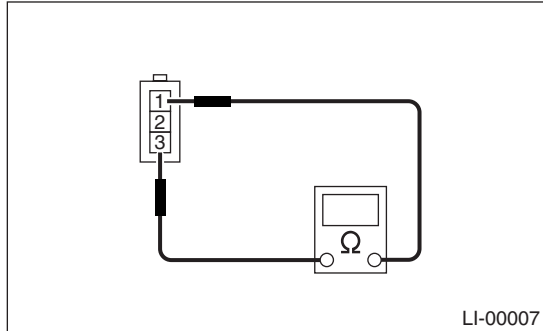
1. ROOM LIGHT

<Ref. to WI-119, WIRING DIAGRAM, Interior Light System.>

B: INSPECTION

1. DOOR SWITCH

Measure the door switch resistance.



Switch position	Terminal No.	Standard
When door is opened	1 and 3	Less than 1 Ω
When door is closed		1 M Ω or more

2. REAR GATE LATCH SWITCH

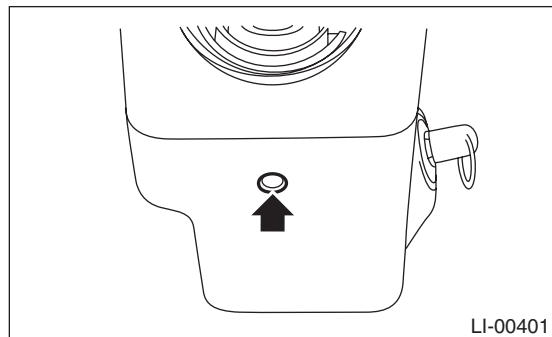
Measure the rear gate latch switch resistance.

Switch position	Terminal No.	Standard
When rear gate is opened	1 and 2	Less than 1 Ω
When rear gate is closed		1 M Ω or more

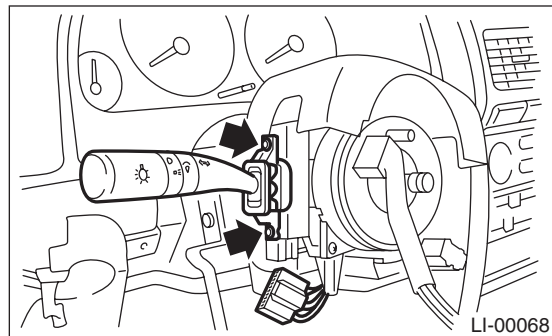
8. Combination Switch (Light)

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the instrument panel lower cover. <Ref. to EI-39, REMOVAL, Instrument Panel Assembly.>
- 3) Remove the screws which secure upper column cover to lower column cover.



- 4) Disconnect the connector from combination switch.
- 5) Remove the screws which secure the switch, then remove the switch.

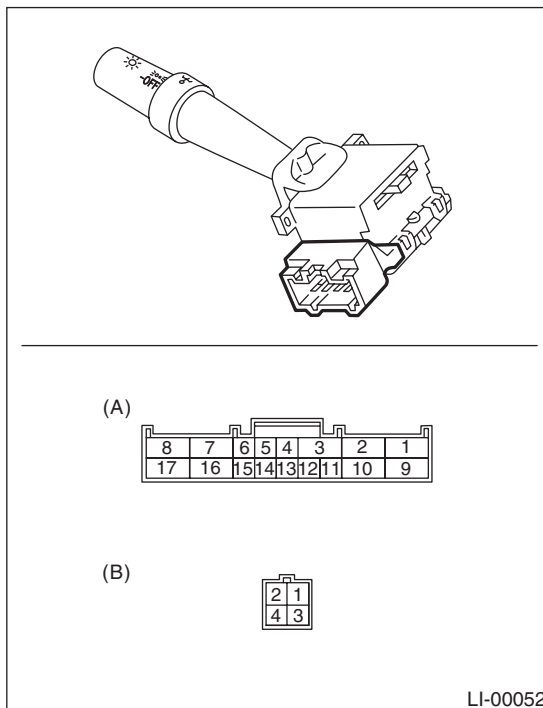


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the combination switch resistance.



- (A) Lighting switch and turn signal switch connector
 (B) Parking switch connector

1. LIGHTING SWITCH

Switch position	Terminal No.	Standard
OFF	—	1 MΩ or more
Tail	14 and 16	Less than 1 Ω
Head	13, 14 and 16	Less than 1 Ω

2. DIMMER AND PASSING SWITCH

Switch position	Terminal No.	Standard
Passing	7, 8 and 16	Less than 1 Ω
Low beam	16 and 17	Less than 1 Ω
High beam	7 and 16	Less than 1 Ω

3. TURN SIGNAL SWITCH

Switch position	Terminal No.	Standard
Left	1 and 2	Less than 1 Ω
Neutral	—	1 MΩ or more
Right	2 and 3	Less than 1 Ω

4. PARKING SWITCH

Switch position	Terminal No.	Standard
OFF	2 and 4	Less than 1 Ω
ON	1 and 4	Less than 1 Ω

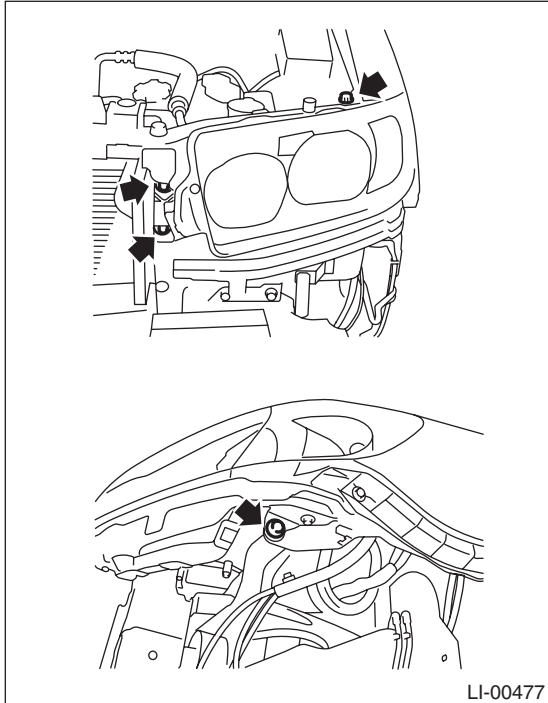
Headlight Assembly

LIGHTING SYSTEM

9. Headlight Assembly

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the air intake duct (when right side headlight is removed). <Ref. to IN (H4SO)-5, REMOVAL, Air Cleaner Case.>
- 3) Remove the front bumper. <Ref. to EI-21, REMOVAL, Front Bumper.>
- 4) Remove the four bolts and disconnect the connectors, and then detach the headlight assembly.



B: INSTALLATION

Install in the reverse order of removal.

C: DISASSEMBLY

1. LENS

CAUTION:

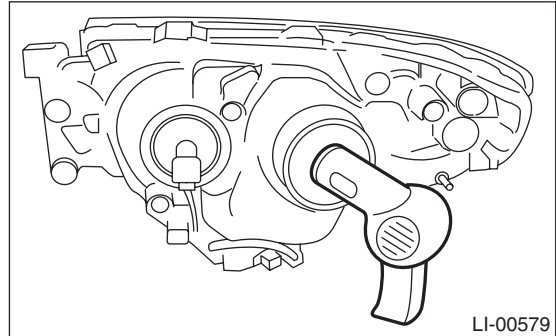
- Do not touch the bulb glass portion.
- Do not touch inside the lens (extension portion) or reflector portion.
- Replace the packing with a new part.

- 1) Remove the headlight assembly. <Ref. to LI-10, REMOVAL, Headlight Assembly.>
- 2) Disconnect the headlight bulb connector.
- 3) Remove the back cover and then remove the bulb.

- 4) Use a drier to warm up the area around the seal through the bulb installation hole.

CAUTION:

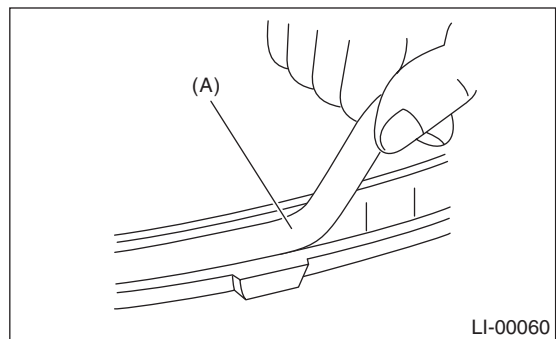
Avoid heating one specific point of the seal portion and heating the headlight assembly to 120°C (248°F) or more.



- 5) Remove the hook, and then take the lens off the headlight assembly.
- 6) Remove the packing (A) from seal groove.

CAUTION:

Completely remove the packing not to leave any residue behind.



(A) Packing

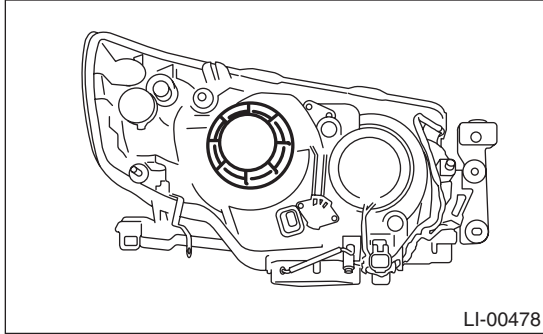
2. HID HEADLIGHT BALLAST

CAUTION:

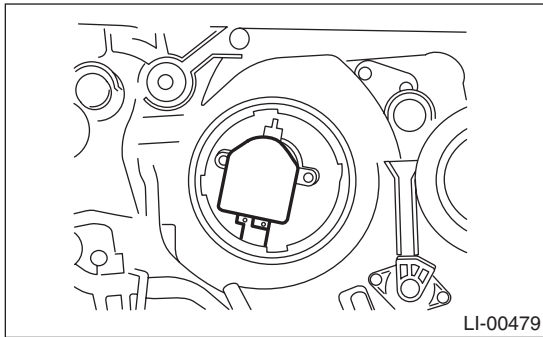
- Do not operate with wet hands.
- As the lightening circuit on the HID headlights uses high voltage, be sure to confirm that the power supply is turned off before working on it.
- Do not leave the headlight without a ballast for a long time. Dust, moisture, etc. entering the headlight may affect its performance.

- 1) Disconnect the ground cable from the battery.
- 2) Remove the headlight assembly. <Ref. to LI-10, REMOVAL, Headlight Assembly.>

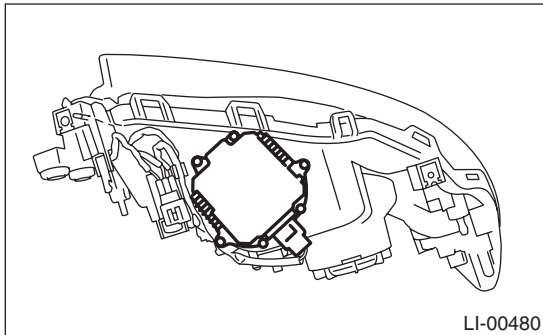
3) Remove the back cover.



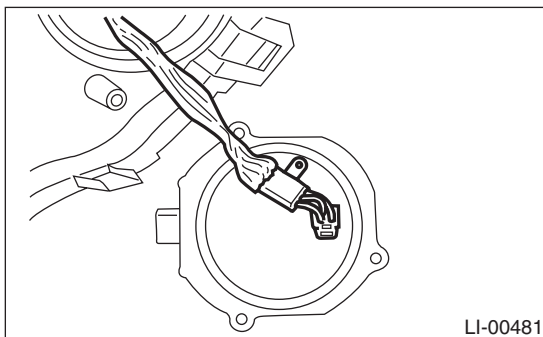
4) Disconnect the harness connector.



5) Loosen the screws to remove ballast.



6) Disconnect the connector from the headlight ballast.



CAUTION:
Be careful because the notch is easily bent.

7) Turn the beam adjustment screw so that the beam is facing upward, then create space for the socket portion to pass through the inside of the light.

CAUTION:

The reflector should not interfere with the extension case.

8) Place the socket portion toward the front side of the reflector bracket.

9) Turn the beam adjustment screw so that the beam is facing downward, then create space for the socket portion to pass under the reflector bracket.

CAUTION:

The reflector should not interfere with the extension case.

10) Remove the socket from headlight from below the housing.

CAUTION:

The socket should not get sandwiched between the reflector and the light housing.

Headlight Assembly

LIGHTING SYSTEM

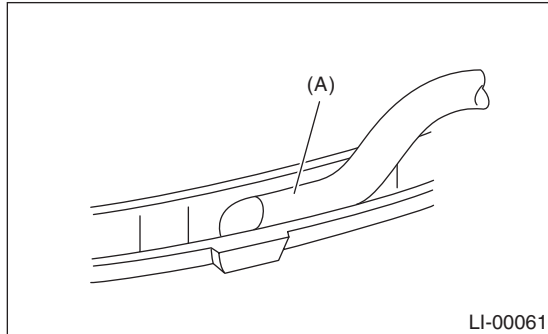
D: ASSEMBLY

1. LENS

- 1) Cut the tip of packing (A) at an angle of 45°.
- 2) With the cut end facing upward, insert packing (A) into the seal groove.

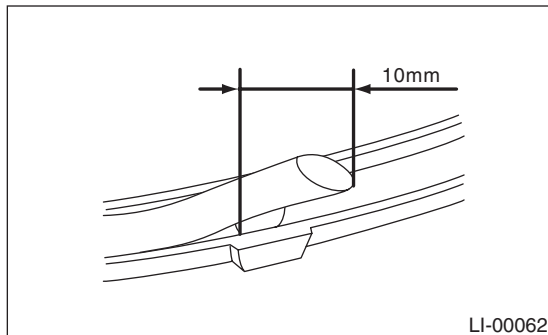
CAUTION:

- If the packing protrudes, slowly take it off the groove.
- Do not stretch the packing. If the packing is stretched, seal fails.



(A) Packing

- 3) After making a round of the seal, cut its tip at an angle of 45°, with its length 10 mm (0.39 in) longer than the circumference of seal so that the tip overlaps the other. Then, press it onto the seal, using a screwdriver.



- 4) Match the positions of the lens and headlight assembly, and then insert the lens into the headlight assembly.
- 5) Engage the hooks.
- 6) Put the seal portion of headlight assembly into the water and check that water does not enter inside the headlight.

CAUTION:

Be sure that water does not enter inside the headlight through the bulb socket and ventilation hole.

E: ADJUSTMENT

1. HEADLIGHT AIMING

CAUTION:

Turn off the light before adjusting the headlight aiming. If it is necessary to inspect the aiming, do not turn on the light for more than two minutes.

NOTE:

Before checking the headlight beam level, be sure of the following:

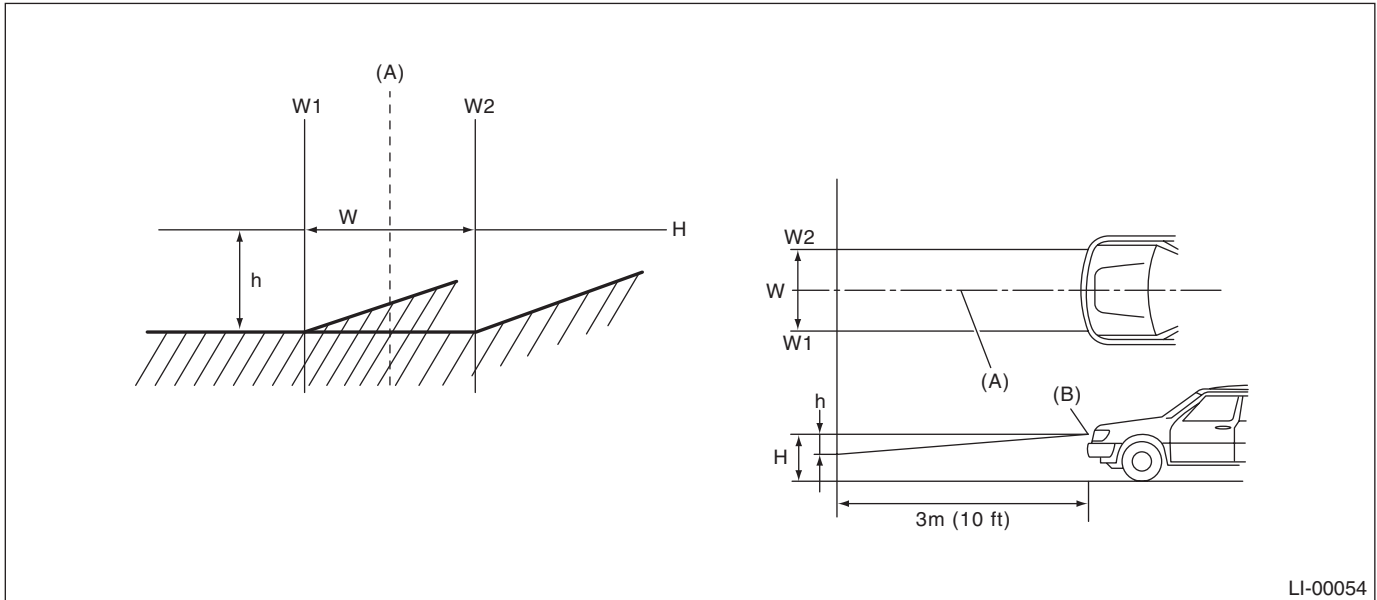
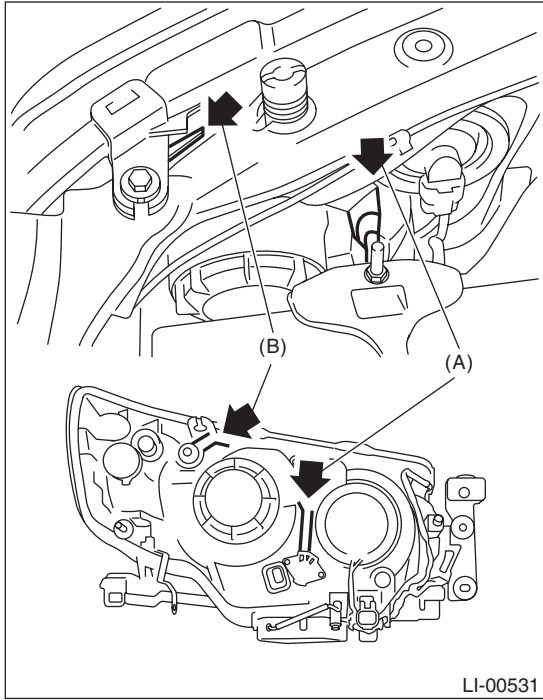
- The area around the headlight does not have any scratch, damage or other type of deformation.
- Vehicle is parked on a level surface.
- The inflation pressure of tires is correct.
- Vehicle's fuel tank is full.

- 1) Bounce the vehicle several times to normalize the suspension.
- 2) Make certain that someone is seated in the driver's seat.
- 3) Measure the distance between the low beam valve centers and the height of the valve center.
- 4) Cover the headlight that is not being adjusted with a cloth.
- 5) Turn the headlights on and then adjust the low beam while displaying the beam on the screen.

Headlight Assembly

NOTE:

Adjust the vertical beam level (A) first, then horizontal beam level (B) using a screwdriver.



(A) Vehicle center

(B) Bulb center marking

h mm (in) at 3 m (10 ft)	21 (0.83)
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Headlight Bulb

LIGHTING SYSTEM

10. Headlight Bulb

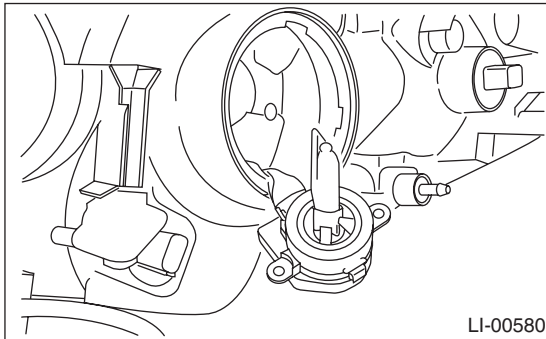
A: REMOVAL

1. HALOGEN TYPE

CAUTION:

- Because the halogen bulb operates at a high temperature, dirt and oil on the bulb surface reduces the bulb's service life. Hold the flange portion when replacing the bulb and never touch the glass portion.
- The entering of dust, moisture, etc. into the headlight may affect its performance. Therefore, never leave the headlight without a bulb for extended periods of time.

- 1) Disconnect the ground cable from the battery.
- 2) Remove the air intake duct (when right side headlight is removed). <Ref. to IN (H4SO)-5, REMOVAL, Air Cleaner Case.>
- 3) Remove the back cover.
- 4) Disconnect the harness connector.
- 5) Remove the light bulb retaining spring to remove the bulb.



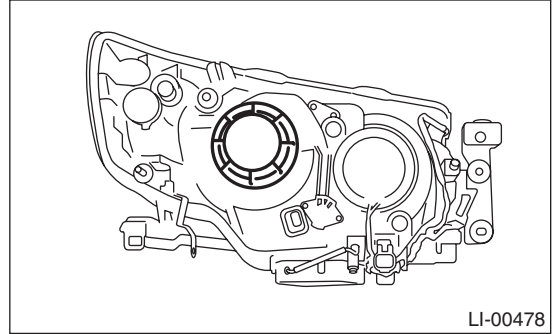
2. HID TYPE

CAUTION:

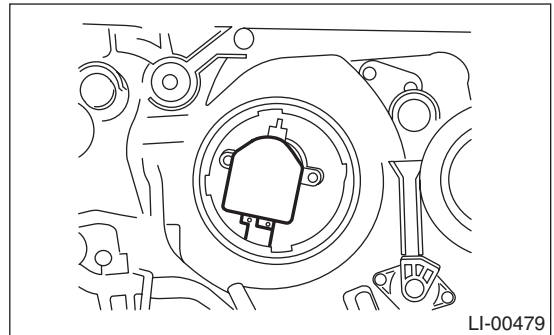
- Do not operate with wet hands.
- As the lightening circuit uses high voltage, be sure to confirm that the power supply is turned off before working on it.
- When replacing the bulb, hold the flange portion and never touch the glass portion.
- Do not leave the headlight without a bulb for a long time. Dust, moisture, etc. entering the headlight may affect its performance.

- 1) Disconnect the ground cable from the battery.
- 2) Remove the headlight assembly. <Ref. to LI-14, HID TYPE, REMOVAL, Headlight Bulb.>

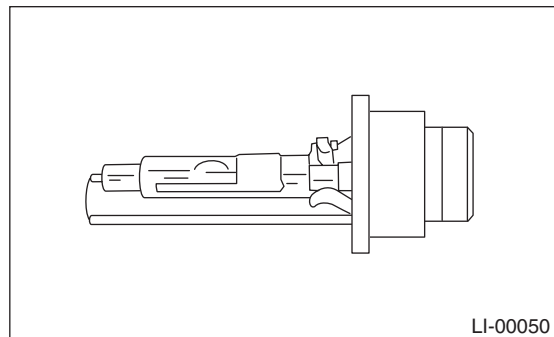
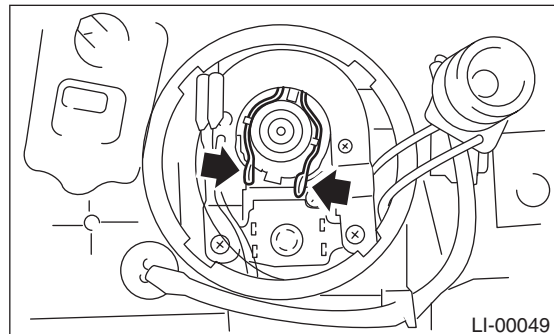
- 3) Remove the back cover.



- 4) Disconnect the harness connector.



- 5) Remove the light bulb retaining spring to remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1. HALOGEN TYPE

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification.
<Ref. to LI-2, SPECIFICATION, General Description.>
- 3) If NG, replace the bulb with a new part.

2. HID TYPE

CAUTION:

- **Do not operate with wet hands.**
- **Do not touch the harness, inner headlight, or any metallic portion of the headlight when the light is illuminated (when the lighting switch is turned on).**
- **When performing a lighting test, make sure that the headlight is mounted on the vehicle, and the power supply is connected to the connector on the vehicle's side.**

- 1) Check the bulb specification.
<Ref. to LI-2, SPECIFICATION, General Description.>
- 2) Install a specified HID bulb for headlight lighting test.
- 3) If the headlight does not illuminate, replace the bulb with a new part.
- 4) Check the HID ballast.

Check the ballast in the following methods and judge if it can be reused or not.

- (1) Perform the cold start (turning on the lights after the headlights is gone off for more than 10 minutes) and hot start (turning on the headlights for more than 15 minutes → turning off the lights for one minute → turning on the lights again) several times and check if the headlights are lit surely.
 - (2) Check the lighting condition from immediately after the cold start until the stable condition (approx. 5 min.), to make sure that the unstable condition (flicker etc.) does not occur.
 - (3) Attach the two bulbs having been used for the same period of time to the right and left headlights and keep the headlights for approx. 30 minutes lit. Check the difference of brightness between right and left headlights.
- 5) If NG, replace the ballast with a new part.

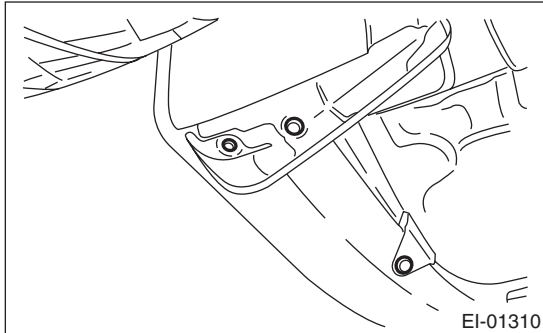
Front Turn Signal Light Bulb

LIGHTING SYSTEM

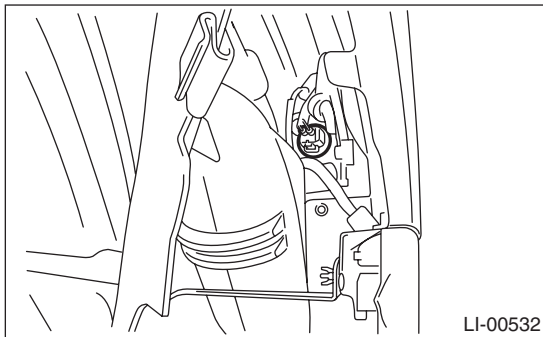
11. Front Turn Signal Light Bulb

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the three clips holding the mud guard.



- 3) Turn over the mud guard and turn the socket and then remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

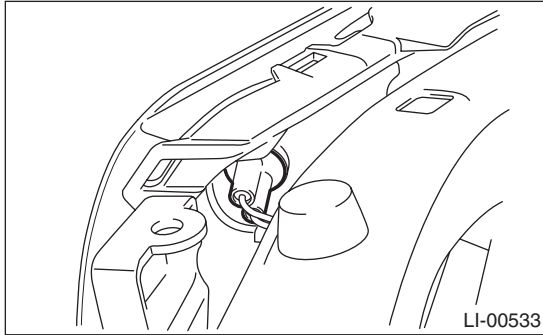
C: INSPECTION

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification.
<Ref. to LI-2, SPECIFICATION, General Description.>
- 3) If NG, replace the bulb with a new part.

12. Clearance/Parking Light Bulb

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the six clips holding the upper part of bumper face and turn over the upper part of bumper face.
- 3) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification.
<Ref. to LI-2, SPECIFICATION, General Description.>
- 3) If NG, replace the bulb with a new part.

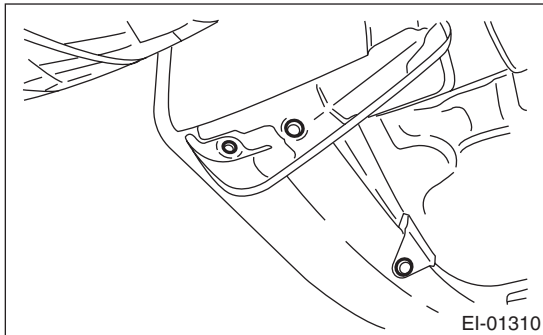
Front Side Marker Light Bulb

LIGHTING SYSTEM

13. Front Side Marker Light Bulb

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the three clips holding the mud guard.



- 3) Turn over the mud guard, turn the socket and then remove the bulb.

B: INSTALLATION

Install in the reverse order of removal.

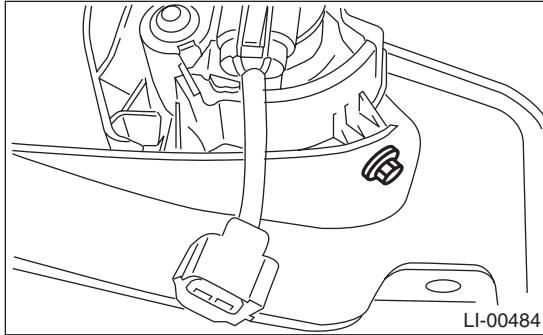
C: INSPECTION

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification.
<Ref. to LI-2, SPECIFICATION, General Description.>
- 3) If NG, replace the bulb with a new part.

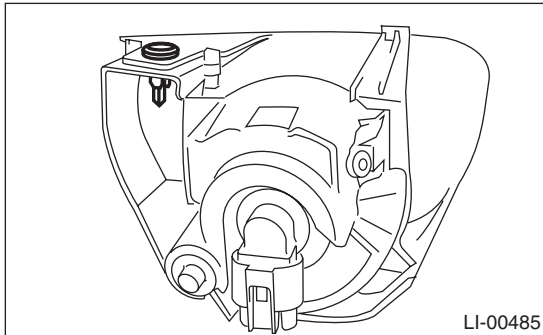
14. Front Fog Light Assembly

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the front bumper. <Ref. to EI-21, REMOVAL, Front Bumper.>
- 3) Remove the lower side bolt.



- 4) Remove the upper side clip, and then detach the fog light assembly.



B: INSTALLATION

Install in the reverse order of removal.

C: ADJUSTMENT

Fog light aiming

NOTE:

Before checking the fog light beam level, be sure of the following:

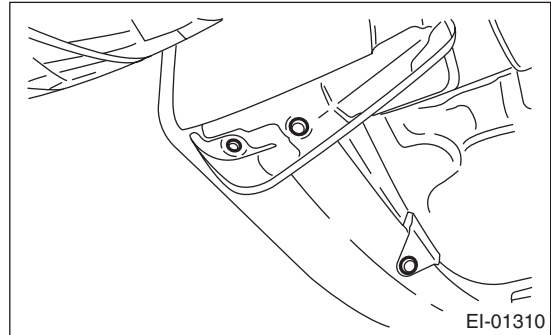
- The area around the fog light does not have any scratch, damage or other type of deformation.
- Vehicle is parked on a level surface.
- The inflation pressure of tires is correct.
- Vehicle's fuel tank is full.

1) Bounce the vehicle several times to normalize the suspension.

2) Make certain that someone is seated in the driver's seat.

3) Measure the height of fog light center.

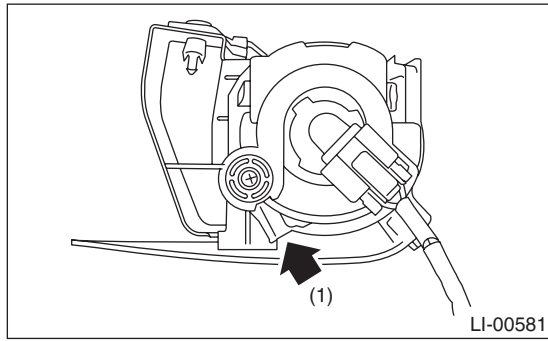
4) Disengage the three clips, and then turn over the mud guard.



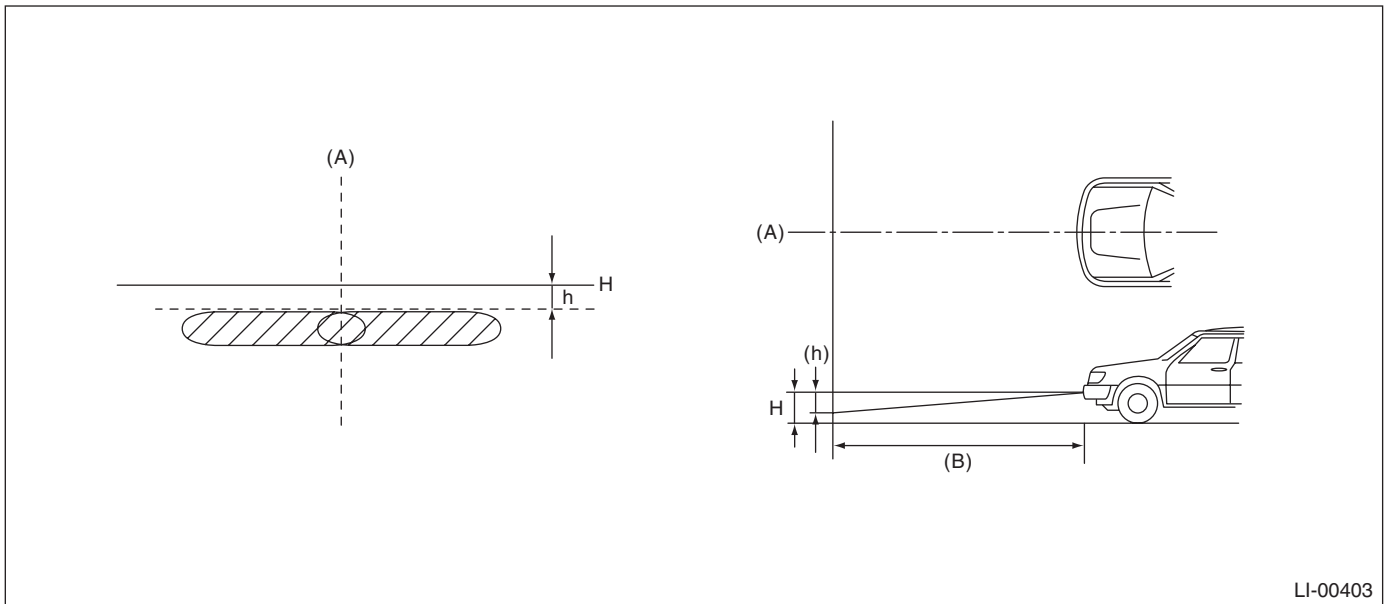
Front Fog Light Assembly

LIGHTING SYSTEM

5) Adjust the front fog light pattern by inserting a Phillips screwdriver to the adjusting hole.



(1) Adjusting hole



LI-00403

(A) Vehicle center

(B) 3 m (10 ft)

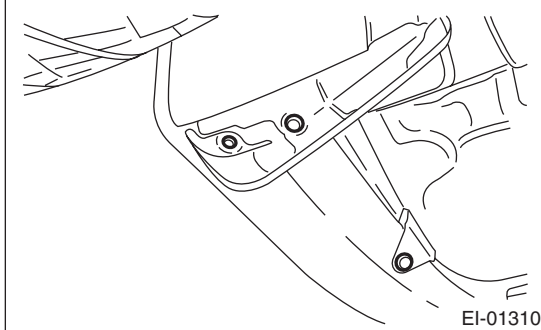
(H) Height of fog light center (mm)

h dimension mm (in)	60 (2.4)
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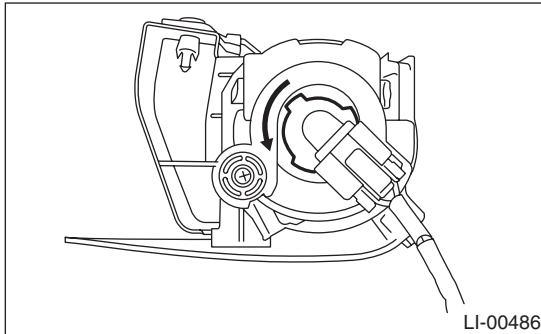
15. Front Fog Light Bulb

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Disengage the three clips, and then turn over the mud guard.



- 3) Remove the spring retainer then detach the fog light bulb.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification.
<Ref. to LI-2, SPECIFICATION, General Description.>
- 3) If NG, replace the bulb with a new part.

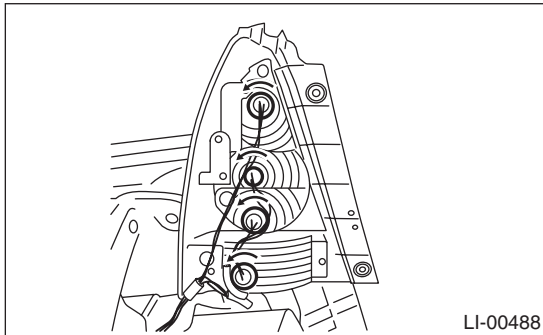
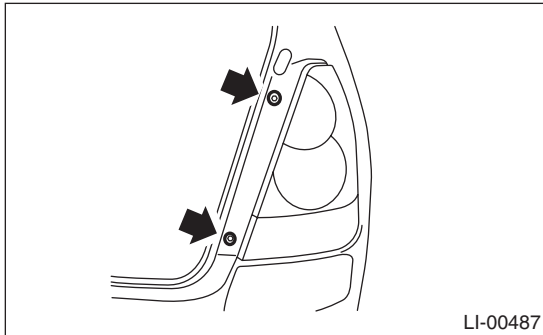
Rear Combination Light Assembly

LIGHTING SYSTEM

16. Rear Combination Light Assembly

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the two bolts, and then detach the rear combination light after disconnecting the connector.



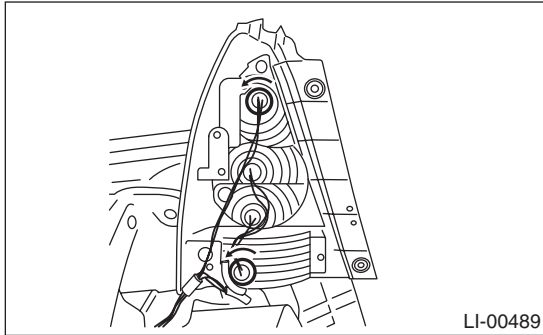
B: INSTALLATION

Install in the reverse order of removal.

17. Tail/Stop Light Bulb

A: REMOVAL

- 1) Remove the rear combination light assembly.
<Ref. to LI-22, REMOVAL, Rear Combination Light Assembly.>
- 2) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

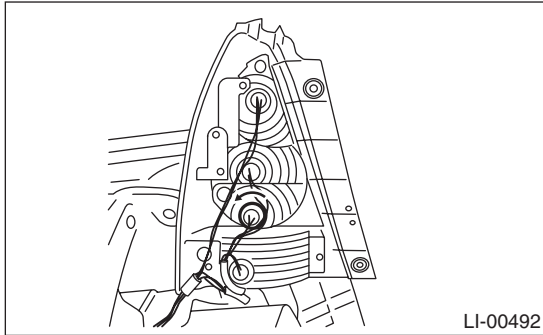
C: INSPECTION

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification.
<Ref. to LI-2, SPECIFICATION, General Description.>
- 3) If NG, replace the bulb with a new part.

19.Rear Turn Signal Light Bulb

A: REMOVAL

- 1) Remove the rear combination light assembly.
<Ref. to LI-22, REMOVAL, Rear Combination Light Assembly.>
- 2) Turn the socket and remove the bulb.



B: INSTALLATION

Install in the reverse order of removal.

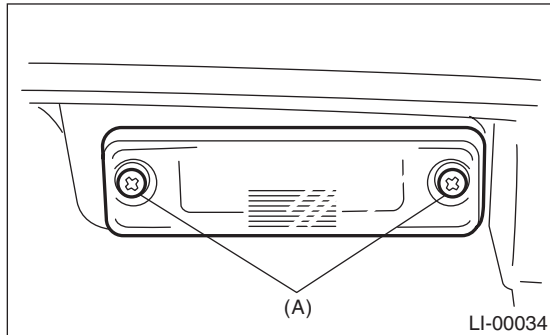
C: INSPECTION

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification.
<Ref. to LI-2, SPECIFICATION, General Description.>
- 3) If NG, replace the bulb with a new part.

20. License Plate Light

A: REMOVAL

- 1) Remove the license plate light mounting screw (A) and then remove the lens.



- 2) Remove the bulb.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

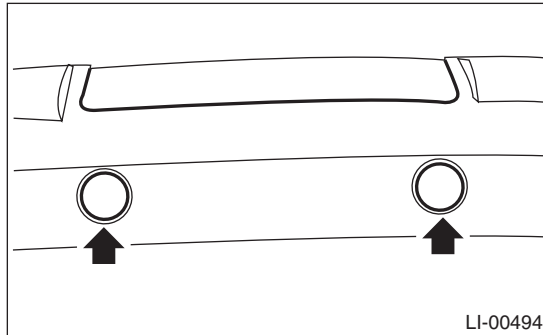
- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification.
<Ref. to LI-2, SPECIFICATION, General Description.>
- 3) If NG, replace the bulb with a new part.

21.High-mounted Stop Light

A: REMOVAL

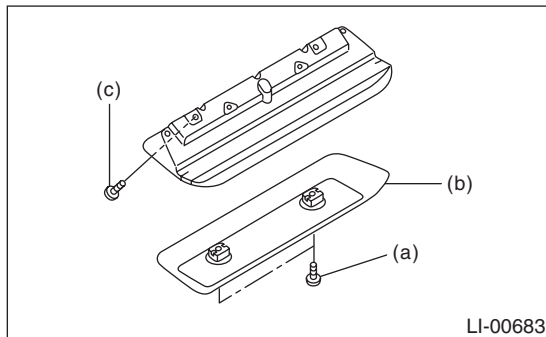
1. REAR SPOILER BUILT-IN TYPE

- 1) Disconnect the ground cable from the battery.
- 2) For model with roof spoiler, remove the roof spoiler.
- 3) Unpeel the tape on the backside of the high-mounted stop light and remove the nuts, to remove the high-mounted stop light.



2. STANDARD TYPE

- 1) Disconnect the ground cable from the battery.
- 2) Remove the screws (a) and then detach the cover (b).
- 3) Remove the screws (c) and then detach the high-mounted stop light while disconnecting the connector.



B: INSTALLATION

Install in the reverse order of removal.

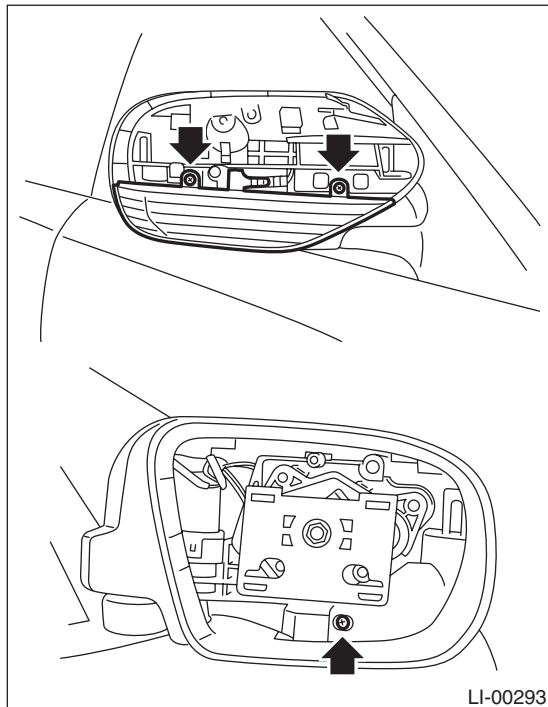
C: INSPECTION

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification.
<Ref. to LI-2, SPECIFICATION, General Description.>
- 3) If NG, replace the bulb with a new part.

22.Side Turn Signal Light Assembly

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the scalp cap. <Ref. to GW-11, REPLACEMENT, Scalp Cap.>
- 3) Disconnect the harness connector, remove the 3 mounting screws and then remove the side turn signal light assembly.



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

- 1) Install the side turn signal light assembly and check that it blinks normally.
- 2) If it does not blink normally, replace the side turn signal light assembly with a new part.

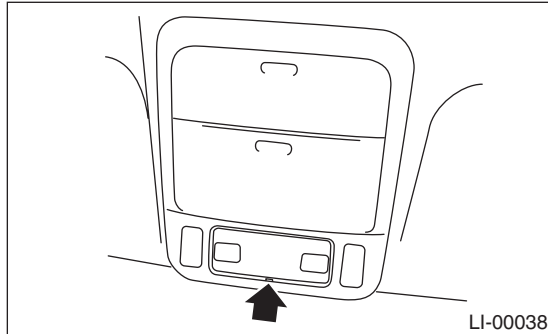
NOTE:

Since a LED (Light Emitting Diode) is used for the side turn signal light, replace the side turn signal light assembly if the LED does not turn on.

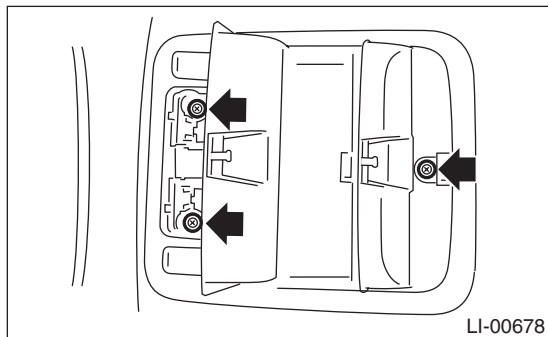
23. Spot Map Light

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Insert a flat tip screwdriver into the notch on the lens and remove it by prying.



- 3) Remove the spot map light mounting screw.



- 4) Disconnect the harness connectors and remove the spot map light.

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1. SPOT MAP LIGHT BULB

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification.
<Ref. to LI-2, SPECIFICATION, General Description.>
- 3) If NG, replace the bulb with a new part.

2. SPOT MAP LIGHT SWITCH

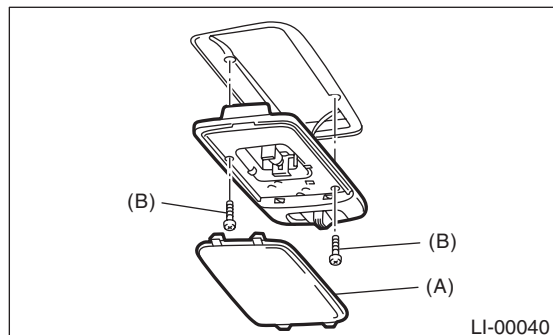
Measure the spot map light switch resistance.

Switch position	Terminal No.	Standard
OFF	—	1 M Ω or more
ON	1 and 2	18 \pm 5.4 Ω

24. Room Light

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the lens (A) and mounting screws (B).



- 3) Disconnect the harness connector and remove the room light.

B: INSTALLATION

Install in the reverse order of removal.

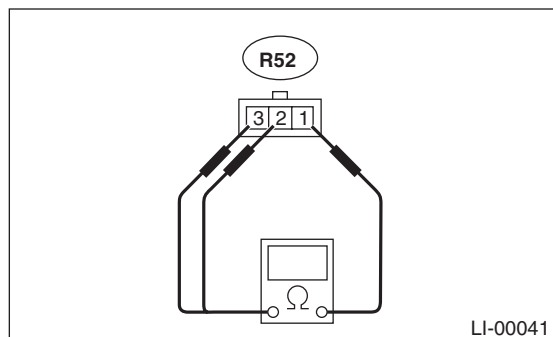
C: INSPECTION

1. ROOM LIGHT BULB

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification.
<Ref. to LI-2, SPECIFICATION, General Description.>
- 3) If NG, replace the bulb with a new part.

2. ROOM LIGHT SWITCH

Measure the room light switch resistance.

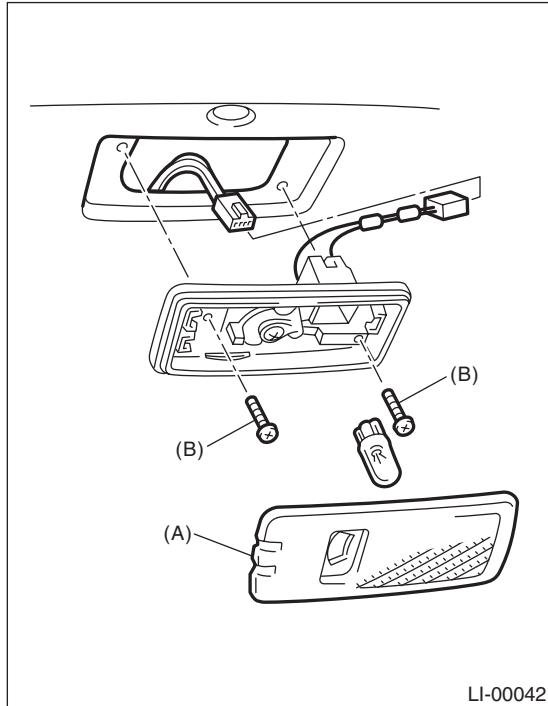


Switch position	Terminal No.	Standard
OFF	—	1 MΩ or more
ON	1 and 3	1.5±0.5 Ω
DOOR	1 and 2	1.5±0.5 Ω

25. Luggage Room Light

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the lens (A) and mounting screws (B) of the luggage room light.



- 3) Disconnect the harness connectors and remove the luggage room light.

B: INSTALLATION

Install in the reverse order of removal.

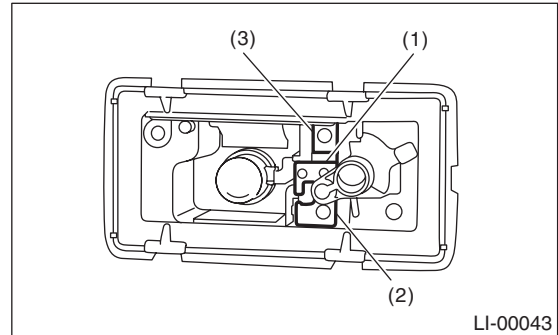
C: INSPECTION

1. LUGGAGE ROOM LIGHT BULB

- 1) Visually check the bulb for blow out.
- 2) Check the bulb specification.
<Ref. to LI-2, SPECIFICATION, General Description.>
- 3) If NG, replace the bulb with a new part.

2. LUGGAGE ROOM LIGHT SWITCH

Measure the luggage room light switch resistance.



Switch position	Terminal No.	Standard
OFF	—	1 MΩ or more
ON	1 and 3	1.5±0.5 Ω
DOOR	1 and 2	1.5±0.5 Ω

Luggage Room Light

LIGHTING SYSTEM

General Description

WIPER AND WASHER SYSTEMS

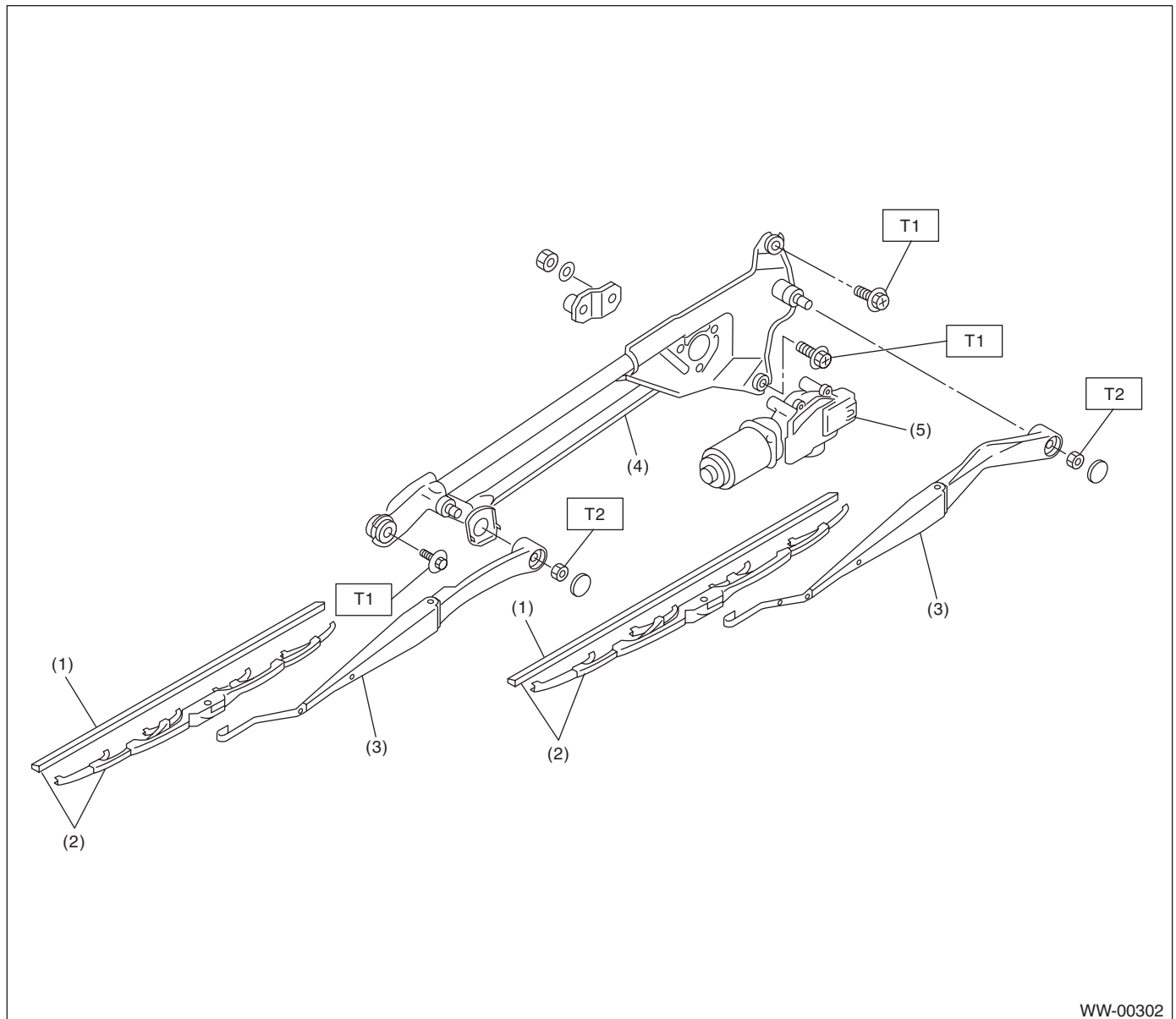
1. General Description

A: SPECIFICATION

Front wiper motor	Input	12 V — 72 W or less
Rear wiper motor	Input	12 V — 42 W or less
Front washer pump	Pump type	Centrifugal
	Input	12 V — 36 W or less
Rear washer pump	Pump type	Centrifugal
	Input	12 V — 36 W or less

B: COMPONENT

1. FRONT WIPER



- (1) Wiper rubber
- (2) Wiper blade ASSY
- (3) Wiper arm

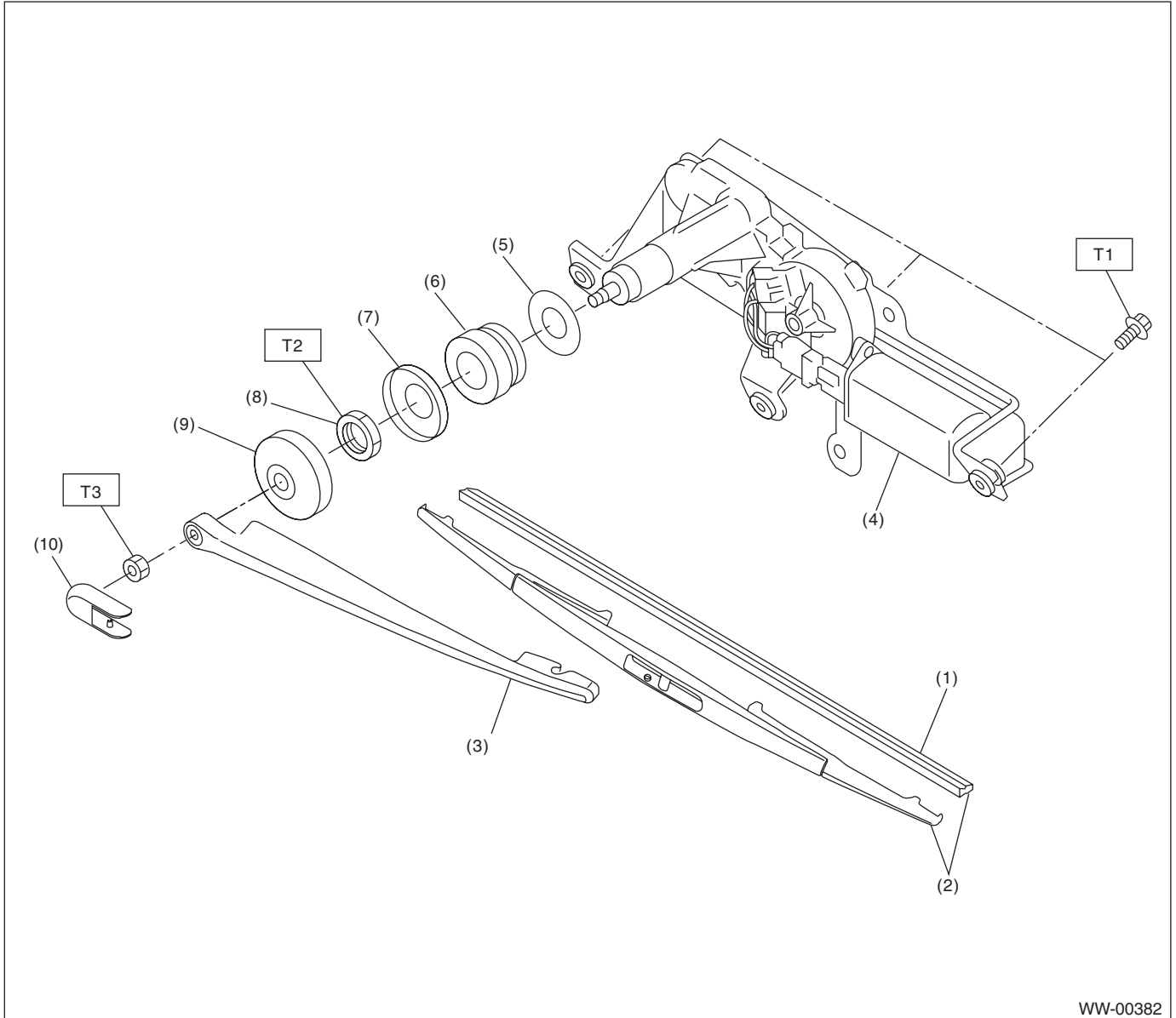
- (4) Wiper link
- (5) Wiper motor

Tightening torque: N·m (kgf·m, ft·lb)

T1: 6.0 (0.61, 4.4)

T2: 20 (2.0, 14.5)

2. REAR WIPER



WW-00382

- | | |
|----------------------|----------------------|
| (1) Wiper rubber | (6) Cushion |
| (2) Wiper blade ASSY | (7) Spacer B |
| (3) Wiper arm | (8) Nut |
| (4) Wiper motor | (9) Cap |
| (5) Spacer A | (10) Wiper arm cover |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 6.0 (0.61, 4.4)

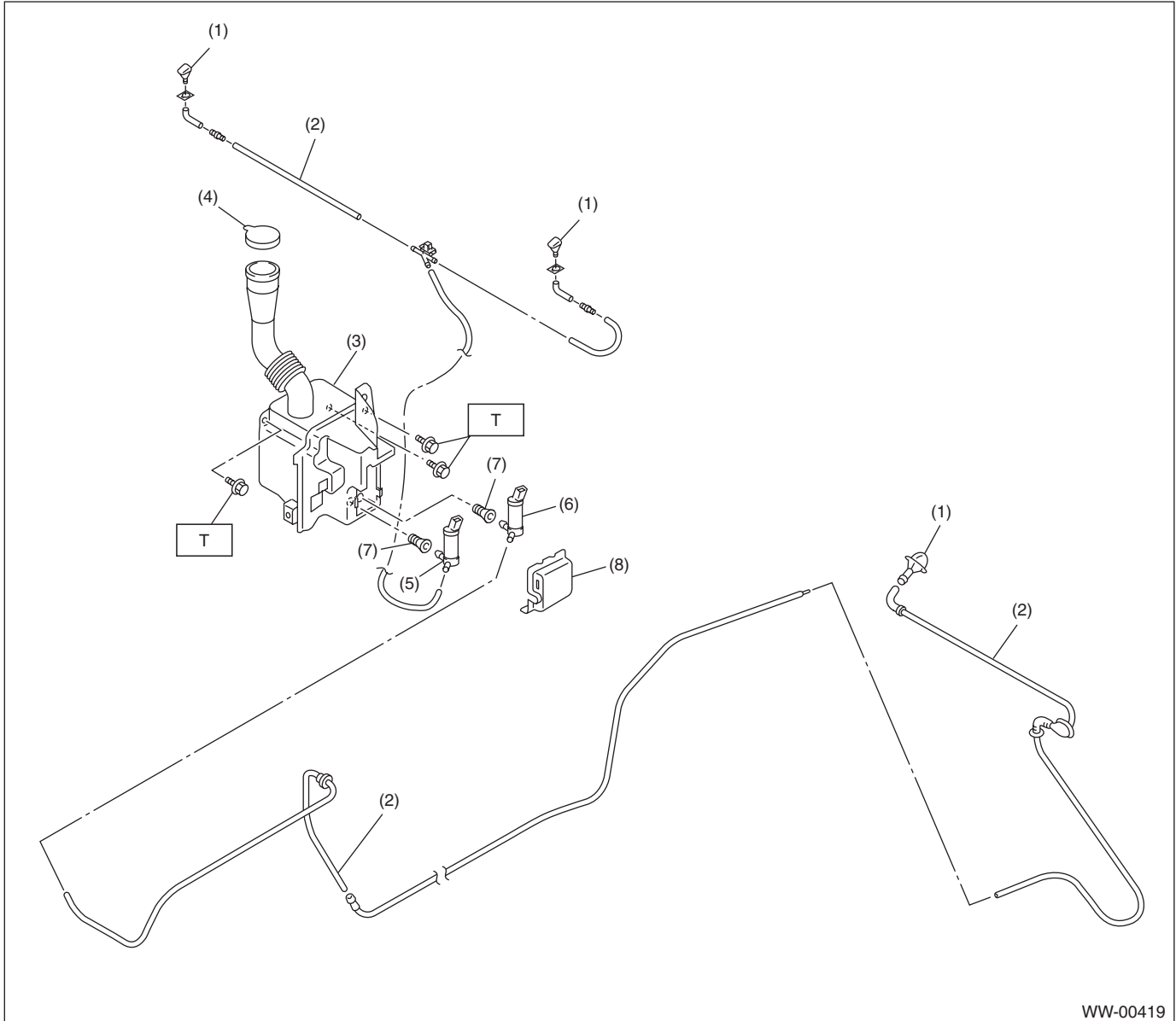
T2: 7.5 (0.76, 5.5)

T3: 8.0 (0.82, 5.9)

General Description

WIPER AND WASHER SYSTEMS

3. WASHER TANK



WW-00419

- | | |
|---------------------|------------------------|
| (1) Washer nozzle | (5) Front washer motor |
| (2) Washer hose | (6) Rear washer motor |
| (3) Washer tank | (7) Grommet |
| (4) Washer tank cap | (8) Washer motor cover |

Tightening torque: N·m (kgf·m, ft·lb)

T: 6.0 (0.61, 4.4)

C: CAUTION

- Connect the connectors and hoses securely during reassembly.

After reconnection, make sure each part operates normally.

- Be careful with the airbag system wiring harness which passes near electrical parts and switches.
- All airbag system wiring harness and connectors are colored yellow. Do not use a tester equipment on these circuits.
- Care must be taken when connecting the washer hose so that no bending, jamming, etc. are caused.

- If even a small amount of silicon oil or grease enters tank and washer fluid passages, an oil film will be formed on the glass, and will cause the wiper to chatter and judder. Be careful no oil comes into contact with the system.

2. Wiper and Washer System

A: WIRING DIAGRAM

1. WIPER AND WASHER (FRONT)

<Ref. to WI-121, WIRING DIAGRAM, Front Wiper and Washer System.>

2. WIPER AND WASHER (REAR)

<Ref. to WI-122, WIRING DIAGRAM, Rear Wiper and Washer System.>

B: INSPECTION

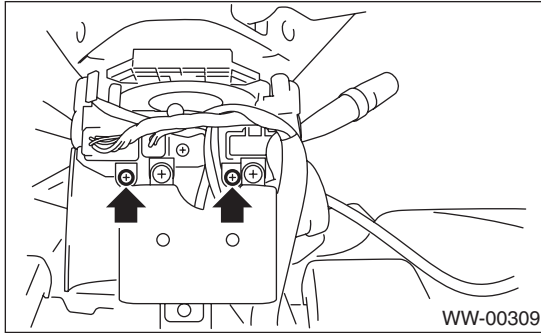
Symptom	Repair order
Wiper and washers do not operate.	(1) Wiper fuse (F/B No. 14, 15) (2) Combination switch (3) Wiper motor (4) Wiring harness
Wipers do not operate in LO or HI.	(1) Combination switch (2) Wiper motor (3) Wiring harness
Wipers do not operate in INT.	(1) Combination switch (2) Wiper motor (3) Wiring harness
Washer motor does not operate.	(1) Washer switch (2) Washer motor (3) Wiring harness
Wipers do not operate when washer switch is turned to ON.	(1) Wiper motor (2) Wiring harness
Washer fluid spray does not operate properly.	(1) Washer motor (2) Washer hose and nozzle

Combination Switch (Wiper)

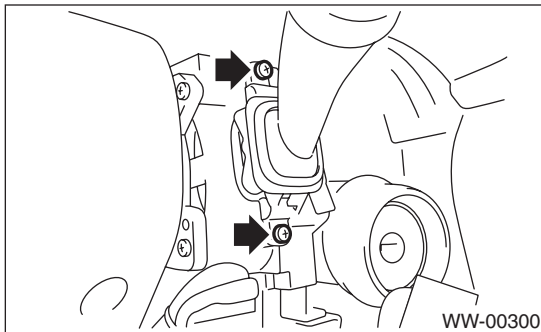
3. Combination Switch (Wiper)

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the instrument panel lower cover. <Ref. to EI-39, REMOVAL, Instrument Panel Assembly.>
- 3) Loosen the screw to remove a steering column lower cover.
- 4) Remove the steering column upper cover mounting screw.



- 5) Disconnect the connector from combination switch.
- 6) Loosen the screw to remove the combination switch.

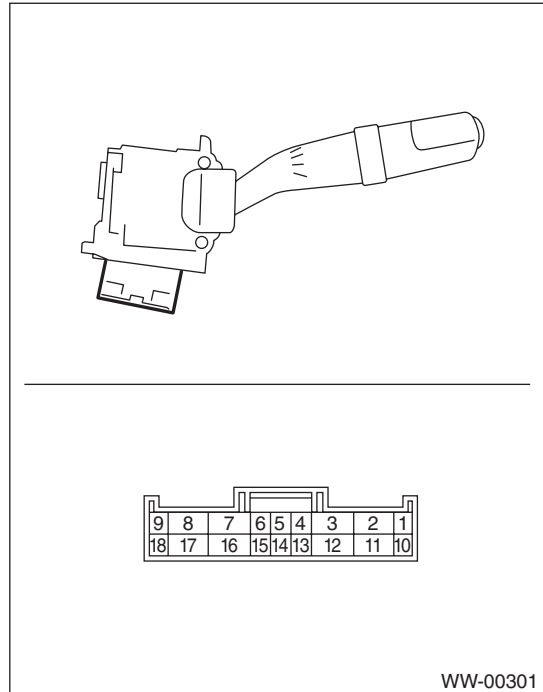


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

- Inspect the continuity between each connector terminal.



	Switch position	Terminal No.	Standard
Front	LO	7 and 17	Less than 1 Ω
	HI	8 and 17	Less than 1 Ω
	Washer ON	2 and 11	Less than 1 Ω
Rear	Washer ON	2 and 12	Less than 1 Ω
	OFF	Between any two of following terminals: 2, 10, 12, 13	1 MΩ or more
	INT	2 and 13	Less than 1 Ω
	ON	2 and 10	Less than 1 Ω
	Washer ON	2 and 10 10 and 12 2 and 12	Less than 1 Ω

If continuity is not as specified, replace the switch.

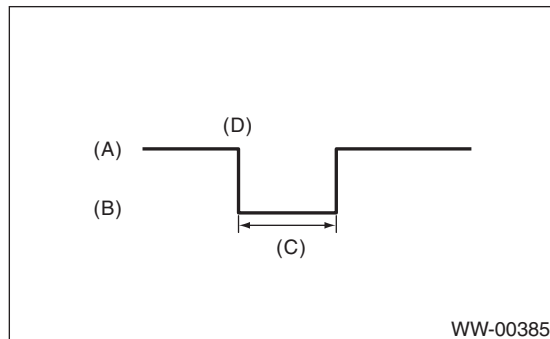
- Intermittent operation inspection
- Inspect wiper switch separately
- 1) Set the voltmeter between switch terminal No. 7 (+) and No. 2 (-).
 - 2) Connect the battery between switch terminal No. 17 (+) and No. 2 (-).
 - 3) Turn the front wiper switch to INT.
 - 4) Connect the battery (+) to switch terminal No. 16 for 5 seconds.

Combination Switch (Wiper)

5) Connect battery (–) to switch terminal No. 16 and measure the voltage during intermittent operation.

Terminals

No. 7 — No. 2:



- (A) Approx. 12 V
- (B) Approx. 0 V
- (C) Intermittent stationary time
- (D) Connect battery (–) to terminal No. 16.

6) Perform step 1) to 5) when intermittent control switch is in MIN or MAX.

Intermittent stationary time:

MIN: Approx. 2 sec.

MAX: Approx. 16 sec.

7) If operation is not as specified, replace the switch.

Wiper Blade

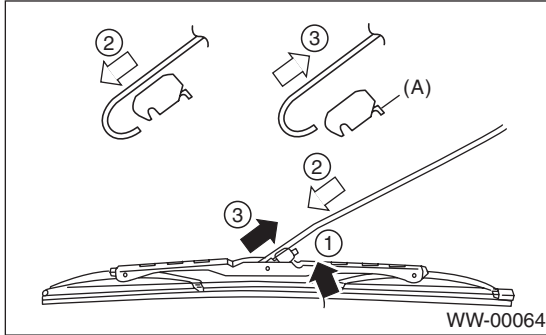
WIPER AND WASHER SYSTEMS

4. Wiper Blade

A: REMOVAL

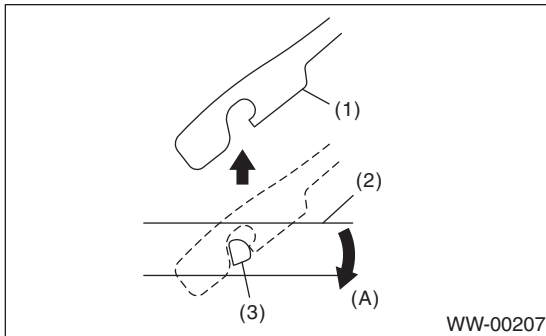
1. FRONT

While pushing the locking clip (A) up, pull out the blade assembly to the direction of the arrow and remove it from the wiper arm.



2. REAR

Turn the blade in the direction of arrow (A) and remove it from arm.



- (A) Turn the wiper blade.
- (1) Wiper arm
- (2) Wiper blade
- (3) Wiper blade attachment section

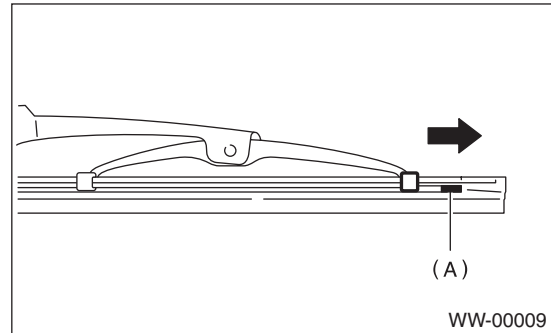
B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Confirm that the clip is locked securely.

C: DISASSEMBLY

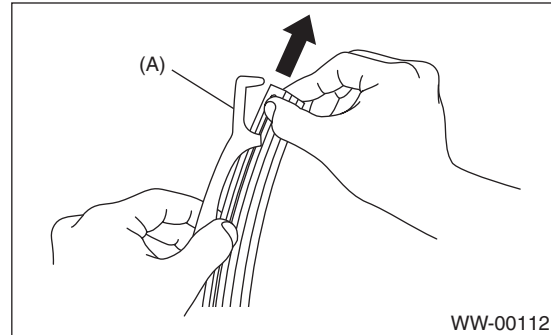
1. FRONT

Pull side (A) of the wiper rubber stopper and remove the rubber from the blade assembly.



2. REAR

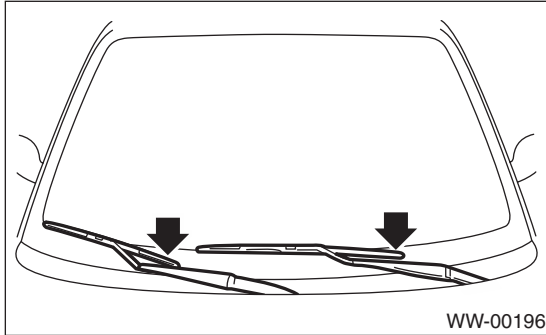
Pull the wiper rubber top slightly from stopper (A) and pull out completely.



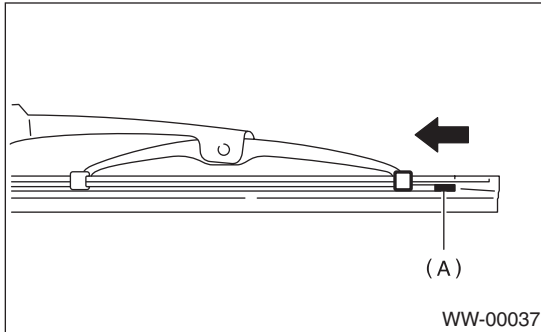
D: ASSEMBLY

1. FRONT

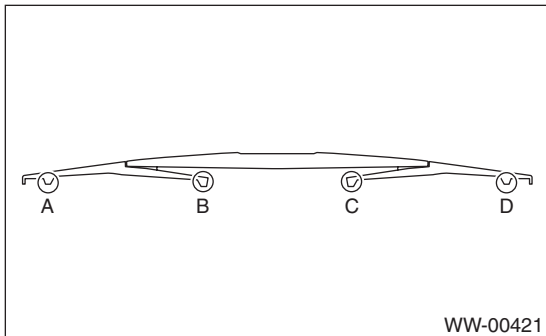
1) Insert the wiper rubber onto the blade so that the stopper is in the position shown.



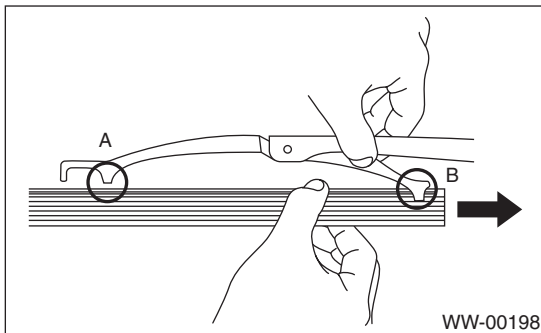
2) Make sure the wiper rubber is securely fastened to the pull stopper (A).



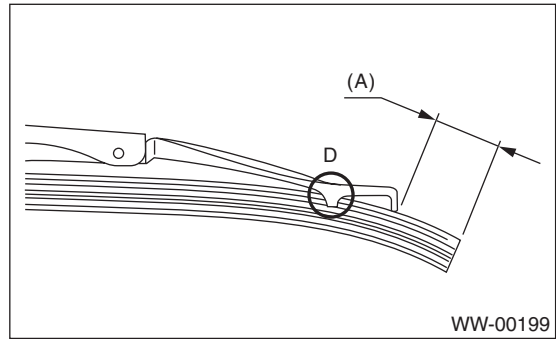
2. REAR



1) Insert the wiper rubber into claw (B).

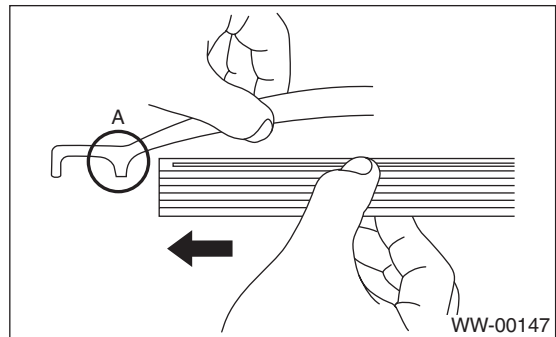


2) Insert the wiper rubber until its top end protrudes approx. 20 mm (0.79 in) from stopper (D).



(A) 20 mm (0.79 in)

3) Insert the wiper rubber into claw (A).



E: INSPECTION

1) When the wiper does not operate properly, inspect the following item.

- Make sure the movable part of blade assembly moves smoothly.
- Make sure the wiper rubber is not deformed or damaged.

2) Replace with a new part if damage is found.

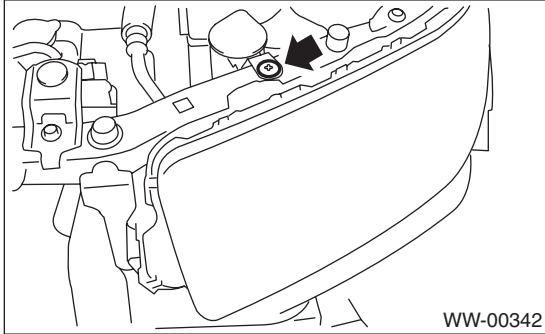
Washer Tank and Motor

WIPER AND WASHER SYSTEMS

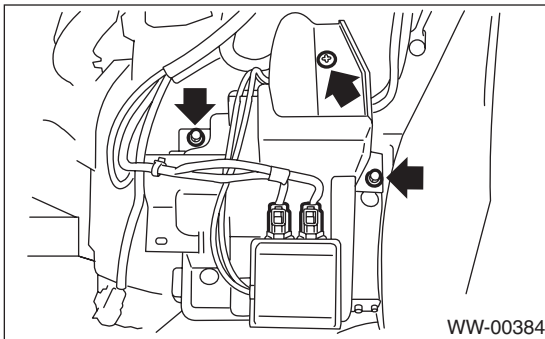
5. Washer Tank and Motor

A: REMOVAL

- 1) Open the front hood.
- 2) Disconnect the ground cable from the battery.
- 3) Remove the front bumper. <Ref. to EI-21, REMOVAL, Front Bumper.>
- 4) Remove the clip holding washer water supply tap.



- 5) Remove three bolts, hose and connector, and then remove the washer tank.



B: INSTALLATION

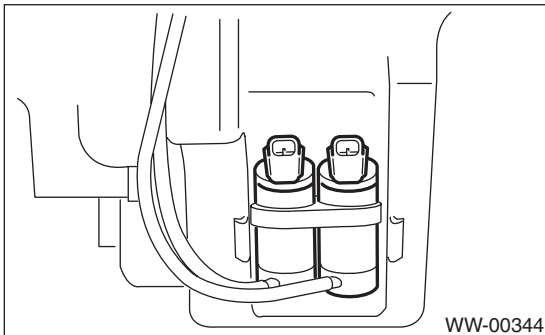
Install in the reverse order of removal.

Tightening torque:

6.0 N·m (0.61 kgf·m, 4.4 ft·lb)

C: DISASSEMBLY

Pull out the washer motor from tank.

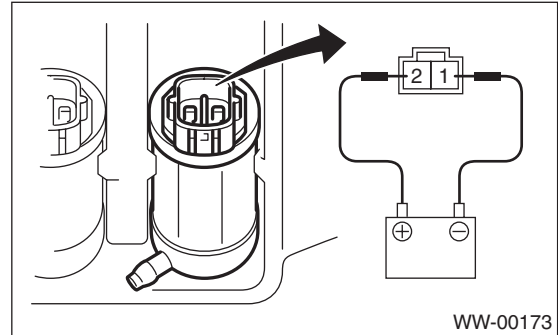


D: ASSEMBLY

- 1) Assemble in the reverse order of disassembly.
- 2) Confirm that water does not leak from installation area of motor.

E: INSPECTION

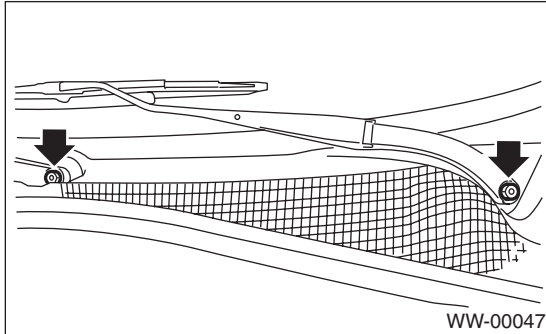
Apply battery voltage to the connector terminal of the washer motor and make sure the motor operates.



6. Front Wiper Arm

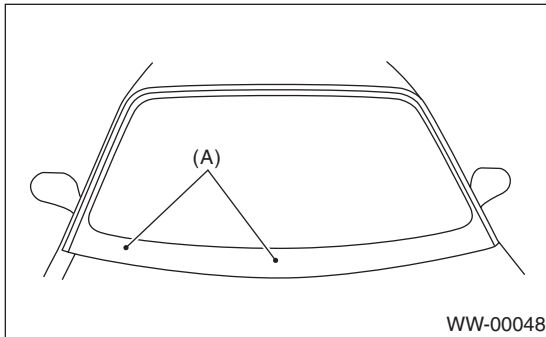
A: REMOVAL

- 1) Open the front hood.
- 2) Remove the cap.
- 3) Loosen the nut to remove the arm.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Operate the wiper once.
- 3) Align the wiper blade to ceramic print point mark (A) of front window panel.

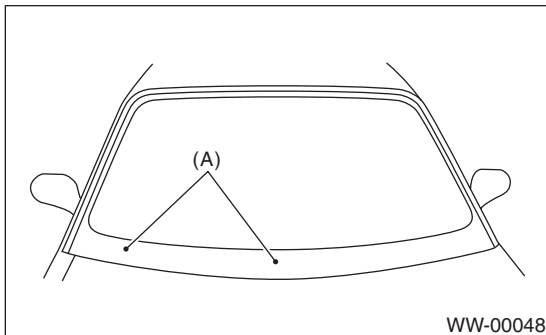


Tightening torque:

Refer to "COMPONENT" of "General Description". <Ref. to WW-2, FRONT WIPER, COMPONENT, General Description.>

C: ADJUSTMENT

Operate the wiper once. Align the wiper blade to ceramic print point mark (A) of front window panel.



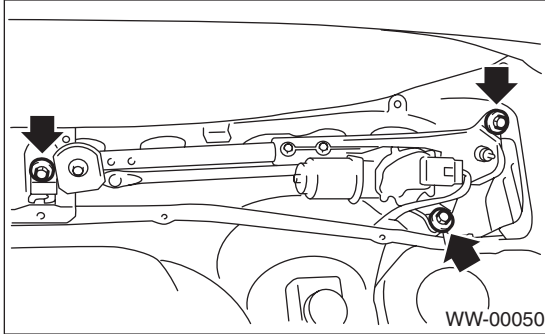
Front Wiper Motor and Link

WIPER AND WASHER SYSTEMS

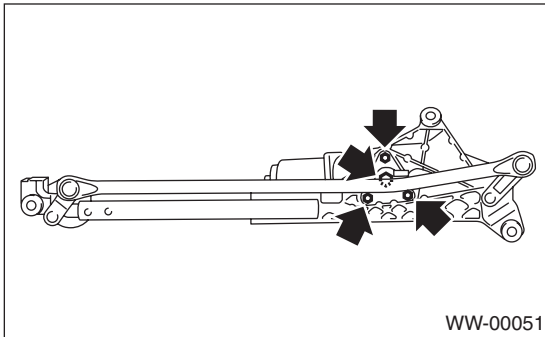
7. Front Wiper Motor and Link

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the cowl panel. <Ref. to EI-31, REMOVAL, Cowl Panel.>
- 3) Disconnect the connector of motor.
- 4) Loosen the bolts and nuts to remove the wiper link.

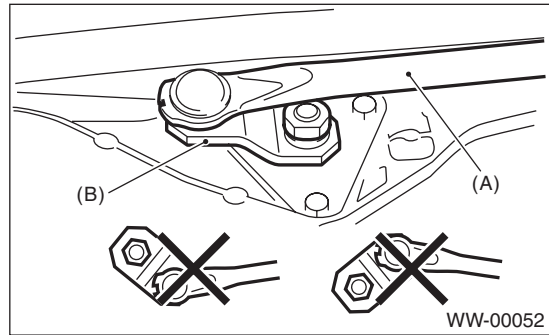


- 5) Loosen the bolts and nuts to remove the motor.



B: INSTALLATION

- 1) Install the wiper link to the vehicle, then connect the motor connector.
- 2) Connect the ground cable to the battery.
- 3) To confirm that the motor is at the auto stop position, connect the harness to the motor and turn the wiper switch ON/OFF once.
- 4) Disconnect the ground cable from the battery.
- 5) Tighten the nut where rod (A) and link plate (B) is aligned in a straight line.



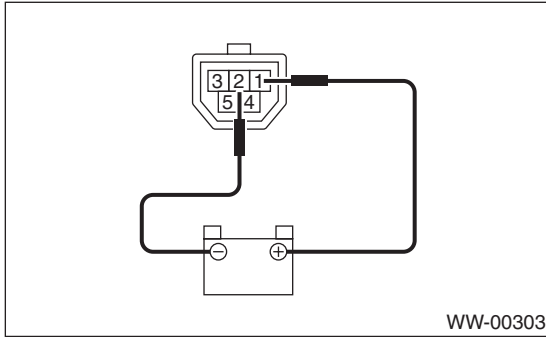
- 6) Install in the reverse order of removal.

Tightening torque:

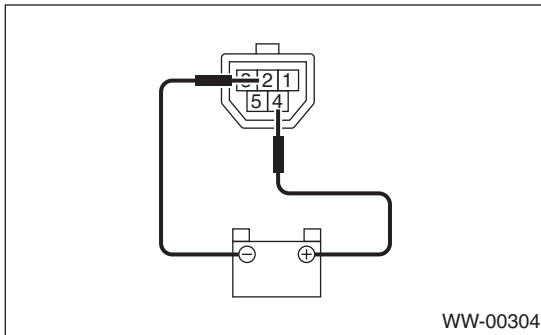
Refer to "COMPONENT" of "General Description". <Ref. to WW-2, FRONT WIPER, COMPONENT, General Description.>

C: INSPECTION

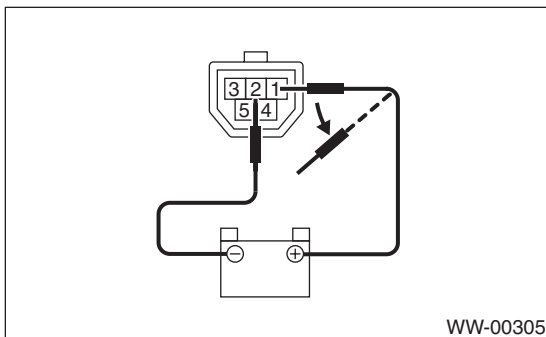
1) When the battery is connected to the terminal of connectors as shown in the figure, confirm that the motor operates at low speed.



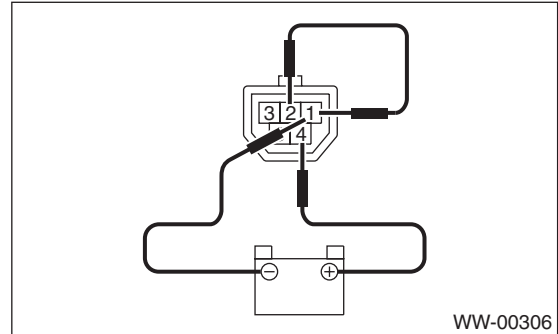
2) When the battery is connected to the terminal of connectors as shown in the figure, confirm that the wiper motor operates at high speed.



3) Connect the battery to terminals of the connector, and remove the terminal connection with motor rotating at low speed, and stop the wiper motor in mid-operation.



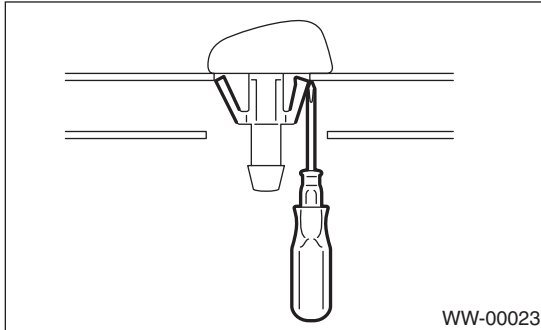
4) Connect the battery and confirm that the motor stops at the automatic stop position after the motor operates at low speed again.



8. Front Washer Nozzle

A: REMOVAL

- 1) Remove the washer hose from the washer nozzle.
- 2) Open the clips on the underside of the front hood with a thin screwdriver or other tool, and remove the washer nozzle.



B: INSTALLATION

Install in the reverse order of removal.

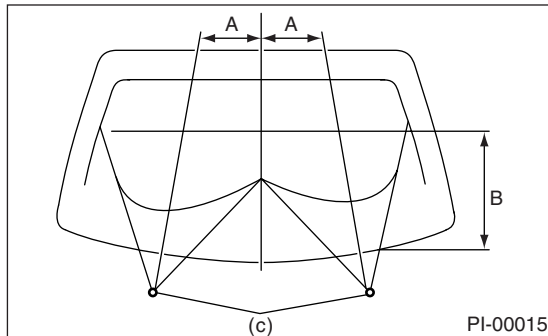
C: INSPECTION

- Make sure the nozzle and hose are not clogged.
- Make sure the hose is not bent.
- It is not possible to adjust the ejection position of the washer liquid because it is the scatter nozzle.
- If the spray position is largely different from the position shown as follows, replace the washer nozzle.

In ejection position:

A: 250 mm (9.84 in)

B: 345 mm (13.58 in)

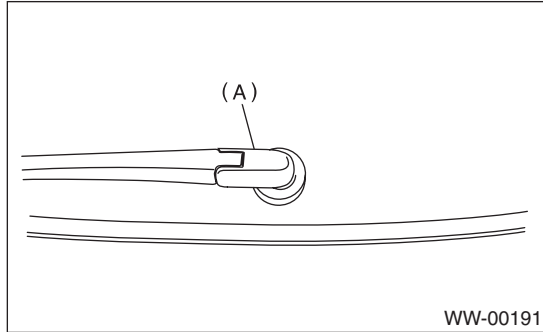


(C) Nozzle

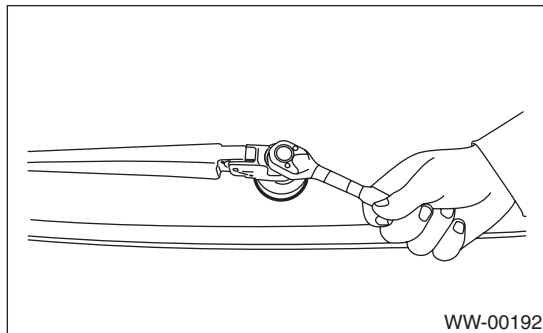
9. Rear Wiper Arm

A: REMOVAL

- 1) Detach the wiper arm cover (A).

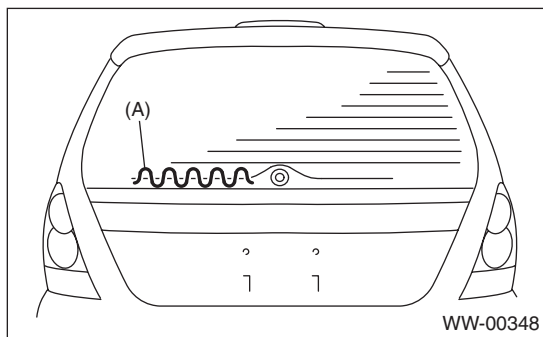


- 2) Loosen the nut to remove the wiper arm.



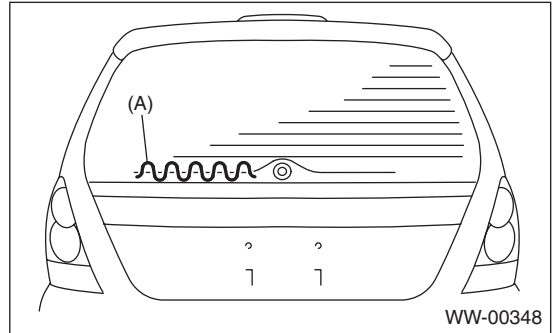
B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Operate the rear wiper once.
- 3) Align the blade to center of the rear defogger heat wire (A).



C: ADJUSTMENT

- 1) Operate the rear wiper once.
- 2) Align the blade to center of the rear defogger heat wire (A).



Tightening torque:

Refer to "COMPONENT" of "General Description". <Ref. to WW-3, REAR WIPER, COMPONENT, General Description.>

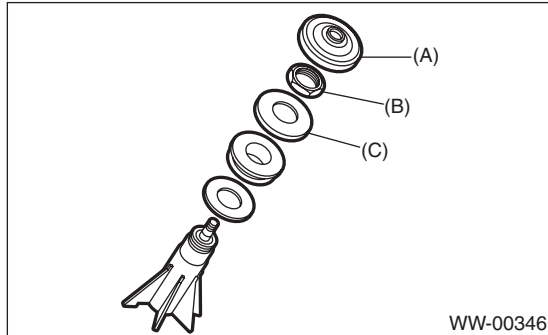
Rear Wiper Motor

WIPER AND WASHER SYSTEMS

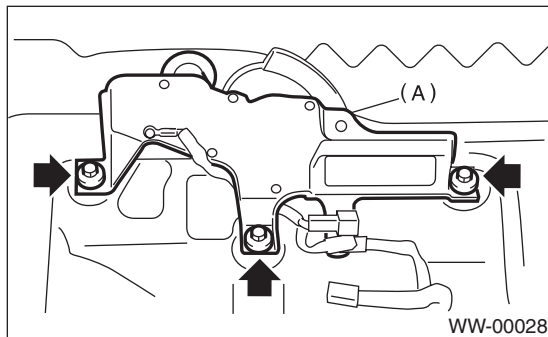
10.Rear Wiper Motor

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the rear wiper arm.
- 3) Remove the cap (A), nut (B), and spacer (C) from rear wiper shaft.

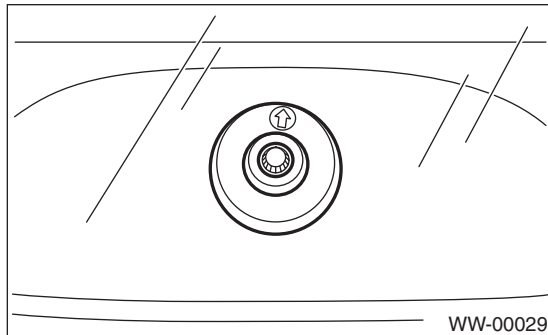


- 4) Remove the rear gate lower trim. <Ref. to EI-47, REMOVAL, Rear Gate Trim.>
- 5) Unclip the clip of harness and disconnect connector of wiper motor.
- 6) Loosen the bolts to remove the wiper motor assembly (A).



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Install the rear wiper cushion with the arrow mark facing up, as shown in the figure.

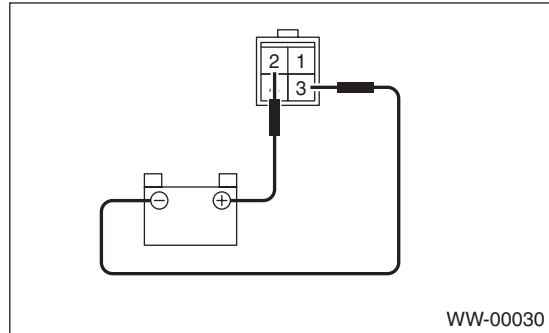


Tightening torque:

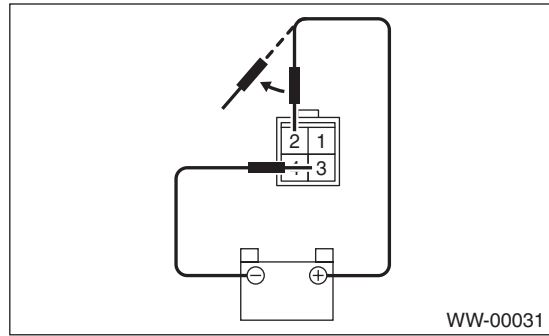
Refer to "COMPONENT" of "General Description". <Ref. to WW-3, REAR WIPER, COMPONENT, General Description.>

C: INSPECTION

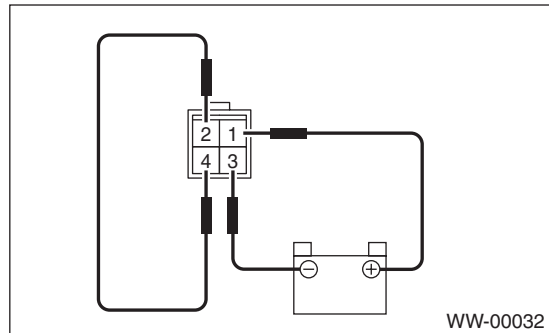
- 1) Connect the battery to the wiper motor connector and confirm that wiper motor operates.



- 2) Connect the battery to terminals of the connector, and remove the terminal connection with motor rotating, and stop the wiper motor in mid-operation.



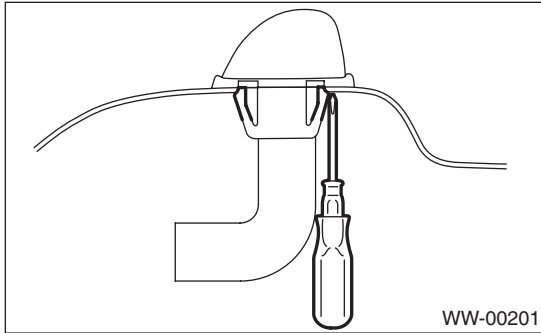
- 3) Connect the battery and confirm that the motor stops at the automatic stop position after the motor operates at low speed again.



11.Rear Washer

A: REMOVAL

- 1) Remove the rear gate upper trim. <Ref. to EI-47, REMOVAL, Rear Gate Trim.>
- 2) Remove the washer hose from the washer nozzle.
- 3) Push the anchor of the washer nozzle body with a flat tip screwdriver or equivalent, and remove the washer nozzle.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Adjust the position of the washer liquid sprayer. <Ref. to WW-17, ADJUSTMENT, Rear Washer.>

C: INSPECTION

- Make sure the nozzle and hose are not clogged.
- Make sure the hose is not bent.

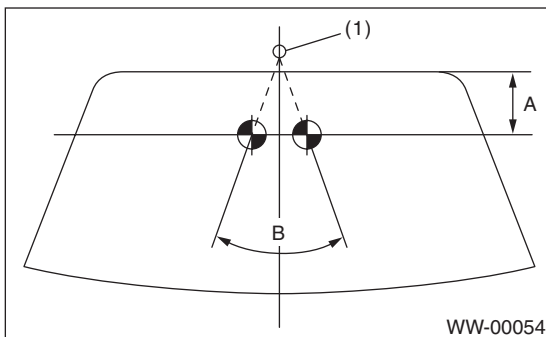
D: ADJUSTMENT

- 1) Turn the wiper switch to OFF position.
- 2) When the vehicle stops, adjust the washer liquid ejection position as shown in the figure.

In ejection position:

A: 35 mm (1.38 in)

B: 72°



(1) Nozzle

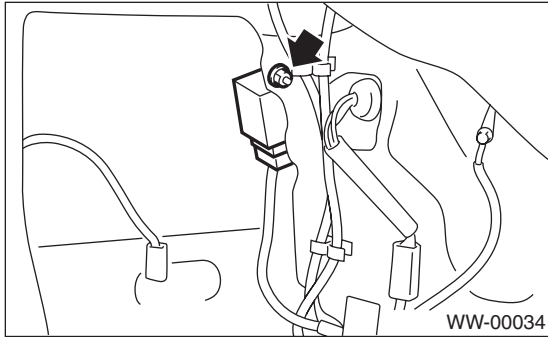
Wiper Control Relay

WIPER AND WASHER SYSTEMS

12. Wiper Control Relay

A: REMOVAL

- 1) Disconnect the ground cable from battery.
- 2) Remove the quarter lower trim RH. <Ref. to EI-44, REMOVAL, Rear Quarter Trim.>
- 3) Loosen the nut to remove the control unit.

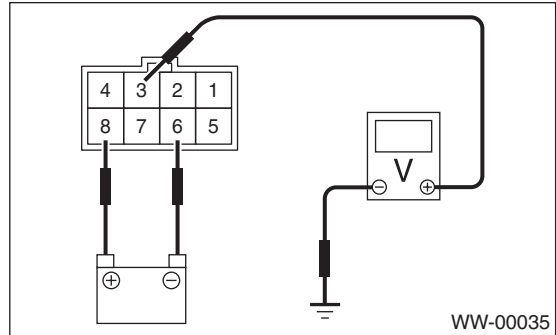


B: INSTALLATION

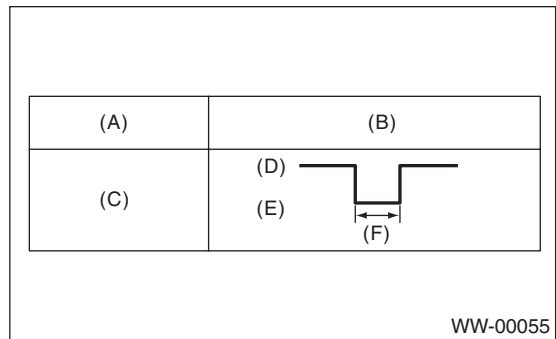
Install in the reverse order of removal.

C: INSPECTION

- 1) Disconnect the connector from the wiper control relay.
- 2) Connect the positive (+) probe from the battery to terminal 8 and the negative (-) probe to terminal 6. Connect the positive (+) probe from the voltage meter to terminal 3 and the negative (-) probe to the ground.



- 3) Measure the voltage when the wiper relay operates.



- (A) Switch position
- (B) Voltage
- (C) ON
- (D) 12 V
- (E) 0 V
- (F) 9±2 sec.

If operation is not as specified, replace the switch.

1. General Description

A: CAUTION

- Before disassembling or reassembling parts, always disconnect the battery ground cable from battery. When replacing the radio, control unit, and other parts provided with memory functions, record the memory contents before disconnecting the battery ground cable. Otherwise, the memory is cleared.
- Reassemble the parts in the reverse order of disassembly procedure unless otherwise indicated.
- Adjust parts to the given specifications.
- Connect the connectors and hoses securely during reassembly.
- After reassembly, make sure functional parts operate smoothly.

B: PREPARATION TOOL

1. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.
Conductive silver composition (DUPONT No. 4817 or equivalent)	Used for repairing antenna wire.

2. Radio System

A: WIRING DIAGRAM

1. RADIO BODY

<Ref. to WI-124, WIRING DIAGRAM, Audio System.>

B: INSPECTION

Symptom	Repair order
No power coming in. (No display and no sound from speakers)	<ol style="list-style-type: none"> 1. Check the fuse and power supply for radio. 2. Check the radio ground. 3. Remove the radio for repair.
A specific speaker does not operate.	<ol style="list-style-type: none"> 1. Check the speaker. 2. Check the output circuit between radio and speaker.
Radio generates noise with engine running.	<ol style="list-style-type: none"> 1. Check the radio ground. 2. Check the generator. 3. Check the ignition coil. 4. Remove the radio for repair.
Volume is low in AM and FM modes or interference noise occurs.	<ol style="list-style-type: none"> 1. Check the antenna. 2. Check the antenna amplifier. 3. Check the noise suppressor. 4. Check the radio ground. 5. Remove the radio for repair.

Front Accessory Power Supply Socket System

ENTERTAINMENT

3. Front Accessory Power Supply Socket System

A: WIRING DIAGRAM

1. FRONT ACCESSORY POWER SUPPLY SOCKET

<Ref. to WI-126, WIRING DIAGRAM, Front Accessory Power Supply Socket System.>

4. Rear Accessory Power Supply Socket System

A: WIRING DIAGRAM

1. REAR ACCESSORY POWER SOCKET

<Ref. to WI-127, WIRING DIAGRAM, Rear Accessory Power Supply Socket System.>

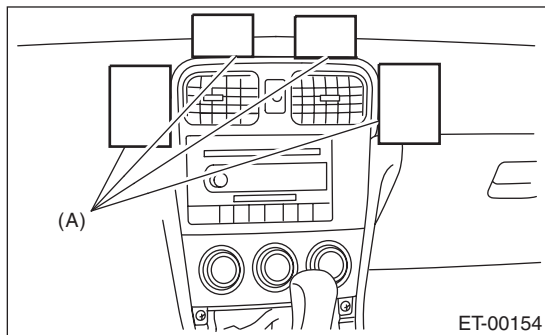
5. Radio Body

A: REMOVAL

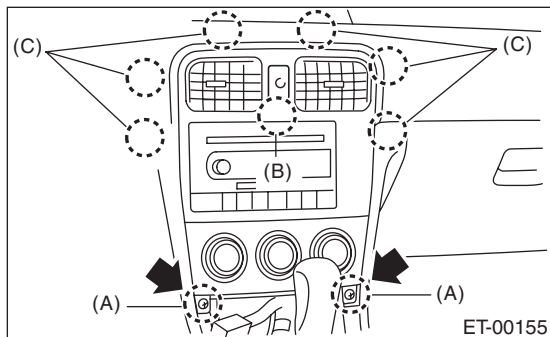
- 1) Disconnect the ground cable from the battery.
- 2) Remove the front cover. <Ref. to EI-38, REMOVAL, Console Box.>
- 3) Affix the thick protective tape (A) to the instrument panel pad to protect the surface.

NOTE:

Affix the protective tape so that it covers the vertical wall in the back of the gap between the panel center and the pad.



- 4) Remove the screws.

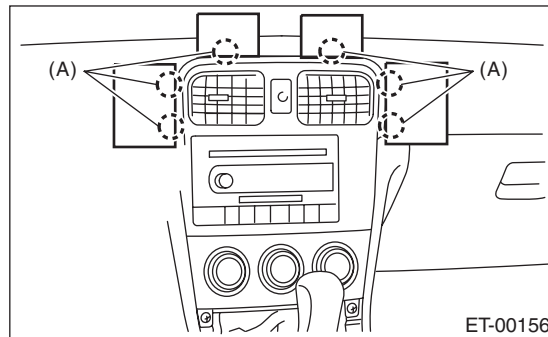


- (A) Screw
- (B) Clip
- (C) Claw

- 5) While pulling on the lower portion of the center console panel, insert a flat tip screwdriver into the portion (A) to remove the claw.

CAUTION:

Be very careful because it is possible to damage the instrument panel if the flat tip screwdriver is inserted into any other area than specified.



(A) Position for inserting the flat tip screwdriver

- 6) Disconnect the connector.
- 7) Remove the fitting screws, and slightly pull the radio out from the center console.
- 8) Disconnect the harness connectors and antenna feeder cord.

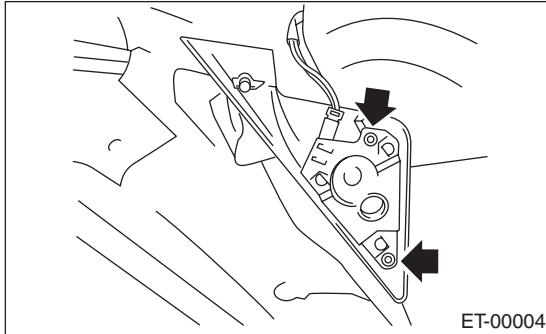
B: INSTALLATION

Install in the reverse order of removal.

6. Tweeter

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the gusset cover.
- 3) Remove the tweeter mounting screws.



- 4) Disconnect the harness connector and remove the tweeter.

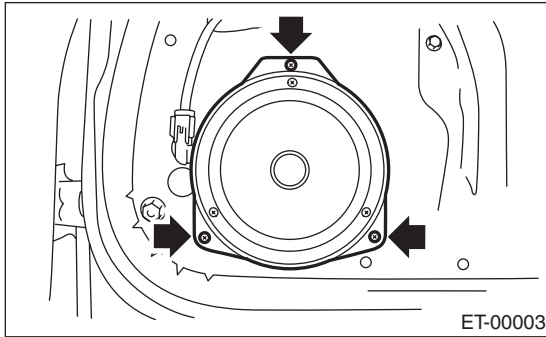
B: INSTALLATION

Install in the reverse order of removal.

7. Front Speaker

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the front door trim. <Ref. to EI-34, REMOVAL, Front Door Trim.>
- 3) Remove the front speaker mounting screws.



- 4) Disconnect the harness connector and remove the front speaker.

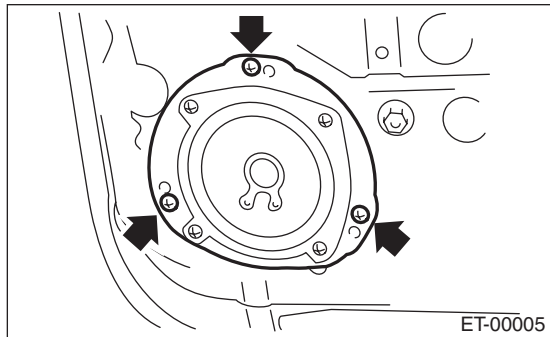
B: INSTALLATION

Install in the reverse order of removal.

8. Rear Speaker

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the rear door trim. <Ref. to EI-35, REMOVAL, Rear Door Trim.>
- 3) Remove the rear speaker mounting screws.



- 4) Disconnect the harness connector and remove the rear speaker.

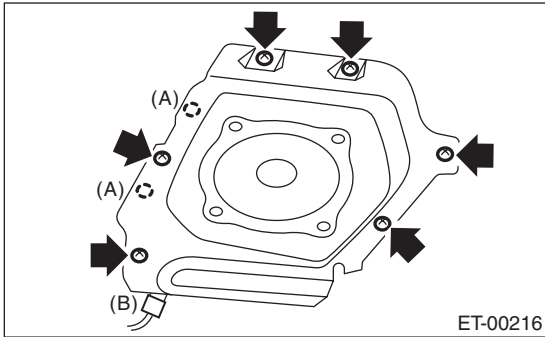
B: INSTALLATION

Install in the reverse order of removal.

9. Woofers

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the rear seat belt, rear seat, rear quarter upper, rear quarter lower, insulator and luggage floor mat.
- 3) Remove the woofer trim.
- 4) Remove the woofer mounting screws and clip (A).



- 5) Disconnect the harness connector (B) and detach the woofers.

B: INSTALLATION

Install in the reverse order of removal.

10. Antenna

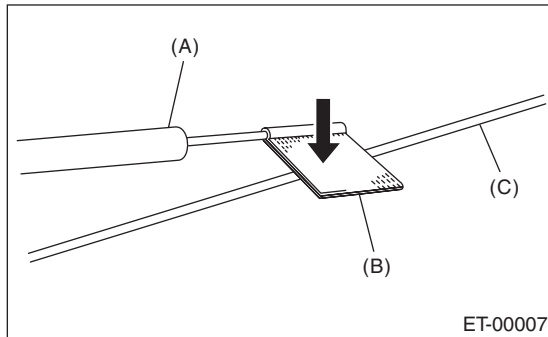
A: INSPECTION

Measure the resistance between the antenna terminal and each antenna wire.

If an antenna wire is OK, resistance will be less than 1 Ω . If an antenna wire is broken, resistance will be more than 1 M Ω .

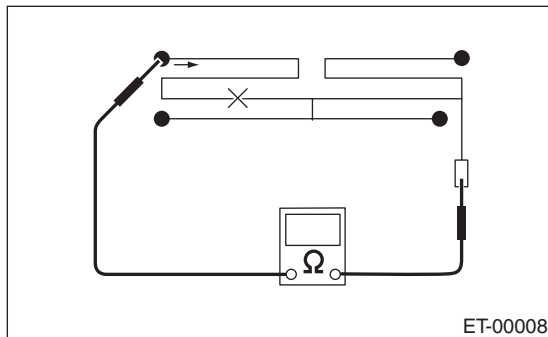
NOTE:

When checking the continuity, wind a piece of aluminum foil around the tip of tester probe and press foil against wire with your finger.



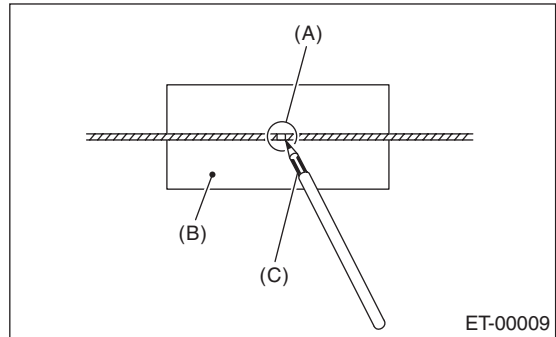
- (A) Tester probe
- (B) Aluminum foil
- (C) Antenna wire

To locate the broken point, move the probe along antenna wire.



B: REPAIR

- 1) Clean the antenna wire and surrounding area with a cloth dampened by alcohol.
- 2) Paste a thin masking film on the glass along broken wire.
- 3) Apply the conductive silver composition (DUPONT No. 4817 or equivalent) on the broken portion with a drawing pen.



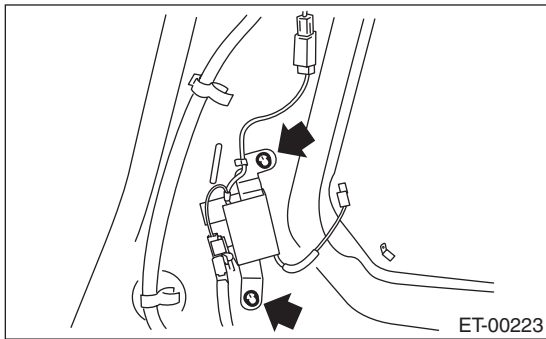
- (A) Broken portion
- (B) Masking film
- (C) Conductive silver composition

- 4) Dry out the deposited portion.
- 5) After repair has been completed, measure the resistance in repaired wire.

11. Antenna Amplifier

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the rear quarter upper trim. <Ref. to EI-44, REMOVAL, Rear Quarter Trim.>
- 3) Disconnect the harness connectors and terminals.
- 4) Remove the mounting screw and detach the antenna amplifier.

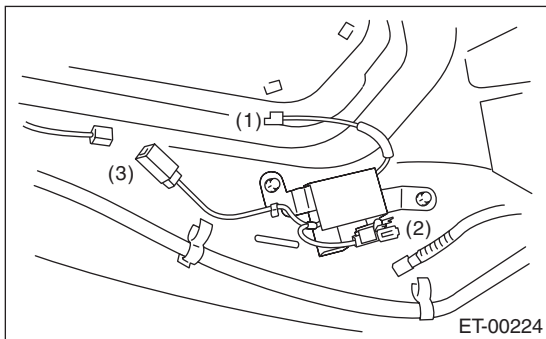


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the resistance of antenna amplifier.



- 1) Inspecting for poor insulation (shorting) of the cord crimping

Terminal No.	Standard
1 and Amplifier body	10 kΩ or more
2 and Amplifier body	10 kΩ or more
3 and Amplifier body	10 kΩ or more

- 2) Check antenna amp

Disconnect each connector, then measure the direct current value at the above locations using the tester checker.

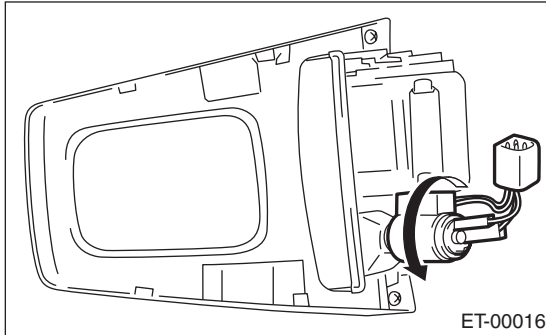
Standard:

$$(+B = 13.5 V) \Rightarrow 50 \pm 10 mA$$

12. Front Accessory Power Supply Socket

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the front cover. <Ref. to EI-38, REMOVAL, Console Box.>
- 3) Disconnect the harness connectors and remove the front accessory power supply socket.



B: INSTALLATION

Install in the reverse order of removal.

Rear Accessory Power Supply Socket

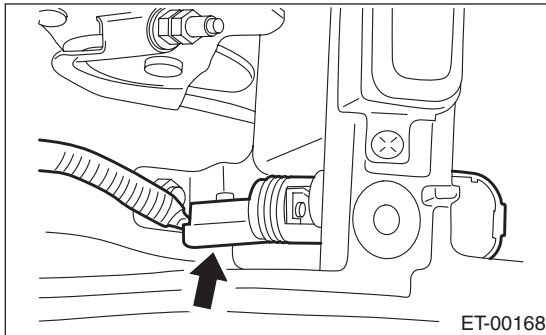
ENTERTAINMENT

13. Rear Accessory Power Supply Socket

A: REMOVAL

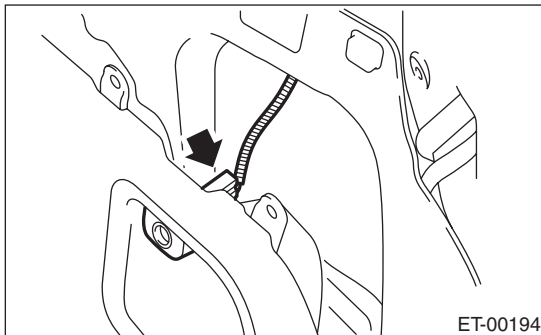
1. FRONT

- 1) Disconnect the ground cable from the battery.
- 2) Remove the console cover. <Ref. to EI-38, REMOVAL, Console Box.>
- 3) Disconnect the harness connector, and remove the accessory power supply socket.



2. REAR

- 1) Disconnect the ground cable from the battery.
- 2) Remove the rear quarter lower trim. <Ref. to EI-44, REMOVAL, Rear Quarter Trim.>
- 3) Disconnect the harness connector, and remove the accessory power supply socket.



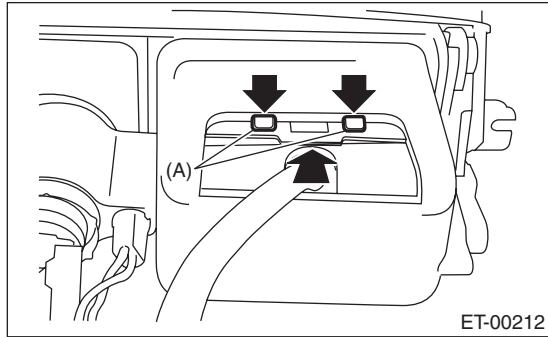
B: INSTALLATION

Install in the reverse order of removal.

14.AUX Input Terminal

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the console front cover. <Ref. to EI-38, REMOVAL, Console Box.>
- 3) Remove the tab (A), and remove AUX input terminal.



B: INSTALLATION

Install in the reverse order of removal.

AUX Input Terminal

ENTERTAINMENT

General Description

COMMUNICATION SYSTEM

1. General Description

A: CAUTION

- Before disassembling or reassembling parts, always disconnect the battery ground cable from battery. When replacing the radio, control unit, and other parts provided with memory functions, record the memory contents before disconnecting the battery ground cable. Otherwise, the memory is cleared.
- Reassemble the parts in the reverse order of disassembly procedure unless otherwise indicated.
- Adjust parts to the given specifications.
- Connect the connectors and hoses securely during reassembly.
- After reassembly, make sure functional parts operate smoothly.

B: PREPARATION TOOL

1. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.

2. Horn System

A: WIRING DIAGRAM

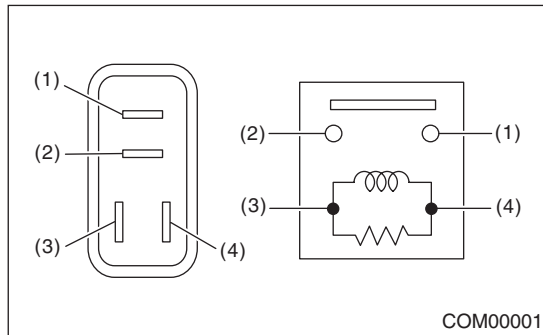
1. HORN

<Ref. to WI-128, WIRING DIAGRAM, Horn System.>

B: INSPECTION

1. HORN RELAY

Measure the security horn relay resistance between terminals (indicated in the table below) when connecting terminal No. 4 to battery positive terminal and terminal No. 3 to battery ground terminal.

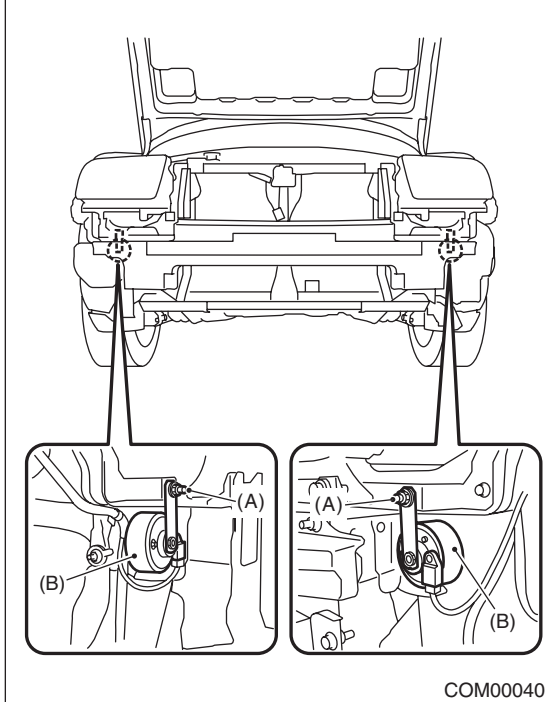


Continuity	Terminal No.	Standard
Yes	1 and 2	Less than 1 Ω
No		1 M Ω or more

3. Horn

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the front bumper. <Ref. to EI-21, REMOVAL, Front Bumper.>
- 3) Remove the horn bracket mounting bolt (A).
- 4) Disconnect the harness connector and remove the horn assembly (B).

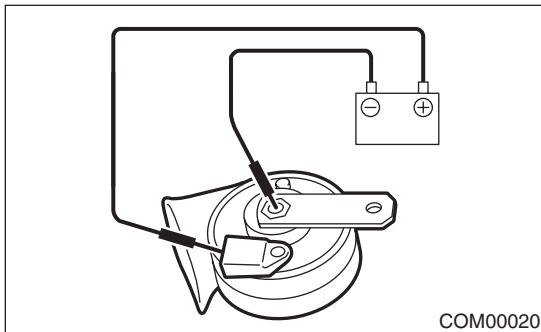


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

With 12 V direct current supply between horn terminal and case ground, check that the horn sounds properly.



4. Horn Switch

A: REMOVAL

WARNING:

Before servicing, be sure to read the notes in the AB section for proper handling of the driver's airbag module. <Ref. to AB-4, CAUTION, General Description.>

NOTE:

Horn switch is a unit with the driver's airbag module.

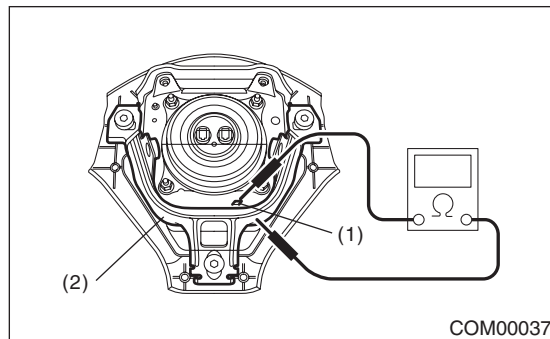
- 1) Disconnect the ground cable from the battery.
- 2) Remove the driver's airbag module. <Ref. to AB-14, REMOVAL, Driver's Airbag Module.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the resistance between horn switch terminal and airbag module bracket.



- (1) Horn switch terminal
- (2) Airbag module bracket

Switch position	Terminal No.	Resistance
When airbag module bracket is pushed	Horn switch terminal and airbag module bracket	Less than 1 Ω
When airbag module bracket is separated		1 M Ω or more

Horn Switch

COMMUNICATION SYSTEM

COM-6

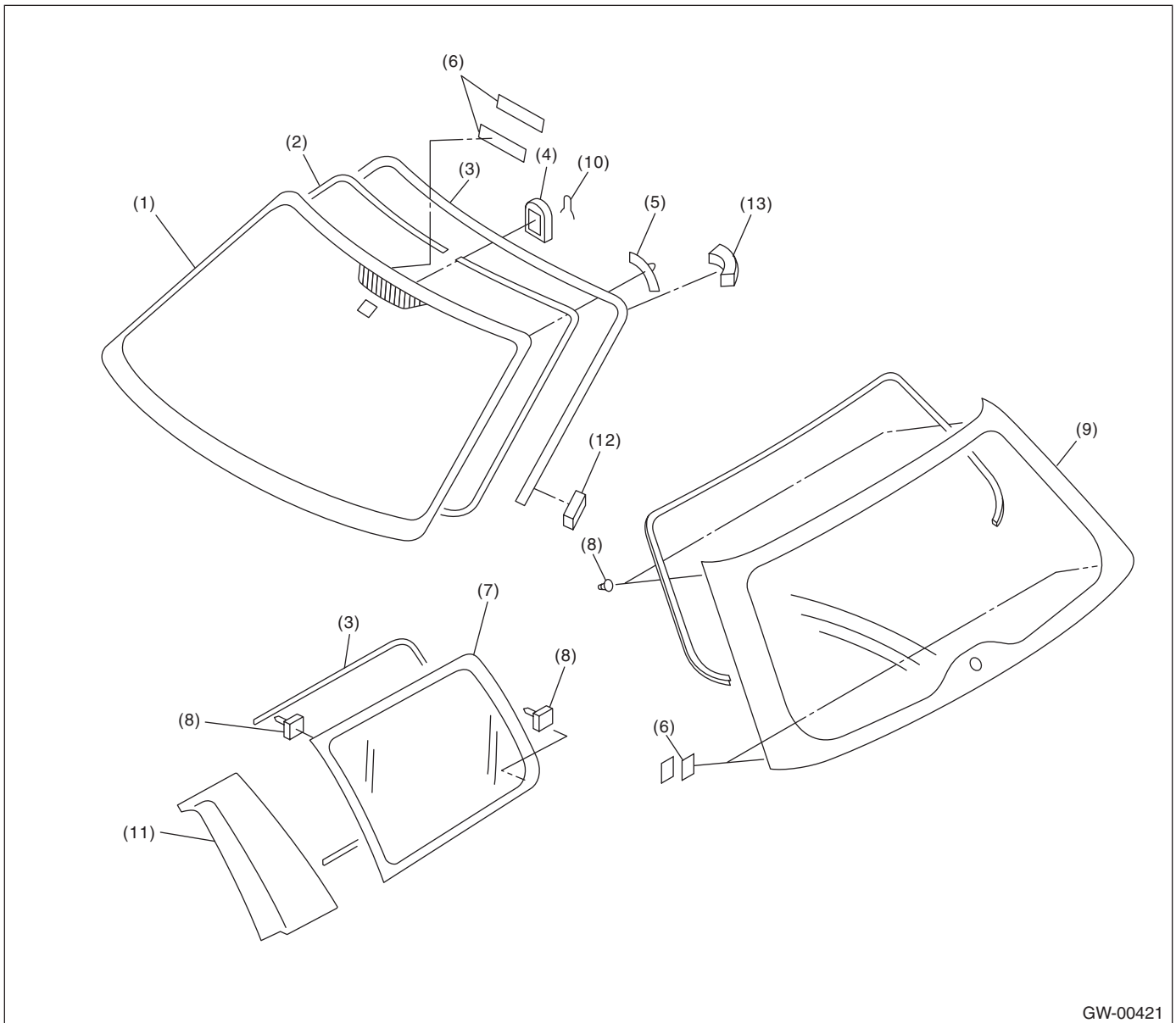
General Description

GLASS/WINDOWS/MIRRORS

1. General Description

A: COMPONENT

1. FIXED GLASS

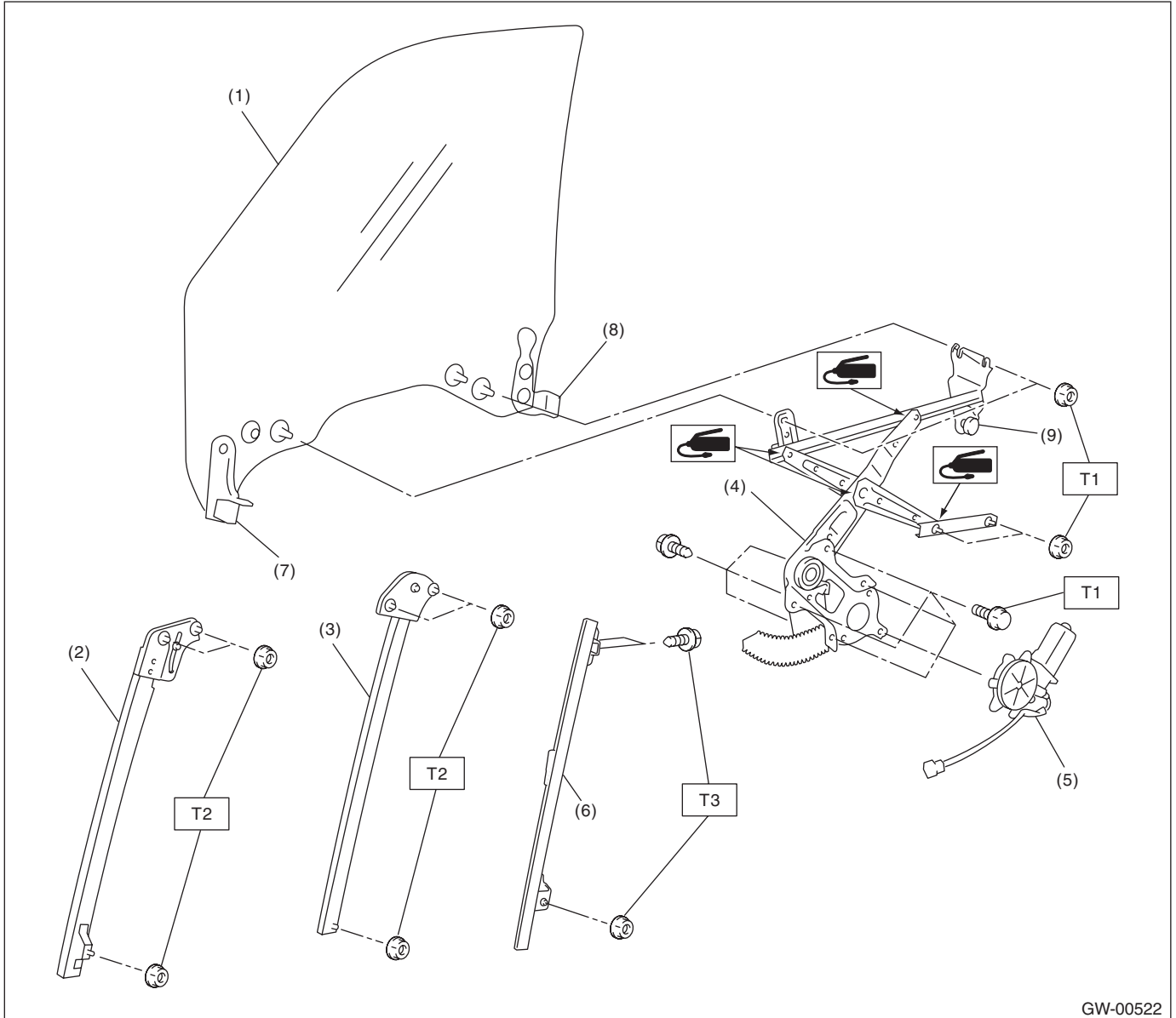


- (1) Windshield glass
- (2) Dam rubber
- (3) Molding
- (4) Rearview mirror mount
- (5) Locating pin

- (6) Fastener
- (7) Rear quarter glass
- (8) Locating pin
- (9) Rear gate glass

- (10) Spring
- (11) Cover C pillar
- (12) Seal A
- (13) Seal B

2. FRONT DOOR GLASS



GW-00522

- | | |
|-----------------------|--------------------|
| (1) Glass | (6) Guide rail |
| (2) Door sash (Front) | (7) Holder (Front) |
| (3) Door sash (Rear) | (8) Holder guide |
| (4) Regulator ASSY | (9) Slider |
| (5) Motor ASSY | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 7.5 (0.75, 5.4)

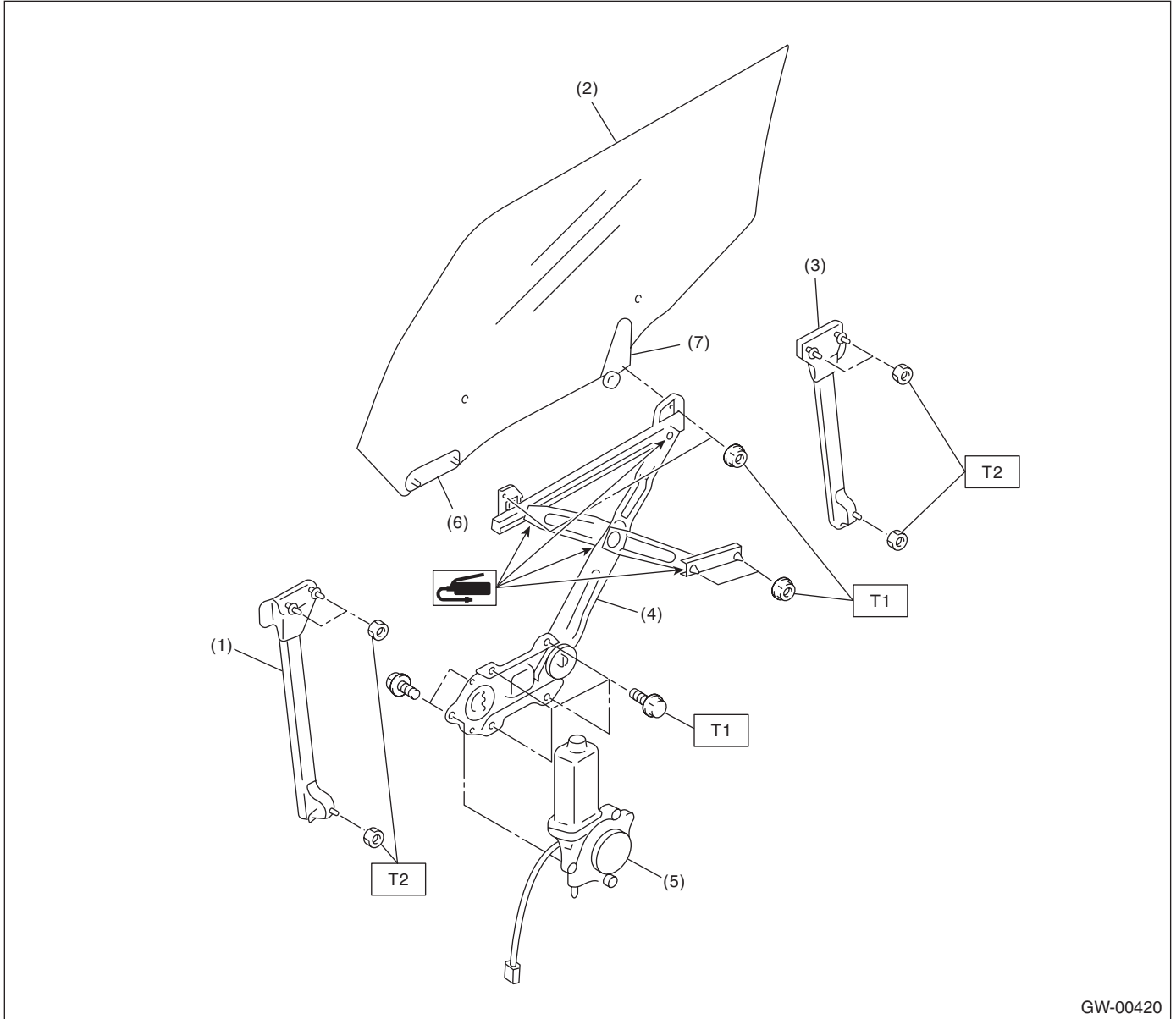
T2: 14 (1.4, 10.3)

T3: 6 (0.6, 4.3)

General Description

GLASS/WINDOWS/MIRRORS

3. REAR DOOR GLASS



GW-00420

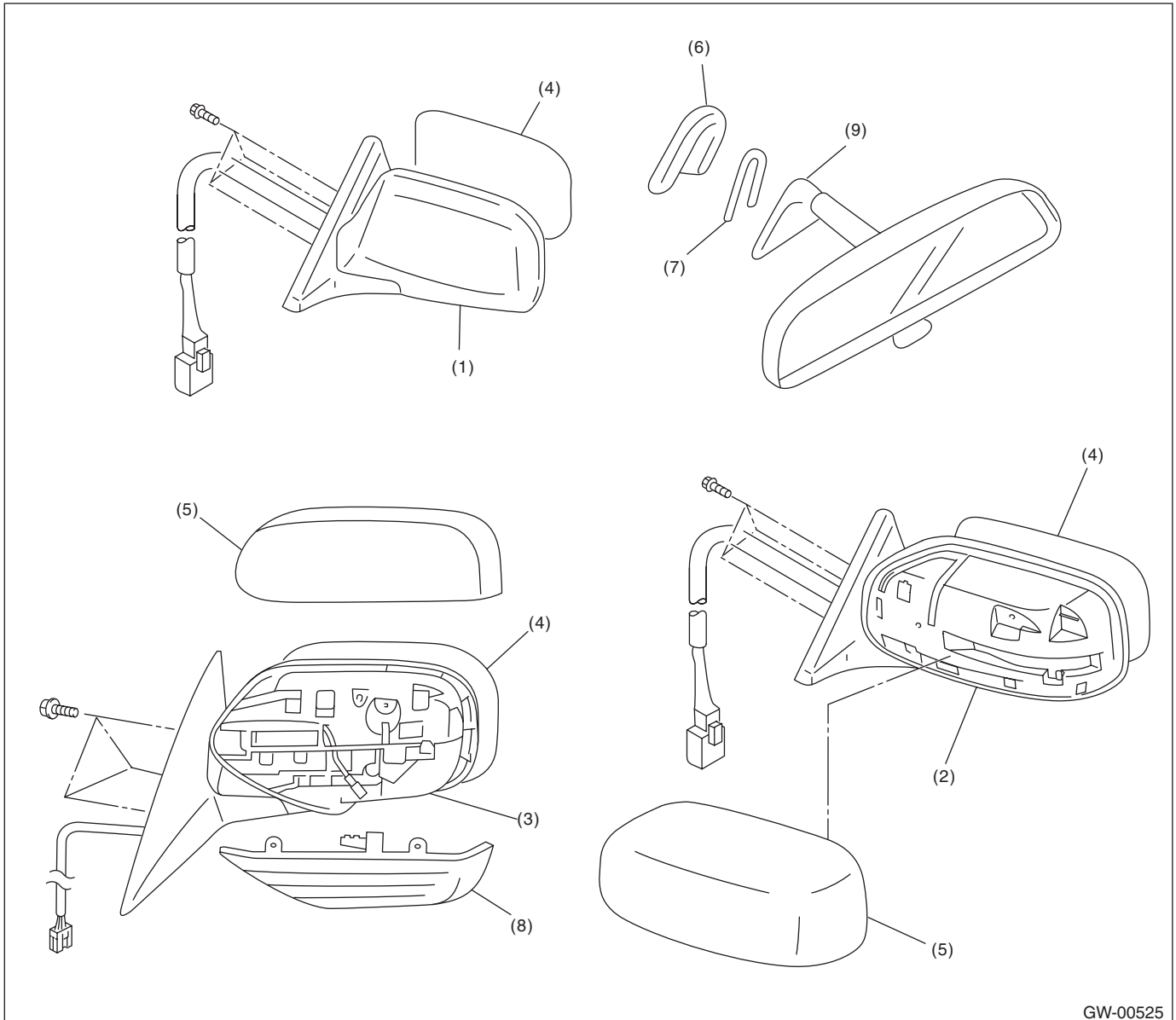
- | | |
|-----------------------|--------------------|
| (1) Door sash (Front) | (5) Motor ASSY |
| (2) Glass | (6) Holder (Front) |
| (3) Door sash (Rear) | (7) Holder (Rear) |
| (4) Regulator ASSY | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 7.5 (0.75, 5.4)

T2: 14 (1.4, 10.3)

4. MIRROR



GW-00525

- | | | |
|--|---------------|----------------------------|
| (1) Outer mirror (Large size) | (4) Mirror | (7) Spring |
| (2) Outer mirror (Standard size) | (5) Scalp cap | (8) Side turn signal light |
| (3) Outer mirror (with side turn signal light) | (6) Mount | (9) Rearview mirror |

B: CAUTION

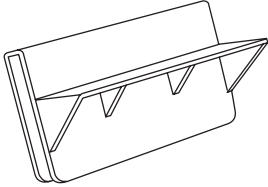
- When electrical connectors are disconnected, always conduct an operational check after connecting them again.
- Avoid impact and damage to the glass.

General Description

GLASS/WINDOWS/MIRRORS

C: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST61299AE000	61299AE000	SPACER	Used for adjusting the upper end position of door glass. (Glass thickness: 5 mm (0.197 in))

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for checking voltage and continuity.
Piano wire	Used for removing the window glass.
Windshield glass knife	Used for removing the window glass.

2. Power Window System

A: WIRING DIAGRAM

1. POWER WINDOW

<Ref. to WI-129, WIRING DIAGRAM, Power Window System.>

B: INSPECTION

Symptom	Repair order
All power windows do not operate.	<ol style="list-style-type: none">1. Fuse (SBF-6) (F/B No. 18)2. Power window circuit breaker3. Power window relay4. Wiring harness
Particular window does not operate.	<ol style="list-style-type: none">1. Power window main switch2. Power window sub-switch3. Power window motor4. Wiring harness
"Window Lock" does not operate.	Power window main switch

Power Window Control Switch

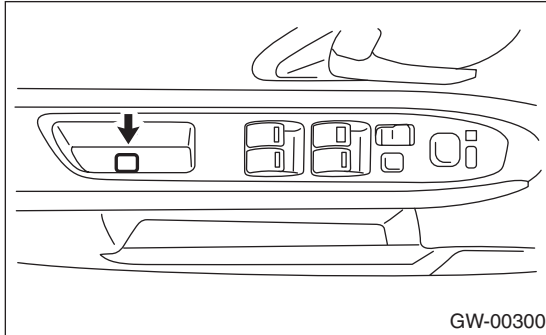
GLASS/WINDOWS/MIRRORS

3. Power Window Control Switch

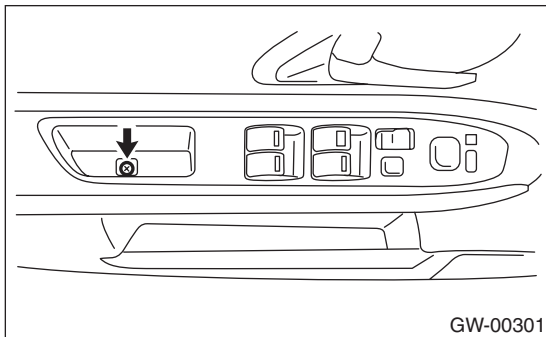
A: REMOVAL

1. MAIN SWITCH

- 1) Disconnect the ground cable from the battery.
- 2) Remove the screw cover by using a flat tip screwdriver.



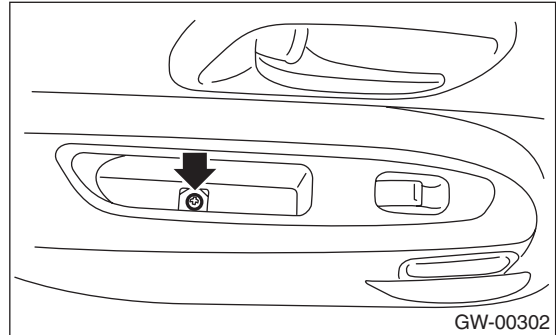
- 3) Loosen the screw to remove power window main switch.



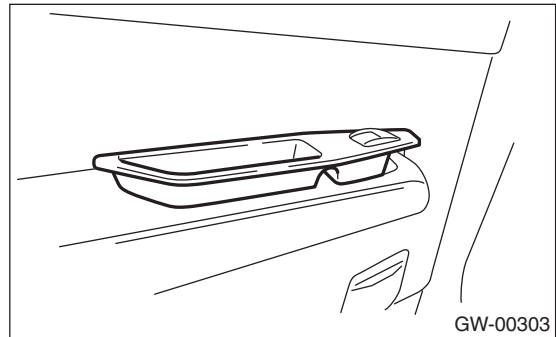
- 4) Disconnect the connector.

2. SUB-SWITCH

- 1) Disconnect the ground cable from the battery.
- 2) Remove the screw securing the switch panel.



- 3) Remove the switch panel.



- 4) Disconnect the connector.

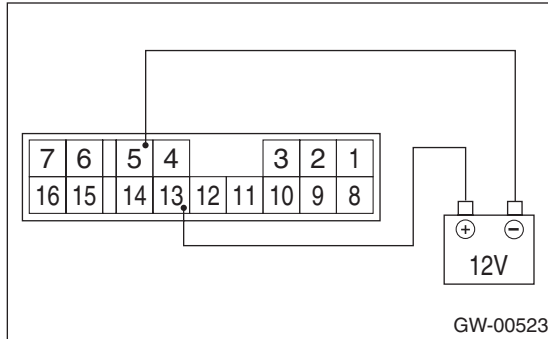
B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1. MAIN SWITCH

- 1) Remove the main switch. <Ref. to GW-8, MAIN SWITCH, REMOVAL, Power Window Control Switch.>
- 2) Turn the window lock switch to UNLOCK.
- 3) Connect the battery and the main switch as shown in the following figure.



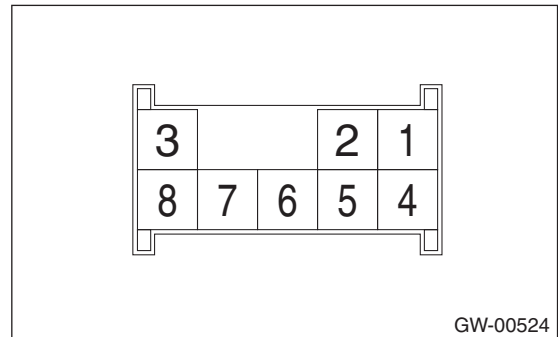
- 4) Measure the main switch resistance.

	Switch position	Terminal No.	Standard
Driver's side	UP	13 and 2 1 and 5	Less than 1 Ω
	OFF	1 and 5 2 and 5	Less than 1 Ω
	DOWN	13 and 1 2 and 5	Less than 1 Ω
	AUTO DOWN	13 and 1 2 and 5	Less than 1 Ω
Passenger's side	UP	13 and 6 7 and 5	Less than 1 Ω
	OFF	5 and 6 5 and 7	Less than 1 Ω
	DOWN	13 and 7 6 and 5	Less than 1 Ω
Rear LH	UP	11 and 13 10 and 5	Less than 1 Ω
	OFF	5 and 11 5 and 10	Less than 1 Ω
	DOWN	13 and 11 10 and 5	Less than 1 Ω
Rear RH	UP	13 and 16 15 and 5	Less than 1 Ω
	OFF	5 and 15 5 and 16	Less than 1 Ω
	DOWN	13 and 15 16 and 5	Less than 1 Ω

- 5) Replace the main switch if faulty.

2. SUB-SWITCH

- 1) Remove the sub-switch. <Ref. to GW-8, SUB-SWITCH, REMOVAL, Power Window Control Switch.>
- 2) Measure the sub-switch resistance.



	Switch position	Terminal No.	Standard
Passenger's side, rear	UP	8 and 5 4 and 7	Less than 1 Ω
	OFF	6 and 5 4 and 7	Less than 1 Ω
	DOWN	8 and 7 6 and 5	Less than 1 Ω

- 3) Replace the sub-switch if faulty.

Remote Control Mirror System

GLASS/WINDOWS/MIRRORS

4. Remote Control Mirror System

A: WIRING DIAGRAM

1. REMOTE CONTROL MIRROR

<Ref. to WI-134, WIRING DIAGRAM, Remote Control Mirror System.>

B: INSPECTION

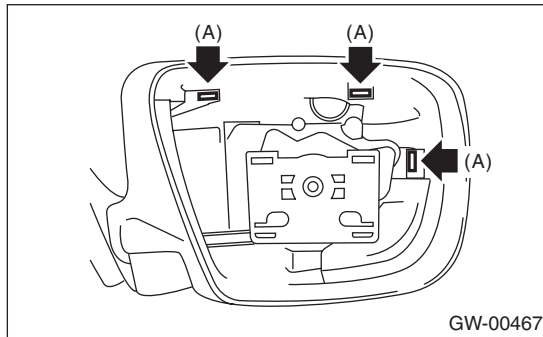
Symptom	Repair order
All function does not operate.	<ol style="list-style-type: none">1. Fuse (F/B No. 4) (F/B No. 13) (F/B No. 17) (F/B No. 18)2. Mirror switch3. Wiring harness
One side of the mirror motor does not operate.	<ol style="list-style-type: none">1. Mirror switch2. Mirror motor3. Wiring harness
Mirror heater does not operate.	<ol style="list-style-type: none">1. Mirror switch2. Mirror heater3. Wiring harness

5. Scalp Cap

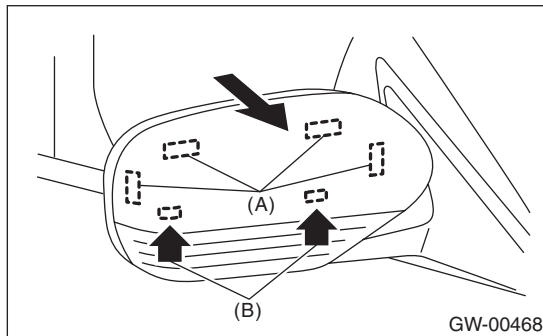
A: REPLACEMENT

1. OUTER MIRROR WITH SIDE TURN SIGNAL LIGHT

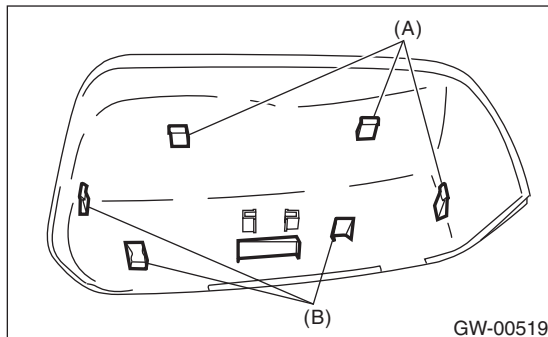
- 1) Remove the mirror. <Ref. to GW-14, REPLACEMENT, Outer Mirror.>
- 2) Press-in the upper side clips (A) from inside of outer mirror.



- 3) Pull the scalp cap frontward of outer mirror, remove the upper side clips (A) and lower side hooks (B), and then remove the scalp cap.



- 4) Insert the lower hooks (B) of scalp cap to the outer mirror and push the upper clips (A) in.



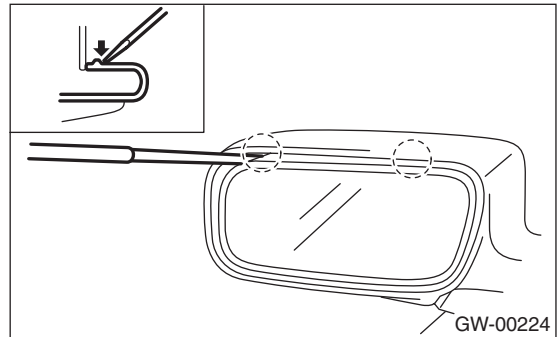
- 5) Install the scalp cap securely.

CAUTION:

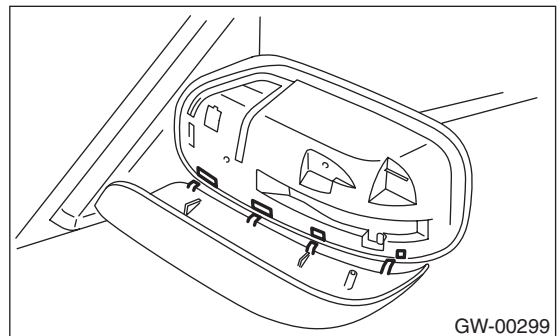
Do not remove the scalp cap forcibly. The lower hooks may be damaged.

2. STANDARD SIZE OUTER MIRROR

- 1) Put the mirror side down.
- 2) Insert a thin screw driver, push the clip part of scalp cap, and then remove the scalp cap.



- 3) Insert the claw at the lower side of scalp cap to the door mirror.



- 4) Install the scalp cap securely.

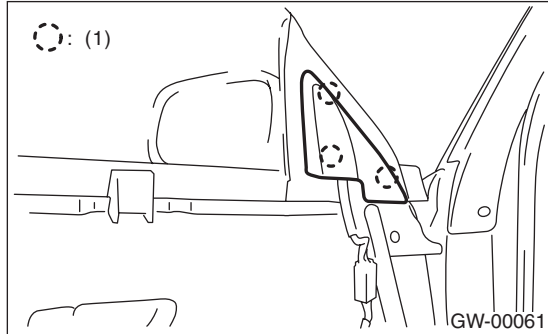
Outer Mirror Assembly

GLASS/WINDOWS/MIRRORS

6. Outer Mirror Assembly

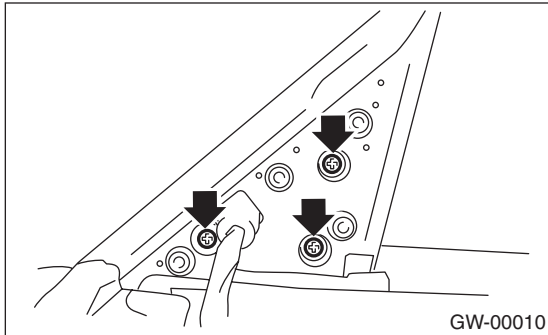
A: REMOVAL

- 1) Remove the door trim. <Ref. to EI-34, REMOVAL, Front Door Trim.>
- 2) Remove the mirror gusset cover.



(1) Hook

- 3) Disconnect the outer mirror connector.
- 4) Remove the grommet, and loosen the screws to remove the outer mirror assembly.



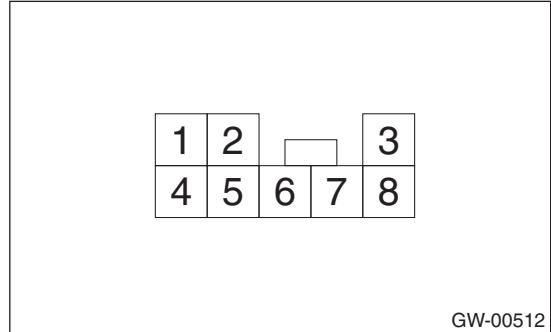
B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

1. OUTER MIRROR WITH SIDE TURN SIGNAL LIGHT (MODEL WITHOUT MIRROR HEATER)

- 1) Check to ensure that the outer mirror moves properly when the battery voltage is applied to terminals.

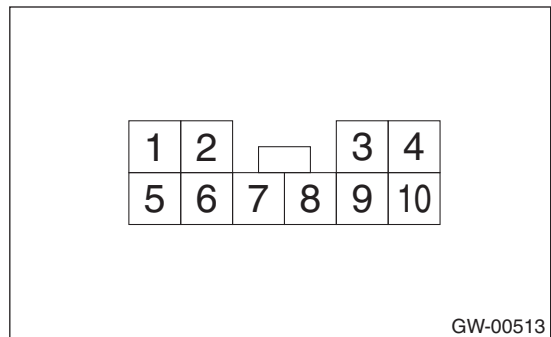


Switch position	Terminal No.
OFF	—
UP	6 (+) and 3 (-)
DOWN	3 (+) and 6 (-)
LEFT	7 (+) and 8 (-)
RIGHT	8 (+) and 7 (-)

- 2) Replace the mirror if defective.

2. OUTER MIRROR WITH SIDE TURN SIGNAL LIGHT (MODEL WITH MIRROR HEATER)

- 1) Check to ensure that the outer mirror moves properly when the battery voltage is applied to terminals.

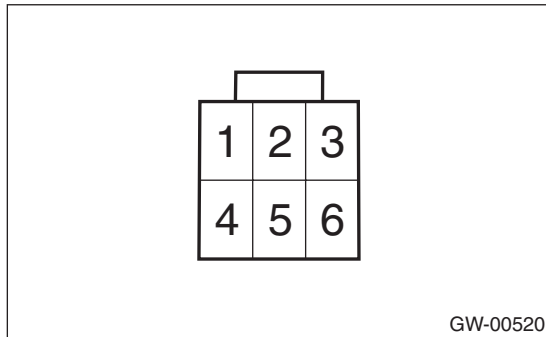


Switch position	Terminal No.
OFF	—
UP	7 (+) and 3 (-)
DOWN	3 (+) and 7 (-)
LEFT	8 (+) and 9 (-)
RIGHT	9 (+) and 8 (-)

- 2) Replace the mirror if defective.

3. STANDARD SIZE OUTER MIRROR (MODEL WITHOUT MIRROR HEATER)

1) Check to ensure that the outer mirror moves properly when the battery voltage is applied to terminals.

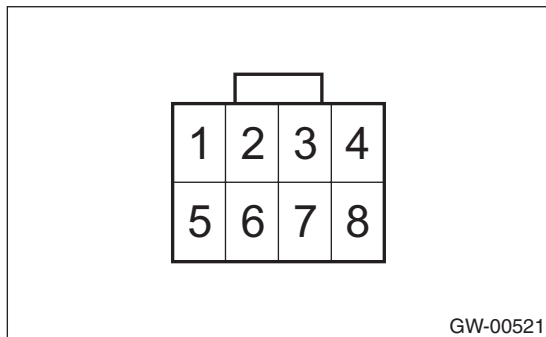


Switch position	Terminal No.
OFF	—
UP	1 (+) and 3 (-)
DOWN	3 (+) and 1 (-)
LEFT	2 (+) and 3 (-)
RIGHT	3 (+) and 2 (-)

2) Replace the mirror if defective.

4. STANDARD SIZE OUTER MIRROR (MODEL WITH MIRROR HEATER)

1) Check to ensure that the outer mirror moves properly when the battery voltage is applied to terminals.



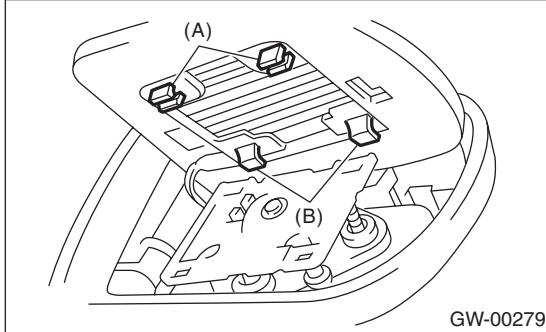
Switch position	Terminal No.
OFF	—
UP	2 (+) and 4 (-)
DOWN	4 (+) and 2 (-)
LEFT	3 (+) and 4 (-)
RIGHT	4 (+) and 3 (-)

2) Replace the mirror if defective.

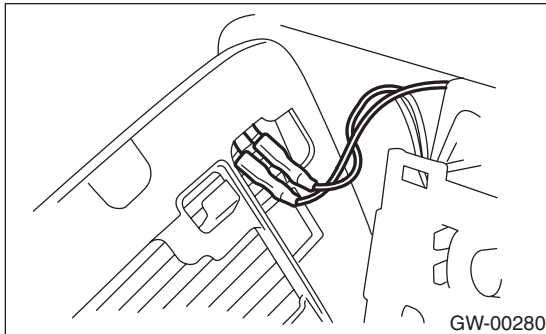
7. Outer Mirror

A: REPLACEMENT

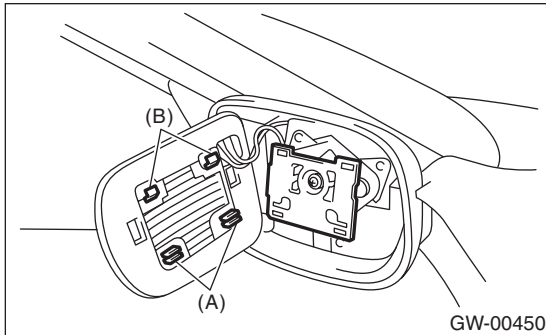
- 1) Face the mirror upward.
- 2) Use a flat tip screwdriver to remove clip (A).
- 3) Lift the mirror lower part to remove hooks (B).



- 4) Disconnect the mirror heater connector from the end part of the mirror. (Model with mirror heater)



- 5) Catch the hooks (B) and install clips (A).



CAUTION:

- When removing the mirror, be careful not to damage the back surface of mirror with a flat tip screwdriver.
- When installing the mirror, insert the hook and clip securely.

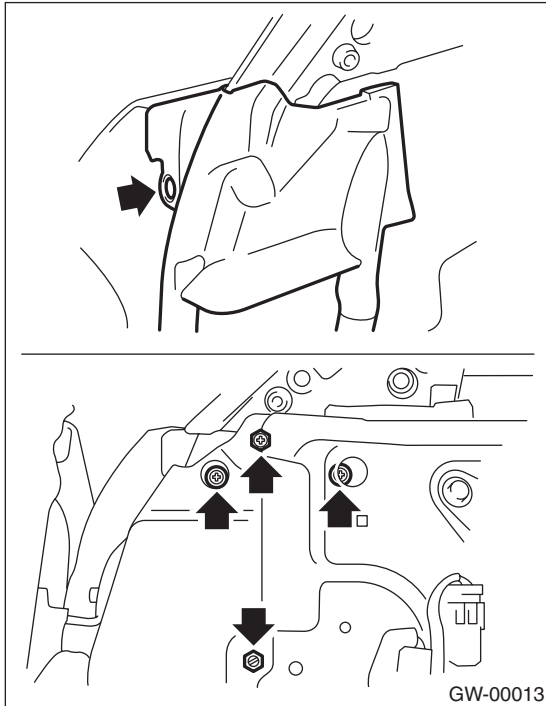
Front Door Glass

GLASS/WINDOWS/MIRRORS

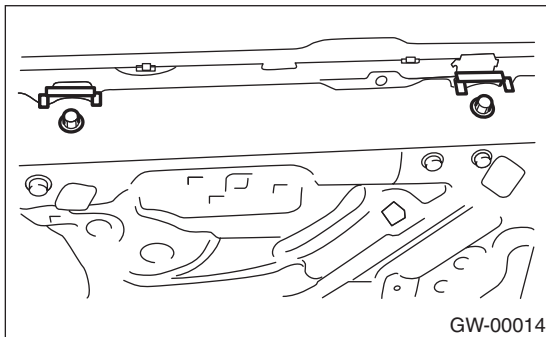
9. Front Door Glass

A: REMOVAL

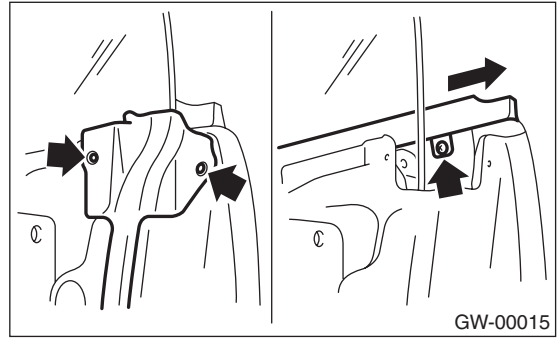
- 1) Remove the front door trim. <Ref. to EI-34, REMOVAL, Front Door Trim.>
- 2) Remove the front speaker. <Ref. to ET-8, REMOVAL, Front Speaker.>
- 3) Remove the sealing cover. <Ref. to EB-13, REMOVAL, Front Sealing Cover.>
- 4) Remove the outer mirror assembly. <Ref. to GW-12, REMOVAL, Outer Mirror Assembly.>
- 5) Remove the front end of door weather strip and gusset.



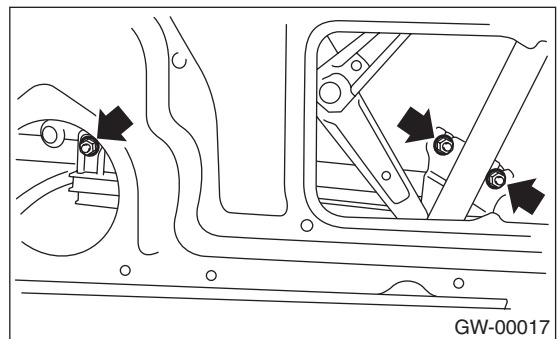
- 6) Remove the stabilizers.



- 7) Remove the rear end of door weather strip and weather strip outer.



- 8) Operate the power window switch to move glass to position shown in the figure, and then remove the three nuts from the service holes.



- 9) Remove the door glass.

CAUTION:

- Since the gear may be disengaged, do not turn regulator in the closing direction after removing glass.
- Avoid impact and damage to the glass.

B: INSTALLATION

- 1) Install in the reverse order of removal.

CAUTION:

Make sure that glass holder (front), holder guide, and slider of the regulator are placed securely in sash.

- 2) Adjust the front door glass. <Ref. to GW-17, ADJUSTMENT, Front Door Glass.>

Tightening torque:

Refer to "COMPONENT" of "General Description". <Ref. to GW-3, FRONT DOOR GLASS, COMPONENT, General Description.>

C: ADJUSTMENT

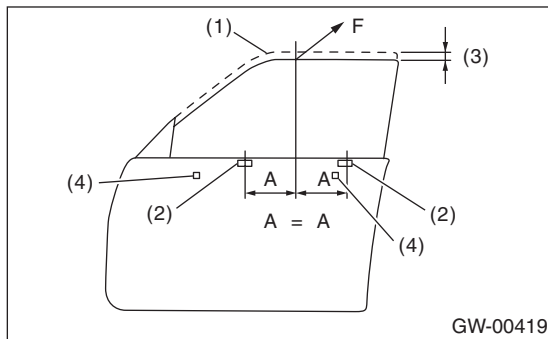
NOTE:

Before adjustment, ensure that all adjusting nuts of stabilizer, upper stopper and sash are loose, and door glass rises up to the point that it comes in contact with weather strip.

1) Temporarily tighten the adjusting nut on one side of rear sash at the midpoint of slotted hole in the inner panel.

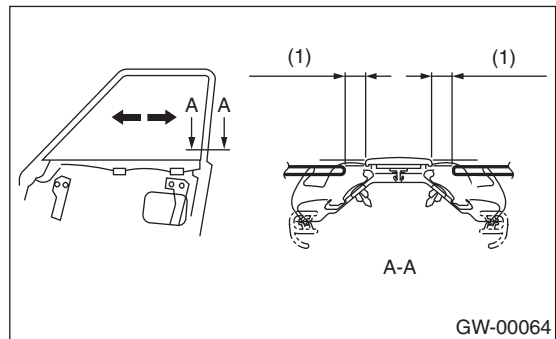
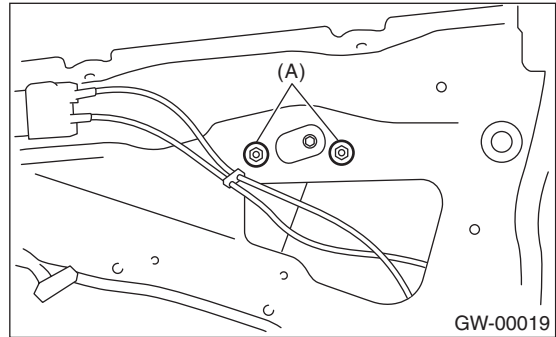
2) Temporarily tighten the regulator B channel at the top position of slotted hole.

3) Lower the door glass 10 — 15 mm (0.39 — 0.59 in) from fully closed position. While applying an outward pressure (F) of 45.0 ± 5 N (4.6 ± 0.5 kgf, 10.1 ± 1.1 lb) to the upper edge of glass above midpoint of two outer stabilizers, press the inner stabilizer to the glass at a pressure of 25 ± 5 N (2.5 ± 0.5 kgf, 5.5 ± 1.1 lb) to secure it.



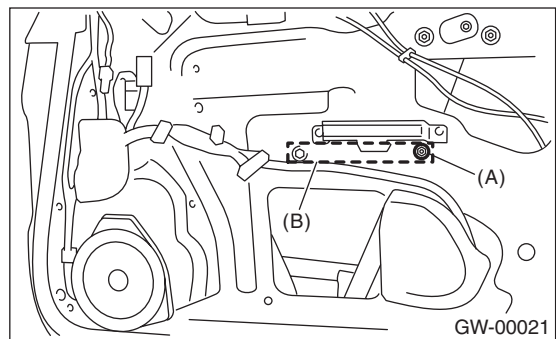
- (1) Fully closed position
- (2) Stabilizer
- (3) 10 — 15 mm (0.39 — 0.59 in)
- (4) Upper stopper

4) To adjust the clearance between front glass and center pillar cover, loosen the nuts (A), and move the rear sash back and forward until clearance becomes the value shown. (Difference up and down: Within 1.5 mm (0.059 in))



- (1) 12 ± 1 mm (0.472 ± 0.039 in)

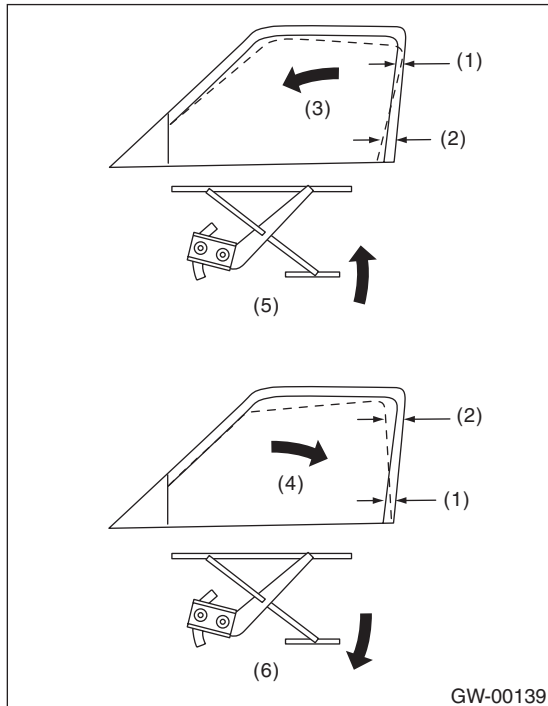
5) For adjustment of the upper and lower ends of center pillar, loosen the adjusting nut (A) of B-channel (B).



Front Door Glass

GLASS/WINDOWS/MIRRORS

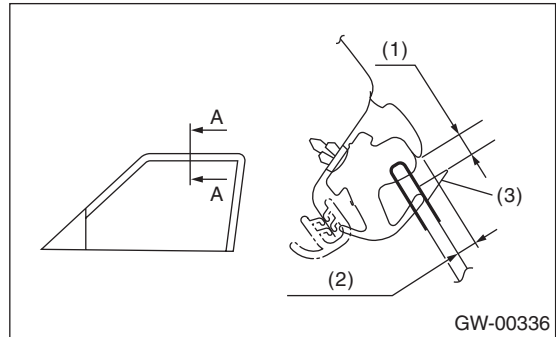
6) Adjust so that the upper and lower ends of center pillar are the same size.



- (1) Narrow
- (2) Wide
- (3) Glass tilts too far rearward
- (4) Glass tilts too far forward
- (5) Raise B channel
- (6) Lower B channel

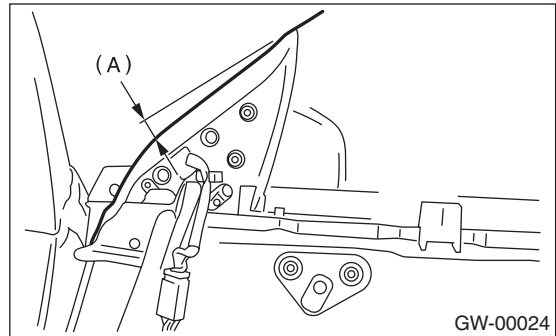
7) For glass stroke adjustment, attach special tool to the glass, close door, and raise the glass to the top edge using regulator until positional relationship between glass and weather strip becomes as shown. And secure the glass so that the upper stopper touches the glass holder without fail.

ST 61299AE000 SPACER (GLASS THICKNESS: 5 mm (0.197 in) FOR DOOR GLASS)



- (1) 2.2 — 3.8 mm (0.087±0.150 in)
- (2) When reusing the weather strip:
8.5 — 10.5 mm (0.335 — 0.413 in)
When replacing the weather strip:
7.5 — 9.5 mm (0.295 — 0.374 in)
- (3) ST

For preventing wind noise, adjust the glass at the position where tip of gusset is raised up a little.



- (A) 0 — 1.5 mm (0 — 0.059 in)

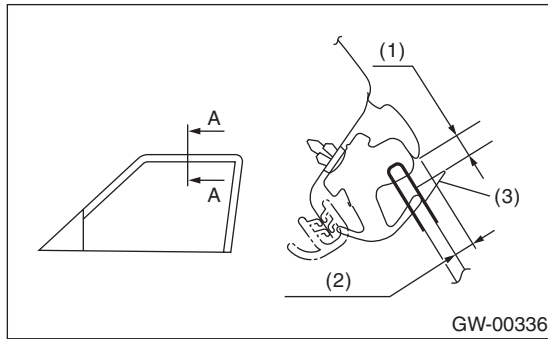
8) After stabilizer adjustment, carry out glass cohesion adjustment. First, visually ensure positional relationship between retainer & molding and glass of the roof side, and then begin with rear sash adjustment. Adjust two adjusting bolts alternately step by step to obtain dimensions shown below (cross-section A).

NOTE:

If two nuts are loosened at the same time, the sash moves back and forth. Therefore, when one nut is adjusted, secure the other.

9) Make the same adjustment of two adjusting bolts of rear sash.

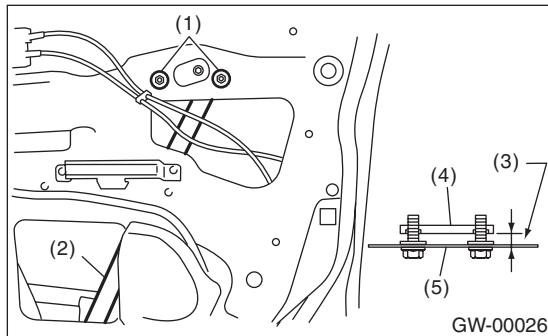
ST 61299AE000 SPACER (GLASS THICKNESS: 5 mm (0.197 in) FOR DOOR GLASS)



- (1) 2.2 — 3.8 mm (0.087±0.150 in)
- (2) When reusing the weather strip:
8.5 — 10.5 mm (0.335 — 0.413 in)
When replacing the weather strip:
7.5 — 9.5 mm (0.295 — 0.374 in)
- (3) ST

NOTE:

Do not tilt the sash bracket to inner panel during adjustment. If tilting, the regulator does not operate smoothly.



- (1) Sash bracket
- (2) Rear sash
- (3) Adjust the lines parallel
- (4) Rear sash
- (5) Inner panel

10) Make adjustment of front sash in the same manner as that of rear sash.

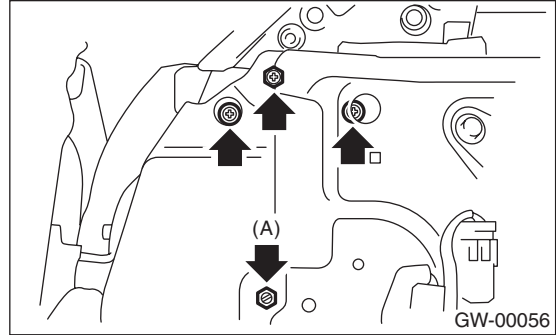
NOTE:

Although front and rear sashes must, as a rule, be adjusted in the same manner, in some door installation, the adjustment in a different manner may be required. However, adjustment of one sash to the maximum amount and the other to the minimum amount is not permitted. Such adjustment may result in applying excessive load against regulator.

11) After adjustments, tighten the nuts.

12) After adjustment of the glass, close the door. If there is a gap between outer lip of gusset and glass surface, adjust the gap with adjusting nut (A) in lower fitting part of gusset to prevent generation of wind noise.

13) During adjustment, loosen the other three clamping screws.



14) After adjustment, tighten the bolts and nuts.

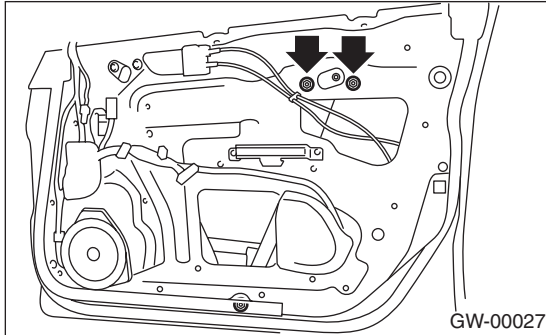
Front Regulator and Motor Assembly

GLASS/WINDOWS/MIRRORS

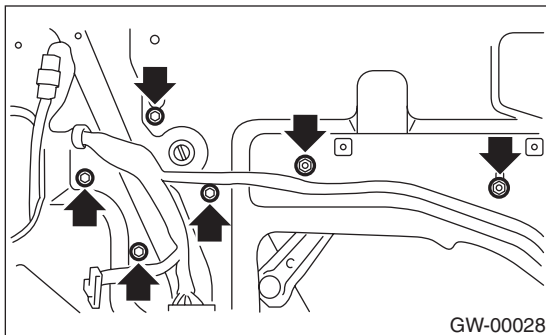
10. Front Regulator and Motor Assembly

A: REMOVAL

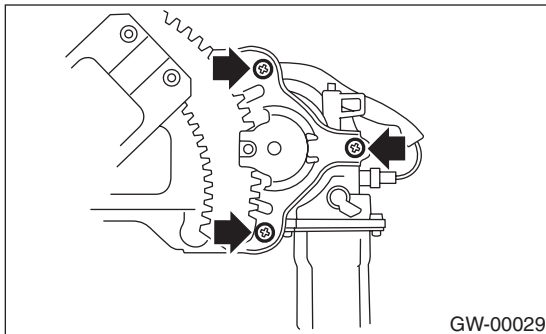
- 1) Remove the door glass. <Ref. to GW-16, REMOVAL, Front Door Glass.>
- 2) Loosen the nuts to remove the rear sash.



- 3) Disconnect the motor connector.
- 4) Loosen four bolts and two nuts to remove regulator assembly.



- 5) Loosen screws to remove motor assembly.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Adjust the front door glass. <Ref. to GW-17, ADJUSTMENT, Front Door Glass.>

Tightening torque:

Refer to “**COMPONENT**” of “**General Description**”. <Ref. to GW-3, FRONT DOOR GLASS, COMPONENT, General Description.>

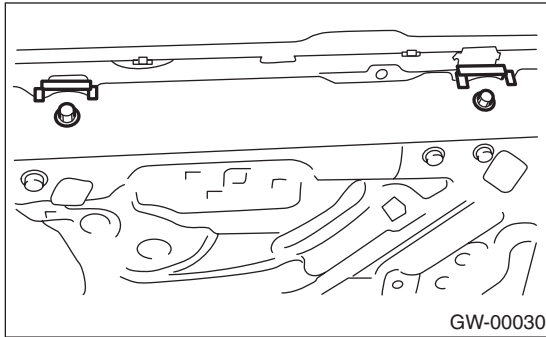
C: INSPECTION

- 1) Make sure that the power window motor rotates properly when the battery voltage is applied to the terminals of motor connector.
- 2) Change polarity of battery connection to terminals to ensure that the motor rotates in reverse direction.

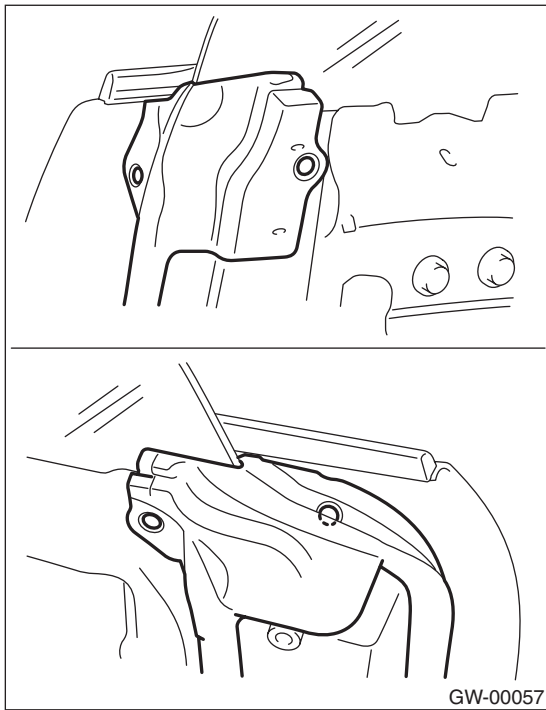
11.Rear Door Glass

A: REMOVAL

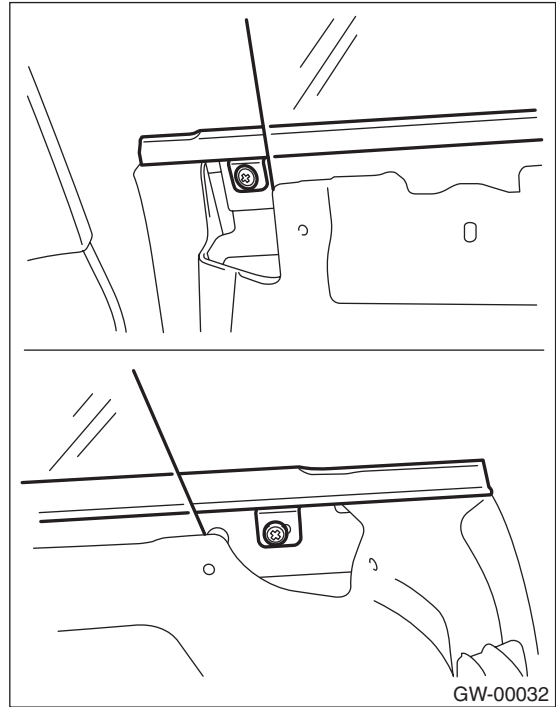
- 1) Remove the rear door trim. <Ref. to EI-35, REMOVAL, Rear Door Trim.>
- 2) Remove the front speaker. <Ref. to ET-8, REMOVAL, Front Speaker.>
- 3) Remove the sealing cover. <Ref. to EB-16, REMOVAL, Rear Sealing Cover.>
- 4) Remove the stabilizers.



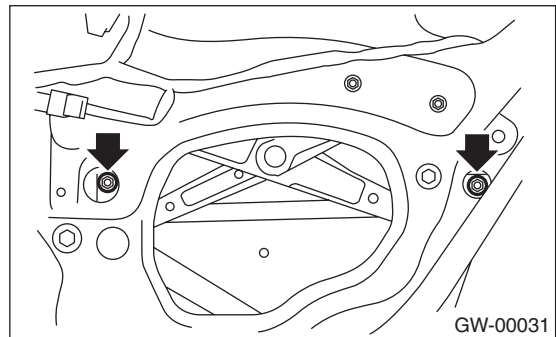
- 5) Remove the door weather strip.



- 6) Loosen two screws to remove the weather strip outer.



- 7) Operate the power window switch to move the glass to the position as shown in the figure, and remove two nuts.



- 8) Take out the door glass.

CAUTION:
Avoid impact and damage to the glass.

Rear Door Glass

GLASS/WINDOWS/MIRRORS

B: INSTALLATION

1) Install in the reverse order of removal.

CAUTION:

Make sure that glass holder (front) and holder (rear) are placed securely in sash.

2) Adjust the rear door glass. <Ref. to GW-22, ADJUSTMENT, Rear Door Glass.>

Tightening torque:

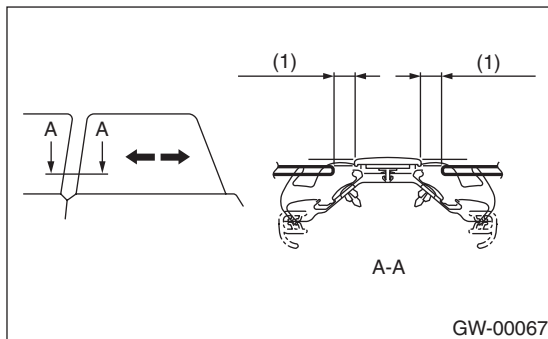
Refer to “COMPONENT” of “General Description”. <Ref. to GW-4, REAR DOOR GLASS, COMPONENT, General Description.>

C: ADJUSTMENT

NOTE:

The rear door glass, as a rule, is adjusted in the same manner as front glass, although they are different in dimension.

1) Adjust the glass position using the following dimensions as a guide line. (Difference up and down: Within 1.5 mm (0.059 in))



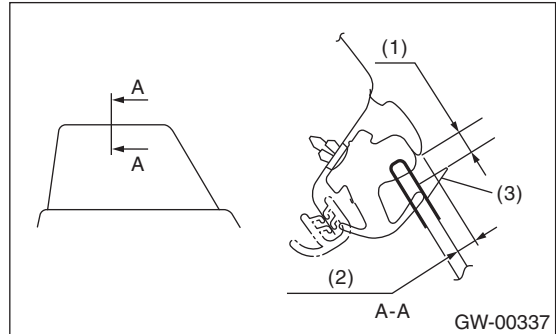
(1) 12 ± 1 mm (0.472 \pm 0.039 in)

NOTE:

- If dimensions are smaller than the given dimensions, glass may get caught in weather strip during lifting/lowering operation and may not be fully open.
- After adjustment, move the glass up and down to check whether it is caught.

2) Attach the special tool to the glass, and adjust the glass adhesion until the dimensional value becomes as shown below.

ST 61299AE00 SPACER (GLASS THICKNESS: 5 mm (0.197 in) FOR DOOR GLASS)



(1) 2.2 — 3.8 mm (0.087 — 0.150 in)

(2) When reusing the weather strip:
8.5 — 10.5 mm (0.335 — 0.413 in)

When replacing the weather strip:
7.5 — 9.5 mm (0.295 — 0.374 in)

(3) ST

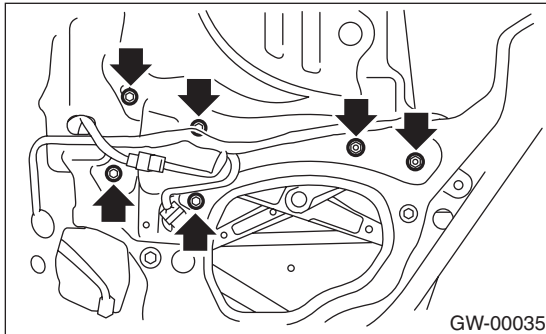
NOTE:

- If rear glass adhesion is higher than necessary, glass may get caught in weather strip of center pillar corner, resulting in early wear of weather strip. Care should be taken for adjustment.
- After adjustment, move the glass up and down to check whether it is caught.

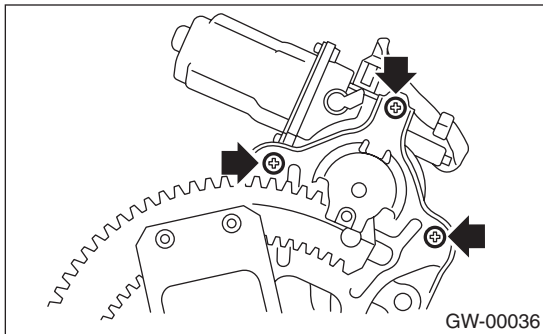
12. Rear Regulator and Motor Assembly

A: REMOVAL

- 1) Remove the rear door glass. <Ref. to GW-21, REMOVAL, Rear Door Glass.>
- 2) Remove the front sash.
- 3) Disconnect the motor connector.
- 4) Loosen four bolts and two nuts to remove regulator assembly.



- 5) Loosen screws to remove motor assembly.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Adjust the rear door glass. <Ref. to GW-22, ADJUSTMENT, Rear Door Glass.>

Tightening torque:

Refer to "COMPONENT" of "General Description". <Ref. to GW-4, REAR DOOR GLASS, COMPONENT, General Description.>

C: INSPECTION

- 1) Make sure that the power window motor rotates properly when the battery voltage is applied to the terminals of motor connector.
- 2) Change polarity of battery connection to terminals to ensure that the motor rotates in reverse direction.

Windshield Glass

GLASS/WINDOWS/MIRRORS

13. Windshield Glass

A: REMOVAL

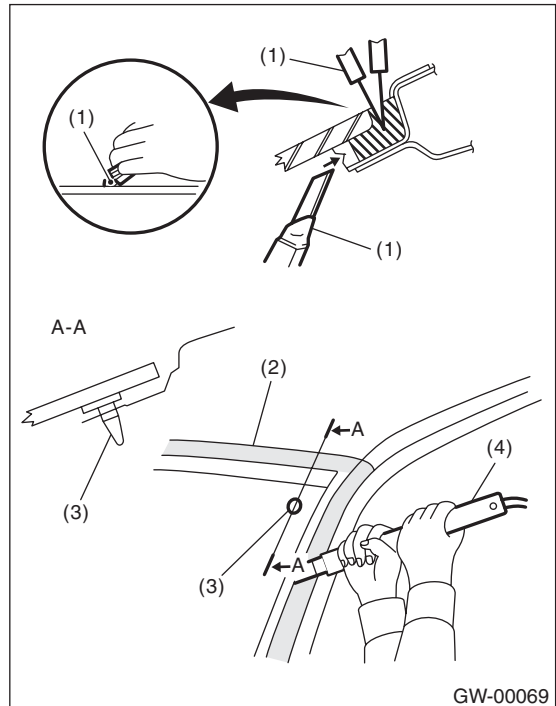
1. WHEN USING THE WINDSHIELD GLASS KNIFE

- 1) Remove the cowl panel. <Ref. to EI-31, REMOVAL, Cowl Panel.>
- 2) Remove the glass molding.
- 3) Tape the body side of the circumference of windshield glass for protection.
- 4) Apply sufficient amount of soapy water to the adhesive part.
- 5) Make a cut in the adhesive part using a putty knife so that windshield glass knife can be inserted easily.
- 6) Insert the windshield glass knife into adhesive part.
- 7) While holding the knife edge and windshield glass edge at a right angle, move the windshield glass knife in parallel to the windshield glass edge along the surface and edge of windshield glass to cut the adhesive part.

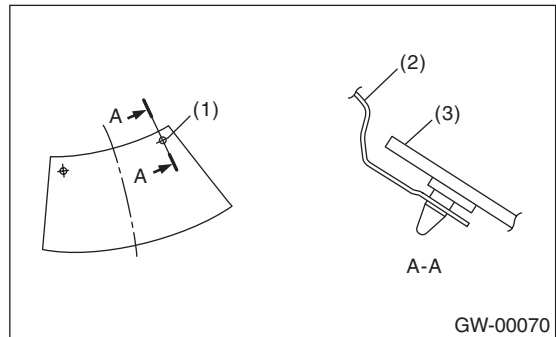
NOTE:

- Do not twist the windshield glass knife.
- Cutting of adhesive part shall be started with wider gap between windshield glass and body.
- Because the locating pins are bonded to the corners of glass, use piano wire to cut the pin.

- 8) For model with wiper deicer, detach the front pillar trim, then disconnect the harness connector.



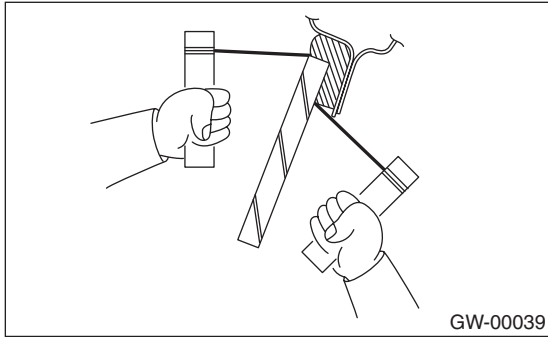
- (1) Putty knife
- (2) Tape for protection
- (3) Locating pin
- (4) Windshield glass knife



- (1) Locating pin
- (2) Body panel
- (3) Glass

2. USING PIANO WIRE

- 1) Remove the cowl panel. <Ref. to EI-31, REMOVAL, Cowl Panel.>
- 2) Remove the front molding.
- 3) Tape the body side of the circumference of windshield glass for protection.
- 4) Make a hole in the adhesive part using drill or knife.
- 5) Pass the piano wire through the hole, and attach securely both the wire ends to pieces of wood.



- 6) Pull the wire ends alternately to cut off the adhesive part.

CAUTION:

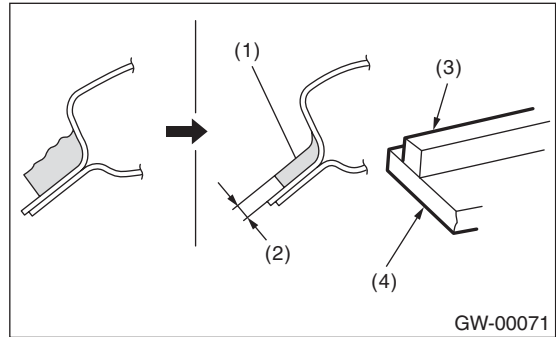
- Do not tightly pull the piano wire against the windshield glass edge.
- Be careful not to damage interior and exterior parts.
- When removal is made with area close to instrument panel, place a protection plate over it. Pay particular attention to the removal.
- Do not cross piano wires. Otherwise they may be cut.

B: INSTALLATION

- 1) Clean the external circumference of windshield glass with alcohol or white gasoline.
- 2) Remove the adhesive layer on the body using cutter knife to obtain smooth face of 2 mm (0.08 in) thick.

CAUTION:

Be careful not to damage the body and paint surface.



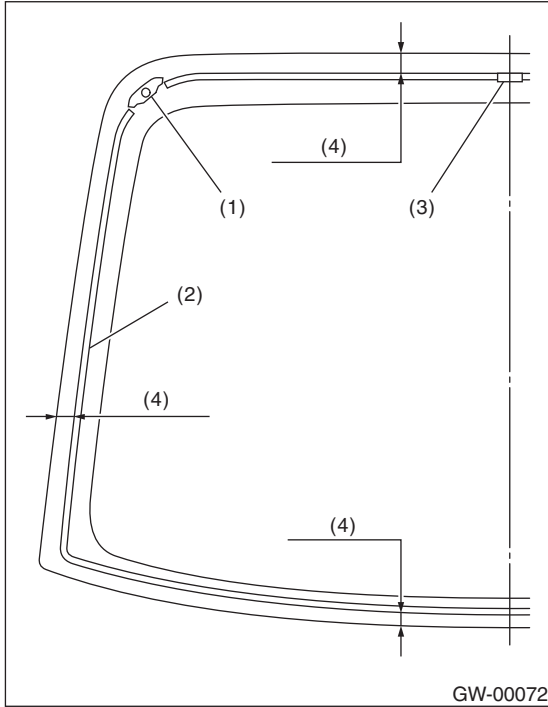
- (1) Adhesive
- (2) 2 mm (0.08 in)
- (3) Dam rubber
- (4) Glass

- 3) Clean the body with alcohol or white gasoline to eliminate cutting powder, dust and dirt completely from body.

Windshield Glass

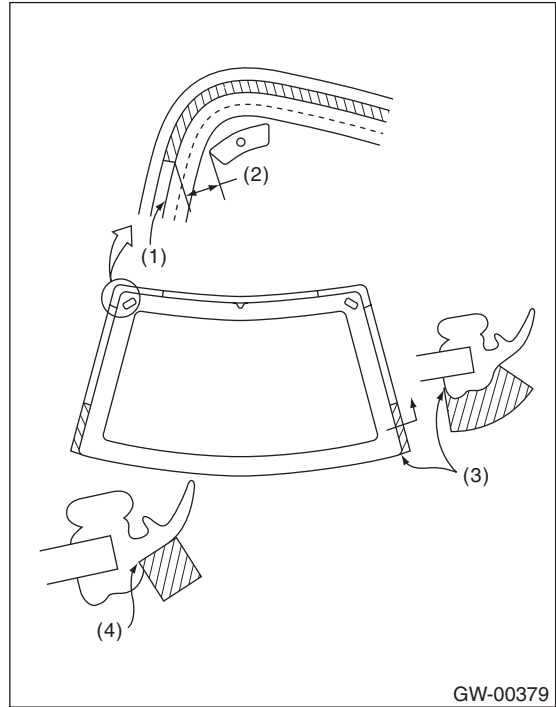
GLASS/WINDOWS/MIRRORS

4) Adhere the dam rubber to the glass back surface.



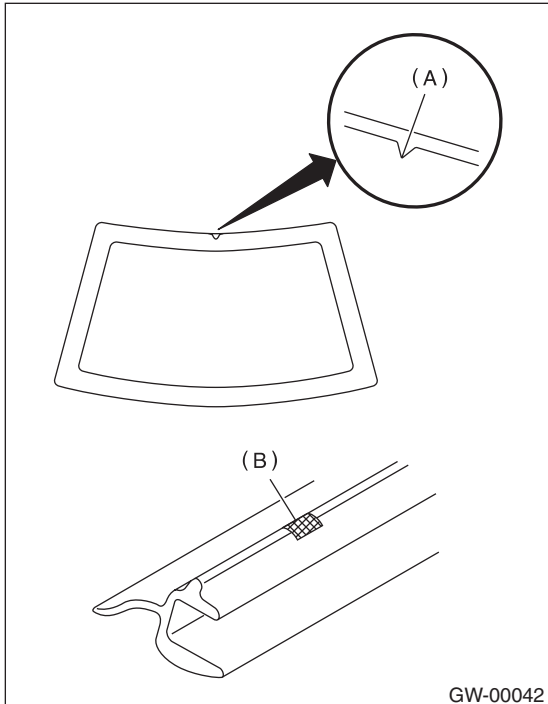
- (1) Locating pin
- (2) Dam rubber
- (3) Fastener
- (4) 13 mm (0.51 in)

6) Install the seal A and seal B to the molding back side.



- (1) Backside lip R stopper
- (2) 73 mm (2.87 in)
- (3) Reference position (edge) when affixing the seal A
- (4) Reference position (lip R stopper) when affixing the seal B

5) Peel away the backing paper of the double-sided tape. Align the molding mark (B) with the notch (A), affix the molding to the entire circumference of the edge of the glass, and press uniformly.



7) Apply the primer to the adhesive surface of glass using sponge.

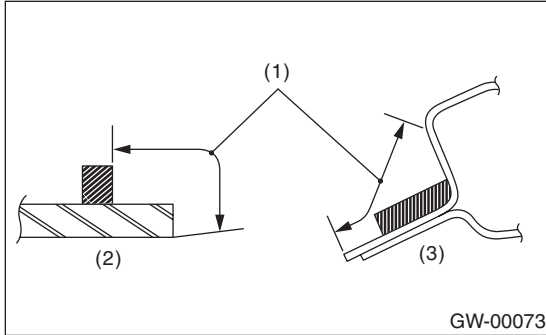
Glass primer:
Dow Automotive
U-401 and U-402

8) Apply the primer to the adhesive surface of body.

Painted surface primer:
Dow Automotive
U-413

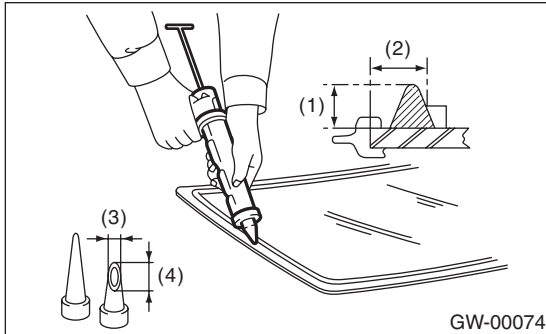
NOTE:

- Primer once attached to the painted surface of the body and the internal trim is hard to wipe off. Mask the circumference of such area.
- Let primer dry for about ten minutes before installing the glass.
- Do not touch the surface coated with primer.



- (1) Application of primer
- (2) Glass side
- (3) Body side

9) Cut off the cartridge nozzle tip as shown and set it in sealant gun.

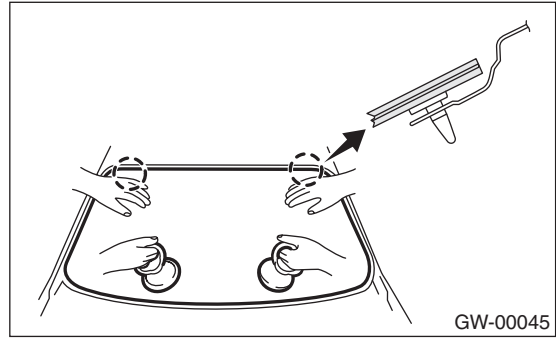


- (1) 10 — 13 mm (0.39 — 0.51 in)
- (2) 13 mm (0.51 in)
- (3) 10 mm (0.39 in)
- (4) 15 mm (0.59 in)

10) Apply adhesive to the glass end surface as shown.

Adhesive:
Dow Automotive
ESSEX U-400 HV

11) Fit the locating pins using suction rubber cup to install windshield glass.



- 12) Lightly press the windshield glass for tight fit.
- 13) Make flush the adhesive surface juttred out using spatula.
- 14) After completion of all work, allow the vehicle to stand for about 24 hours.

NOTE:

- When door is opened/closed after glass is bonded, always lower the door glass first, and then open/close it carefully.
- Move the vehicle slowly.
- For minimum drying time and vehicle standing time before driving after bonding, follow instructions or instruction manual from the adhesive manufacturer.

15) After curing of adhesive, pour the water on external surface of vehicle to check that there are no water leaks.

NOTE:

When a vehicle is returned to the user, tell him or her that the vehicle should not be subjected to heavy impact for at least three days.

16) Install the cowl panel. <Ref. to EI-31, INSTALLATION, Cowl Panel.>

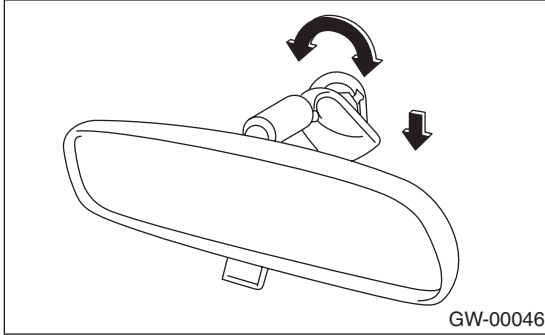
14.Rearview Mirror

A: REMOVAL

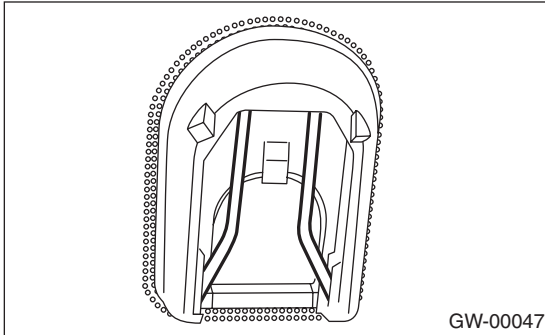
NOTE:

Never reuse the spring. Prepare a new spring before removal.

1) Turn the mirror base 90° clockwise or counterclockwise to remove it.



2) Remove the spring from the mirror base.



CAUTION:

Be careful not to damage the mirror surface.

3) When the mirror base is damaged, use the piano wire or spatula to remove.

CAUTION:

Be careful not to damage the windshield glass.

B: INSTALLATION

1) When the mirror base is removed, clean the old adhesive, and align the windshield glass mark to install.

Adhesive:

REPAIR KIT IN MR (Part No. 65029FC000)

2) Make sure the mirror base is securely attached and then install the spring to it.

3) Install in the reverse order of removal.

C: INSPECTION

Check that the mirror is not damaged.

Check that the spring is not damaged.

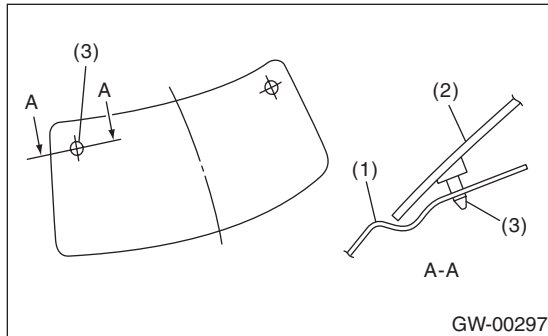
15.Rear Gate Glass

A: REMOVAL

- 1) Remove the rear gate garnish. <Ref. to EB-20, REMOVAL, Rear Gate Garnish.>
- 2) Disconnect the electrical connectors from rear defogger terminal.
- 3) Remove the glass in the same procedure as for windshield glass. <Ref. to GW-24, REMOVAL, Windshield Glass.>

NOTE:

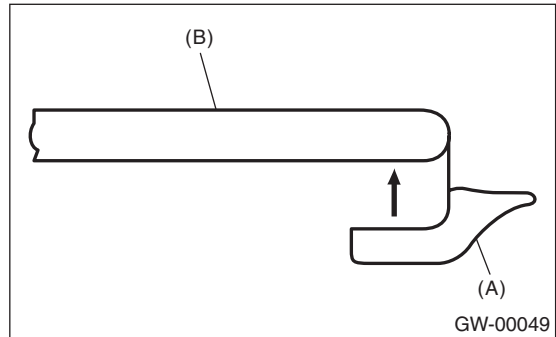
The locating pin is adhered to the corner portion on the vehicle's indoor side of the glass. Use the piano wire to cut each pin.



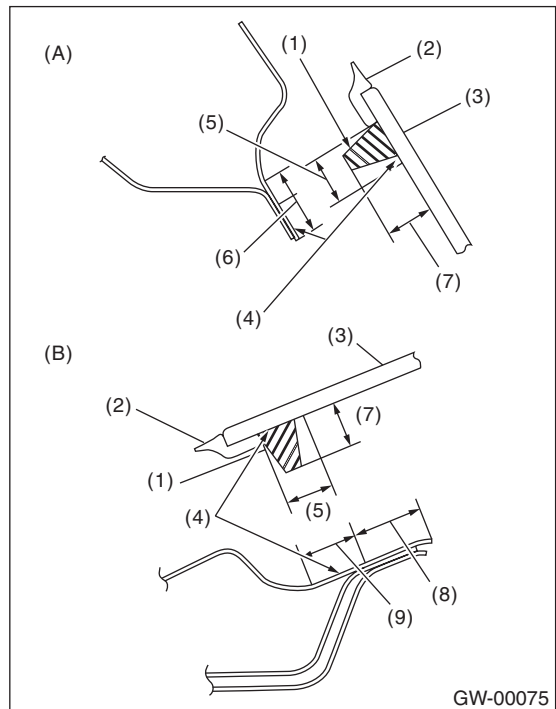
- (1) Body panel
- (2) Glass
- (3) Locating pin

B: INSTALLATION

- 1) Install a new rubber strip (A) in position with the edge (B) of the rear gate glass.



- 2) Install the glass in the same procedure as for windshield glass.



- (A) Upside
- (B) Left side and right side
- (1) Adhesive
- (2) Strip rubber
- (3) Glass
- (4) Primer
- (5) 12 mm (0.47 in)
- (6) 14 mm (0.55 in)
- (7) 10 — 13 mm (0.39 — 0.51 in)
- (8) 8 mm (0.31 in)
- (9) 12 mm (0.47 in)

Rear Gate Glass

GLASS/WINDOWS/MIRRORS

3) About one hour after installation, inspect for leaks.

4) After completion of all work, allow the vehicle to stand for about 24 hours.

NOTE:

- When door is opened/closed after glass is bonded, always lower the door glass first, and then open/close it carefully.
- Move the vehicle slowly.
- For minimum drying time and vehicle standing time before driving after bonding, follow instructions or instruction manual from the adhesive manufacturer.
- When a vehicle is returned to the user, tell him or her that the vehicle should not be subjected to heavy impact for at least three days.

5) Connect the rear defogger terminals.

6) Install the rear gate garnish. <Ref. to EB-20, INSTALLATION, Rear Gate Garnish.>

16.Rear Window Defogger System

A: WIRING DIAGRAM

1. REAR WINDOW DEFOGGER

<Ref. to WI-133, WIRING DIAGRAM, Rear Defogger System.>

B: INSPECTION

Symptom	Repair order
Rear window defogger does not operate.	<ol style="list-style-type: none">1. Fuse (M/B No. 1) (F/B No. 17)2. Rear defogger relay3. Rear defogger timer4. Defogger switch5. Rear defogger condenser6. Defogger wire7. Wiring harness

Rear Window Defogger

GLASS/WINDOWS/MIRRORS

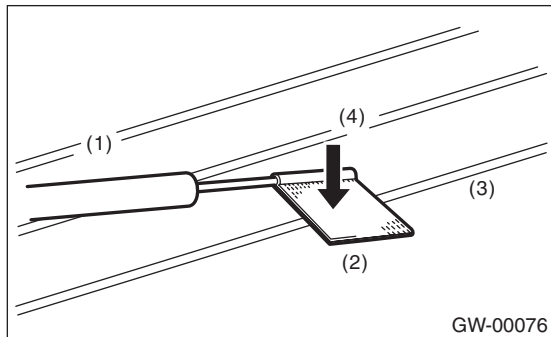
17.Rear Window Defogger

A: INSPECTION

CAUTION:

When wiping off the stain on glass with cloth, use a dry and soft cloth and move it in the direction of the heat wire extension to avoid damage to the heat wire.

- 1) Turn the ignition switch to ON.
- 2) Turn the defogger switch to ON.
- 3) Wrap the tips of tester probe with aluminum foil to avoid damage to heat wire.

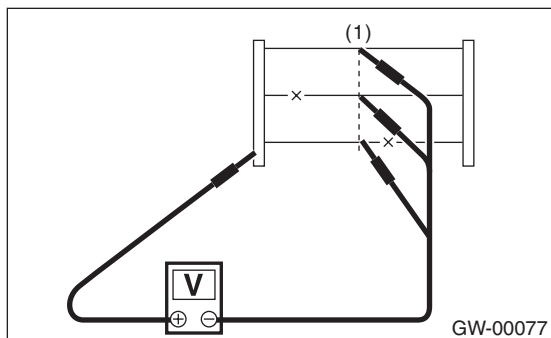


- (1) Tester probe
- (2) Aluminum foil
- (3) Heat wire
- (4) Press

- 4) Measure the voltage at heat wire center (1) with DC voltmeter.

Standard voltage:

Approx. 6 V



- (1) Center of heat wire

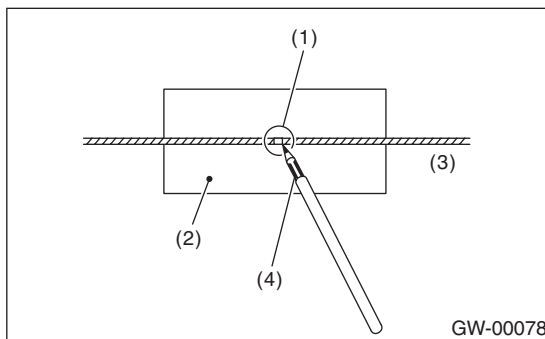
Voltage	Criteria
Approx. 6 V	Normal
Approx. 12 V or 0 V	Open

NOTE:

- If the measured value is 12 V, the circuit is open between heat wire center and positive (+) terminal of tester probe.
 - If it is 0 V, the circuit is open between heat wire center and ground.
- 5) Connect the tester probe of positive lead of voltmeter to positive terminal of heat wire and move tester probe of negative lead along the heat wire up to the negative terminal end. If voltage changes from zero to several volts during movement of tester probe, heat wire is open at the voltage change point.

B: REPAIR

- 1) Clean the broken portion with alcohol or white gasoline.
- 2) Mask both side of wire with thin film.
- 3) Apply the conductive silver composition (DUPONT No. 4817) to the broken point.



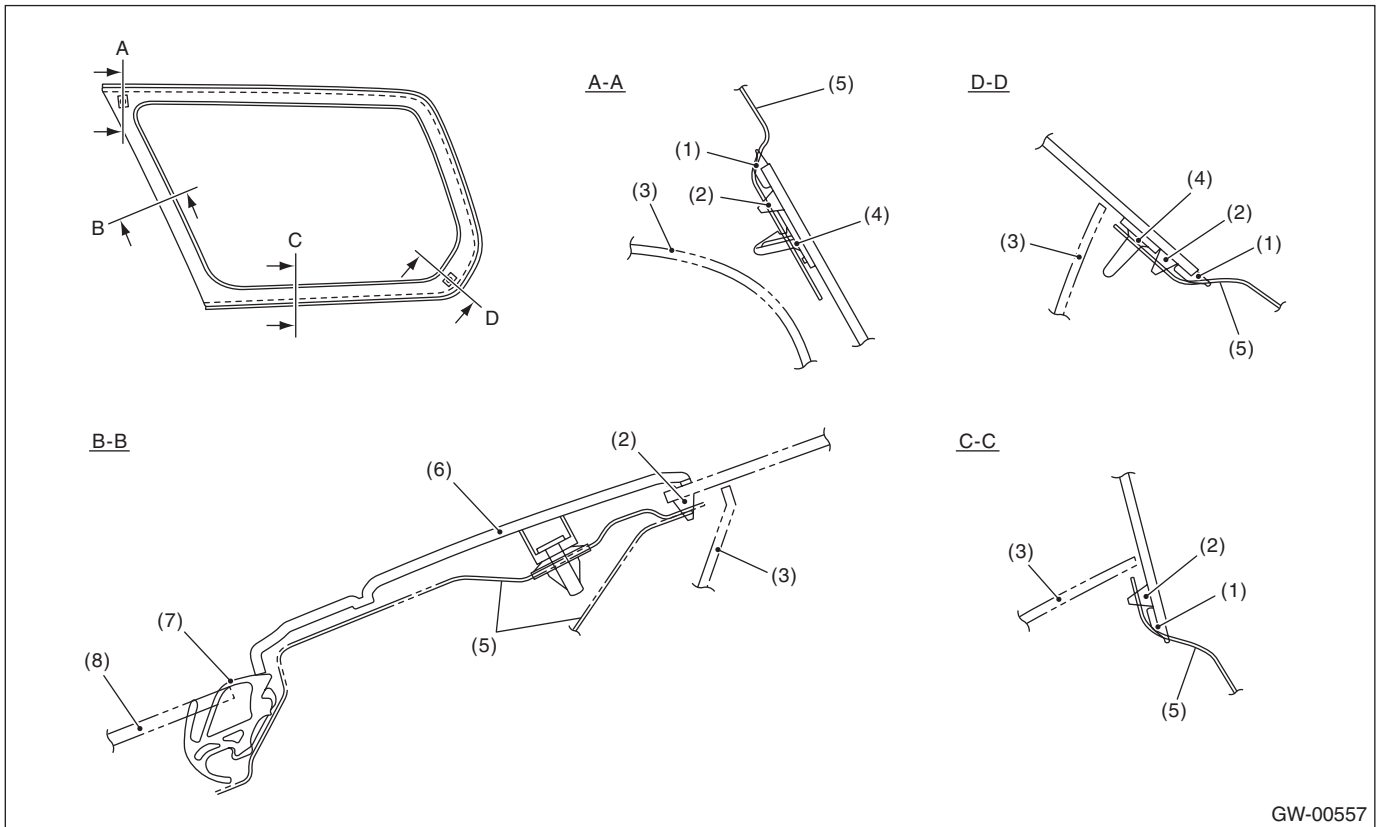
- (1) Broken portion
- (2) Thin film
- (3) Broken wire
- (4) Conductive silver composition (DUPONT No. 4817)

- 4) After repair, check the wire.

18.Rear Quarter Glass

A: REMOVAL

Remove the glass in the same procedure as for windshield glass. <Ref. to GW-24, REMOVAL, Windshield Glass.>



GW-00557

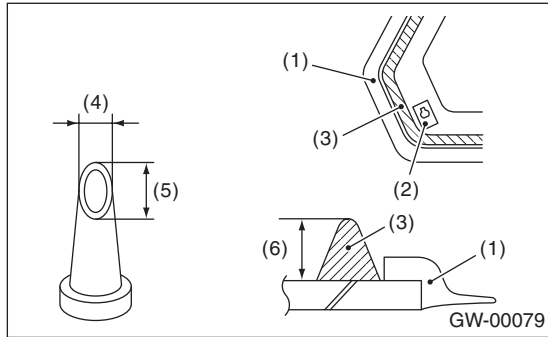
- | | | |
|----------------------|--------------------|---------------------|
| (1) Molding | (4) Locating pin | (7) Weather strip |
| (2) Adhesive | (5) Vehicle body | (8) Rear door glass |
| (3) Compartment trim | (6) Cover C pillar | |

Rear Quarter Glass

GLASS/WINDOWS/MIRRORS

B: INSTALLATION

1) Cut off the nozzle tip as shown in the figure.



- (1) Molding
- (2) Locating pin
- (3) Adhesive
- (4) 10 mm (0.39 in)
- (5) 15 mm (0.59 in)
- (6) 10 — 13 mm (0.39 — 0.51 in)

2) Install the glass in the same procedure as for windshield glass. <Ref. to GW-25, INSTALLATION, Windshield Glass.>

3) After completion of all work, allow the vehicle to stand for about 24 hours.

NOTE:

- When door is opened/closed after glass is bonded, always lower the door glass first, and then open/close it carefully.
- Move the vehicle slowly.
- For minimum drying time and vehicle standing time before driving after bonding, follow instructions or instruction manual from the adhesive manufacturer.

4) After curing of adhesive, pour the water on external surface of vehicle to check that there are no water leaks.

NOTE:

When a vehicle is returned to the user, tell him or her that the vehicle should not be subjected to heavy impact for at least three days.

19.Sunroof Glass

A: REMOVAL

<Ref. to SR-5, REMOVAL, Sunroof Lid.>

B: INSTALLATION

<Ref. to SR-5, INSTALLATION, Sunroof Lid.>

C: ADJUSTMENT

<Ref. to SR-5, ADJUSTMENT, Sunroof Lid.>

Sunroof Glass

GLASS/WINDOWS/MIRRORS

General Description

BODY STRUCTURE

1. General Description

A: PREPARATION TOOL

TOOL NAME	REMARKS
Tram tracking gauge	Used for measuring dimension.
Tape measure	Used for measuring dimension.

2. Datum Points

A: LOCATION

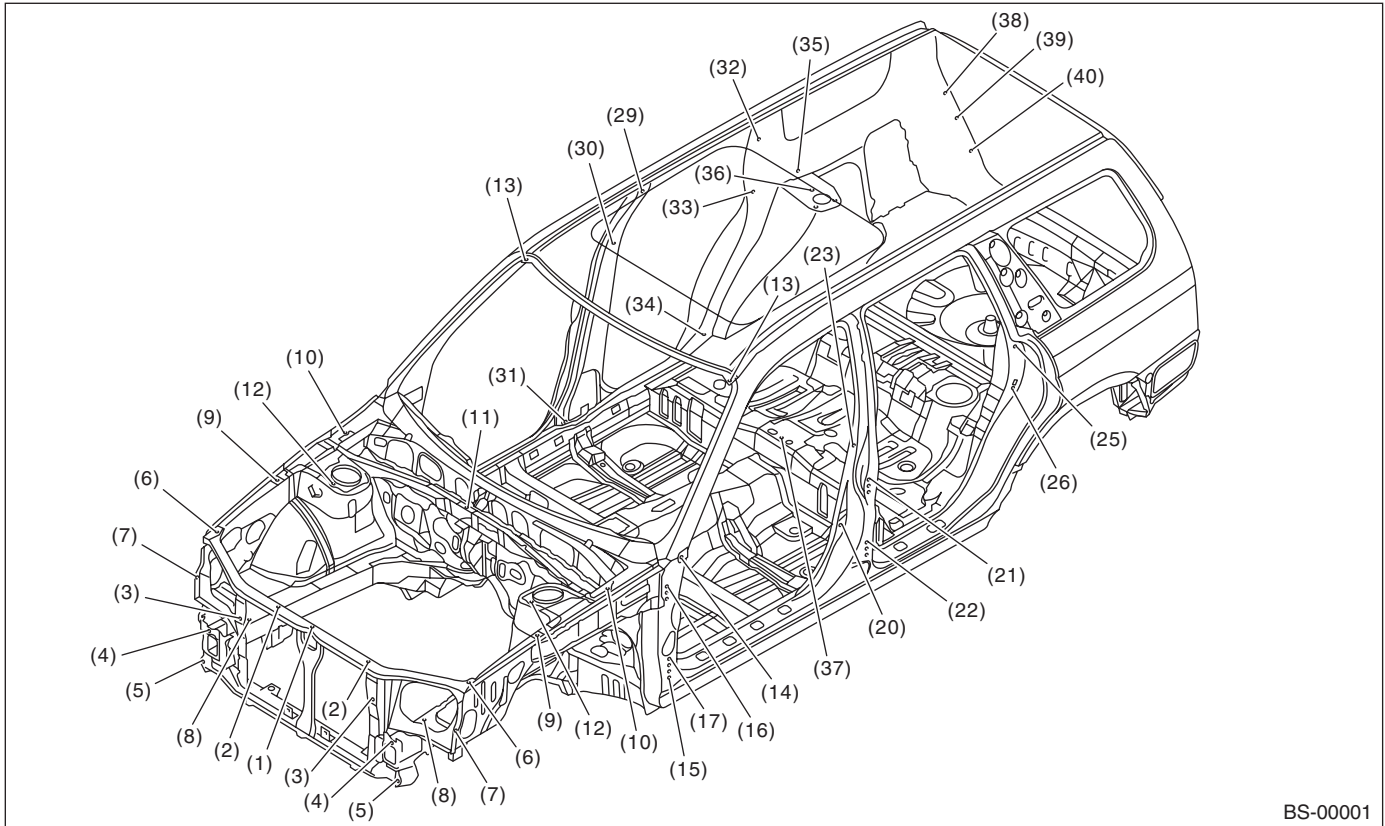
NOTE:

- Datum points are specified for body repair.
- Guide holes, locators, and indents are provided to facilitate panel replacement and to increase alignment accuracy.

Datum Points

BODY STRUCTURE

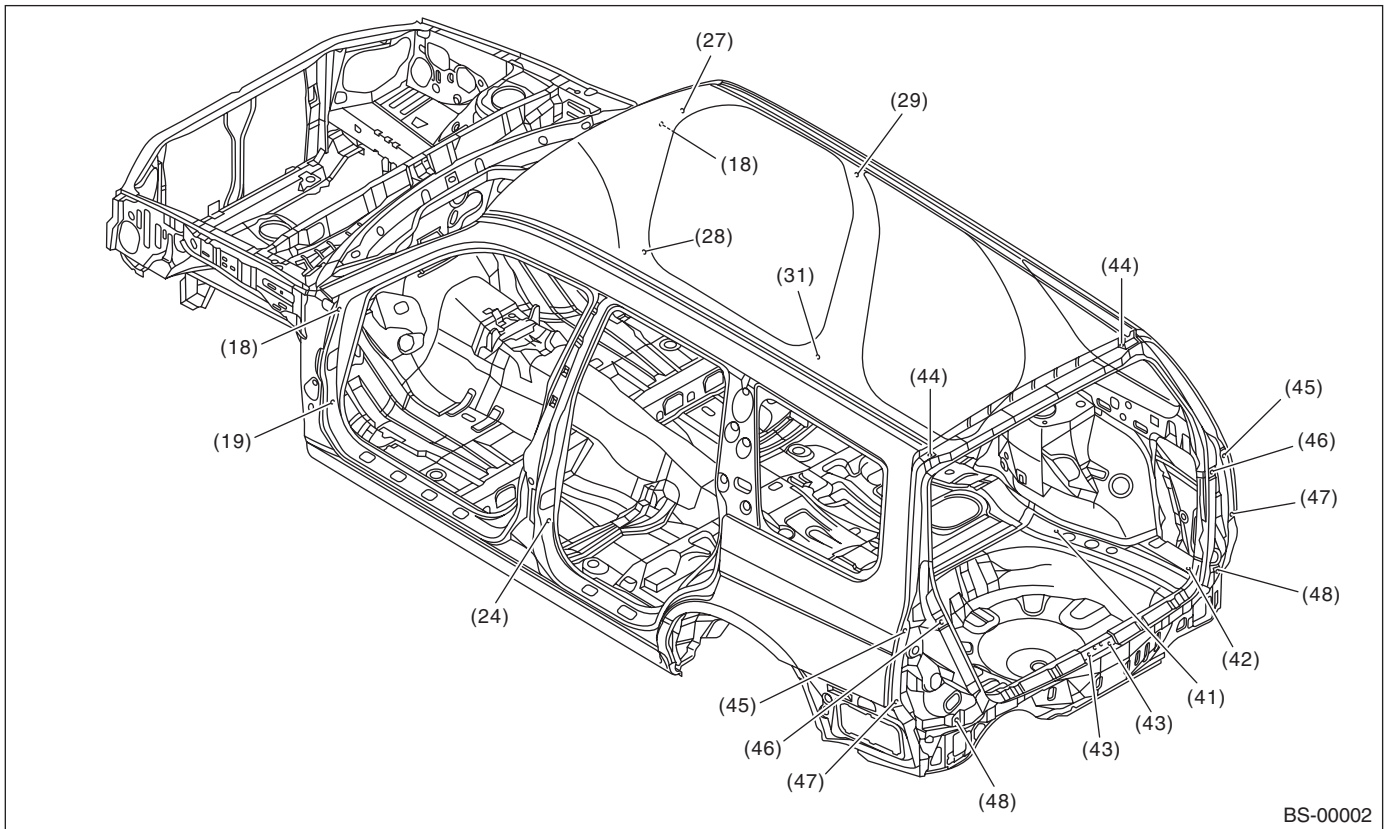
- Both right and left reference points are symmetrical.



- | | | |
|---|--|---|
| (1) Radiator panel gauge hole 6 mm (0.24 in) dia. (Vehicle center) | (13) Front glass attaching hole LH 6.5 × 10.5 mm (0.26 × 0.41 in) RH 6.5 × 7 mm (0.26 × 0.28 in) | (29) Trim attaching hole 8.5 mm (0.33 in) dia. (Symmetrical) |
| (2) Radiator attaching hole 12 mm (0.47 in) dia. | (14) Fender attaching hole 10 mm (0.39 in) dia. (Symmetrical) | (30) Pad attaching hole 5 mm (0.20 in) dia. (Symmetrical) |
| (3) Headlight attaching hole 7 mm (0.28 in) dia. (Symmetrical) | (15) Fender attaching hole 10 mm (0.39 in) dia. (Symmetrical) | (31) Harness attaching hole 7 mm (0.28 in) dia. (Symmetrical) |
| (4) Frame plate gauge hole 8 mm (0.31 in) dia. (Symmetrical) | (16) Front door hinge attaching hole 12 mm (0.47 in) dia. (Symmetrical) | (32) Trim attaching hole 8.5 mm (0.33 in) dia. (Symmetrical) |
| (5) Bumper beam attaching hole 11 mm (0.43 in) dia. (Symmetrical) | (17) Front door hinge attaching hole 12 mm (0.47 in) dia. (Symmetrical) | (33) Trim attaching hole 7 mm (0.28 in) dia. (Symmetrical) |
| (6) Fender attaching hole 7 mm (0.28 in) dia. (Symmetrical) | (20) Front door switch attaching hole 4.1 mm (0.16 in) dia. (Symmetrical) | (34) Harness attaching hole 7 × 7 mm (0.28 × 0.28 in) (Symmetrical) |
| (7) Fender attaching hole 7 mm (0.28 in) dia. (Symmetrical) | (21) Rear door hinge attaching hole 12 mm (0.47 in) dia. (Symmetrical) | (35) Tonneau cover attaching hole 5.5 mm (0.22 in) dia. (Symmetrical) |
| (8) RH power steering tank attaching hole LH ATF cooler pipe attaching hole 9 mm (0.35 in) dia. | (22) Rear door hinge attaching hole 12 mm (0.47 in) dia. (Symmetrical) | (36) Rear strut attaching hole 10 mm (0.39 in) dia. (Symmetrical) |
| (9) Fender attaching hole 7 mm (0.28 in) dia. (Symmetrical) | (23) Front weather strip attaching hole 5.2 mm (0.20 in) dia. (Symmetrical) | (37) Floor mat attaching hole 8 mm (0.31 in) dia. (Symmetrical) |
| (10) Fender attaching hole 7 mm (0.28 in) dia. (Symmetrical) | (25) Rear weather strip attaching hole 5.2 mm (0.20 in) dia. (Symmetrical) | (38) Trim attaching hole 9 × 9 mm (0.35 × 0.35 in) (Symmetrical) |
| (11) Modular bracket gauge hole 8 mm (0.31 in) dia. (Vehicle center) | (26) Rear door switch attaching hole 4.1 mm (0.16 in) dia. (Symmetrical) | (39) Trim attaching hole 8 mm (0.31 in) dia. (Symmetrical) |
| (12) Front strut attaching hole 9.5 mm (0.37 in) dia. (Symmetrical) | | (40) Trim attaching hole 8 mm (0.31 in) dia. (Symmetrical) |

Datum Points

BODY STRUCTURE

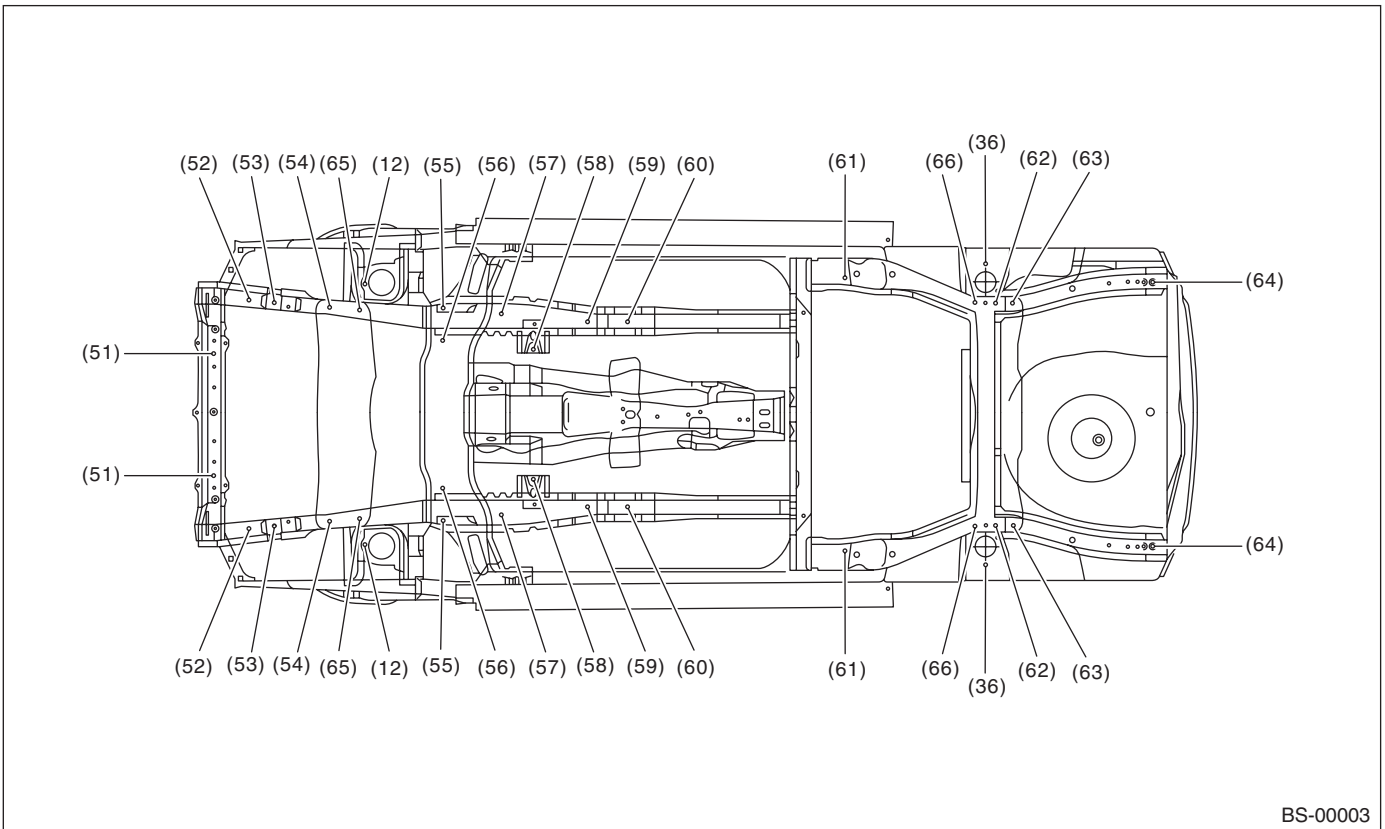


BS-00002

- | | | |
|---|--|---|
| (18) Front weather strip attaching hole 5.2 mm (0.20 in) dia. (Symmetrical) | (31) Harness attaching hole 7 mm (0.28 in) dia. (Symmetrical) | (45) Combination light mounting hole 9.5 mm (0.37 in) dia. (Symmetrical) |
| (19) Trim attaching hole 7 mm (0.28 in) dia. (Symmetrical) | (41) Harness attaching hole 7.5 mm (0.30 in) dia. | (46) Combination light mounting hole 7 mm (0.28 in) dia. (Symmetrical) |
| (24) Trim attaching hole 7 mm (0.28 in) dia. (Symmetrical) | (42) Assemblies hole 12 mm (0.47 in) dia. | (47) Combination light mounting hole 8 × 15 mm (0.31 × 0.59 in) (Symmetrical) |
| (27) Front pillar gauge hole 12 mm (0.47 in) dia. (Symmetrical) | (43) Striker gauge hole 5 mm (0.20 in) dia. (Symmetrical) | (48) Bumper bracket attaching hole 7 mm (0.28 in) dia. (Symmetrical) |
| (28) Insulator attaching hole 8 mm (0.31 in) dia. (Symmetrical) | (44) Harness attaching hole 7 × 7 mm (0.28 × 0.28 in) dia. (Symmetrical) | |
| (29) Trim attaching hole 8.5 mm (0.33 in) dia. (Symmetrical) | | |

Datum Points

BODY STRUCTURE

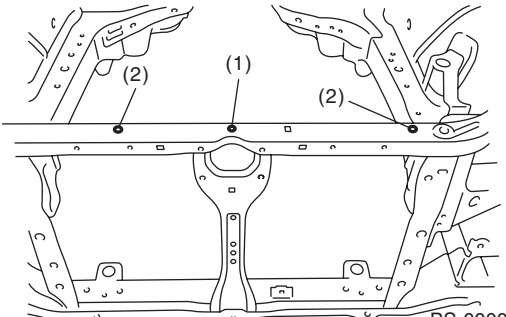
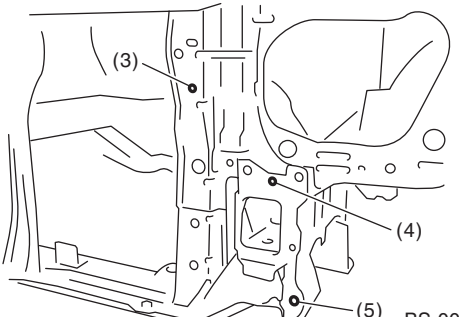
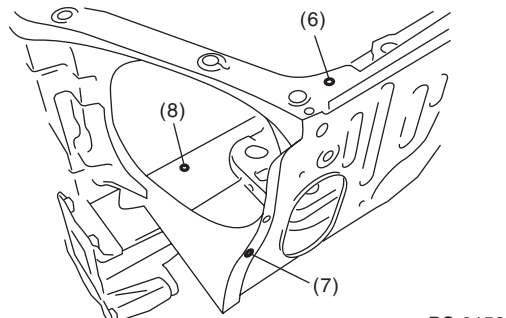
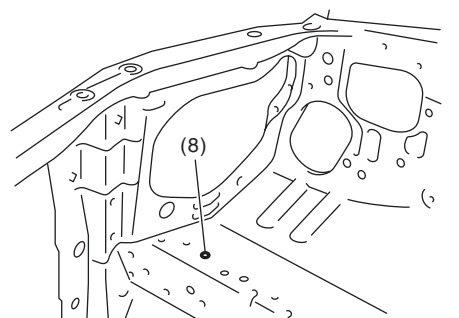
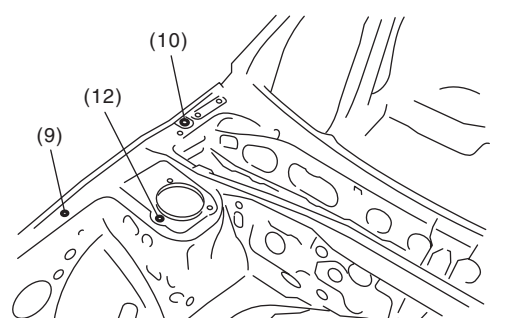
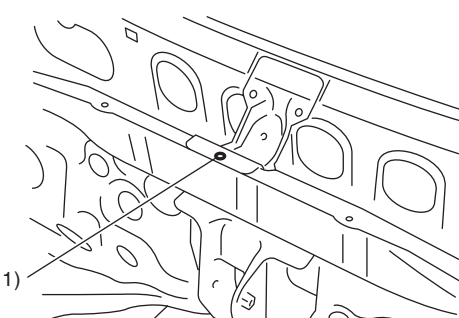
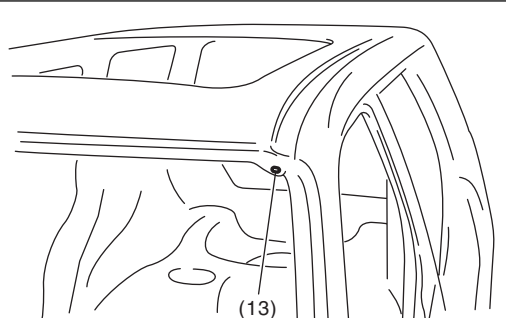
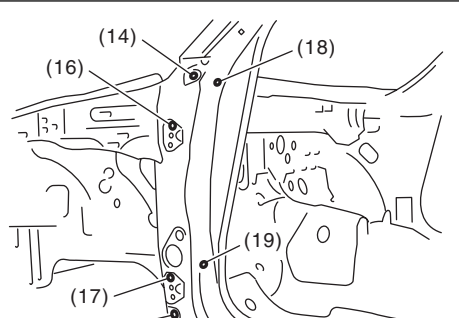
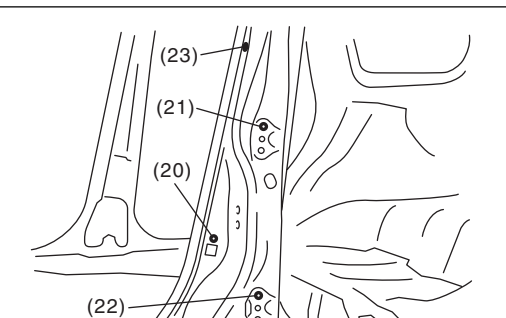
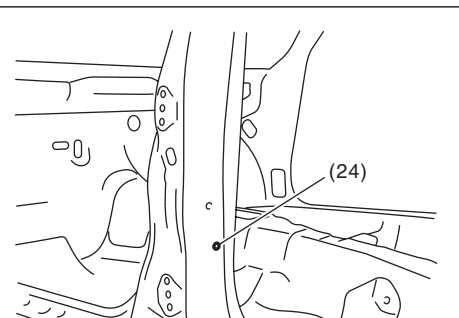


BS-00003

- | | | |
|--|---|---|
| (12) Front strut attaching hole 9.5 mm (0.37 in) dia. (Symmetrical) | (56) Transverse link attaching hole 16 mm (0.63 in) dia. (Symmetrical) | (63) Rear crossmember attaching hole 12 mm (0.47 in) dia. (Symmetrical) |
| (36) Rear strut attaching hole 10 mm (0.39 in) dia. (Symmetrical) | (57) Subframe attaching hole 16 mm (0.63 in) dia. (Symmetrical) | (64) Rear bumper beam attaching hole RH 15 mm (0.57 in) LH 19 × 15 mm (0.75 × 0.59 in) dia. |
| (51) Radiator lower frame gauge hole 12 mm (0.47 in) dia. (Symmetrical) | (58) Transmission crossmember attaching hole 14 mm (0.55 in) dia. (Symmetrical) | (65) Front crossmember attaching hole 12.4 mm (0.49 in) dia. (Symmetrical) |
| (52) Side frame gauge hole 20 mm (0.79 in) dia. (Symmetrical) | (59) Rear side frame gauge hole 15 mm (0.59 in) dia. (Symmetrical) | (66) Rear crossmember attaching hole 16 mm (0.63 in) dia. (Symmetrical) |
| (53) Subframe attaching hole 16 mm (0.63 in) dia. (Symmetrical) | (60) Rear side frame gauge hole 18 mm (0.71 in) dia. (Symmetrical) | |
| (54) Front crossmember attaching hole 12.4 mm (0.49 in) dia. (Symmetrical) | (61) Rear differential attaching hole 16 mm (0.63 in) dia. (Symmetrical) | |
| (55) Transverse link attaching hole 17 mm (0.69 in) dia. (Symmetrical) | (62) Rear crossmember gauge hole 16 mm (0.63 in) dia. (Symmetrical) | |

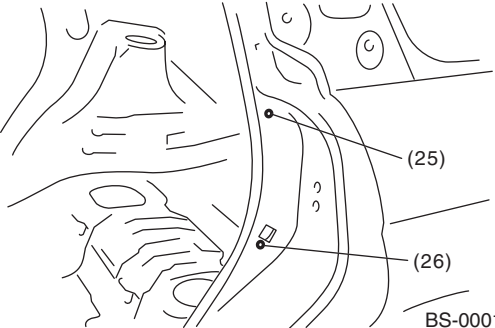
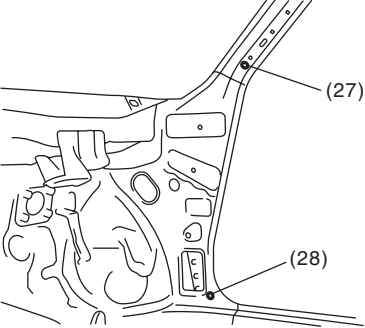
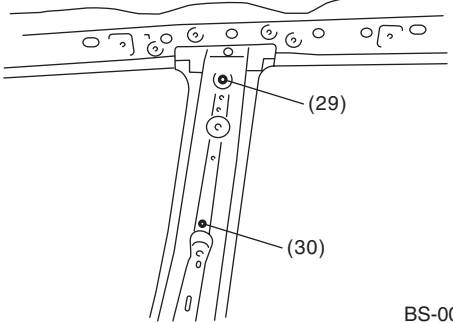
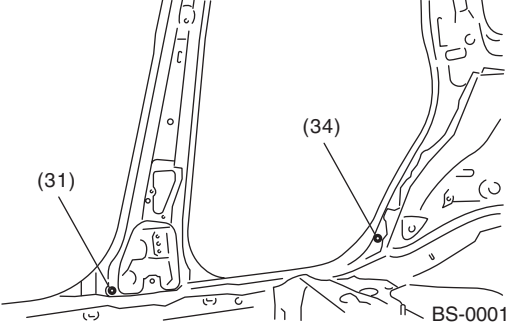
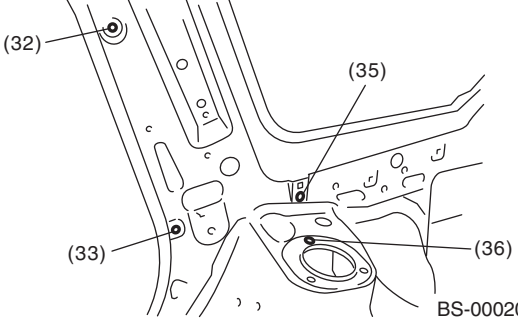

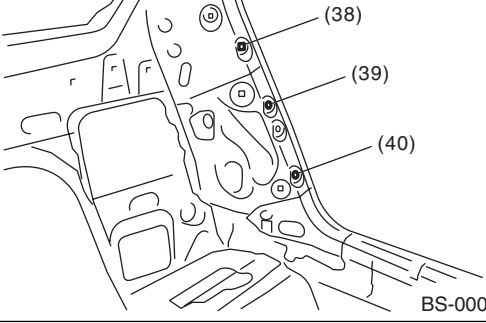
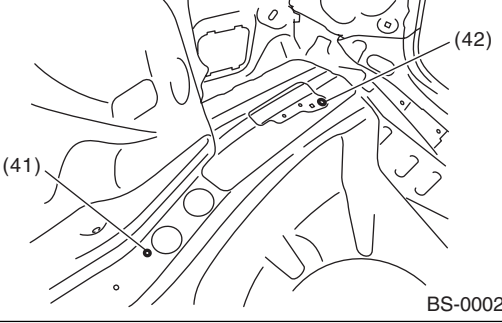
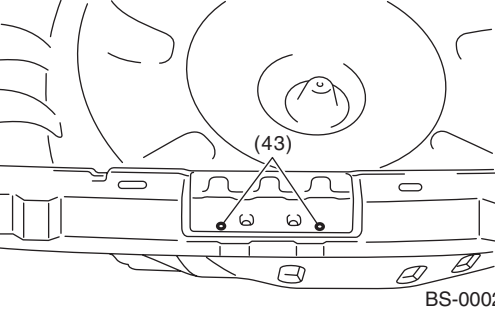
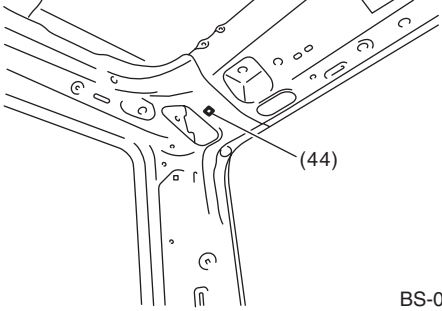
Datum Points

BODY STRUCTURE

 <p>Diagram showing datum points (1) and (2) on the front cross-member area.</p>	 <p>Diagram showing datum points (3), (4), and (5) on the front quarter panel area.</p>
 <p>Diagram showing datum points (6), (7), and (8) on the front suspension assembly.</p>	 <p>Diagram showing datum point (8) on the front quarter panel area.</p>
 <p>Diagram showing datum points (9), (10), and (12) on the front suspension assembly.</p>	 <p>Diagram showing datum point (11) on the front quarter panel area.</p>
 <p>Diagram showing datum point (13) on the front suspension assembly.</p>	 <p>Diagram showing datum points (14), (15), (16), (17), (18), and (19) on the front quarter panel area.</p>
 <p>Diagram showing datum points (20), (21), and (22) on the front suspension assembly.</p>	 <p>Diagram showing datum point (24) on the front quarter panel area.</p>

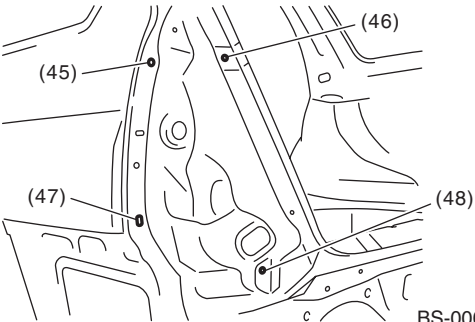
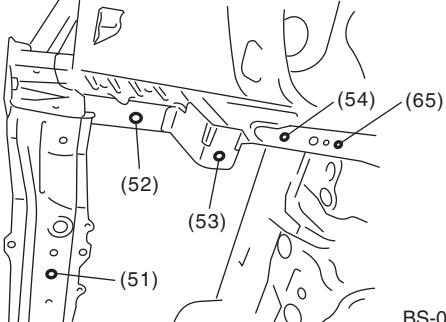
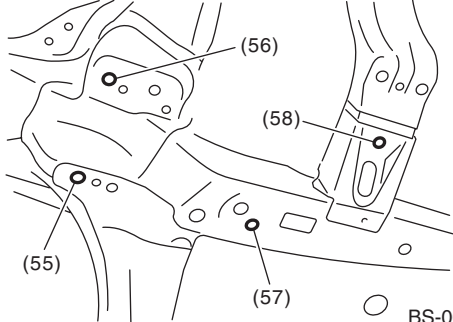
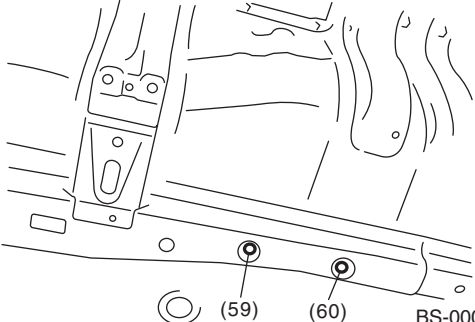
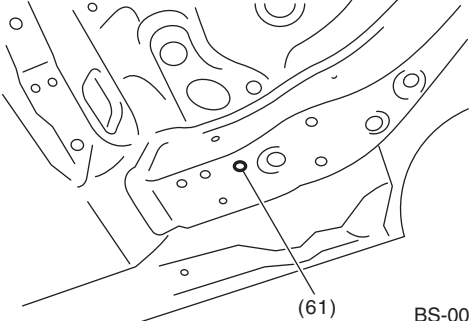
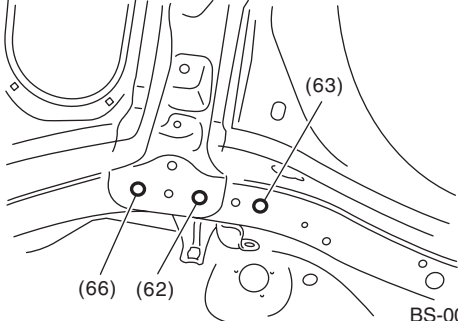
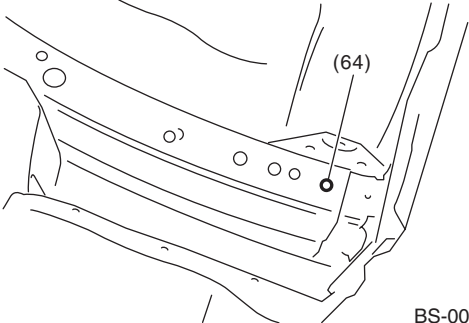
Datum Points

BODY STRUCTURE

 <p>(25) (26)</p> <p>BS-00016</p>	 <p>(27) (28)</p> <p>BS-00017</p>
 <p>(29) (30)</p> <p>BS-00018</p>	 <p>(31) (34)</p> <p>BS-00019</p>
 <p>(32) (33) (35) (36)</p> <p>BS-00020</p>	 <p>(37)</p> <p>BS-00021</p>
 <p>(38) (39) (40)</p> <p>BS-00022</p>	 <p>(41) (42)</p> <p>BS-00023</p>
 <p>(43)</p> <p>BS-00024</p>	 <p>(44)</p> <p>BS-00025</p>

Datum Points

BODY STRUCTURE

 <p>BS-00026</p>	 <p>BS-00027</p>
 <p>BS-00028</p>	 <p>BS-00029</p>
 <p>BS-00030</p>	 <p>BS-00031</p>
 <p>BS-00032</p>	<p>SUBARU.</p>

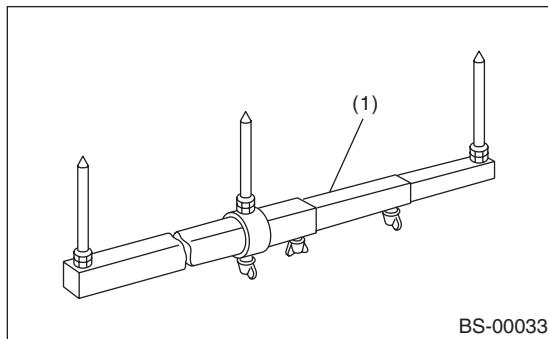
3. Datum Dimensions

A: MEASUREMENT

For details concerning points to measure, refer to "Position". <Ref. to BS-3, LOCATION, Datum Points.>

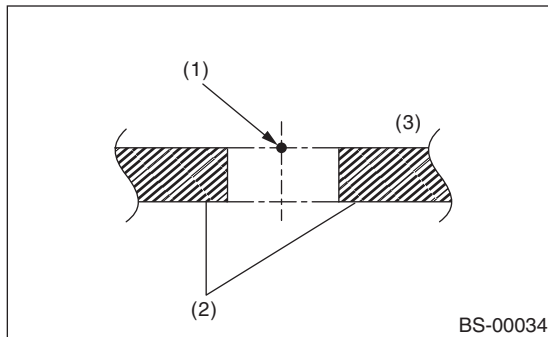
NOTE:

- Using a tram tracking gauge, measure all the dimensions.
- When using a tape measure, carefully measure dimensions without letting the tape measure sag or twist.
- Measure the linear dimensions between cores of holes.
- Suffixes "RH" and "LH" indicate right-hand and left-hand.



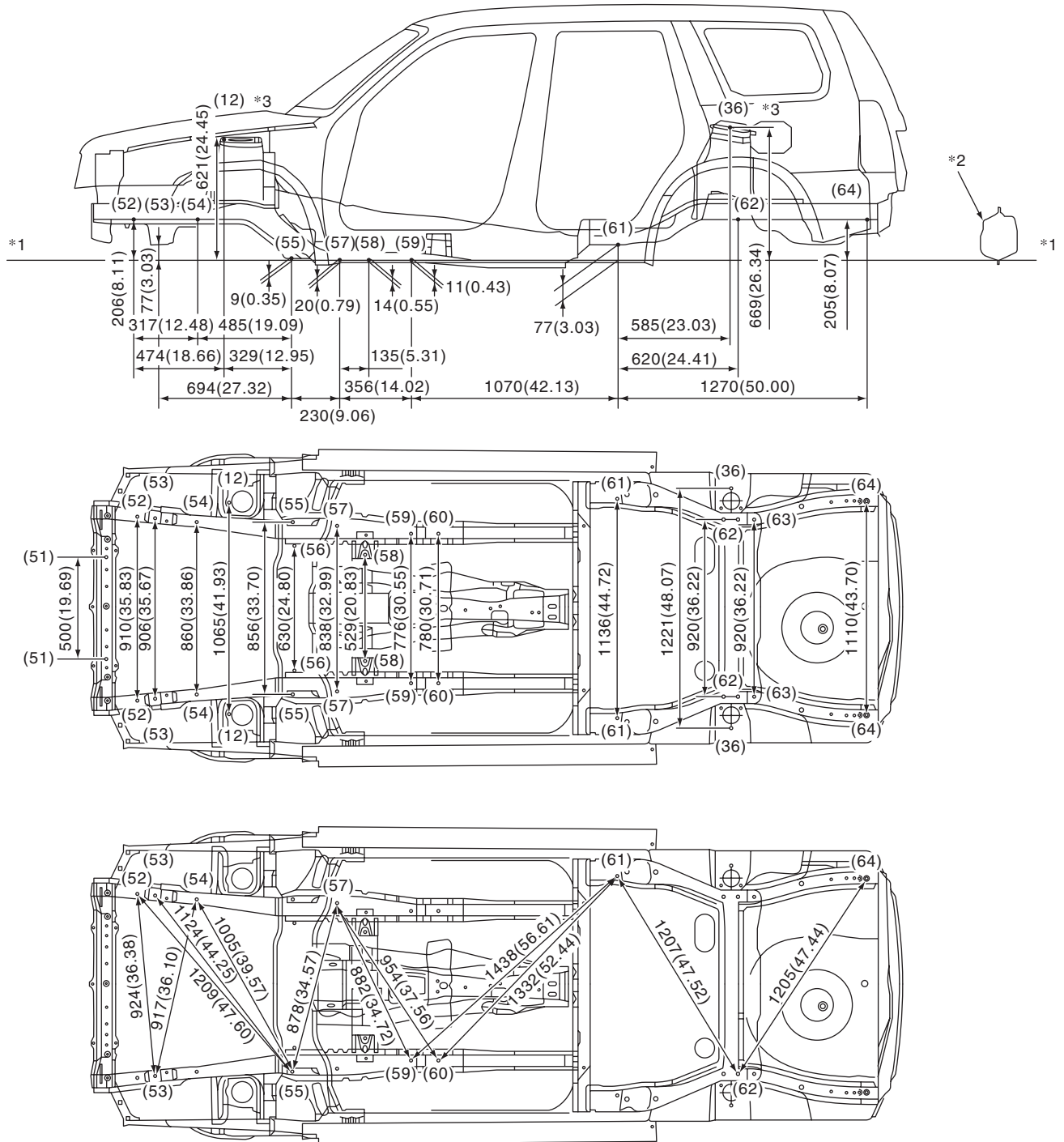
(1) Tram tracking gauge

- Measure at the center of the circle around the outside of the body panel.



- (1) Datum points
- (2) Body panel
- (3) Outside

1. CENTER STRUCTURE



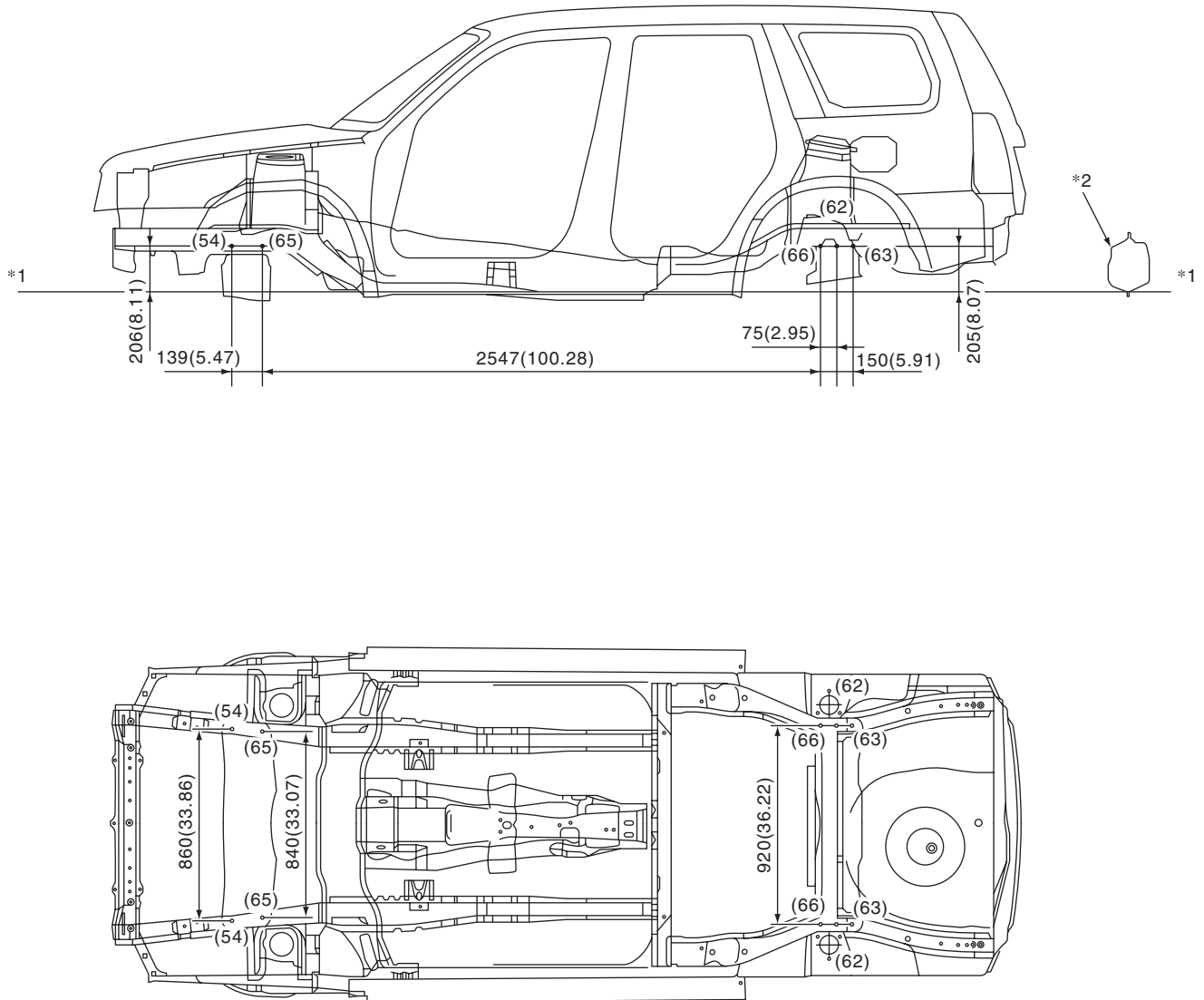
- *1: Standard Line
 - *2: Side sill
 - *3: Upper surface
- Unit: mm (in)

BS-00035

Datum Dimensions

BODY STRUCTURE

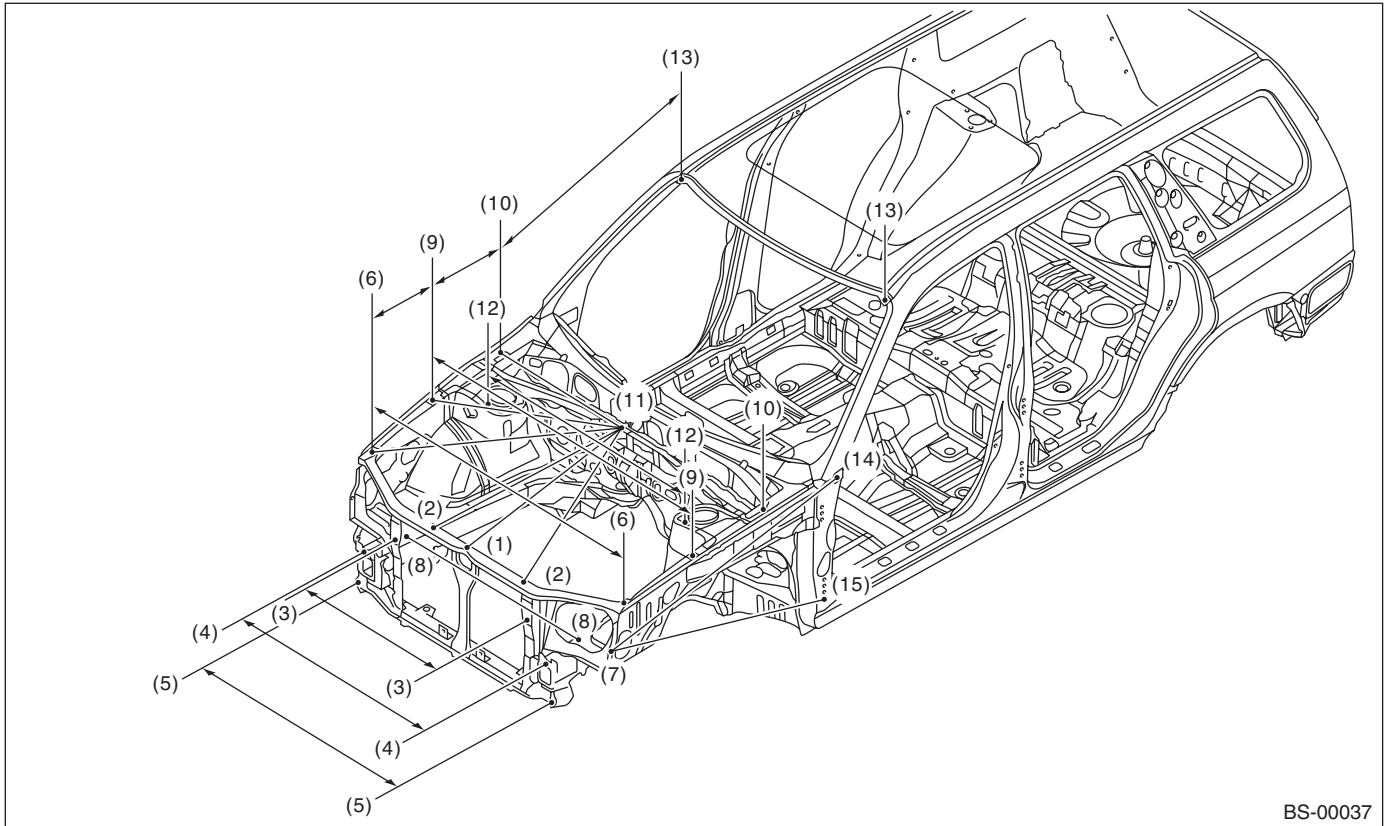
2. SUSPENSION CROSSMEMBER



*1: Standard Line
*2: Side sill
Unit: mm (in)

BS-00036

3. FRONT STRUCTURE

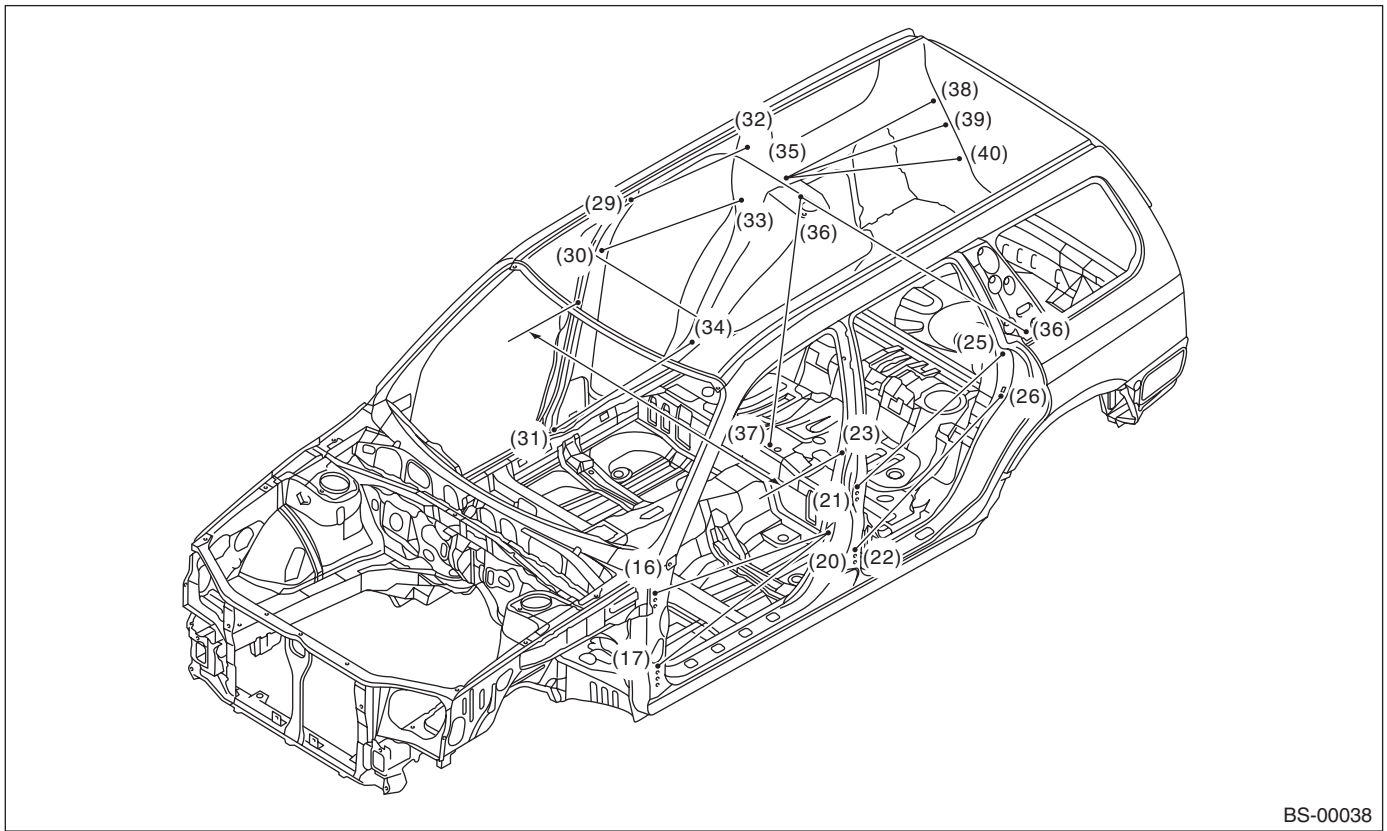


BS-00037

Unit: mm (in)			
Point of measurement	Dimension	Point of measurement	Dimension
(1) to (11)	822 (32.36)	(7) LH to (15) LH	1,092 (42.99)
(2) RH to (11)	842 (33.15)	(8) RH to (8) LH	921 (36.26)
(2) LH to (11)	875 (34.45)	(9) RH to (9) LH	1,396 (54.96)
(3) RH to (3) LH	716 (28.19)	(9) RH to (10) RH	398 (15.67)
(4) RH to (4) LH	978 (38.50)	(9) LH to (10) LH	398 (15.67)
(5) RH to (5) LH	1,049 (41.30)	(9) RH to (11)	767 (30.20)
(6) RH to (6) LH	1,341 (52.80)	(9) LH to (11)	767 (30.20)
(6) RH to (9) RH	349 (13.74)	(10) RH to (11)	722 (28.43)
(6) LH to (9) LH	349 (13.74)	(10) LH to (11)	722 (28.43)
(6) RH to (11)	944 (37.17)	(10) RH to (13) RH	907 (35.71)
(6) LH to (11)	944 (37.17)	(10) LH to (13) LH	907 (35.71)
(7) RH to (14) RH	1,184 (46.61)	(11) to (12) RH	565 (22.24)
(7) LH to (14) LH	1,184 (46.61)	(11) to (12) LH	565 (22.24)
(7) RH to (15) RH	1,092 (42.99)	(12) RH to (12) LH	1,065 (41.93)

Datum Dimensions

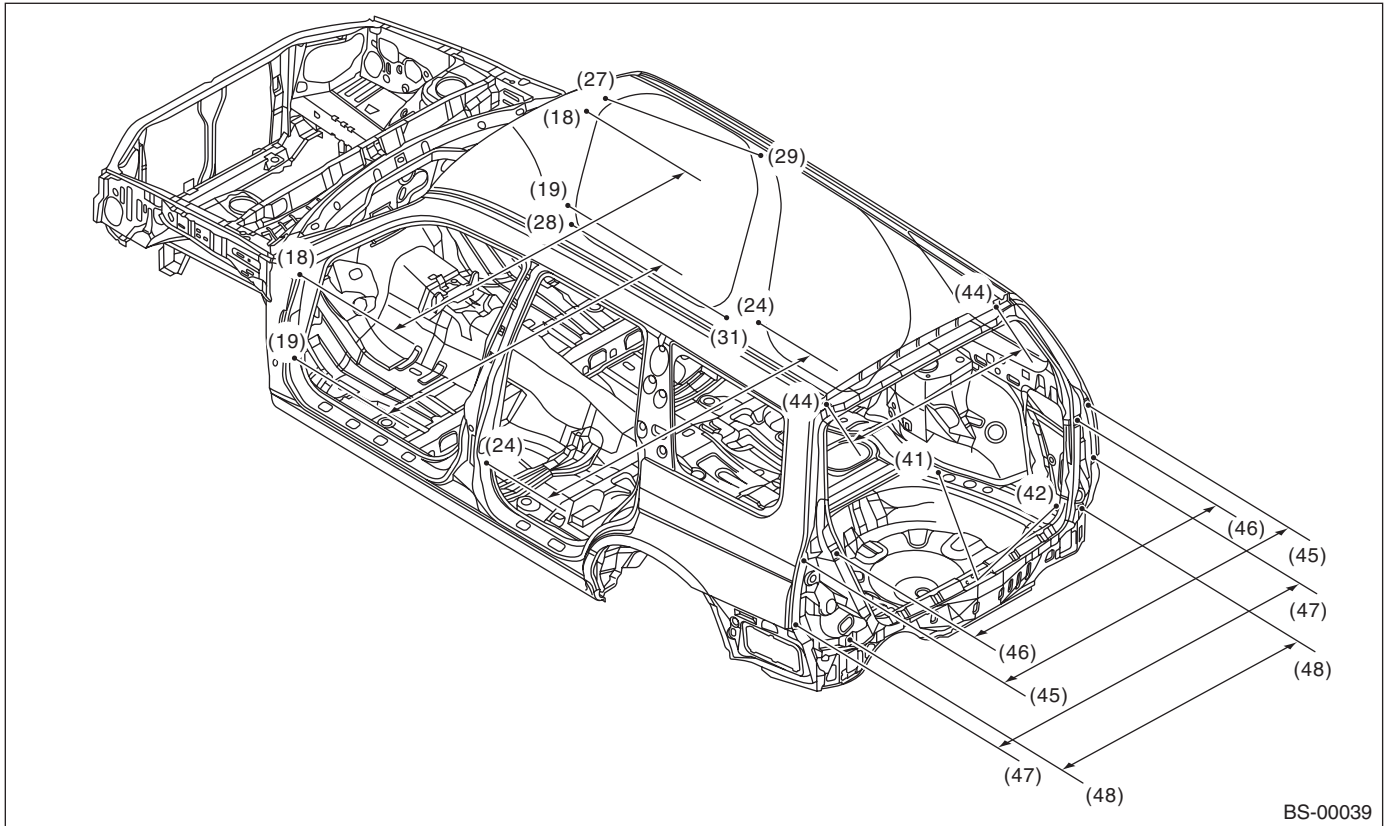
BODY STRUCTURE



BS-00038

Unit: mm (in)			
Point of measurement	Dimension	Point of measurement	Dimension
(16) RH to (20) RH	980 (38.58)	(30) LH to (33) LH	796 (31.34)
(16) LH to (20) LH	980 (38.58)	(31) RH to (34) RH	759 (29.88)
(17) RH to (20) RH	982 (38.66)	(31) LH to (34) LH	759 (29.88)
(17) LH to (20) LH	982 (38.66)	(35) RH to (38) RH	665 (26.18)
(21) RH to (25) RH	853 (33.58)	(35) LH to (38) LH	665 (26.18)
(21) LH to (25) LH	853 (33.58)	(35) RH to (39) RH	711 (27.99)
(22) RH to (26) RH	895 (35.24)	(35) LH to (39) LH	711 (27.99)
(22) LH to (26) LH	895 (35.24)	(35) RH to (40) RH	784 (30.87)
(23) LH to (23) RH	1,429 (56.26)	(35) LH to (40) LH	784 (30.87)
(29) RH to (32) RH	674 (26.54)	(36) LH to (36) RH	1,221 (48.07)
(29) LH to (32) LH	674 (26.54)	(36) RH to (37) RH	1,067 (42.01)
(30) RH to (33) RH	796 (31.34)	(36) LH to (37) LH	1,067 (42.01)

4. REAR STRUCTURE



BS-00039

Unit: mm (in)			
Point of measurement	Dimension	Point of measurement	Dimension
(18) RH to (18) LH	1,449 (57.05)	(41) RH to (43) RH	794 (31.26)
(19) RH to (19) LH	1,459 (57.44)	(41) LH to (43) LH	805 (31.69)
(27) RH to (29) RH	1,007 (39.65)	(42) RH to (42) LH	1,110 (43.70)
(27) LH to (29) LH	1,007 (39.65)	(44) RH to (44) LH	878 (34.57)
(28) RH to (31) RH	813 (32.01)	(45) RH to (45) LH	1,474 (58.03)
(28) LH to (31) LH	813 (32.01)	(46) RH to (46) LH	1,252 (49.29)
(24) RH to (24) LH	1,438 (56.61)	(47) RH to (47) LH	1,552 (61.10)
(41) RH to (41) LH	950 (37.40)	(48) RH to (48) LH	1,210 (47.64)

Datum Dimensions

BODY STRUCTURE

General Description

INSTRUMENTATION/DRIVER INFO

1. General Description

A: SPECIFICATION

Combination meter	Speedometer	Electric pulse type
	Engine coolant temperature gauge	Cross coil type
	Fuel gauge	Cross coil type
	Tachometer	Electric pulse type
	Turn signal indicator light	14 V — 2 W
	Charge indicator light	14 V — 1.4 W
	Oil pressure warning light	LED
	ABS warning light	14 V — 1.4 W
	Malfunction indicator light	LED
	HI-beam indicator light	14 V — 2 W
	Door open warning light	LED
	Seat belt warning light	LED
	Brake warning light	14 V — 2 W
	AWD warning light	LED
	Airbag warning light	LED
	Meter illumination light	14 V — 3.4 W, 14 V — 2 W
	AT OIL TEMP warning light	LED
	Cruise indicator light	14 V — 1.4 W
	Low fuel warning light	LED
	Security indicator light	LED
	Select indicator	LCD
	LCD back light	14 V — 1.4 W
	Cruise set indicator light	14 V — 1.4 W
	Vehicle dynamics control (VDC) indicator light	14 V — 3 W
Vehicle dynamics control (VDC) warning light	LED	

B: CAUTION

- Be careful not to damage the meters and instrument panel.
- Be careful not to damage the meter glass.
- Make sure the electrical connector is connected securely.
- After installation, make sure that each meter operates normally.
- Use gloves to avoid damage and getting fingerprints on the glass surface and meter surfaces.
- Do not apply excessive force to the printed circuit.
- Do not drop or otherwise apply impact.

C: PREPARATION TOOL

1. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.

2. Combination Meter System

A: WIRING DIAGRAM

1. COMBINATION METER

<Ref. to WI-136, WIRING DIAGRAM, Combination Meter.>

2. OUTSIDE TEMPERATURE INDICATOR

<Ref. to WI-144, WIRING DIAGRAM, Outside Temperature Display System.>

B: INSPECTION

CAUTION:

When measuring the voltage and resistance of the ECM, TCM and each sensor, use a tapered pin with a diameter of less than 0.64 mm (0.025 in) in order to avoid poor contact. Do not insert the pin more than 2 mm (0.08 in).

1. SYMPTOM CHART

Symptom	Repair order	NOTE
Combination meter assembly does not operate.	<ol style="list-style-type: none"> 1. Power supply 2. Ground distribution 	<Ref. to IDI-4, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Combination Meter System.>
Speedometer does not operate.	<ol style="list-style-type: none"> 1. Vehicle speed sensor (MT model) TCM (AT model) 2. Harness 3. Speedometer 	MT model: <Ref. to IDI-5, CHECK VEHICLE SPEED SENSOR, INSPECTION, Combination Meter System.> AT model: <Ref. to IDI-6, CHECK OF TRANSMISSION CONTROL MODULE (TCM), INSPECTION, Combination Meter System.>
Tachometer does not operate.	<ol style="list-style-type: none"> 1. ECM 2. Harness 3. Tachometer 	<Ref. to IDI-6, CHECK ENGINE CONTROL MODULE (ECM), INSPECTION, Combination Meter System.>
Fuel gauge does not operate.	<ol style="list-style-type: none"> 1. Fuel level sensor 2. Harness 3. Fuel gauge 	<Ref. to IDI-7, CHECK FUEL LEVEL SENSOR, INSPECTION, Combination Meter System.>
Engine coolant temperature gauge does not operate.	<ol style="list-style-type: none"> 1. Engine coolant temperature sensor 2. Harness 3. Engine coolant temperature gauge 	<Ref. to IDI-8, CHECK ENGINE COOLANT TEMPERATURE SENSOR, INSPECTION, Combination Meter System.>
Outside temperature indicator does not operate.	<ol style="list-style-type: none"> 1. Ambient sensor 2. Harness 3. Combination meter 	<Ref. to IDI-9, CHECK OUTSIDE TEMPERATURE INDICATOR, INSPECTION, Combination Meter System.>

Combination Meter System

INSTRUMENTATION/DRIVER INFO

2. CHECK POWER SUPPLY AND GROUND CIRCUIT

Step	Check	Yes	No
<p>1 CHECK POWER SUPPLY FOR COMBINATION METER. 1) Remove the combination meter. <Ref. to IDI-10, REMOVAL, Combination Meter.> 2) Disconnect the combination meter harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between combination meter connector and chassis ground. Connector & terminal (i10) No. 9 (+) — Chassis ground (-):</p>	<p>Is the voltage 10 V or more?</p>	<p>Go to step 2.</p>	<p>Check the harness for open or short between the ignition switch and combination meter.</p>
<p>2 CHECK POWER SUPPLY FOR COMBINATION METER. Measure the voltage between combination meter connector and chassis ground. Connector & terminal (i10) No. 8 (+) — Chassis ground (-):</p>	<p>Is the voltage 10 V or more?</p>	<p>Go to step 3.</p>	<p>Check the harness for open or short between the fuse and combination meter.</p>
<p>3 CHECK GROUND CIRCUIT OF COMBINATION METER. 1) Turn the ignition switch to OFF. 2) Measure the resistance of harness between combination meter connector and chassis ground. Connector & terminal (i10) No. 10 — Chassis ground:</p>	<p>Is the resistance less than 10 Ω?</p>	<p>Replace the combination meter printed circuit.</p>	<p>Repair the wiring harness.</p>

3. CHECK VEHICLE SPEED SENSOR

Step	Check	Yes	No
<p>1</p> <p>CHECK VEHICLE SPEED SENSOR.</p> <p>1) Lift up the vehicle and support it with rigid racks.</p> <p>2) Remove the combination meter with harness connector.</p> <p>3) Drive the vehicle faster than 20 km/h (12 MPH).</p> <p>WARNING: Be careful not to get caught in the running wheels.</p> <p>4) Measure the voltage between combination meter connector and chassis ground.</p> <p>Connector & terminal (i10) No. 12 (+) — Chassis ground (-):</p>	Is the voltage 1 ↔ 5 V?	Check the speedometer. <Ref. to IDI-12, REMOVAL, Speedometer.>	Go to step 2.
<p>2</p> <p>CHECK VEHICLE SPEED SENSOR POWER SUPPLY.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the vehicle speed sensor harness connector.</p> <p>3) Turn the ignition switch to ON.</p> <p>4) Measure the voltage between the speed sensor connector and the engine ground.</p> <p>Connector & terminal (B17) No. 3 (+) — Engine ground (-):</p>	Is the voltage 10 V or more?	Go to step 3.	Check the harness for open or short between the ignition switch and vehicle speed sensor.
<p>3</p> <p>CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND ENGINE GROUND.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Measure the resistance between the speed sensor connector and the engine ground.</p> <p>Connector & terminal (B17) No. 2 — Engine ground:</p>	Is the resistance less than 10 Ω?	Go to step 4.	Repair the wiring harness.
<p>4</p> <p>CHECK HARNESS BETWEEN VEHICLE SPEED SENSOR AND COMBINATION METER.</p> <p>1) Disconnect the connector from the combination meter.</p> <p>2) Measure the resistance between the speed sensor harness connector and combination meter.</p> <p>Connector & terminal (B17) No. 1 — (i10) No. 12:</p>	Is the resistance less than 10 Ω?	Replace the vehicle speed sensor.	Repair the wiring harness.

Combination Meter System

INSTRUMENTATION/DRIVER INFO

4. CHECK OF TRANSMISSION CONTROL MODULE (TCM)

	Step	Check	Yes	No
1	<p>CHECK TCM SIGNAL.</p> <p>1) Lift up the vehicle and support it with rigid racks.</p> <p>2) Drive the vehicle faster than 10 km/h (6 MPH).</p> <p>WARNING: Be careful not to get caught in the running wheels.</p> <p>3) Measure the voltage between TCM connector and chassis ground.</p> <p>Connector & terminal (B56) No. 1 (+) — Chassis ground (-):</p>	Is the voltage 1 ↔ 5 V?	Go to step 2.	Check the TCM. <Ref. to 4AT(D)(diag)-2, Basic Diagnostic Procedure.>
2	<p>CHECK THE HARNESS BETWEEN TCM AND COMBINATION METER.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connectors from TCM and combination meter.</p> <p>3) Measure the resistance between TCM harness connector and combination meter harness connector.</p> <p>Connector & terminal (B56) No. 1 — (i10) No. 12:</p>	Is the resistance less than 10 Ω?	Check the speedometer. <Ref. to IDI-12, REMOVAL, Speedometer.>	Repair the wiring harness.

5. CHECK ENGINE CONTROL MODULE (ECM)

	Step	Check	Yes	No
1	<p>CHECK ECM SIGNAL.</p> <p>1) Start the engine.</p> <p>2) Measure the voltage between ECM connector and engine ground.</p> <p>Connector & terminal Non-turbo model (B135) No. 27 (+) — Engine ground (-): Turbo model (B135) No. 26 (+) — Engine ground (-):</p>	Is the voltage 0 ↔ 14 V?	Go to step 2.	Inspect the ECM. <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.> <Ref. to EN(H4DOTC)(diag)-2, Basic Diagnostic Procedure.>
2	<p>CHECK HARNESS BETWEEN COMBINATION METER AND ECM.</p> <p>1) Turn the ignition switch to OFF.</p> <p>2) Disconnect the connector from ECM and combination meter.</p> <p>3) Measure the resistance between ECM harness connector and combination meter harness connector.</p> <p>Connector & terminal Non-turbo model (B135) No. 27 — (i10) No. 12: Turbo model (B135) No. 26 — (i10) No. 12:</p>	Is the resistance less than 10 Ω?	Check the tachometer. <Ref. to IDI-13, REMOVAL, Tachometer.>	Repair the wiring harness.

Combination Meter System

INSTRUMENTATION/DRIVER INFO

6. CHECK FUEL LEVEL SENSOR

	Step	Check	Yes	No
1	<p>CHECK FUEL LEVEL SENSOR. 1) Remove the fuel level sensor. <Ref. to FU(H4SO)-54, REMOVAL, Fuel Level Sensor.> 2) Measure the resistance between fuel level sensor terminals when the float is in FULL or EMPTY position.</p> <p>Terminals No. 2 — No. 3:</p>	Is the resistance 0.5 to 2.5 Ω (FULL) and 50 to 52 Ω (EMPTY)?	Go to step 2.	Replace the fuel level sensor.
2	<p>CHECK FUEL SUB LEVEL SENSOR. 1) Remove the fuel sub level sensor. <Ref. to FU(H4SO)-55, REMOVAL, Fuel Sub Level Sensor.> 2) Measure the resistance between fuel sub level sensor terminals when the float is in FULL or EMPTY position.</p> <p>Terminals No. 1 — No. 2:</p>	Is the resistance 0.5 to 2.5 Ω (FULL) and 42 to 44 Ω (EMPTY)?	Go to step 3.	Replace the fuel sub level sensor.
3	<p>CHECK HARNESS BETWEEN FUEL SUB LEVEL SENSOR AND COMBINATION METER. 1) Disconnect the connector from the combination meter. 2) Measure the resistance between the fuel sub level sensor harness connector terminal and combination meter harness connector terminal.</p> <p>Connector & terminal (R59) No. 1 — (i11) No. 1:</p>	Is the resistance less than 10 Ω ?	Go to step 4.	Repair the wiring harness.
4	<p>CHECK HARNESS BETWEEN FUEL LEVEL SENSOR AND FUEL SUB LEVEL SENSOR. Measure the resistance between fuel level sensor harness connector terminal and fuel sub level sensor harness connector terminal.</p> <p>Connector & terminal (R58) No. 3 — (R59) No. 2:</p>	Is the resistance less than 10 Ω ?	Go to step 5.	Repair the wiring harness.
5	<p>CHECK FUEL LEVEL SENSOR GROUND CIRCUIT. Measure the resistance between fuel level sensor harness connector terminal and chassis ground.</p> <p>Connector & terminal (R58) No. 2 — Chassis ground:</p>	Is the resistance less than 10 Ω ?	Inspect the fuel gauge. <Ref. to IDI-14, REMOVAL, Fuel Gauge.>	Repair the wiring harness.

Combination Meter System

INSTRUMENTATION/DRIVER INFO

7. CHECK ENGINE COOLANT TEMPERATURE SENSOR

	Step	Check	Yes	No
1	<p>CHECK ENGINE COOLANT TEMPERATURE SENSOR. Check the engine coolant temperature sensor. <Ref. to EN(H4SO)(diag)-2, Basic Diagnostic Procedure.></p>	Is the engine coolant temperature sensor OK?	Go to step 2.	Replace the engine coolant temperature sensor.
2	<p>CHECK HARNESS BETWEEN ENGINE COOLANT TEMPERATURE SENSOR AND COMBINATION METER. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the engine coolant temperature sensor and combination meter. 3) Measure the resistance between the engine coolant temperature sensor harness connector and combination meter harness connector. Connector & terminal (E8) No. 3 — (i11) No. 10:</p>	Is the resistance less than 10 Ω ?	Go to step 3.	Repair the wiring harness.
3	<p>CHECK ENGINE COOLANT TEMPERATURE GAUGE GROUND CIRCUIT. Measure the resistance between the combination meter harness connector terminal and chassis ground. Connector & terminal (i11) No. 9 — Chassis ground:</p>	Is the resistance less than 10 Ω ?	Inspect the engine coolant temperature gauge. <Ref. to IDI-15, REMOVAL, Engine Coolant Temperature Gauge.>	Repair the wiring harness.

Combination Meter System

INSTRUMENTATION/DRIVER INFO

8. CHECK OUTSIDE TEMPERATURE INDICATOR

Step	Check	Yes	No
1 CHECK POWER SUPPLY FOR AMBIENT SENSOR. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from ambient sensor. 3) Turn the ignition switch to ON. 4) Measure the voltage between ambient sensor harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(F78) No. 2 (+) — Chassis ground (-):</i>	Is the voltage 4 V or more?	Go to step 3.	Go to step 2.
2 CHECK HARNESS BETWEEN AMBIENT SENSOR AND COMBINATION METER. 1) Turn the ignition switch to OFF. 2) Disconnect the connector from the combination meter. 3) Measure the resistance between the ambient sensor harness connector terminal and combination meter harness connector terminal. <i>Connector & terminal</i> <i>(F78) No. 1 — (i10) No. 25:</i> <i>(F78) No. 2 — (i10) No. 24:</i>	Is the resistance less than 10 Ω ?	Replace the combination meter printed circuit.	Repair the wiring harness.
3 CHECK AMBIENT SENSOR. 1) Remove the ambient sensor. 2) Check the ambient sensor. <Ref. to IDI-16, INSPECTION, Ambient Sensor.>	Is the ambient sensor OK?	Go to step 4.	Replace the ambient sensor.
4 CHECK OUTSIDE TEMPERATURE INDICATOR. 1) Connect the combination meter harness connector. 2) Connect a resistor (3 k Ω) between the terminals of ambient sensor harness connector. 3) Turn the ignition switch to ON and check the outside temperature indicator display.	Is the outside temperature indicator indicating 25°C (77°F)?	Repair the poor contact of ambient sensor harness connector.	Replace the combination meter print circuit.

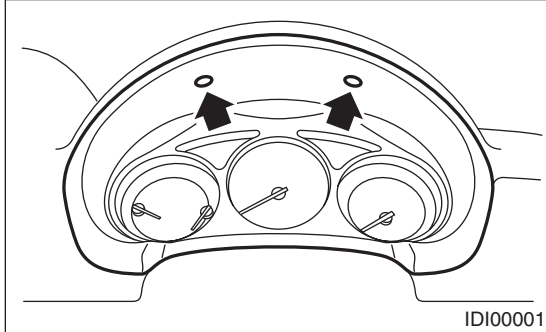
Combination Meter

INSTRUMENTATION/DRIVER INFO

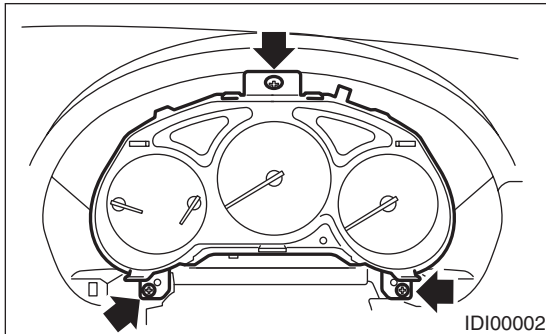
3. Combination Meter

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Set the tilt steering at the lowest position.
- 3) Remove the screws and detach the meter visor.



- 4) Remove the screws of combination meter and pull out the meter.



- 5) Disconnect the connector in the upper area of combination meter to remove the meter.

CAUTION:

- Be careful not to damage the meter or instrument panel.
- Be careful not to damage the meter glass.

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

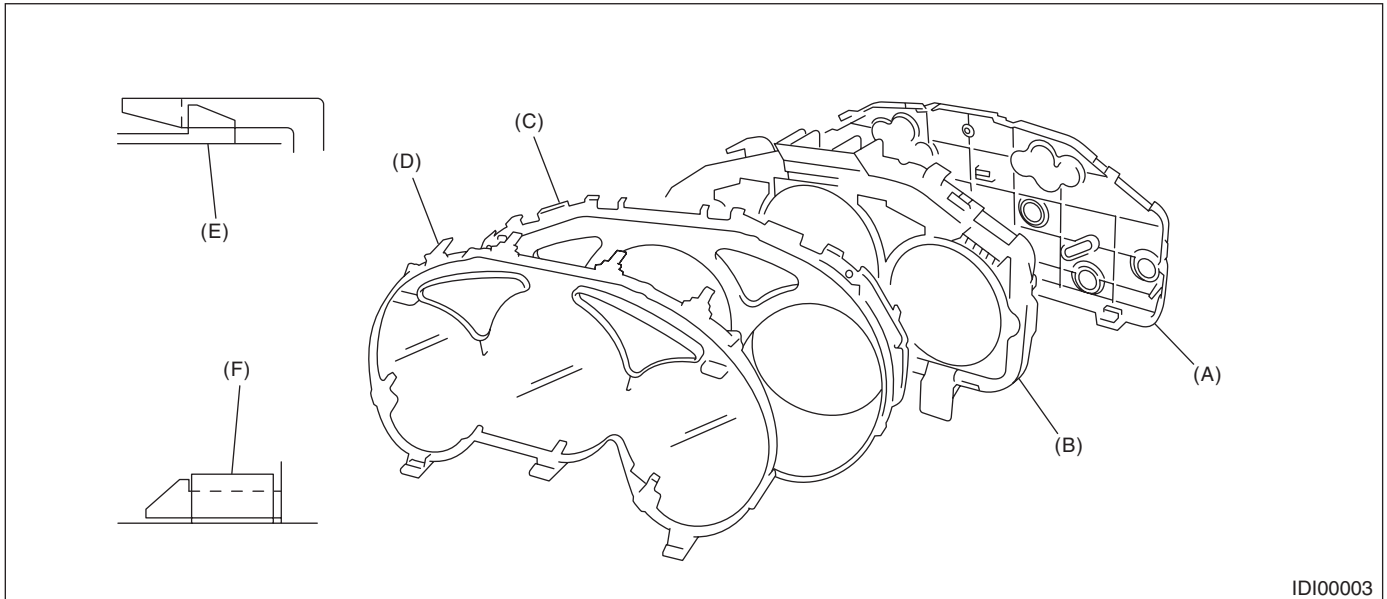
- Make sure the electrical connector is connected securely.
- Make sure that each meter operates normally.

C: DISASSEMBLY

CAUTION:

Use gloves to avoid damage and getting fingerprints on the glass surface and meter surfaces.

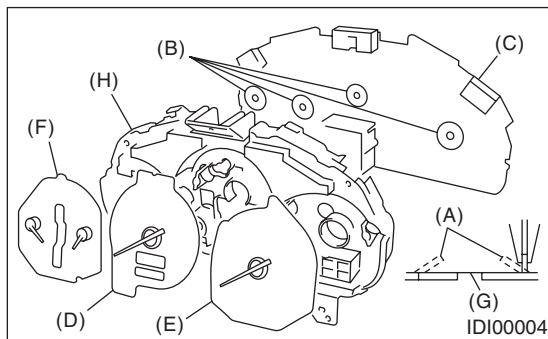
- 1) Disengage the claw (E) to remove case (B) from back cover (A).
- 2) Disengage claw (F) to remove meter glass (D) and reflector (C) from the inner case.



IDI00003

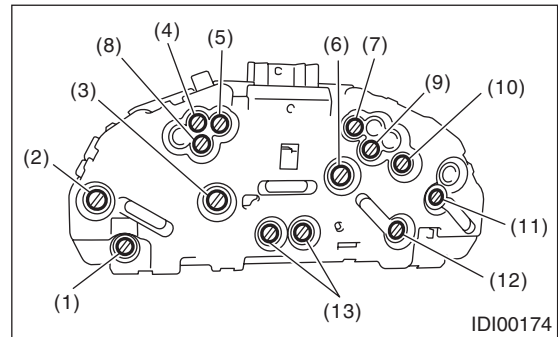
3) Pull up claw (A) in portion (B) of combination meter printed circuit (C) with combination pliers. Push out the speedometer (D) and tachometer (E) and water temperature gauge & fuel gauge assembly (F) using the hole (G).

4) Pull up the claw in the center of the combination meter printed circuit (C), and remove the printed circuit from case (H).



IDI00004

1. BULB REPLACEMENT



IDI00174

- (1) Charge indicator light
- (2) Tachometer
- (3) Speedometer and tachometer
- (4) HI-beam indicator light
- (5) Turn signal indicator light (Right)
- (6) Speedometer
- (7) Turn signal indicator light (Left)
- (8) Vehicle dynamics control (VDC) indicator
- (9) Brake warning light
- (10) ABS warning light
- (11) Fuel gauge
- (12) Engine coolant temperature gauge
- (13) LCD (Outside temperature display, odometer/tripmeter, and select indicator)

D: ASSEMBLY

Assemble in the reverse order of disassembly.

Speedometer

INSTRUMENTATION/DRIVER INFO

4. Speedometer

A: REMOVAL

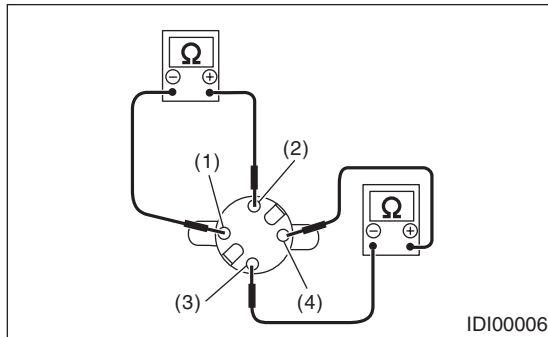
Disassemble the combination meter, and then remove the speedometer. <Ref. to IDI-11, DISASSEMBLY, Combination Meter.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the speedometer resistance.



- (1) COS-
- (2) COS+
- (3) SIN-
- (4) SIN+

Terminals	Specified resistance
SIN+ and SIN- terminal	200±8 Ω
COS+ and COS- terminal	200±8 Ω

If defective, replace the speedometer.
If OK, replace the combination meter printed circuit.

5. Tachometer

A: REMOVAL

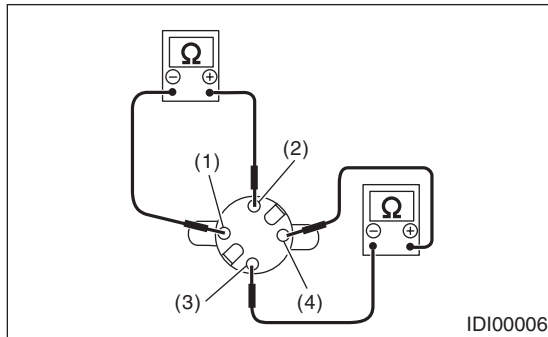
Disassemble the combination meter, and then remove the tachometer. <Ref. to IDI-11, DISASSEMBLY, Combination Meter.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the tachometer resistance.



- (1) COS-
- (2) COS+
- (3) SIN-
- (4) SIN+

Terminals	Specified resistance
SIN+ and SIN- terminal	200±8 Ω
COS+ and COS- terminal	200±8 Ω

If defective, replace the tachometer.

If OK, replace the combination meter printed circuit.

6. Fuel Gauge

A: REMOVAL

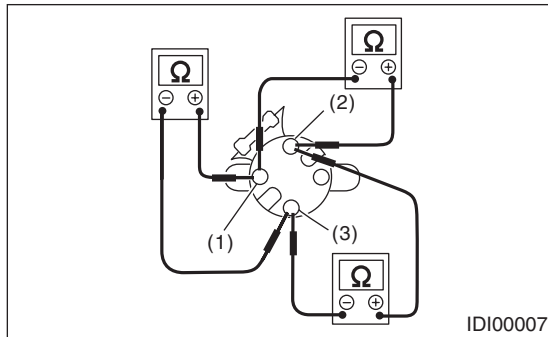
Disassemble the combination meter, and then remove the engine coolant temperature gauge & fuel gauge assembly. <Ref. to IDI-11, DISASSEMBLY, Combination Meter.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the fuel gauge resistance.



- (1) UNIT
- (2) IGN
- (3) GND

Terminals	Specified resistance
IGN and GND terminal	170±10 Ω
IGN and UNIT terminal	35±10 Ω
UNIT and GND terminal	136±10 Ω

Replace the engine coolant temperature gauge & fuel gauge assembly if defective.

If OK, replace the combination meter printed circuit.

7. Engine Coolant Temperature Gauge

A: REMOVAL

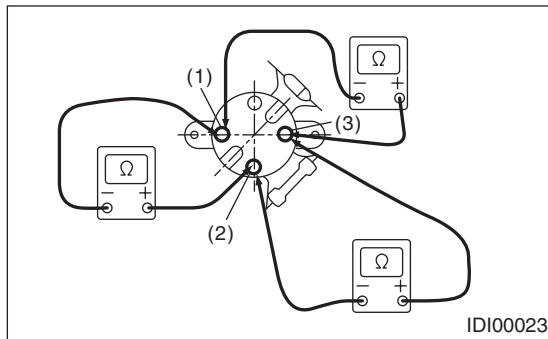
Disassemble the combination meter, and then remove the engine coolant temperature gauge & fuel gauge assembly. <Ref. to IDI-11, DISASSEMBLY, Combination Meter.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the engine coolant temperature gauge resistance.



- (1) GND
- (2) IGN
- (3) UNIT

Terminals	Specified resistance
IGN and GND terminal	208±10 Ω
IGN and UNIT terminal	56±10 Ω
UNIT and GND terminal	264±10 Ω

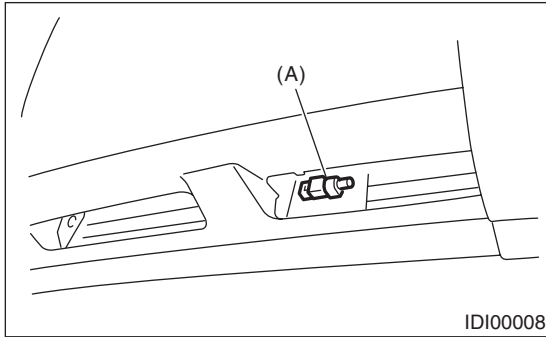
Replace the engine coolant temperature gauge & fuel gauge assembly if defective.

If OK, replace the combination meter printed circuit.

8. Ambient Sensor

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Disconnect the ambient sensor connector.
- 3) Remove the ambient sensor (A) from the radiator lower panel.

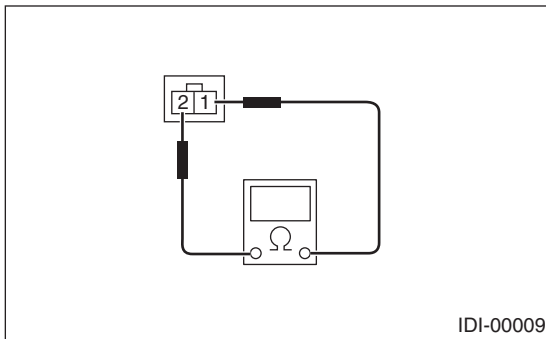


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the ambient sensor resistance.



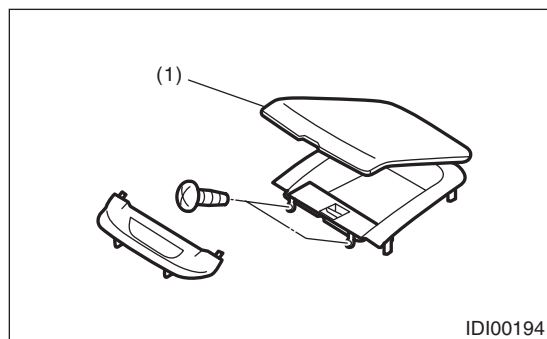
Terminals	Specified resistance
1 and 2	3 kΩ/25°C (77°F)

If NG, replace the ambient sensor.

9. Clock

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the center compartment. <Ref. to EI-50, REMOVAL, Instrument Panel Center Compartment.>
- 3) Remove the clock from the center compartment.



(1) Center compartment

B: INSTALLATION

Install in the reverse order of removal.

General Description

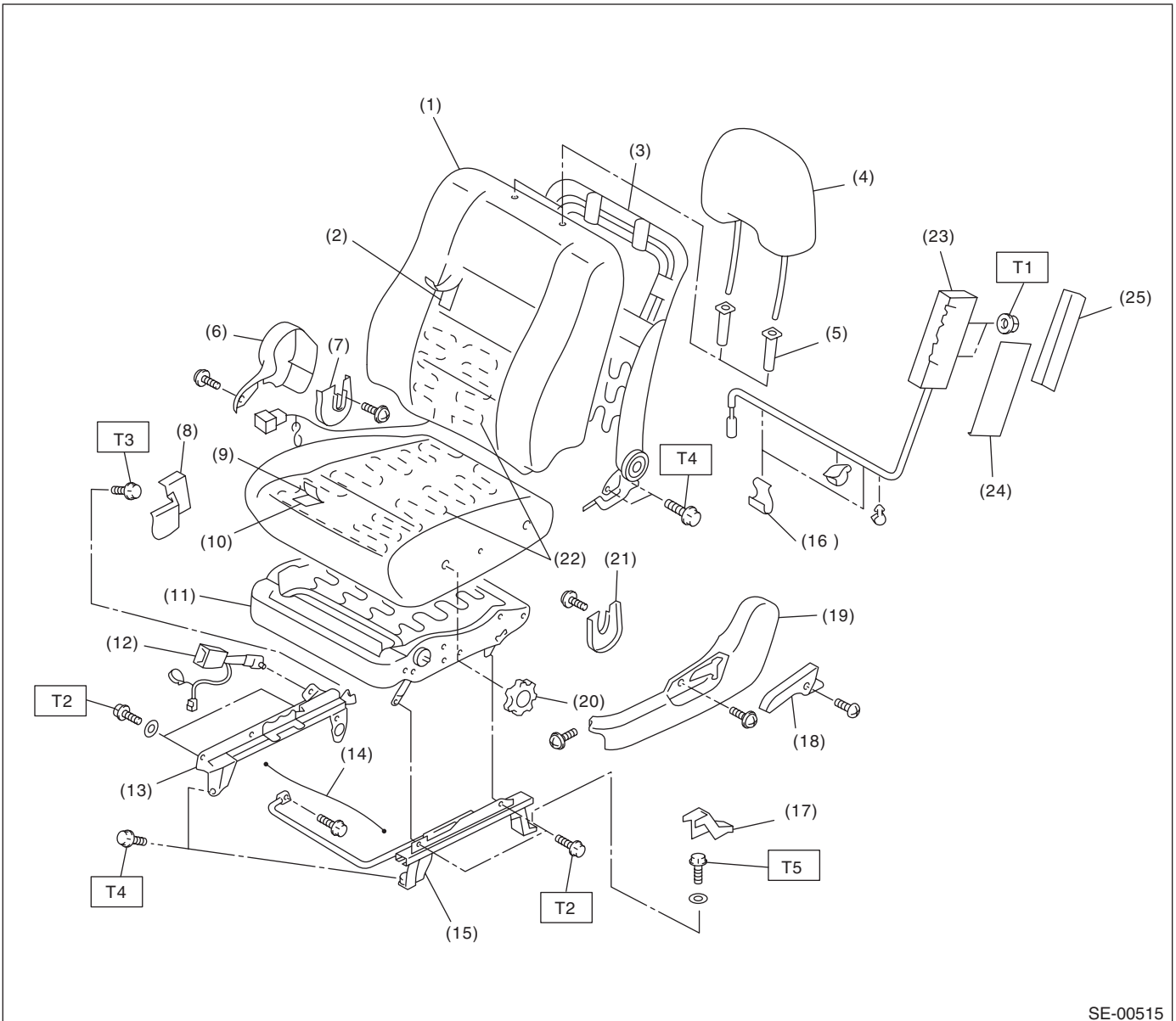
SEATS

1. General Description

A: COMPONENT

1. FRONT SEAT

- Driver's seat (standard seat)



SE-00515

(1) Backrest cover	(12) Inner seat belt ASSY	(23) Side airbag module ASSY
(2) Backrest pad	(13) Inner slide rail	(24) Support pad A
(3) Backrest frame ASSY	(14) Connecting wire	(25) Support pad B
(4) Headrest ASSY	(15) Outer slide rail	
(5) Headrest bushing	(16) Tape	
(6) Seat hinge outer cover LH	(17) Bolt cover RH	
(7) Seat hinge inner cover LH	(18) Reclining lever	
(8) Bolt cover LH	(19) Seat hinge outer cover RH	
(9) Seat cushion cover	(20) Seat lifter dial	
(10) Seat cushion pad ASSY	(21) Seat hinge inner cover RH	
(11) Seat cushion frame ASSY	(22) Seat heater unit	

Tightening torque: N-m (kgf-m, ft-lb)

T1: 7.5 (0.8, 5.5)

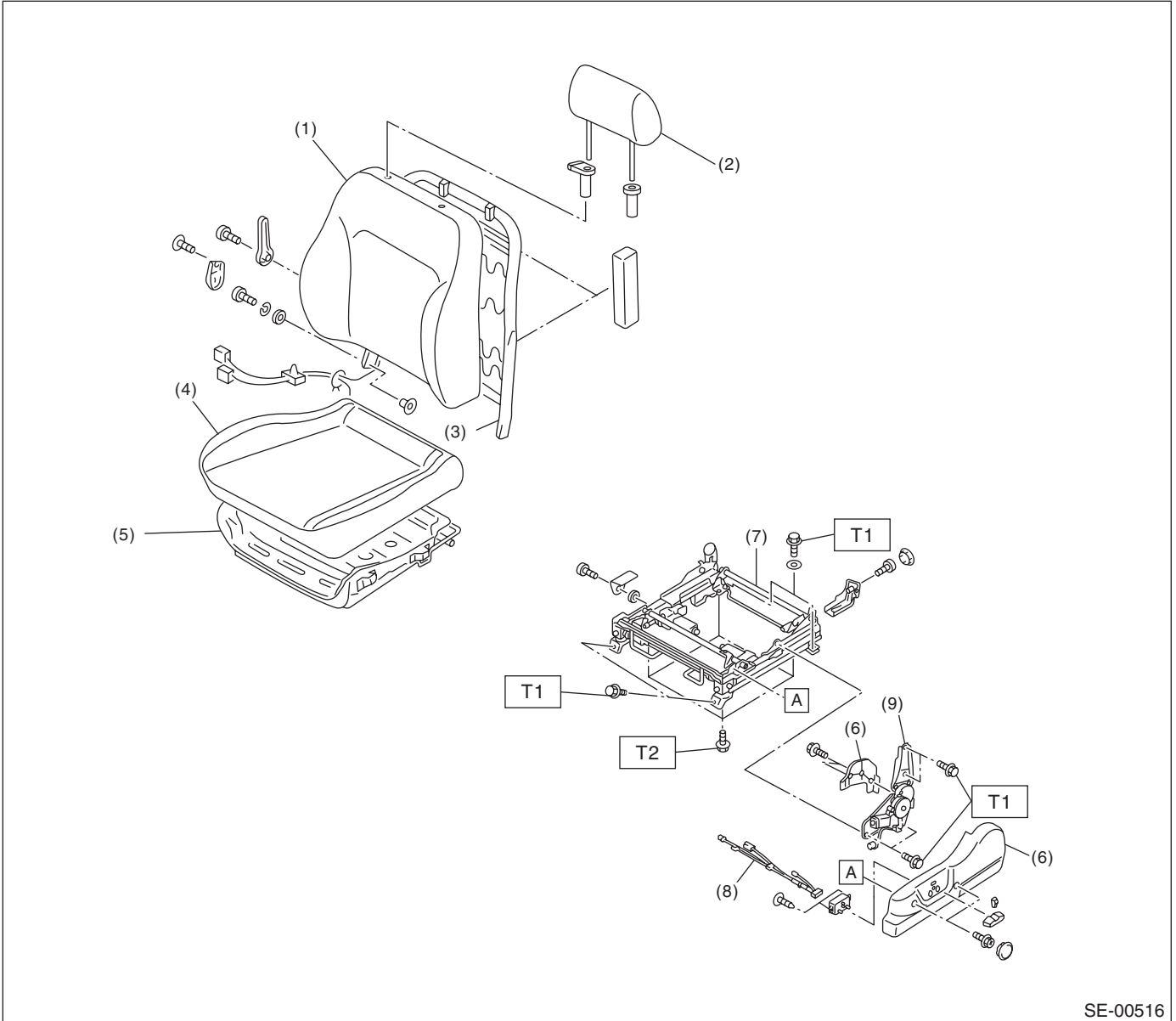
T2: 10 (1.0, 7.4)

T3: 30 (3.0, 22.1)

T4: 52 (5.3, 38.3)

T5: 53 (5.4, 39.0)

- Driver's seat (power seat)



SE-00516

- | | |
|-----------------------------|-------------------------|
| (1) Seat back pad | (6) Hinge cover |
| (2) Headrest | (7) Slide and unit ASSY |
| (3) Seat back frame ASSY | (8) Power seat harness |
| (4) Seat cushion pad | (9) Hinge ASSY |
| (5) Seat cushion frame ASSY | |

Tightening torque: N-m (kgf-m, ft-lb)

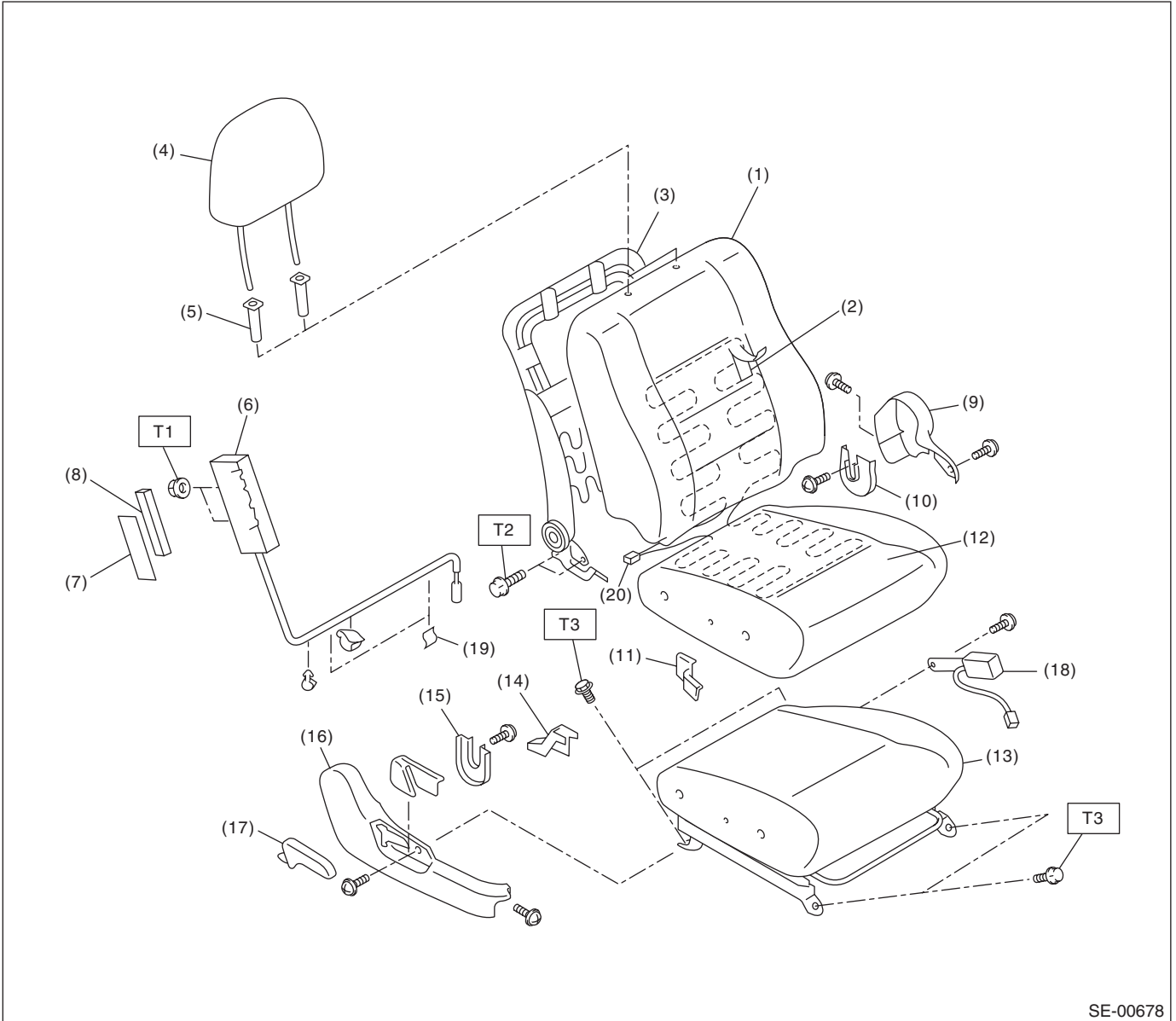
T1: 53 (5.4, 39)

T2: 18 (1.8, 13)

General Description

SEATS

• Passenger's seat



SE-00678

- | | | |
|---------------------------|--------------------------------------|---------------------------|
| (1) Backrest cover | (10) Hinge inner cover LH | (18) Inner seat belt ASSY |
| (2) Backrest pad | (11) Rear bolt cover inside | (19) Tape |
| (3) Backrest frame ASSY | (12) Seat cushion cover | (20) Seat heater unit |
| (4) Headrest ASSY | (13) Occupant detection cushion ASSY | |
| (5) Headrest lock bushing | (14) Rear bolt cover outside | |
| (6) Side airbag module | (15) Hinge inner cover RH | |
| (7) Support pad A | (16) Seat side cover outside | |
| (8) Support pad B | (17) Reclining lever | |
| (9) Seat cover inside | | |

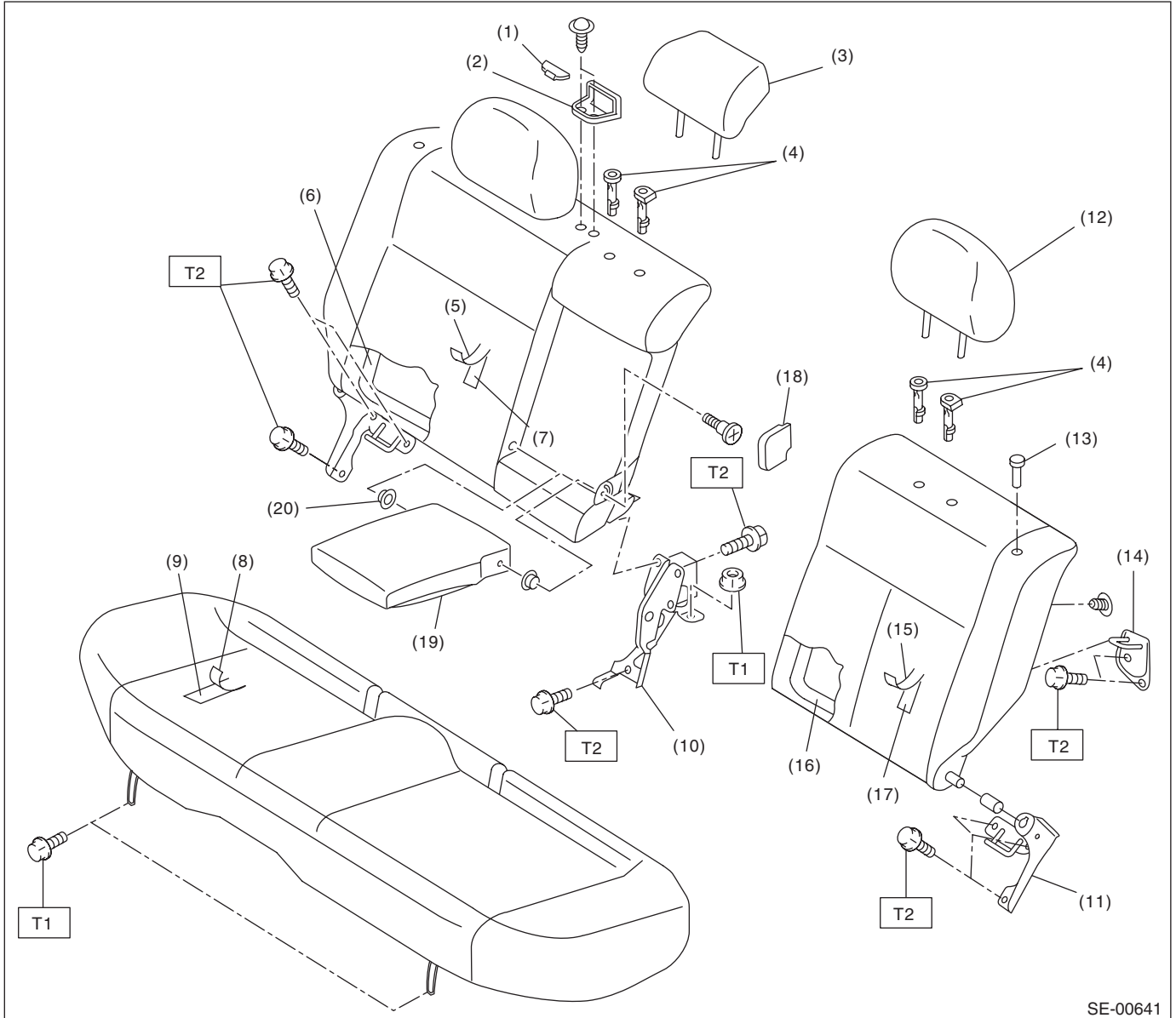
Tightening torque: N·m (kgf·m, ft·lb)

T1: 6 (0.61, 4.43)

T2: 52 (5.3, 38.4)

T3: 53 (5.4, 39.1)

2. REAR SEAT



SE-00641

- | | | |
|---------------------------|------------------------|-------------------------------|
| (1) Webbing guide cap | (9) Seat cushion pad | (17) Backrest pad LH |
| (2) Webbing guide | (10) Hinge CTR | (18) Armrest cover |
| (3) Center pillow | (11) Hinge LH | (19) Rear center armrest ASSY |
| (4) Headrest free bushing | (12) Headrest | (20) Armrest cover |
| (5) Backrest cover RH | (13) Backrest knob | |
| (6) Backrest frame RH | (14) Striker | |
| (7) Backrest pad RH | (15) Backrest cover LH | |
| (8) Seat cushion cover | (16) Backrest frame LH | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 24.5 (2.5, 18.1)

T2: 33 (3.4, 24.6)

B: CAUTION

1. DRIVER'S SEAT

- When removing the front seat from a side airbag loaded vehicle, follow cautions given in the airbag section. <Ref. to AB-4, CAUTION, General Description.>
- Do not remove the seat position sensor from the seat rail.

2. PASSENGER'S SEAT

- When removing the front seat from a side airbag loaded vehicle, follow cautions given in the airbag section. <Ref. to AB-4, CAUTION, General Description.>
- If the seat cushion cover is removed or replaced, make sure to perform occupant detection system adjustment after installing the seat to the vehicle. <Ref. to OD(diag)-17, SYSTEM CALIBRATION (REZEROING), OPERATION, Subaru Select Monitor.>

Failure to do so may cause improper operation of the occupant detection system.

- On the passenger's seat, never remove the occupant detection control module or the pressure sensor from the occupant detection cushion assembly. These are fixed to the occupant detection cushion assembly.
- Do not replace the seat cushion pad by itself. Always replace the occupant detection cushion assembly as a unit. The seat cushion pad, occupant detection sensor, occupant detection control module and seat cushion cover are adjusted as a set at the time of manufacture. If parts from other vehicles or from other sets are used, the occupant detection system will not function properly.
- If the seat cushion cover is removed (including when replacing the heater), always replace the wires of the seat cushion cover with new wires.

C: PREPARATION TOOL

1. GENERAL TOOL

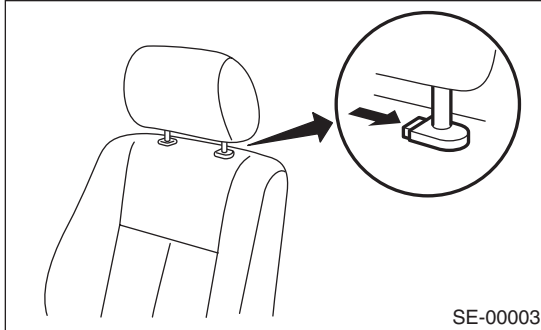
TOOL NAME	REMARKS
Long nose plier	Used for removing the hog ring.
Hog ring pliers	Used for installing the hog ring.
TORX®	Used for removing and installing the slide rail.

2. Front Seat

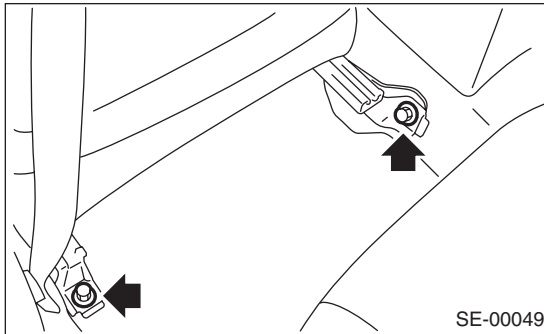
A: REMOVAL

1. DRIVER'S SEAT (STANDARD SEAT)

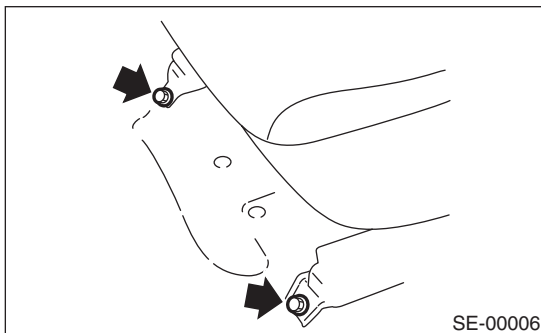
1) While pressing the headrest lock button, remove the headrest.



- 2) Tilt forward the backrest.
- 3) Slide the seat to the front end.
- 4) Remove the bolt cover at the rear end of slide rail, and remove the two bolts at the rear side of seat rail.



- 5) Slide the seat to the rear end.
- 6) Remove the two bolts at the front side of seat rail.



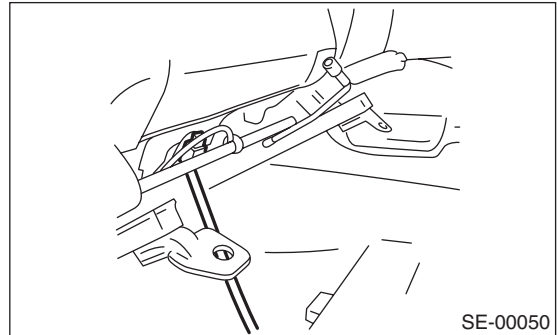
7) Disconnect the ground cable from the battery.

WARNING:

Perform airbag system maintenance at least 20 seconds have passed after removing the battery negative terminal. If the work is started within 20 seconds, the airbag may deploy due to the airbag system backup power supply.

8) Disconnect the connector under the seat.

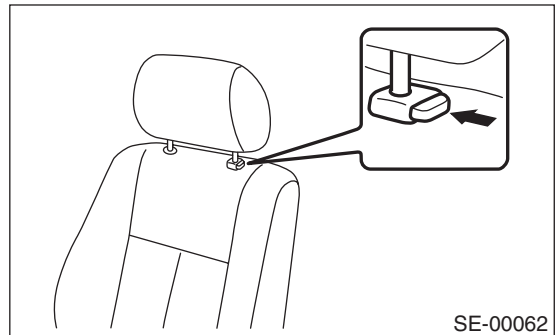
- Side airbag connector
- Seat belt warning light connector
- Buckle switch connector
- Position sensor connector



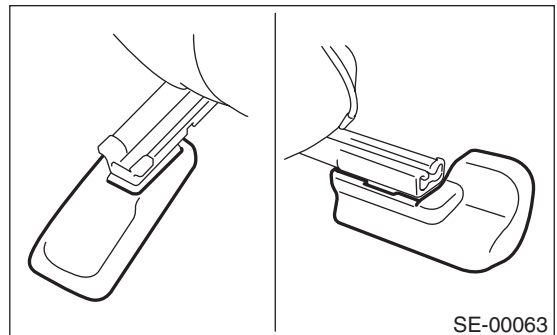
9) Remove the front seat from vehicle.

2. DRIVER'S SEAT (POWER SEAT)

1) While pressing the headrest lock button, remove the headrest.



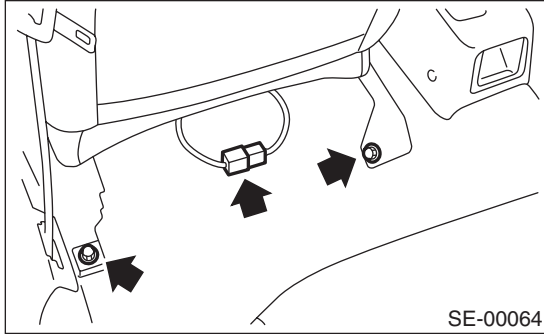
- 2) Tilt forward the backrest.
- 3) Slide the seat to the front end.
- 4) Remove the bolt cover at the rear end of slide rail.



Front Seat

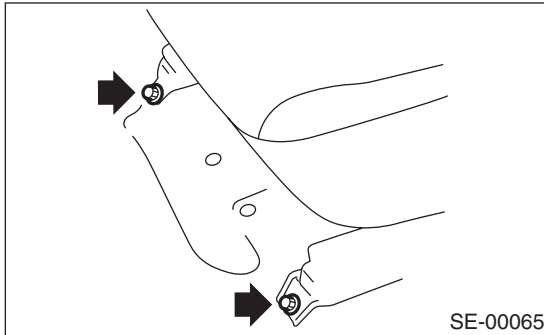
SEATS

5) Remove the two bolts at the rear side of seat rail.



6) Slide the seat to the rear end.

7) Remove the two bolts at the front side of seat rail.



8) Disconnect the ground cable from the battery.

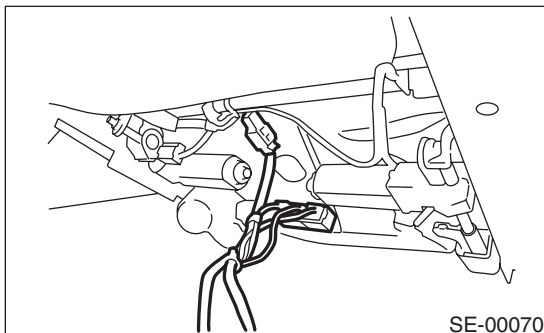
WARNING:

Perform airbag system maintenance at least 20 seconds have passed after removing the battery negative terminal. If the work is started within 20 seconds, the airbag may deploy due to the airbag system backup power supply.

9) Disconnect the connector under the seat.

- Side airbag connector
- Buckle switch connector
- Position sensor connector

10) Disconnect the integrated connector.



11) Remove the front seat from vehicle.

CAUTION:

Be careful not to damage the body, seat or trim when removing the seat from the vehicle.

3. PASSENGER'S SEAT

CAUTION:

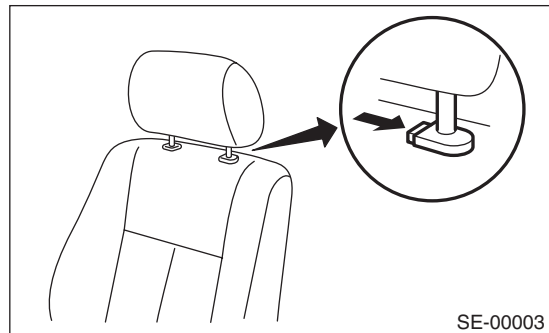
Refer to "CAUTION" of "General Description" before starting the work. <Ref. to SE-6, CAUTION, General Description.>

1) Disconnect the ground cable from the battery.

WARNING:

Perform airbag system maintenance at least 20 seconds have passed after removing the battery negative terminal. If the work is started within 20 seconds, the airbag may deploy due to the airbag system backup power supply.

2) Remove the headrest.



3) Tilt the backrest forward, and move the seat forward.

4) Remove the rear bolt cover, and then remove the rear side of slide rail.

5) Move the seat backward, remove the front bolt cover, and then remove the bolt at the front side of slide rail.

6) Disconnect all the connectors of connector holder in the backside of seat cushion.

- Harness connector of occupant detection control module
- Side airbag connector
- Seat heater connector (model with seat heater)

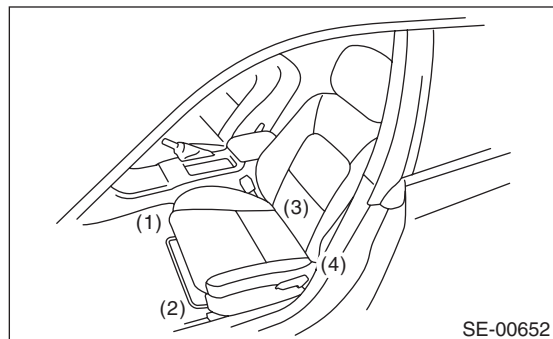
7) Remove the seat from vehicle.

B: INSTALLATION

Install in the reverse order of removal.

NOTE:

Tighten the slide rail installing bolt gradually in several steps to the specified torque in the order as shown in the figure.



SE-00652

CAUTION:

1. Driver's seat

After installing the driver's seat, use the Subaru Select Monitor to confirm that the seat position sensor LH is operating properly. <Ref. to AB(diag)-30, DISPLAY OF STATUS INFORMATION, OPERATION, Subaru Select Monitor.>

2. Passenger's seat

Be sure to perform system calibration for the occupant detection system after passenger's seat installation. <Ref. to OD(diag)-17, SYSTEM CALIBRATION (REZEROING), OPERATION, Subaru Select Monitor.>

Failure to do so may cause improper operation of the occupant detection system.

Tightening torque:

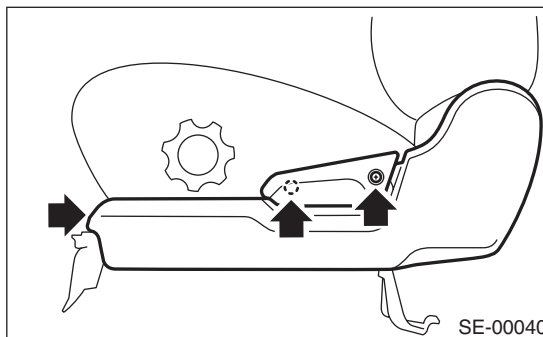
Refer to "COMPONENT" of "General Description". <Ref. to SE-2, FRONT SEAT, COMPONENT, General Description.>

C: DISASSEMBLY

1. DRIVER'S SEAT

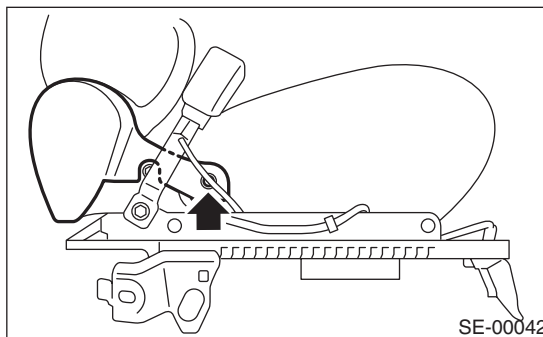
STANDARD SEAT

- 1) Remove the seat from vehicle. <Ref. to SE-7, REMOVAL, Front Seat.>
- 2) Remove the reclining lever cover and reclining hinge cover.



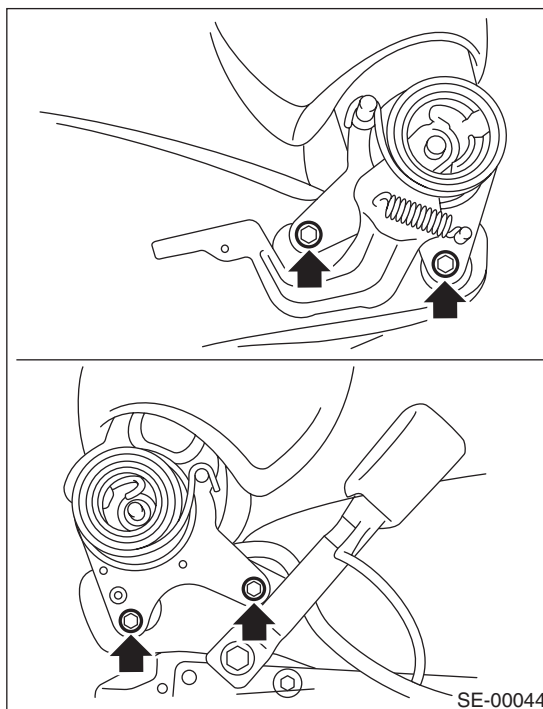
SE-00040

- 3) Loosen the screws to remove hinge cover.



SE-00042

- 4) Remove the two bolts from the reclining hinge on each left and right side.

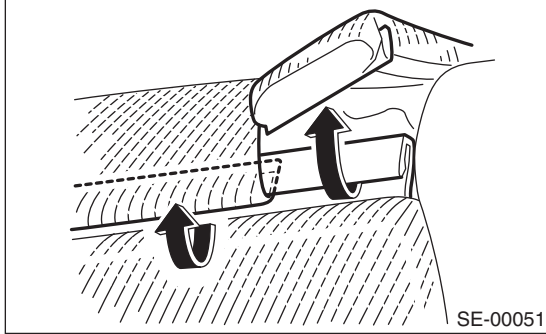


SE-00044

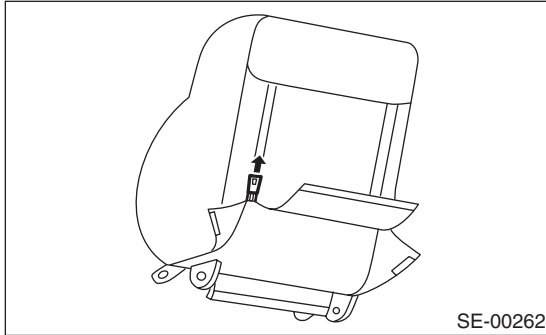
Front Seat

SEATS

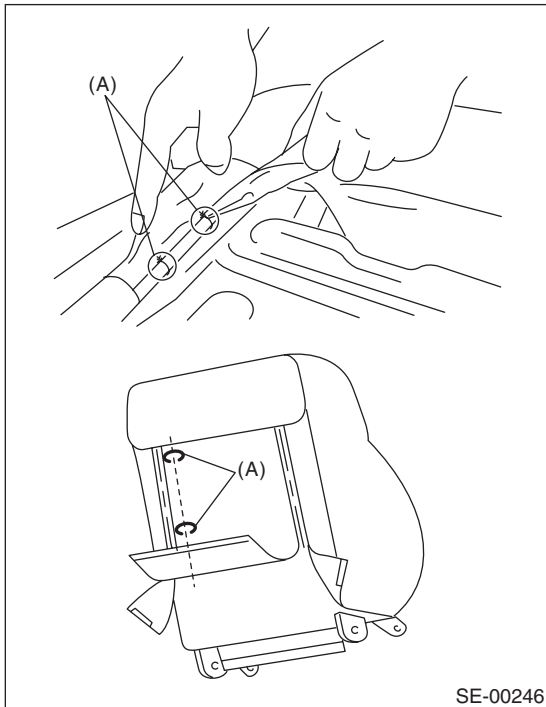
5) Remove the hook at bottom of seat backrest.



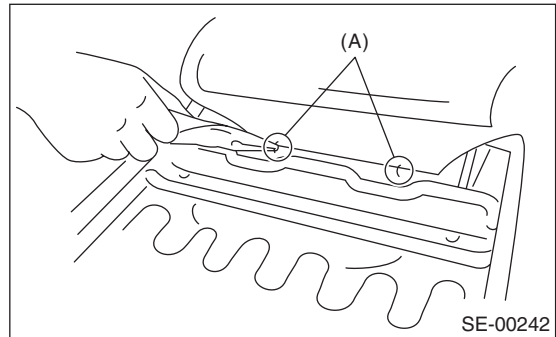
6) Open the fastener at the rear side of backrest.



7) Remove the hog rings (A) on the front side of backrest from the backrest frame. (Seat with side airbag)



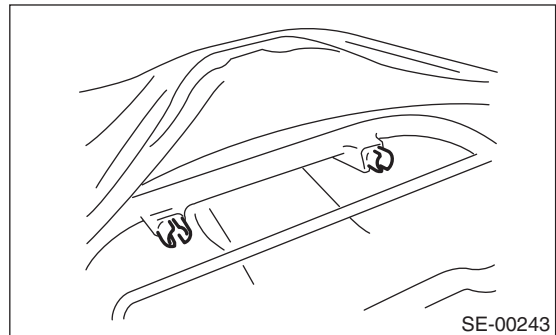
8) Remove the hog ring (A) which secures the backrest cover and backrest pad.



9) Remove the headrest bushing.

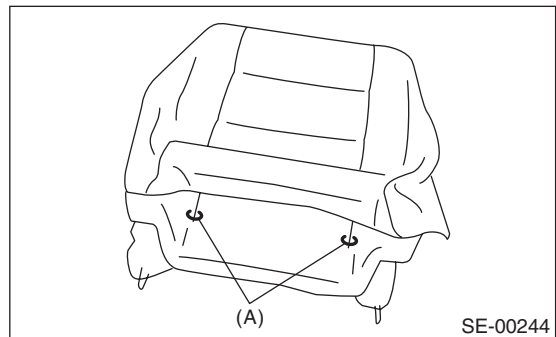
NOTE:

Push outside to remove it from the inside of seat.

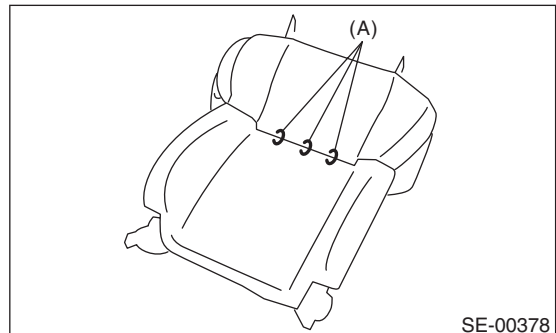


10) Pull out the backrest frame.

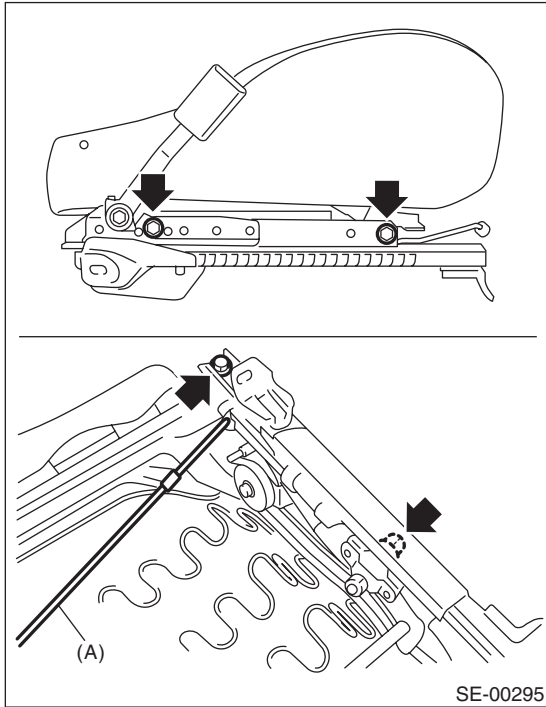
11) Remove the lower hog rings (A) on the front side of backrest.



12) Remove the hog rings (A) on the front side of backrest, and then remove the backrest cover from backrest.

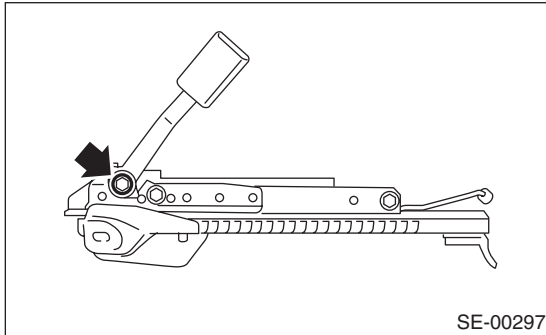


13) Remove the connecting wire (A), then loosen the bolt and nuts to remove slide rail.



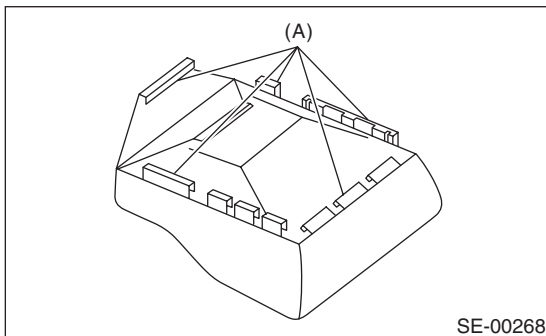
SE-00295

14) Remove the inner seat belt assembly.



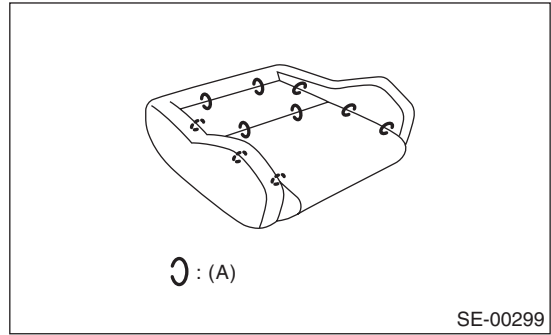
SE-00297

15) Remove the hooks (A), and then remove the seat cushion frame.



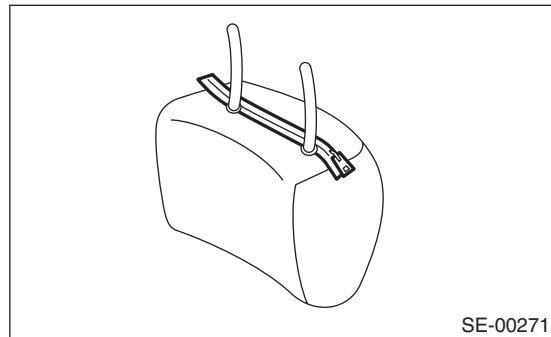
SE-00268

16) Remove the hog rings (A), and then remove the seat cushion cover from seat cushion pad.



SE-00299

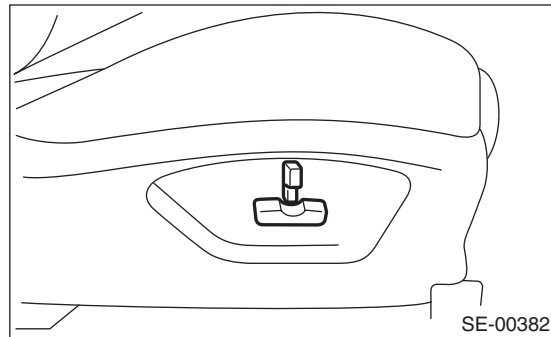
17) Open the fastener on the bottom of the headrest, then remove the headrest cover from the headrest.



SE-00271

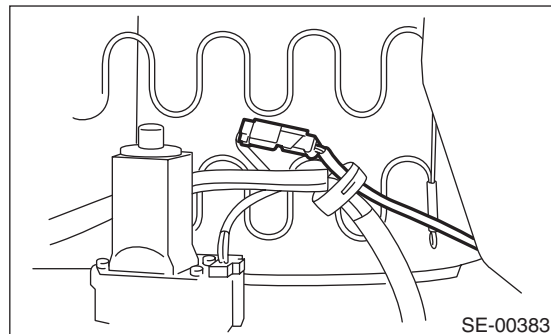
POWER SEAT

- 1) Remove the seat from vehicle. <Ref. to SE-7, REMOVAL, Front Seat.>
- 2) Remove the seat switch knob.



SE-00382

3) Disconnect the connector of reclining motor from the backside of seat cushion.

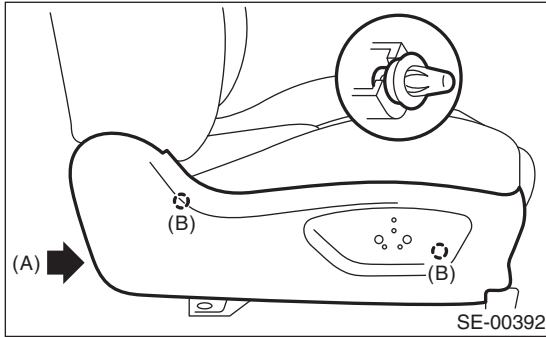


SE-00383

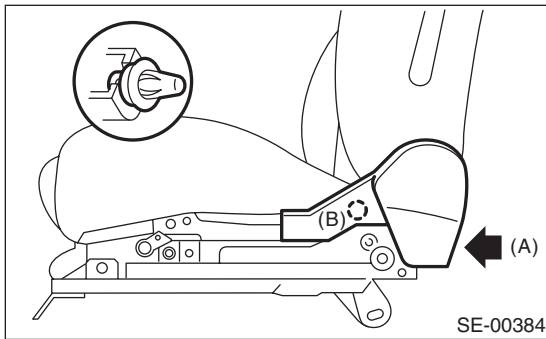
Front Seat

SEATS

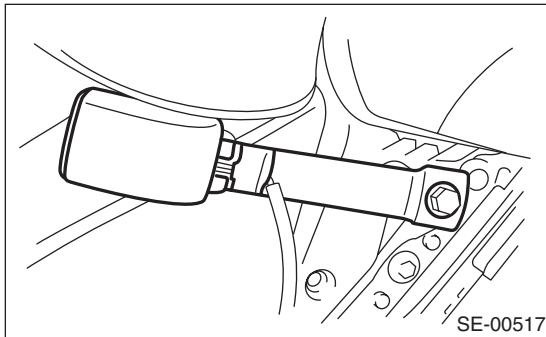
4) Remove the screw (A) and clips (B), and then disconnect the seat switch connector to remove seat hinge outer cover.



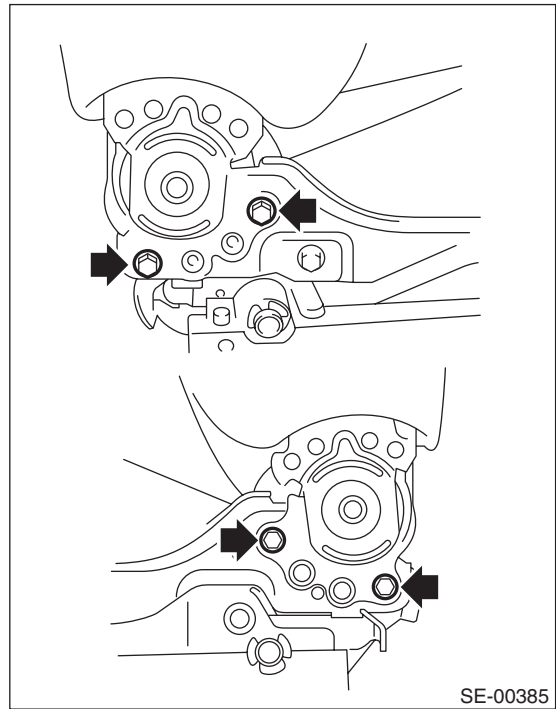
5) Remove the screw (A) and clip (B), and then remove the seat hinge inner cover.



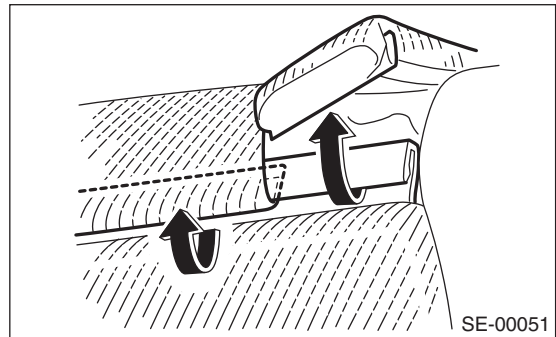
6) Remove the bolts, and then detach the inner seat belt assembly.



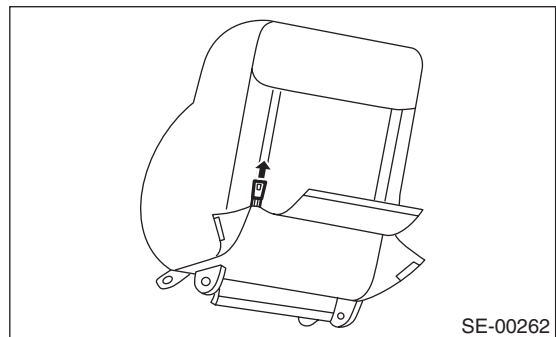
7) Remove the two bolts from the reclining hinge on each left and right side.



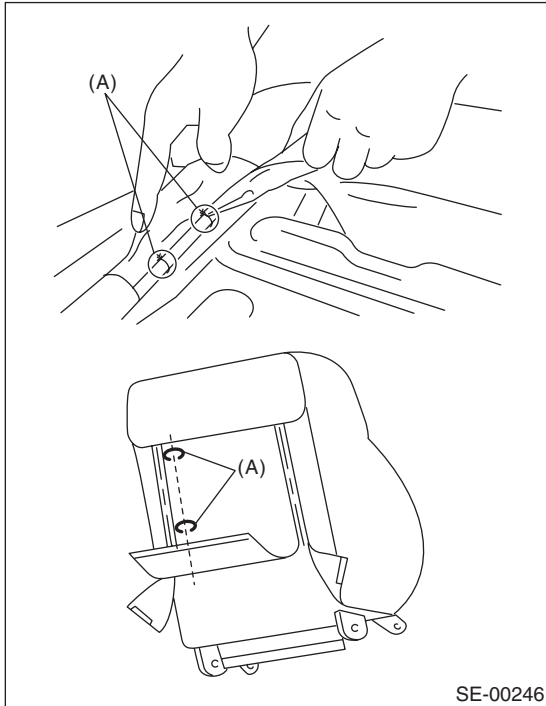
8) Remove the hook at bottom of seat backrest.



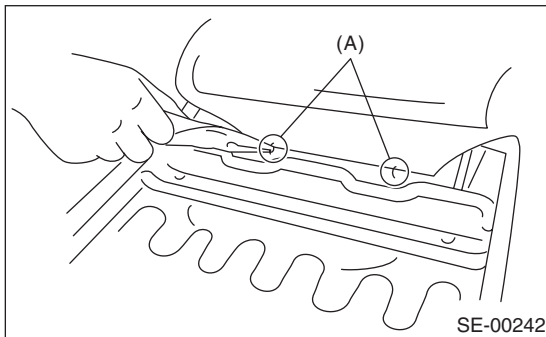
9) Open the fastener at the rear side of backrest.



10) Remove the hog rings (A) on the front side of backrest from the backrest frame. (Seat with side airbag)



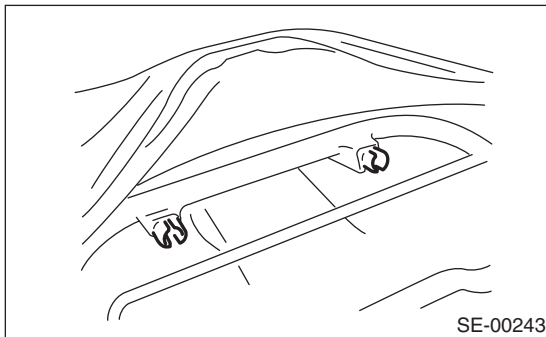
11) Remove the hog ring (A) which secures the backrest cover and backrest pad.



12) Remove the headrest lock bushing.

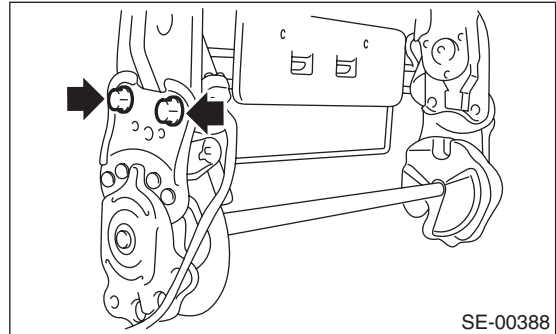
NOTE:

Push outside to remove it from the inside of seat.

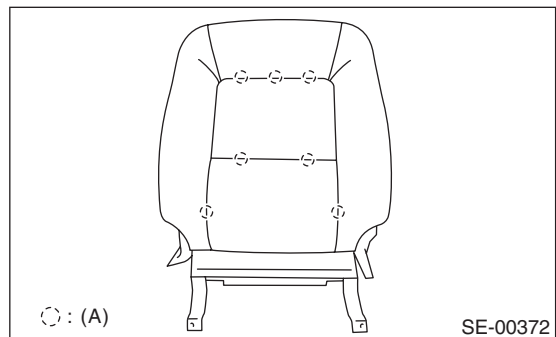


13) Pull out the backrest frame assembly.

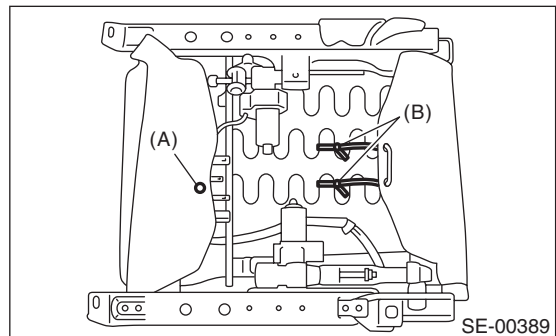
14) Remove the two bolts on each left and right side, and then remove the reclining motor assembly.



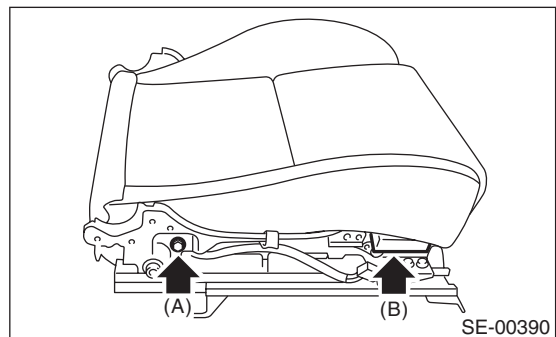
15) Remove the hog rings (A) on the surface side of backrest, and then remove the backrest cover from backrest.



16) Remove the clip (A) and straps (B) on the back of seat cushion.



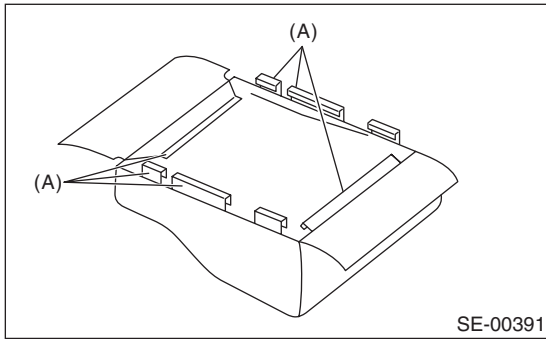
17) Remove the bolt (A) and hook (B) on left and right side, and then remove the seat cushion frame from seat rail assembly.



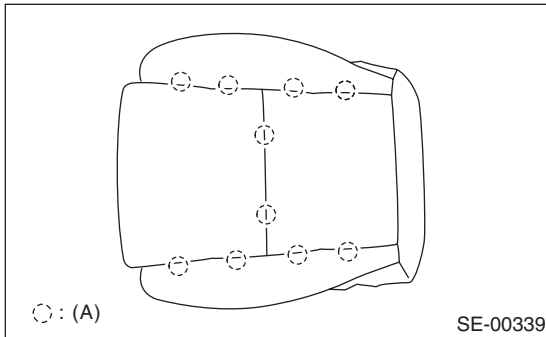
Front Seat

SEATS

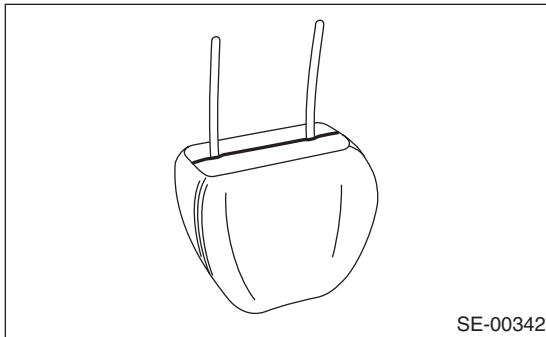
18) Remove the hooks (A), and then remove the seat cushion from seat cushion frame.



19) Remove the hog rings (A), and then remove the seat cushion cover from seat cushion pad.



20) Remove the hooks and hog rings at the bottom of headrest, and then remove the headrest cover from headrest.



2. PASSENGER'S SEAT

CAUTION:

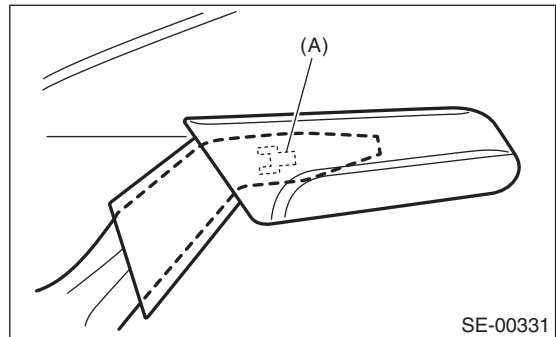
• If the seat cushion cover is removed or replaced, make sure to perform occupant detection system adjustment after installing the seat. <Ref. to OD(diag)-17, SYSTEM CALIBRATION (REZEROING), OPERATION, Subaru Select Monitor.>

Failure to do so may cause improper activation of passenger's airbag.

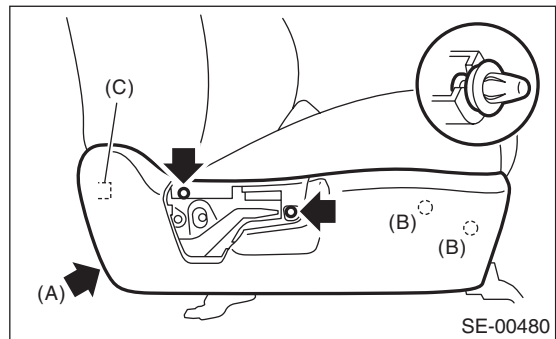
• For the passenger's seat, never remove the occupant detection control module and occupant detection sensor from the seat cushion frame. These all are the parts of occupant detection cushion assemblies.

• If the seat cushion cover is removed (including when replacing the heater), always replace the wires of the seat cushion cover with new wires.

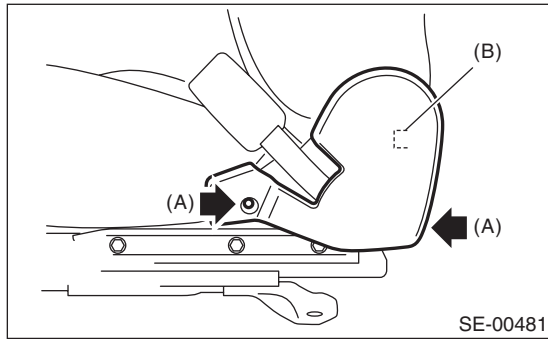
- 1) Remove the seat from vehicle.
- 2) Remove the reclining lever cover.



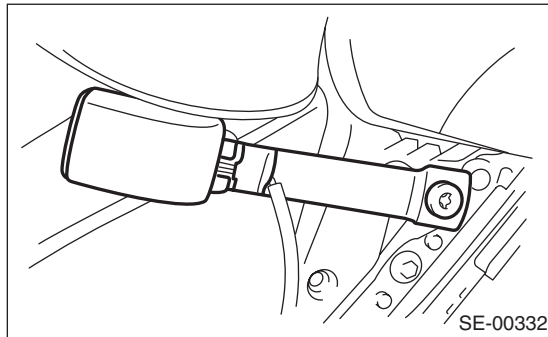
3) Remove the screw (A), clip (B) and claw (C), and then remove the seat side cover outside.



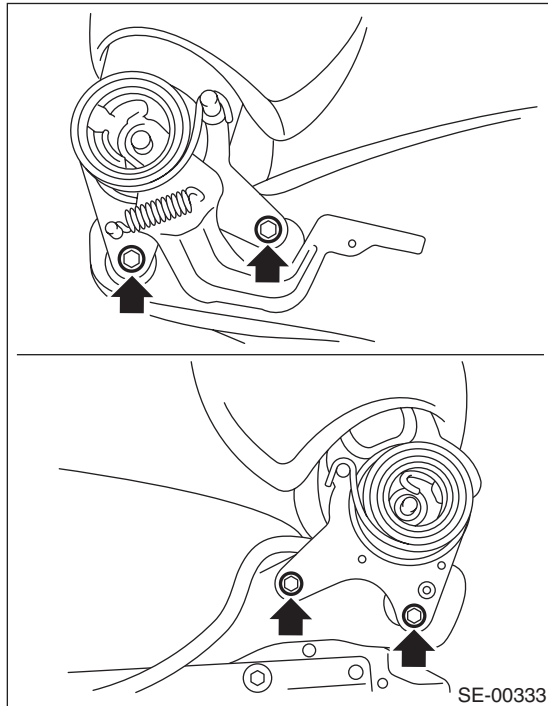
4) Remove the screw (A) and claw (B), and then remove the seat side cover inside.



5) Remove TORX® bolt, and then detach the inner seat belt assembly.

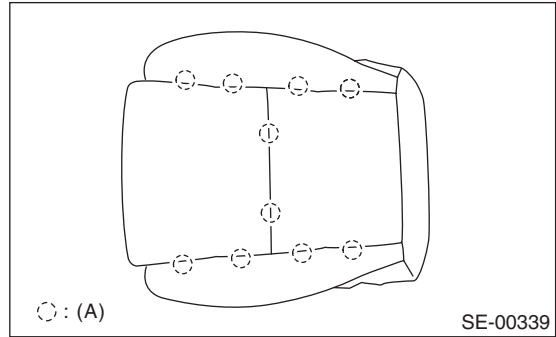


6) Remove the two reclining hinge bolts on each of the left and right sides.



7) Remove the seat cushion pad and cover from seat cushion frame assembly.

8) Remove the hog rings (A), and then remove the seat cushion cover from seat cushion pad.



9) Refer to "DRIVER'S SEAT" for disassembly procedures of backrest and headrest.

D: ASSEMBLY

CAUTION:

When the backrest cover is not installed securely, the side airbag module may not be deployed properly, therefore keep strictly to the following procedure.

- Be careful not to stain or damage the backrest cover during assembly.
- Do not reuse hog rings.
- Secure the hog ring using hog ring pliers.
- Install the hog rings to the specified points securely and make sure that no wrinkle or twisting on backrest cover.

1. DRIVER'S SIDE

Assemble in the reverse order of disassembly.

2. PASSENGER'S SIDE

CAUTION:

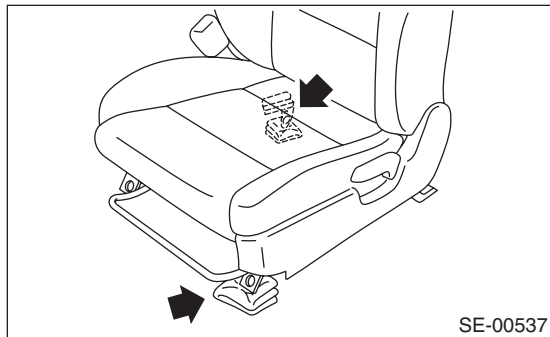
• If the seat cushion cover is removed or replaced, make sure to perform occupant detection system adjustment after installing the seat. <Ref. to OD(diag)-17, SYSTEM CALIBRATION (REZEROING), OPERATION, Subaru Select Monitor.>

• Failure to do so may cause improper activation of passenger's airbag.

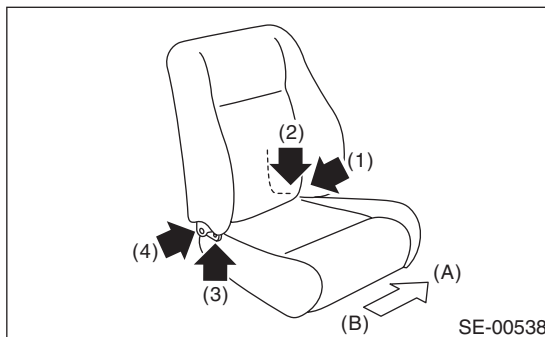
1) Assemble the seat cushion in the reverse order of disassembly.

2) Assemble the backrest in the reverse order of disassembly.

3) When installing the backrest assembly to the seat cushion assembly, fill the gap in the front side of slide rail LH and in the rear side of slide rail RH with cloth etc. in order to stabilize the seat cushion assembly.



4) Temporarily tighten the reclining hinge bolts in the order of (1) through (4) to an extent that the seat backrest assembly is not held securely.



(A) Inside the vehicle

(B) Outside the vehicle

5) Use the reclining lever to place the backrest in the most upright position, and check the first lock position of recliner.

6) Hold the seat cushion assembly securely, and tighten the reclining hinge bolts in the order described above until they reach the specified torque.

CAUTION:

Do not touch the backrest assembly when tightening the reclining hinge bolts.

7) Assemble each harness, inner seat belt assembly and each cover in the reverse order of removal.

Tightening torque:

Refer to "COMPONENT" of "General Description". <Ref. to SE-2, FRONT SEAT, COMPONENT, General Description.>

E: INSPECTION

Check that no tear or fray is on the backrest cover assembly.

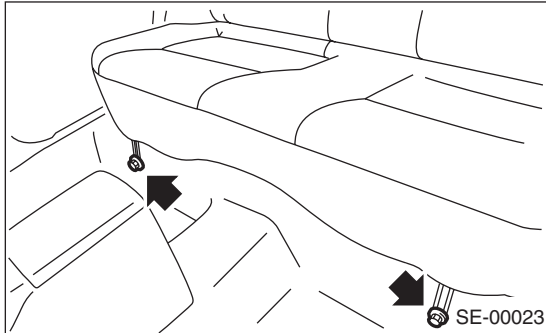
NOTE:

When the door side of backrest cover assembly is torn or frayed, the side airbag may not be deployed properly. Replace it with new part in such a case.

3. Rear Seat

A: REMOVAL

1) Remove the bolt to remove the rear seat cushion.

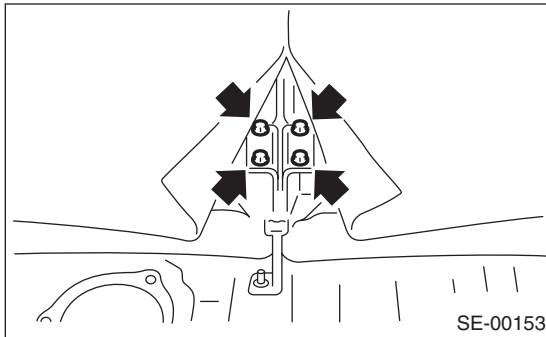


2) Remove the headrest.

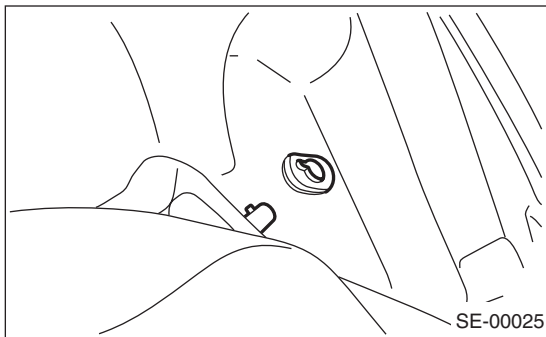
3) Remove the luggage floor mat. <Ref. to EI-49, REMOVAL, Luggage Floor Mat.>

4) Turn over the rear seat backrest.

5) Turn over the seat cover to remove the bolt.



6) Remove the rear seat backrest.



B: INSTALLATION

Install in the reverse order of removal.

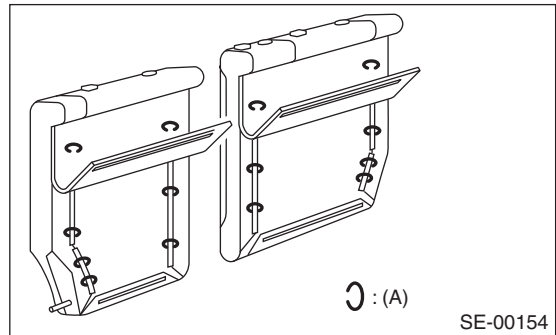
Tightening torque:

Refer to "COMPONENT" of "General Description". <Ref. to SE-5, REAR SEAT, COMPONENT, General Description.>

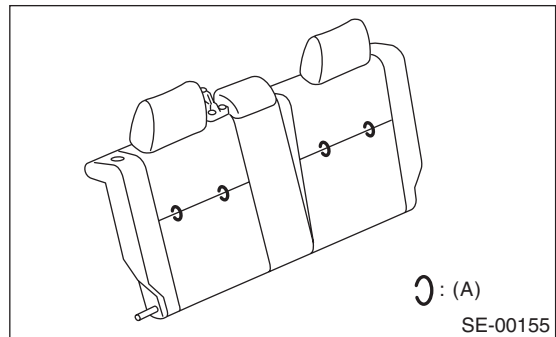
C: DISASSEMBLY

1) Remove the rear seat. <Ref. to SE-17, REMOVAL, Rear Seat.>

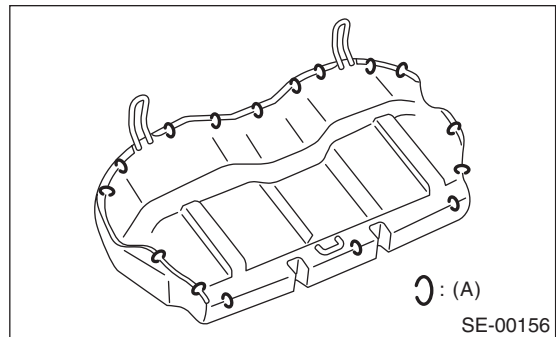
2) Remove the hog rings (A) from the vicinity of the seat backrest.



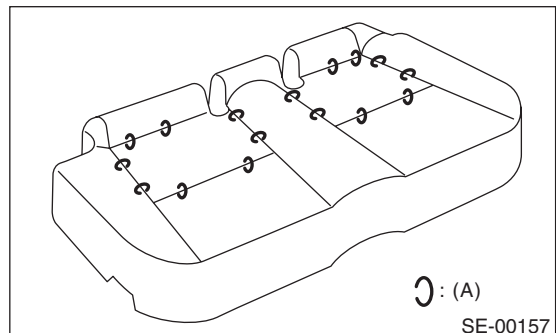
3) Remove the hog rings (A) on the front side of cushion pad, then remove the cover.



4) Remove the hog rings (A) from the vicinity of the seat cushion.



5) Remove the hog rings (A), and then remove the cover.



D: ASSEMBLY

Assemble in the reverse order of disassembly.

NOTE:

- Do not contaminate or damage the cover.
- While installing the hog rings, prevent the seat from getting wrinkled.

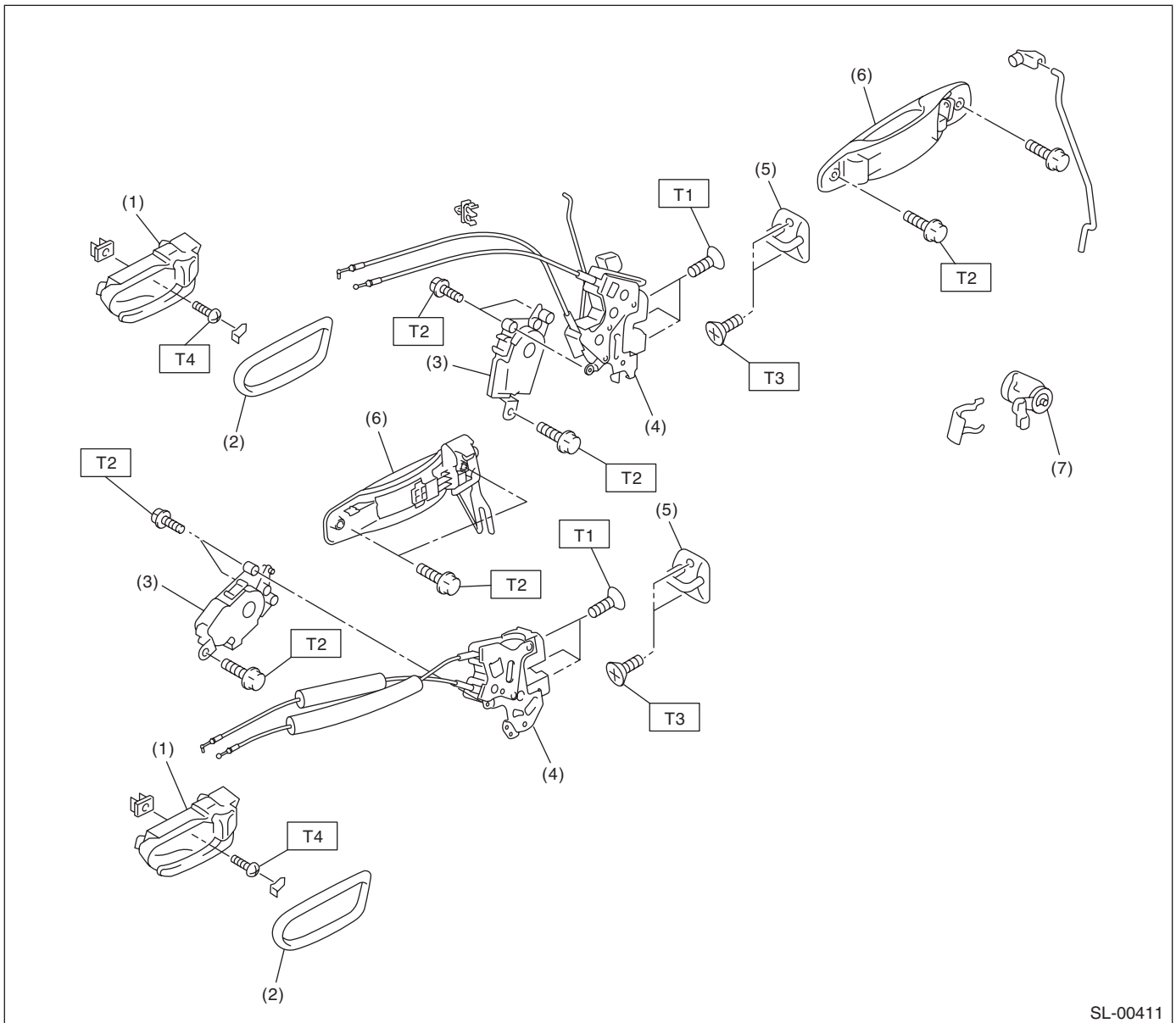
General Description

SECURITY AND LOCKS

1. General Description

A: COMPONENT

1. DOOR LOCK ASSEMBLY



- (1) Inner remote ASSY
- (2) Inner remote cover
- (3) Auto-door lock actuator
- (4) Door latch
- (5) Striker

- (6) Door outer handle
- (7) Key cylinder

Tightening torque: N-m (kgf-m, ft-lb)

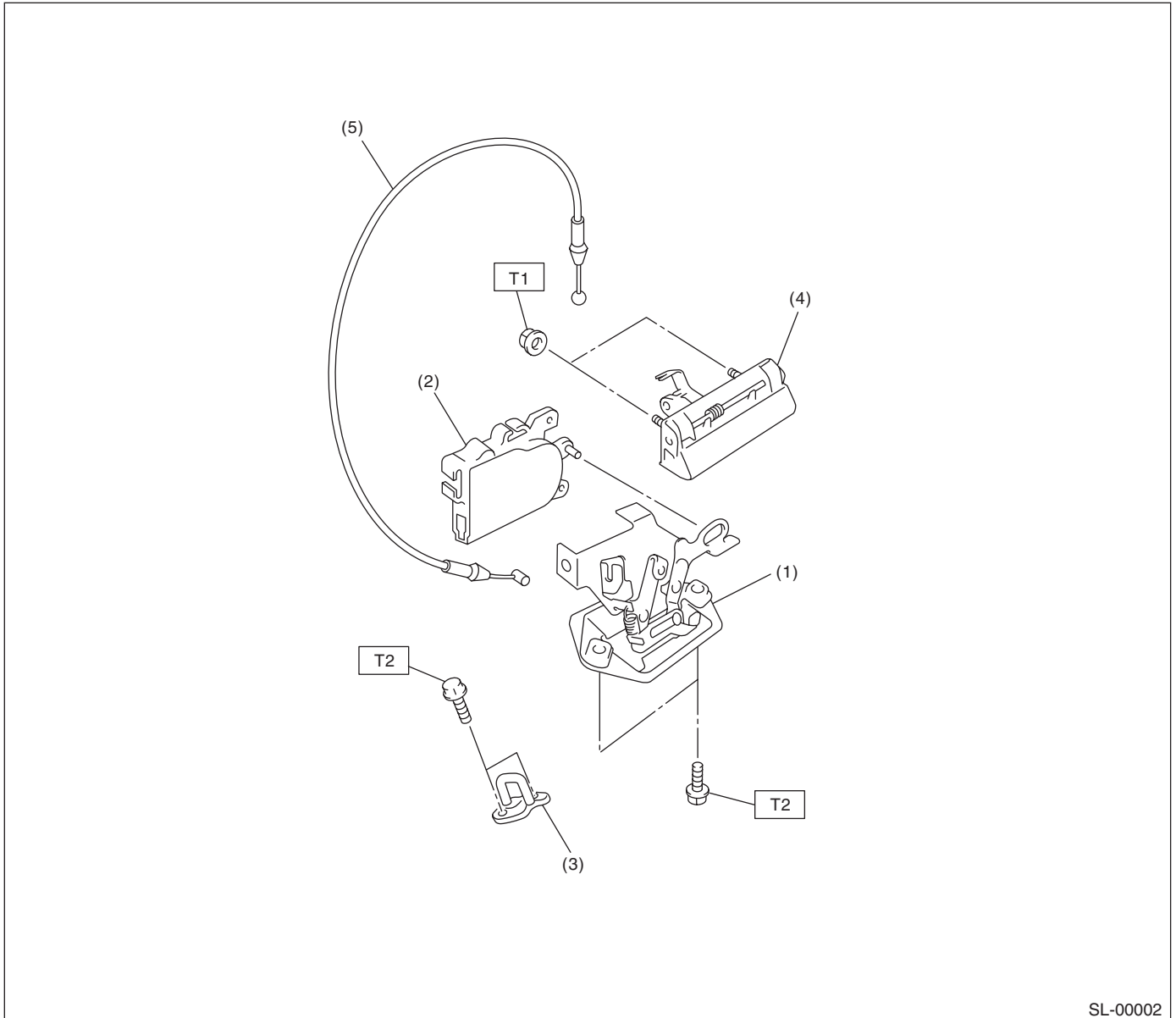
T1: 6.5 (0.66, 4.8)

T2: 7.5 (0.76, 5.5)

T3: 18 (1.8, 13.3)

T4: 1.5 (0.15, 1.1)

2. REAR GATE LOCK



SL-00002

- | | |
|------------------------|----------------------------|
| (1) Rear gate latch | (4) Rear gate outer handle |
| (2) Rear gate actuator | (5) Cable |
| (3) Striker | |

Tightening torque: N·m (kgf·m, ft·lb)

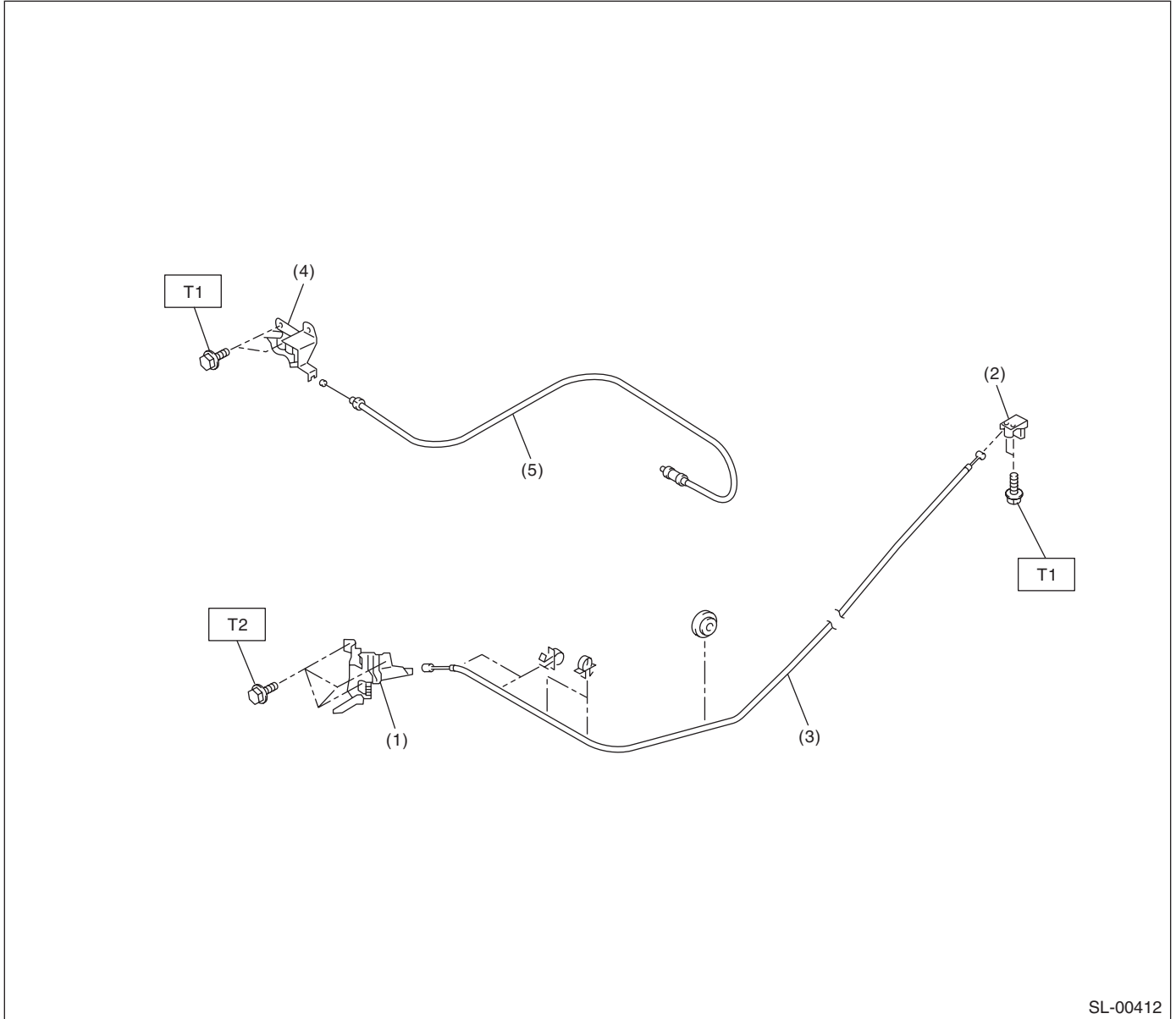
T1: 7.5 (0.76, 5.5)

T2: 25 (2.5, 18.4)

General Description

SECURITY AND LOCKS

3. FRONT HOOD LOCK AND REMOTE OPENERS



SL-00412

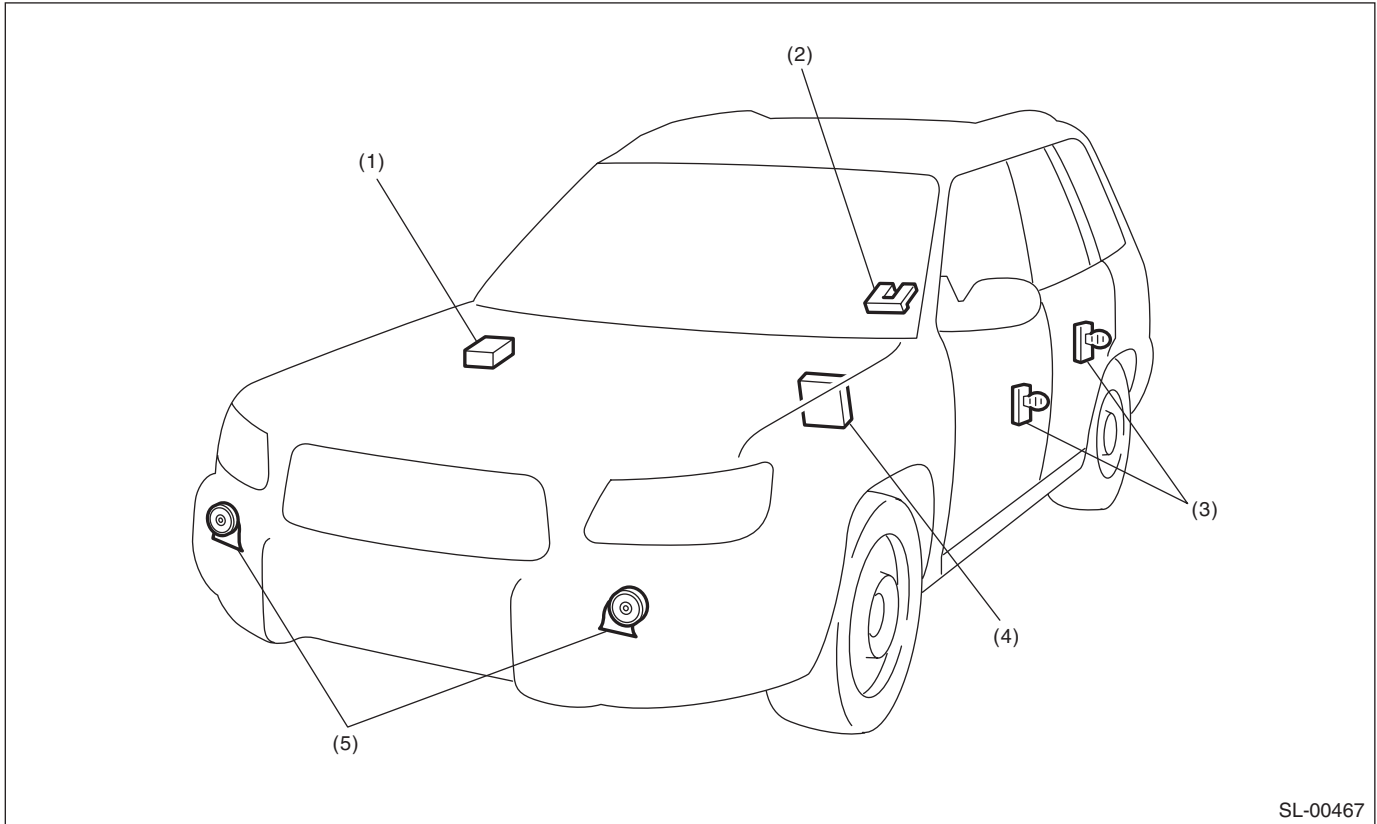
- | | |
|---------------------------|----------------------|
| (1) Front hood lock ASSY | (4) Pull handle ASSY |
| (2) Lever ASSY | (5) Fuel cable ASSY |
| (3) Front hood cable ASSY | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 7.5 (0.76, 5.5)

T2: 33 (3.4, 24.6)

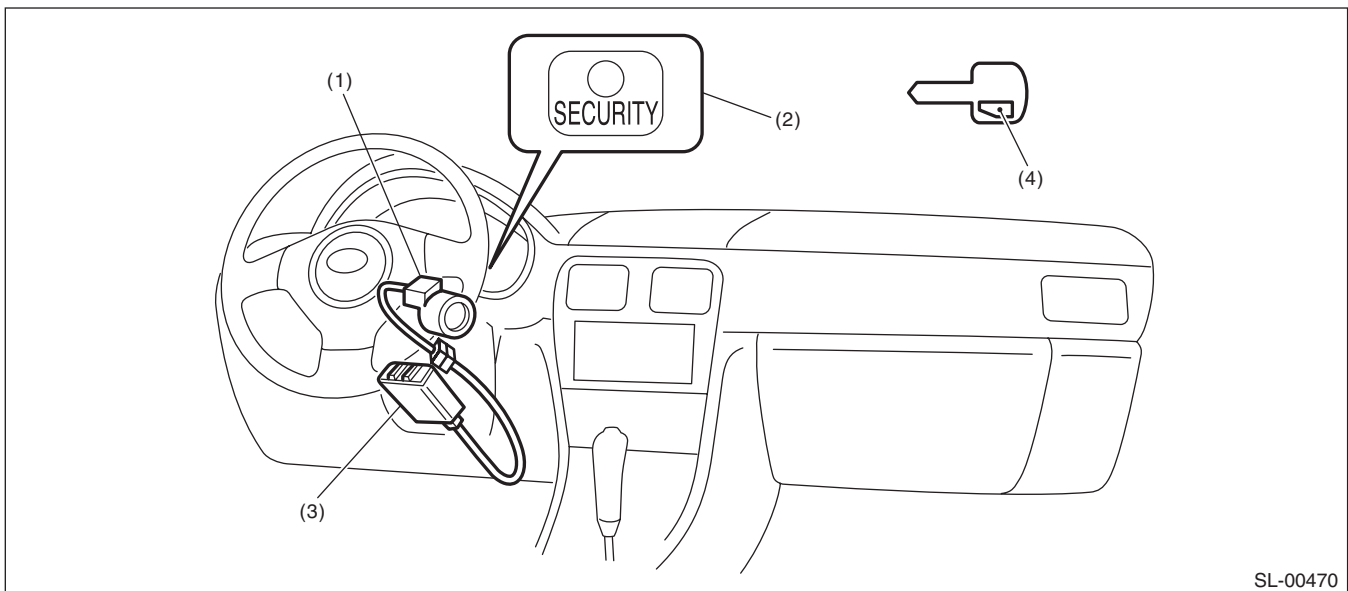
4. KEYLESS ENTRY SYSTEM



SL-00467

- | | | |
|----------------------------------|--------------------------|----------|
| (1) Keyless entry control module | (3) Door switch | (5) Horn |
| (2) Rear gate latch switch | (4) Body integrated unit | |

5. IMMOBILIZER SYSTEM



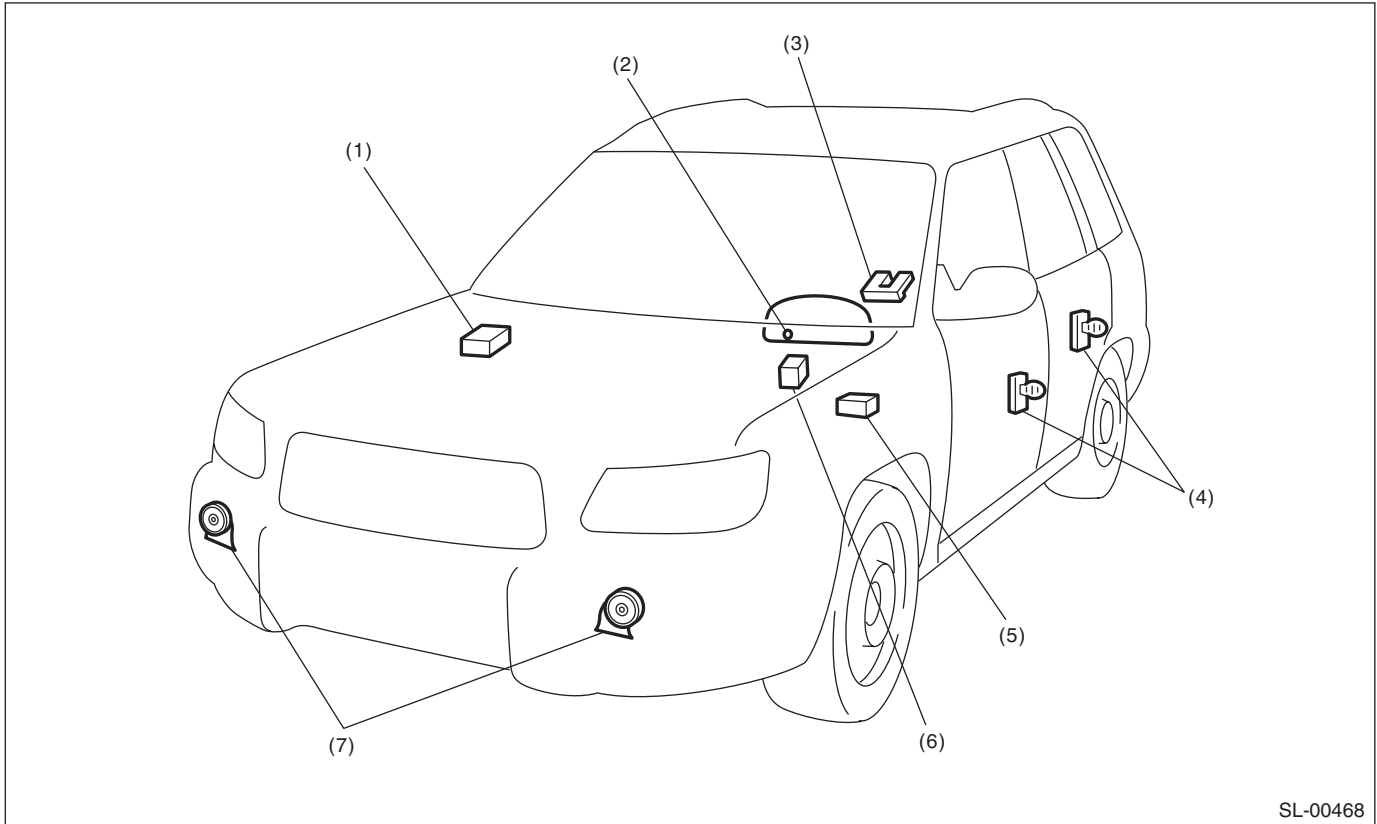
SL-00470

- | | | |
|---|--|-----------------|
| (1) Antenna | (3) Immobilizer control module (IMMCM) | (4) Transponder |
| (2) Security indicator light (LED bulb) | | |

General Description

SECURITY AND LOCKS

6. SECURITY SYSTEM



SL-00468

- | | | |
|---|----------------------------|-----------------------------------|
| (1) Keyless entry control module | (3) Rear gate latch switch | (6) Horn relay (in main fuse box) |
| (2) Security indicator light (in combination meter) | (4) Door switch | (7) Horn |
| (5) Interrupt relay | | |

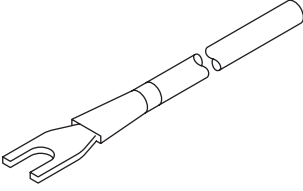
B: CAUTION

- Before disassembling or reassembling parts, always disconnect the battery ground cable from battery. When repairing the radio, control module, etc. which are provided with memory functions, record the memory contents before disconnecting the ground cable from battery. Otherwise, these contents are erased upon disconnection.
- Reassemble the parts in the reverse order of disassembly unless otherwise indicated.
- Adjust the parts to the specifications described in this manual if so designated.

- Connect the connectors and hoses securely during reassembly.
- After reassembly, make sure all the functional parts operate smoothly.
- The wiring harnesses of the airbag system pass near electrical parts and switches.
- All the airbag system wiring harnesses and connectors are yellow. Do not use electrical test equipment on these circuits.
- Be careful not to damage the airbag system wiring harness when servicing the ignition key cylinder.

C: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p style="text-align: center; margin-top: 10px;">ST-925580000</p>	925580000	PULLER	Used for removing trim clip

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.
Drill	Used for replacing ignition key lock.

Door Lock Control System

SECURITY AND LOCKS

2. Door Lock Control System

A: WIRING DIAGRAM

1. DOOR LOCK CONTROL

<Ref. to WI-157, WIRING DIAGRAM, Door Lock System.>

B: INSPECTION

1. SYMPTOM CHART

Symptom	Repair order	Reference
The door lock control system does not operate.	1. Check the fuse.	<Ref. to SL-8, CHECK FUSE, INSPECTION, Door Lock Control System.>
	2. Check the power supply and ground circuit for body integrated unit.	<Ref. to SL-8, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Door Lock Control System.>
	3. Check the door lock switch and the circuit.	<Ref. to SL-9, CHECK DOOR LOCK SWITCH AND CIRCUIT, INSPECTION, Door Lock Control System.>
	4. Check the door lock actuator and the circuit.	<Ref. to SL-10, CHECK DOOR LOCK ACTUATOR AND CIRCUIT, INSPECTION, Door Lock Control System.>
The door lock switch does not operate.	Check the door lock switch and circuit.	<Ref. to SL-9, CHECK DOOR LOCK SWITCH AND CIRCUIT, INSPECTION, Door Lock Control System.>
A specific door lock actuator does not operate.	Check the door lock actuator and circuit.	<Ref. to SL-10, CHECK DOOR LOCK ACTUATOR AND CIRCUIT, INSPECTION, Door Lock Control System.>

2. CHECK FUSE

Step	Check	Yes	No
1 CHECK FUSE. Remove and visually check the fuses No. 2 (in the main fuse box) and No. 3 (in the fuse & relay box).	Is the fuse blown out?	Replace the fuse with a new part.	Check the power supply and ground circuit. <Ref. to SL-8, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Door Lock Control System.>

3. CHECK POWER SUPPLY AND GROUND CIRCUIT

Step	Check	Yes	No
1 CHECK POWER SUPPLY. 1) Disconnect the harness connector of body integrated unit. 2) Measure the voltage between harness connector terminal and chassis ground. Connector & terminal <i>(B280) No. 1 (+) — Chassis ground (-):</i> <i>(B280) No. 2 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Go to step 2.	Check the harness for open or short circuit between body integrated unit and fuse.

Door Lock Control System

Step	Check	Yes	No
2 CHECK GROUND CIRCUIT. Measure the resistance between harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B280) No. 4 — Chassis ground:</i> <i>(B280) No. 13 — Chassis ground:</i>	Is the resistance less than 10 Ω ?	The power supply and ground circuit are OK.	Repair the harness.

4. CHECK DOOR LOCK SWITCH AND CIRCUIT

Step	Check	Yes	No
1 CHECK DOOR LOCK SWITCH CIRCUIT. 1) Disconnect the harness connector of body integrated unit. 2) Measure the resistance between the harness connector terminal and chassis ground when moving the door lock switch to LOCK. <i>Connector & terminal</i> <i>(B281) No. 12 — Chassis ground:</i>	Is the resistance less than 10 Ω ?	Go to step 2.	Go to step 3.
2 CHECK DOOR LOCK SWITCH CIRCUIT. Measure the resistance between the harness connector terminal and chassis ground when the door lock switch is moved to UNLOCK. <i>Connector & terminal</i> <i>(B281) No. 11 — Chassis ground:</i>	Is the resistance less than 10 Ω ?	The door lock switch is OK.	Go to step 3.
3 CHECK DOOR LOCK SWITCH GROUND CIRCUIT. 1) Disconnect the door lock switch harness connector. 2) Measure the resistance between the door lock switch harness connector terminal and the body ground. <i>Connector & terminal</i> <i>No. 5 — Chassis ground:</i>	Is the resistance less than 1 Ω ?	Go to step 4.	Repair the open circuit in the harness or chassis ground.
4 CHECK DOOR LOCK SWITCH. 1) Measure the resistance between the door lock switch terminals when moving the door lock switch to LOCK. <i>Connector & terminal</i> <i>Driver side:</i> <i>No. 5 — No. 9:</i> <i>Passenger side:</i> <i>No. 4 — No. 5:</i>	Is the resistance less than 1 Ω ?	Go to step 5.	Replace the door lock switch.
5 CHECK DOOR LOCK SWITCH. Measure the resistance between the door lock switch terminals when moving the door lock switch to UNLOCK. <i>Connector & terminal</i> <i>Driver side:</i> <i>No. 5 — No. 8:</i> <i>Passenger side:</i> <i>No. 2 — No. 5:</i>	Is the resistance less than 1 Ω ?	Check the harness for open circuits or shorts between the body integrated unit and the door lock switch.	Replace the door lock switch.

Door Lock Control System

SECURITY AND LOCKS

5. CHECK DOOR LOCK ACTUATOR AND CIRCUIT

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL. Measure the voltage between the harness connector terminal and chassis ground of body integrated unit when moving the door lock switch to LOCK. <i>Connector & terminal</i> <i>(B280) No. 6 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Go to step 2.	Replace the body integrated unit.
2 CHECK OUTPUT SIGNAL. Measure the voltage between the harness connector terminal and chassis ground of body integrated unit when moving the door lock switch to UNLOCK. <i>Connector & terminal</i> <i>(B280) No. 7 (+) — Chassis ground (-):</i> <i>(B280) No. 8 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Go to step 3.	Replace the body integrated unit.
3 CHECK DOOR LOCK ACTUATOR. Check the door lock actuator. Front Door Lock Actuator: <Ref. to SL-32, Front Door Lock Actuator.> Rear Door Lock Actuator: <Ref. to SL-36, Rear Door Lock Actuator.> Rear Gate Latch Lock Actuator: <Ref. to SL-39, Rear Gate Latch Lock Actuator.>	Is the door lock actuator OK?	Check the harness for open or short circuits between body integrated unit and door lock actuator.	Replace the door lock actuator.

3. Keyless Entry System

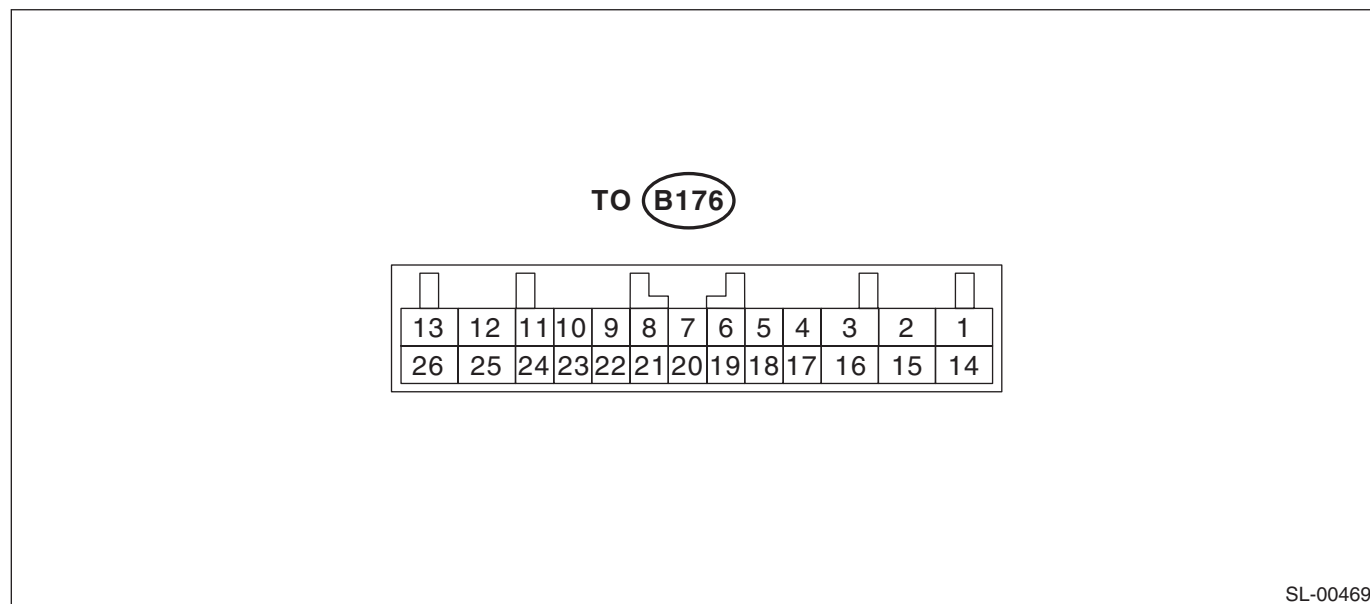
A: WIRING DIAGRAM

1. KEYLESS ENTRY

<Ref. to WI-148, WIRING DIAGRAM, Keyless Entry System.>

B: ELECTRICAL SPECIFICATION

1. KEYLESS ENTRY CONTROL MODULE



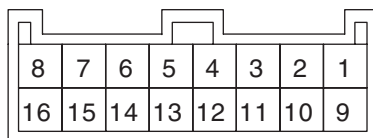
SL-00469

Content	Terminal No.	Measuring condition
Turn signal light LH	1 (OUTPUT)	Battery voltage is present when the keyless transmitter UNLOCK/DISARM or LOCK/ARM button is pressed.
Power supply (Back-up)	2	Battery voltage is constantly present.
Keyless buzzer	3 (OUTPUT)	0 V is present when the keyless transmitter UNLOCK/DISARM or LOCK/ARM button is pressed.
Door lock switch	4 (INPUT)	0 V is present when the door lock switch is turned to UNLOCK.
Door lock switch	5 (INPUT)	0 V is present when the door lock switch is turned to LOCK.
Door switch	6 (INPUT)	0 V is present when opening one of the doors or rear gate.
Key warning switch	9 (INPUT)	Battery voltage is present when inserting the key into ignition switch.
Ignition switch (ON)	10 (INPUT)	Battery voltage is present when ignition switch is turned to ON.
Turn signal light RH	13 (OUTPUT)	Battery voltage is present when the keyless transmitter UNLOCK/DISARM or LOCK/ARM button is pressed.
Ground	14	0 V is constantly present.
Body integrated unit	18 (OUTPUT)	Battery voltage is present when the keyless transmitter UNLOCK/DISARM button is pressed.
Body integrated unit	19 (OUTPUT)	Battery voltage is present when the keyless transmitter LOCK/ARM button is pressed.
Horn relay	24 (OUTPUT)	0 V is present when the keyless transmitter LOCK/ARM button is pressed for approx. 2 seconds, and the panic alarm is operated.
Power supply (Back-up)	26	Battery voltage is constantly present.

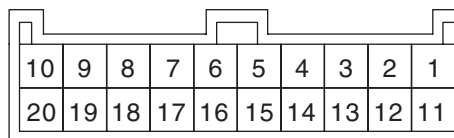
Keyless Entry System

SECURITY AND LOCKS

2. BODY INTEGRATED UNIT



a



b

SL-00364

Content	Terminal No.	Measuring condition
Door switch (Except driver's door)	b7 (INPUT)	0 V is present when opening the doors. (Except driver's door).
Door switch (Driver's door)	b8 (INPUT)	0 V is present when opening the driver's side door.
Door lock switch	b11 (INPUT)	0 V is present when the door lock switch is turned to UNLOCK.
Door lock switch	b12 (INPUT)	0 V is present when the door lock switch is turned to LOCK.
Keyless entry control module (LOCK)	b13 (INPUT)	Battery voltage is present when the keyless transmitter LOCK/ARM button is pressed.
Keyless entry control module (UNLOCK)	b14 (INPUT)	Battery voltage is present when the keyless transmitter UNLOCK/DISARM button is pressed.
Ignition switch (ON)	b19 (INPUT)	Battery voltage is present when ignition switch is turned to ON.
Key warning switch	b20 (INPUT)	Battery voltage is present when inserting the key into ignition switch.
Power supply	a2	Battery voltage is constantly present.
Ground	a4	0 V is constantly present.
Room light	a5 (OUTPUT)	0 V is present when the keyless transmitter UNLOCK/DISARM button is pressed.
Door and rear gate lock actuator	a6 (OUTPUT)	Battery voltage is present when the keyless transmitter LOCK/ARM button is pressed.
Door and rear gate lock actuator (Except driver side)	a7 (OUTPUT)	Battery voltage is present when the keyless transmitter UNLOCK/DISARM button is pressed twice.
Door lock actuator (Driver side)	a8 (OUTPUT)	Battery voltage is present when the keyless transmitter UNLOCK/DISARM button is pressed once.
Ground	a13	0 V is constantly present.

C: INSPECTION

1. SYMPTOM CHART

Symptom	Repair order	Reference
None of the functions of the keyless entry system operate.	1. Check the keyless transmitter battery and function.	<Ref. to SL-14, CHECK KEYLESS TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>
	2. Check the fuse.	<Ref. to SL-16, CHECK FUSE, INSPECTION, Keyless Entry System.>
	3. Check the keyless entry control module power supply and ground circuit.	<Ref. to SL-16, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Keyless Entry System.>
	4. Replace the keyless entry control module.	<Ref. to SL-49, Keyless Entry Control Module.>
The keyless transmitter cannot be registered.	1. Check the keyless transmitter battery and function.	<Ref. to SL-14, CHECK KEYLESS TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>
	2. Check the ignition switch circuit.	<Ref. to SL-16, CHECK IGNITION SWITCH CIRCUIT, INSPECTION, Keyless Entry System.>
	3. Check the door switch.	<Ref. to SL-17, CHECK DOOR SWITCH, INSPECTION, Keyless Entry System.>
	4. Replace the keyless entry control module.	<Ref. to SL-49, Keyless Entry Control Module.>
Door lock or unlock does not operate. NOTE: If the door lock control system does not operate when using the door lock switch, check the door lock control system. <Ref. to SL-8, INSPECTION, Door Lock Control System.>	1. Check the keyless transmitter battery and function.	<Ref. to SL-14, CHECK KEYLESS TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>
	2. Check the key warning switch.	<Ref. to SL-18, CHECK KEY WARNING SWITCH, INSPECTION, Keyless Entry System.>
	3. Check the door switch.	<Ref. to SL-17, CHECK DOOR SWITCH, INSPECTION, Keyless Entry System.>
	4. Check the output signal of the body integrated unit.	<Ref. to SL-19, CHECK OUTPUT SIGNAL OF THE BODY INTEGRATED UNIT, INSPECTION, Keyless Entry System.>
	5. Replace the keyless entry control module.	<Ref. to SL-49, Keyless Entry Control Module.>
The panic alarm does not operate.	1. Check the keyless transmitter battery and function.	<Ref. to SL-14, CHECK KEYLESS TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>
	2. Check the horn operation.	<Ref. to SL-19, CHECK HORN OPERATION, INSPECTION, Keyless Entry System.>
	3. Replace the keyless entry control module.	<Ref. to SL-49, Keyless Entry Control Module.>

Keyless Entry System

SECURITY AND LOCKS

Symptom	Repair order		Reference
Buzzer and hazard light do not operate.	1. Check the buzzer function.		<Ref. to SL-15, CHECK BUZZER CHIRP SETTING, INSPECTION, Keyless Entry System.>
	2. Check buzzer and hazard light operation.	Buzzer	<Ref. to SL-20, CHECK KEYLESS BUZZER, INSPECTION, Keyless Entry System.>
		Hazard light	<Ref. to SL-20, CHECK HAZARD LIGHT OPERATION, INSPECTION, Keyless Entry System.>
	3. Replace the keyless entry control module.		<Ref. to SL-49, Keyless Entry Control Module.>
The room light does not operate.	1. Check the room light operation.		<Ref. to SL-18, CHECK ROOM LIGHT OPERATION, INSPECTION, Keyless Entry System.>
	2. Replace the keyless entry control module.		<Ref. to SL-49, Keyless Entry Control Module.>
The door warning does not operate.	1. Check the door switch.		<Ref. to SL-17, CHECK DOOR SWITCH, INSPECTION, Keyless Entry System.>
	2. Check the buzzer operation.		<Ref. to SL-20, CHECK KEYLESS BUZZER, INSPECTION, Keyless Entry System.>
	3. Replace the keyless entry control module.		<Ref. to SL-49, Keyless Entry Control Module.>

2. CHECK KEYLESS TRANSMITTER BATTERY AND FUNCTION

Step	Check	Yes	No
1 CHECK KEYLESS TRANSMITTER BATTERY. 1) Remove the battery from the keyless transmitter. <Ref. to SL-51, REMOVAL, Transmitter.> 2) Check the battery voltage. <Ref. to SL-51, INSPECTION, Transmitter.>	Is the voltage 2.5 V or more?	Go to step 2.	Replace the keyless transmitter battery.
2 CHECK KEYLESS TRANSMITTER. Register a keyless transmitter which operated normally on other vehicles to the inspection target vehicle. <Ref. to SL-52, REGISTRATION OF KEYLESS TRANSMITTER WITH SUBARU SELECT MONITOR, REPLACEMENT, Transmitter.> 1) Close all the doors and rear gate of inspection target vehicle. 2) Using the keyless transmitter, lock and unlock the doors and rear gate of vehicle.	Is the inspection target vehicle operates lock and unlock normally?	Go to step 3.	Due to vehicle malfunction, continue the keyless entry system diagnosis.
3 CHECK KEYLESS TRANSMITTER. Register the keyless transmitter of the inspection target vehicle to an other vehicle for which the keyless system operates normally. <Ref. to SL-52, REGISTRATION OF KEYLESS TRANSMITTER WITH SUBARU SELECT MONITOR, REPLACEMENT, Transmitter.>	Is the keyless transmitter registered correctly?	Go to step 4.	Replace the keyless transmitter. <Ref. to SL-52, REGISTRATION OF KEYLESS TRANSMITTER WITH SUBARU SELECT MONITOR, REPLACEMENT, Transmitter.>

Keyless Entry System

Step	Check	Yes	No
4 CHECK KEYLESS TRANSMITTER. Check the registered keyless transmitter. 1) Close all the doors and rear gate of the vehicle for which the keyless system operates normally. 2) Using the keyless transmitter, lock and unlock the doors and rear gate of vehicle.	Does the vehicle operates lock and unlock normally?	The keyless transmitter is OK.	Replace the keyless transmitter. <Ref. to SL-52, REGISTRATION OF KEYLESS TRANSMITTER WITH SUBARU SELECT MONITOR, REPLACEMENT, Transmitter.>

CAUTION:

Be sure to reset the keyless transmitter of the other vehicle that was registered to the inspection target vehicle, and the vehicle for which the keyless transmitter was registered for inspection, to the condition before performing the inspection. (Register the keyless transmitter again.)

3. CHECK BUZZER CHIRP SETTING

Step	Check	Yes	No
1 CHECK BUZZER CHIRP SETTING. 1) Check the current setting of the buzzer chirp. 2) Remove the key from the ignition switch. 3) Close all the doors and rear gate. 4) Press the LOCK/ARM or UNLOCK/DISARM button.	Does the buzzer sound?	The buzzer function is OK.	Go to step 2.
2 CHECK BUZZER CHIRP SETTING. NOTE: When steps 1) to 5) are performed with the answer-back buzzer setting OFF, the answer-back buzzer setting is switched to ON. 1) Open the driver's door, and remove the key from ignition switch. 2) Turn the center door lock switch to UNLOCK, then insert the ignition key. 3) Remove and insert the key five times within 10 seconds from the step 2). 4) Close the driver's door within 10 seconds from the 5th of the step 3). 5) Switch the answer-back buzzer setting (ON⇔OFF), then hazard light will blink three times. NOTE: If the driver's door is not closed within 10 seconds, the hazard light blinks once. In this case, retry from the beginning. 6) Press the LOCK/ARM or UNLOCK/DISARM button.	Does the buzzer sound?	The buzzer function is OK.	Check the keyless transmitter function. <Ref. to SL-14, CHECK KEYLESS TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>

Keyless Entry System

SECURITY AND LOCKS

4. CHECK FUSE

Step	Check	Yes	No
1 CHECK FUSE. Remove and visually check the fuses No. 6 (in the main fuse box) and No. 3 (in the fuse & relay box).	Is the fuse blown out?	Replace the fuse with a new part.	Check the power supply and ground circuit. <Ref. to SL-16, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Keyless Entry System.>

5. CHECK POWER SUPPLY AND GROUND CIRCUIT

Step	Check	Yes	No
1 CHECK POWER SUPPLY. 1) Disconnect the keyless entry control module harness connector. 2) Measure the voltage between harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B176) No. 2 (+) — Chassis ground (-):</i> <i>(B176) No. 26 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Go to step 2.	Check the harness for open circuits and shorts between the keyless entry control module and fuse.
2 CHECK GROUND CIRCUIT. Measure the resistance between harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B176) No. 14 — Chassis ground:</i>	Is the resistance less than 10 Ω ?	The power supply and ground circuit are OK.	Repair the harness.

6. CHECK IGNITION SWITCH CIRCUIT

Step	Check	Yes	No
1 CHECK IGNITION SWITCH CIRCUIT. 1) Disconnect the keyless entry control module harness connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B176) No. 10 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Ignition switch function is normal.	Check the harness for open circuits or shorts between the keyless entry control module and the ignition relay.

7. CHECK DOOR SWITCH

Step	Check	Yes	No
1 CHECK DOOR SWITCH CIRCUIT. Measure the voltage between the keyless entry control module harness connector terminal and the body ground. <i>Connector & terminal</i> <i>Front and rear door, rear gate:</i> <i>(B176) No. 6 (+) — Chassis ground (-):</i>	Is the voltage 0 V when any door or rear gate is opened?	Go to step 2.	Go to step 3.
2 CHECK DOOR SWITCH CIRCUIT. Measure the voltage between the keyless entry control module harness connector terminal and the body ground. <i>Connector & terminal</i> <i>Front and rear door, rear gate:</i> <i>(B176) No. 6 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more when any door or rear gate is closed?	The door switch is OK.	Go to step 3.
3 CHECK DOOR SWITCH. 1) Disconnect the door switch harness connector. 2) Measure the resistance between door switch terminals. <i>Terminals</i> <i>Door switch No. 1 — No. 3:</i> <i>Rear gate latch switch No. 1 — No. 2:</i>	Is the resistance 1 M Ω or more when door switch is pushed?	Go to step 4.	Replace the door switch.
4 CHECK DOOR SWITCH. Measure the resistance between door switch terminals. <i>Terminals</i> <i>Door switch No. 1 — No. 3:</i> <i>Rear gate latch switch No. 1 — No. 2:</i>	Is the resistance less than 1 Ω when door switch is released?	Check the harness for open circuits and shorts between the keyless entry control module and the door switch.	Replace the door switch.

Keyless Entry System

SECURITY AND LOCKS

8. CHECK KEY WARNING SWITCH

	Step	Check	Yes	No
1	CHECK FUSE. Remove and visually check the fuse No. 6 (in the main fuse box).	Is the fuse blown out?	Replace the fuse with a new part.	Go to step 2.
2	CHECK KEY WARNING SWITCH CIRCUIT. 1) Disconnect the keyless entry control module harness connector. 2) Insert the key into ignition switch. (LOCK position) 3) Measure the voltage between harness connector terminal and chassis ground. Connector & terminal (B176) No. 9 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 3.	Go to step 4.
3	CHECK KEY WARNING SWITCH CIRCUIT. 1) Remove the key from ignition switch. 2) Measure the voltage between harness connector terminal and chassis ground. Connector & terminal (B176) No. 9 (+) — Chassis ground (-):	Is the voltage 0 V?	The key warning switch is OK.	Go to step 4.
4	CHECK KEY WARNING SWITCH. 1) Disconnect the key warning switch harness connector. 2) Insert the key into ignition switch. (LOCK position) 3) Measure the resistance between key warning switch terminals. Terminals No. 1 — No. 2:	Is the resistance less than 1 Ω ?	Go to step 5.	Replace the key warning switch.
5	CHECK KEY WARNING SWITCH. 1) Remove the key from ignition switch. 2) Measure the resistance between key warning switch terminals. Terminals No. 1 — No. 2:	Is the resistance 1 M Ω or more?	Check the following: • Harness for open circuits and shorts between the key warning switch and fuse. • Harness for open circuits and shorts between the keyless entry control module and the key warning switch.	Replace the key warning switch.

9. CHECK ROOM LIGHT OPERATION

	Step	Check	Yes	No
1	CHECK ROOM LIGHT OPERATION. Make sure the room light illuminates when the room light switch is turned to ON.	Does the room light illuminate?	Go to step 2.	Check the room light circuit.
2	CHECK HARNESS BETWEEN ROOM LIGHT AND BODY INTEGRATED UNIT. 1) Disconnect the body integrated unit harness connector and room light harness connector. 2) Measure the resistance between the body integrated unit harness connector terminal and room light harness connector terminal. Connector & terminal (B280) No. 5 — (R52) No. 2:	Is the resistance less than 10 Ω ?	The room light operation circuit is OK.	Check the harness for open or short circuit between body integrated unit and the room light.

10.CHECK OUTPUT SIGNAL OF THE BODY INTEGRATED UNIT

Step	Check	Yes	No
1 CHECK OUTPUT SIGNAL. Measure the voltage between the keyless entry control module harness connector terminal and the chassis ground when the UNLOCK/DISARM buttons of the keyless transmitter are pressed. <i>Connector & terminal</i> <i>(B176) No. 18 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Go to step 2.	Replace the keyless entry control module.
2 CHECK OUTPUT SIGNAL. Measure the voltage between the keyless entry control module harness connector terminal and the chassis ground when the LOCK/ARM buttons of the keyless transmitter are pressed. <i>Connector & terminal</i> <i>(B176) No. 19 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Go to step 3.	Replace the keyless entry control module.
3 CHECK HARNESS BETWEEN KEYLESS ENTRY CONTROL MODULE AND BODY INTEGRATED UNIT. 1) Disconnect the keyless entry control module harness connector and the body integrated unit harness connector. 2) Measure the resistance between keyless entry control module harness connector terminal and body integrated unit harness connector terminal. <i>Connector & terminal</i> <i>(B176) No. 18 — (B281) No. 14:</i> <i>(B176) No. 19 — (B281) No. 13:</i>	Is the resistance less than 10 Ω ?	Replace the body integrated unit.	Check the harness for open or short circuit between the keyless entry control module and the body integrated unit.

11.CHECK HORN OPERATION

Step	Check	Yes	No
1 CHECK HORN OPERATION. Make sure the horn sounds when the horn switch is pushed.	Does the horn sound?	Go to step 2.	Check the horn circuit.
2 CHECK HORN OPERATION. 1) Disconnect the keyless entry control module harness connector. 2) Connect the harness connector terminal to ground using a suitable lead wire. <i>Connector & terminal</i> <i>(B176) No. 24 (+) — Chassis ground (-):</i>	Does the horn sound?	Replace the keyless entry control module.	Check the harness for open circuits or shorts between the keyless entry control module and the horn relay.

Keyless Entry System

SECURITY AND LOCKS

12.CHECK HAZARD LIGHT OPERATION

	Step	Check	Yes	No
1	CHECK HAZARD LIGHT OPERATION. Make sure the hazard light blinks when hazard switch is turned to ON.	Does the hazard light blink?	Go to step 2.	Check the hazard light circuit.
2	CHECK OUTPUT SIGNAL. 1) Remove the key from ignition switch. 2) Close all the doors and the rear gate. 3) Measure the voltage between the keyless entry control module harness connector terminal and the chassis ground when the LOCK/ARM buttons of the keyless transmitter are pressed. Connector & terminal (B176) No. 1 (+) — Chassis ground (-): (B176) No. 13 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Check the harness for open circuits or shorts between the keyless entry control module and the turn signal light.	Replace the keyless entry control module.

13.CHECK KEYLESS BUZZER

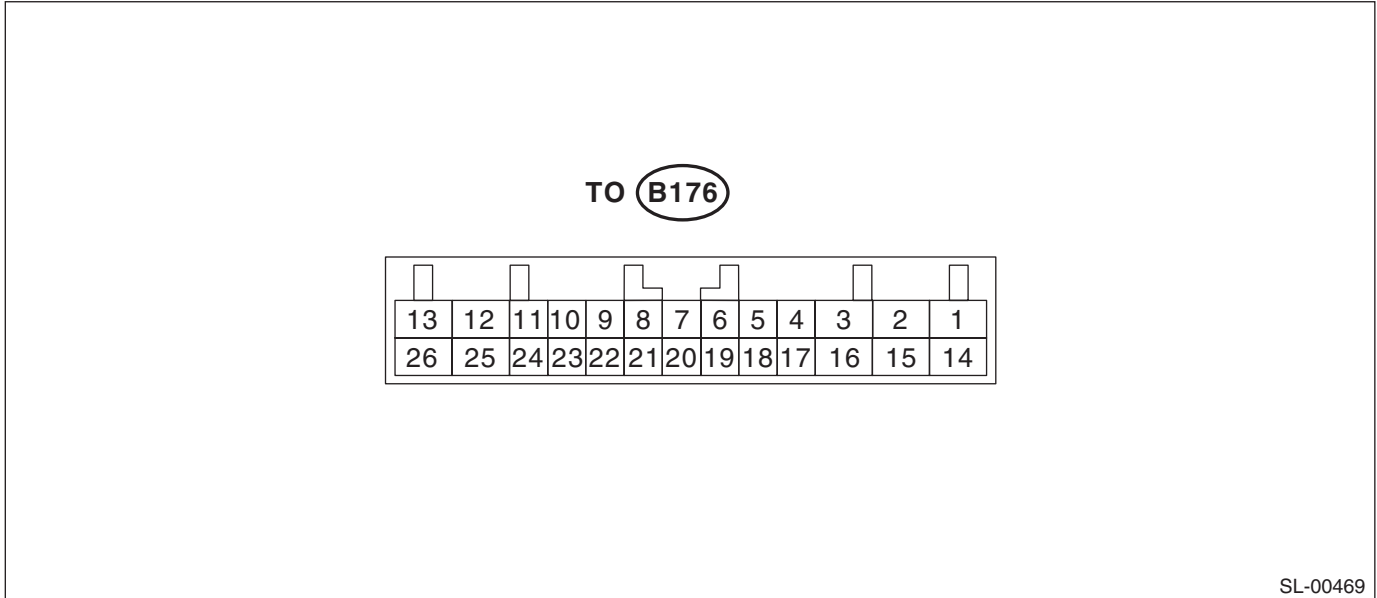
	Step	Check	Yes	No
1	CHECK FUSE. Remove and check the fuse No. 2 (in the main fuse box).	Is the fuse blown out?	Replace the fuse with a new part.	Go to step 2.
2	CHECK FOR POWER SUPPLY OF KEYLESS BUZZER. 1) Disconnect the connector from keyless buzzer. 2) Measure the voltage between the keyless buzzer harness connector terminal and the body ground. Connector & terminal (F102) No. 2 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Go to step 3.	Check for open or short circuit in the harness between fuse and keyless buzzer.
3	CHECK THE HARNESS BETWEEN KEYLESS BUZZER AND KEYLESS ENTRY CONTROL MODULE. 1) Disconnect the connector from the keyless entry control module. 2) Measure the resistance of the harness between keyless buzzer and keyless entry control module. Connector & terminal (F102) No. 1 — (B176) No. 3:	Is the resistance 10 Ω or more?	Go to step 4.	Repair the harness between keyless buzzer and keyless entry control module.
4	CHECK KEYLESS BUZZER. Connect the positive terminal (+) of the battery to No. 2 terminal of the keyless buzzer connector, and the negative (-) terminal to No. 1 terminal. Check the buzzer sounds.	Does the buzzer sound?	Replace the keyless entry control module.	Replace the keyless buzzer.

4. Security System

A: WIRING DIAGRAM

<Ref. to WI-151, WIRING DIAGRAM, Security System.>

B: ELECTRICAL SPECIFICATION



Content	Terminal No.	Measuring condition
Turn signal light LH	1 (OUTPUT)	Battery voltage is present when the alarm operation is activated.
Power supply (Backup)	2	Battery voltage is constantly present.
Door switch	6 (INPUT)	0 V is present when opening one of the doors or rear gate.
Impact sensor	8	When not applying vibration to the impact sensor, it repeats displaying the 0 V and battery voltage every 45 milliseconds.
Ignition switch (ON)	10 (INPUT)	Battery voltage is present when ignition switch is turned to ON.
Horn relay	24 (OUTPUT)	0 V is present when the alarm operation is activated.
Interrupt relay	12 (OUTPUT)	Battery voltage is present when the alarm operation is activated.
Turn signal light RH	13 (OUTPUT)	Battery voltage is present when the alarm operation is activated.
Ground	14	0 V is constantly present.
Security indicator light	15 (OUTPUT)	0 V is present when the alarm operation is activated.
Power supply for turn signal light (Backup)	26	Battery voltage is constantly present.

Security System

SECURITY AND LOCKS

C: INSPECTION

1. BASIC DIAGNOSTIC PROCEDURE

NOTE:

- Turbo model is the model with immobilizer.
- Non-turbo model is the model without immobilizer.

Step	Check	Yes	No
1 SECURITY SYSTEM SETTING. Turn the setting of security system ON. <Ref. to SL-23, SECURITY SYSTEM ON/OFF SETTING, INSPECTION, Security System.>	Is setting completed correctly?	Go to step 2.	<ul style="list-style-type: none"> • Check the ignition switch circuit. <Ref. to SL-28, CHECK IGNITION SWITCH CIRCUIT, INSPECTION, Security System.> • Check the door lock switch circuit. <Ref. to SL-9, CHECK DOOR LOCK SWITCH AND CIRCUIT, INSPECTION, Door Lock Control System.>
2 CHECK SECURITY SYSTEM SETTING OPERATION. 1) Before starting this diagnosis, open all doors. 2) Remove the key from ignition key cylinder, then close all doors and rear gate. 3) Press the LOCK/ARM button of keyless transmitter, and wait for 30 seconds.	Can the security system be set?	Go to step 3.	Go to symptom 1. <Ref. to SL-24, SYMPTOM CHART, INSPECTION, Security System.>
3 CHECK SECURITY INDICATOR LIGHT AND HAZARD LIGHT BLINKING. Check the security indicator light and hazard light blinking. NOTE: The blinking pattern of security indicator light is twice within 1 second in 1 second cycle.	Does the security indicator light and the hazard light blink?	Go to step 4.	Go to symptom 2. <Ref. to SL-24, SYMPTOM CHART, INSPECTION, Security System.>
4 CHECK SECURITY ALARM OPERATION. 1) Unlock all doors using the door lock switch on front door. 2) Open any door or rear gate.	Does the security alarm operate when opening any door or rear gate?	Go to step 5.	Go to symptom 3. <Ref. to SL-24, SYMPTOM CHART, INSPECTION, Security System.>
5 CHECK SECURITY ALARM OPERATION. Check the security alarm operation.	Do all security alarm (horn, hazard light and security indicator light) operate? And is the starter motor deactivated?	Go to step 6.	Go to symptom 4. <Ref. to SL-24, SYMPTOM CHART, INSPECTION, Security System.>
6 CHECK SECURITY ALARM CANCEL OPERATION. Press the UNLOCK/DISARM button of the keyless transmitter. NOTE: Model with immobilizer blinks once, model without immobilizer is remain off.	Do all security alarm (horn and hazard light) stop? And is the starter motor activated?	Go to step 7.	Go to symptom 5. <Ref. to SL-24, SYMPTOM CHART, INSPECTION, Security System.>

Step	Check	Yes	No
7 CHECK BATTERY DISCONNECT PROTECTION. Check that the system functions properly when the battery is disconnected temporarily. <Ref. to SL-23, CHECK BATTERY DISCONNECT PROTECTION., INSPECTION, Security System.>	Does the system function properly when the battery is disconnected temporarily?	Go to step 8 .	Replace the keyless control module.
8 CHECK IMPACT SENSOR. Check the sensitivity of impact sensor. <Ref. to SL-47, CHECK IMPACT SENSOR, ADJUSTMENT, Impact Sensor.> NOTE: Perform this procedure only to the vehicle with an impact sensor (dealer OP).	Is the sensitivity set properly?	Press the UNLOCK/DISARM button of keyless transmitter, and finish the diagnosis.	Adjust the sensitivity properly. <Ref. to SL-47, IMPACT SENSITIVITY ADJUSTMENT, ADJUSTMENT, Impact Sensor.>

2. CHECK BATTERY DISCONNECT PROTECTION.

- 1) Remove the key from the ignition switch.
 - 2) Close all the doors and rear gate.
 - 3) Open the front hood.
 - 4) Press the keyless transmitter LOCK/ARM button, and wait until the security indicator light blinks twice within 1 second in 1 second cycle.
 - 5) Disconnect the ground cable from the battery.
 - 6) Connect the ground cable to the battery.
 - 7) Check that the security indicator light blinks twice within 1 second in 1 second cycle after connecting the battery ground cable.
- If NG, replace the keyless entry control module.

3. SECURITY SYSTEM ON/OFF SETTING

NOTE:

When steps 1) to 4) are performed with the security system setting ON, the security system setting is switched to OFF.

- 1) Close all doors and the rear gate, then sit down on the driver seat. Press the UNLOCK button of the keyless transmitter.
- 2) Turn the ignition switch to ON.
- 3) While turning the center door lock switch to UNLOCK, open the driver's door, and keep this condition for 10 seconds.
- 4) Switch the security system setting (ON↔OFF), then the horn sounds.

Setting	Notification
OFF → ON	Horn sounds once.
ON → OFF	Horn sounds twice.

NOTE:

See the following for security system ON/OFF setting with the select monitor. <Ref. to SL-45, PROCEDURE, Security Control Unit.>

Security System

SECURITY AND LOCKS

4. SYMPTOM CHART

Symptom		Repair order	Reference
1	The security system cannot be set.	1. Check the keyless transmitter function.	<Ref. to SL-14, CHECK KEYLESS TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>
		2. Check the fuse.	<Ref. to SL-25, CHECK FUSE, INSPECTION, Security System.>
		3. Check the keyless entry control module power supply and ground circuit.	<Ref. to SL-26, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Security System.>
		4. Check the door switch.	<Ref. to SL-26, CHECK DOOR SWITCH, INSPECTION, Security System.>
		5. Replace the keyless entry control module.	<Ref. to SL-44, Security Control Unit.>
2	Security system can be set, but the security indicator light or hazard light does not blink.	Security indicator light	<Ref. to SL-27, CHECK SECURITY INDICATOR LIGHT CIRCUIT, INSPECTION, Security System.>
		Hazard light	<Ref. to SL-27, CHECK HAZARD LIGHT OPERATION, INSPECTION, Security System.>
3	Security system does not trigger when one of the doors is opened.	Check the door switch.	<Ref. to SL-26, CHECK DOOR SWITCH, INSPECTION, Security System.>
4	Security alarm does not activate.	All functions	Check the door switch. <Ref. to SL-26, CHECK DOOR SWITCH, INSPECTION, Security System.>
		Security indicator light	Check the security indicator light circuit. <Ref. to SL-27, CHECK SECURITY INDICATOR LIGHT CIRCUIT, INSPECTION, Security System.>
		Horn	Check the horn. <Ref. to SL-27, CHECK THE HORN, INSPECTION, Security System.>
		Hazard light	Check the hazard light operations. <Ref. to SL-27, CHECK HAZARD LIGHT OPERATION, INSPECTION, Security System.>
		Starter motor does not run.	Check the interrupt relay circuit. <Ref. to SL-28, CHECK INTERRUPT RELAY CIRCUIT, INSPECTION, Security System.>
5	The security system cannot be cancelled.	Keyless transmitter	Check the keyless transmitter function. <Ref. to SL-14, CHECK KEYLESS TRANSMITTER BATTERY AND FUNCTION, INSPECTION, Keyless Entry System.>
		Ignition switch	Check the ignition switch circuit. <Ref. to SL-28, CHECK IGNITION SWITCH CIRCUIT, INSPECTION, Security System.>

5. CHECK FUSE

	Step	Check	Yes	No
1	CHECK FUSE. Remove and visually check the fuses No. 2, No. 6 (in the main fuse box) and No. 3 (in the fuse & relay box).	Is the fuse blown out?	Replace the fuse with a new part.	Check the power supply and ground circuit. <Ref. to SL-26, CHECK POWER SUPPLY AND GROUND CIRCUIT, INSPECTION, Security System.>

Security System

SECURITY AND LOCKS

6. CHECK POWER SUPPLY AND GROUND CIRCUIT

Step	Check	Yes	No
1 CHECK POWER SUPPLY. 1) Disconnect the keyless entry control module harness connector. 2) Measure the voltage between harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B176) No. 2 (+) — Chassis ground (-):</i> <i>(B176) No. 26 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Go to step 2.	Check the harness for open circuits or shorts between the keyless entry control module and the fuse.
2 CHECK GROUND CIRCUIT. Measure the resistance between harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B176) No. 14 — Chassis ground:</i>	Is the resistance less than 10 Ω ?	The power supply and ground circuit are OK.	Repair the harness.

7. CHECK DOOR SWITCH

Step	Check	Yes	No
1 CHECK DOOR SWITCH CIRCUIT. Measure the voltage between the keyless entry control module harness connector terminal and the body ground. <i>Connector & terminal</i> <i>Front and rear door:</i> <i>(B176) No. 6 (+) — Chassis ground (-):</i> <i>Rear gate:</i> <i>(B176) No. 7 (+) — Chassis ground (-):</i>	Is the voltage 0 V when each door or rear gate is opened?	Go to step 2.	Go to step 3.
2 CHECK DOOR SWITCH CIRCUIT. Measure the voltage between the keyless entry control module harness connector terminal and the body ground. <i>Connector & terminal</i> <i>Front and rear door:</i> <i>(B176) No. 6 (+) — Chassis ground (-):</i> <i>Rear gate:</i> <i>(B176) No. 7 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more when each door or rear gate is closed?	The door switch is OK.	Go to step 3.
3 CHECK DOOR SWITCH. 1) Disconnect the door switch harness connector. 2) Measure the resistance between door switch terminals. <i>Terminals</i> <i>Door switch No. 1 — No. 3:</i> <i>Rear gate latch switch No. 1 — No. 2:</i>	Is the resistance more than 1 M Ω when door switch is pushed?	Go to step 4.	Replace the door switch.
4 CHECK DOOR SWITCH. Measure the resistance between door switch terminals. <i>Terminals</i> <i>Door switch No. 1 — No. 3:</i> <i>Rear gate latch switch No. 1 — No. 2:</i>	Is the resistance less than 1 Ω when door switch is released?	Check the harness for open circuits or shorts between the keyless entry control module and the door switch.	Replace the door switch.

8. CHECK SECURITY INDICATOR LIGHT CIRCUIT

Step	Check	Yes	No
1 CHECK SECURITY INDICATOR LIGHT. 1) Disconnect the keyless entry control module harness connector. 2) Connect the harness connector terminal to ground using a suitable lead wire. <i>Connector & terminal (B176) No. 15 — Chassis ground:</i>	Does the security indicator light illuminate?	Replace the keyless entry control module.	Go to step 2.
2 CHECK POWER SUPPLY FOR SECURITY INDICATOR LIGHT. 1) Disconnect the connector from the combination meter. 2) Measure the voltage between combination meter harness connector terminal and chassis ground. <i>Connector & terminal (i10) No. 8 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Go to step 3.	Check the harness for open or short circuits between combination meter and fuse.
3 CHECK SECURITY INDICATOR LIGHT CIRCUIT. Measure the resistance between the combination meter harness connector terminal and keyless entry control module harness connector terminal. <i>Connector & terminal (i12) No. 4 — (B176) No. 15:</i>	Is the resistance less than 10 Ω ?	Replace the combination meter.	Check the harness for open or short circuits between combination meter and keyless entry control module.

9. CHECK THE HORN

Step	Check	Yes	No
1 CHECK HORN OPERATION. Make sure the horn sounds when the horn switch is pushed.	Does the horn sound?	Go to step 2.	Check the horn circuit.
2 CHECK HORN OPERATION. 1) Disconnect the keyless entry control module harness connector. 2) Connect the harness connector terminal to ground using a suitable lead wire. <i>Connector & terminal (B176) No. 24 (+) — Chassis ground (-):</i>	Does the horn sound?	Replace the keyless entry control module.	Check the harness for open circuits or shorts between the keyless entry control module and the horn relay.

10. CHECK HAZARD LIGHT OPERATION

Step	Check	Yes	No
1 CHECK HAZARD LIGHT OPERATION. Make sure the hazard light blinks when hazard switch is turned to ON.	Does the hazard light blink?	Go to step 2.	Check the hazard light circuit.

Security System

SECURITY AND LOCKS

Step	Check	Yes	No
2 CHECK KEYLESS ENTRY CONTROL MODULE OUTPUT SIGNAL. 1) Remove the key from the ignition switch. 2) Open the driver's window, then close all doors and the rear gate. 3) Lock all doors with the keyless transmitter or door lock switch to activate the security system. 4) Unlock all doors using the door lock switch. 5) Measure the voltage between the keyless entry control module harness connector terminal and the body ground when any door is open. Connector & terminal (B176) No. 1 (+) — Chassis ground (-): (B176) No. 13 (+) — Chassis ground (-):	Is the voltage 1 — 4 V?	Check the harness for open circuits or shorts between the keyless entry control module and the turn signal light.	Replace the keyless entry control module.

11.CHECK INTERRUPT RELAY CIRCUIT

Step	Check	Yes	No
1 CHECK INTERRUPT RELAY. Remove and check interrupt relay. <Ref. to SL-48, Interrupt Relay.>	Is the interrupt relay normal?	Go to step 2.	Replace the interrupt relay.
2 CHECK INTERRUPT RELAY POWER SUPPLY. Measure the voltage between interrupt relay harness connector terminal and chassis ground. Connector & terminal (B59) No. 1 (+) — Chassis ground (-):	Is the voltage more than 10 V when ignition switch is turned to START?	Go to step 3.	Check the harness for open circuits or shorts between the interrupt relay and the ignition switch.
3 CHECK THE HARNESS BETWEEN INTERRUPT RELAY AND KEYLESS ENTRY CONTROL MODULE. 1) Turn the ignition switch to OFF. 2) Disconnect the keyless entry control module harness connector. 3) Measure the resistance of the harness between interrupt relay harness connector terminal and keyless entry control module harness connector. Connector & terminal (B59) No. 3 — (B176) No. 12:	Is the resistance less than 10 Ω ?	Replace the keyless entry control module.	Check the harness for open or short circuits between interrupt relay and keyless entry control module.

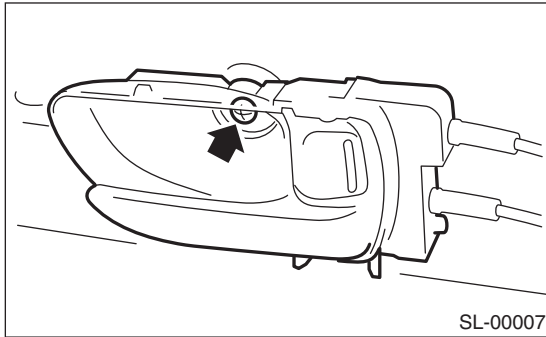
12.CHECK IGNITION SWITCH CIRCUIT

Step	Check	Yes	No
1 CHECK IGNITION SWITCH SIGNAL. 1) Disconnect the keyless entry control module harness connector. 2) Turn the ignition switch to ON. 3) Measure the voltage between harness connector terminal and chassis ground. Connector & terminal (B176) No. 10 (+) — Chassis ground (-):	Is the voltage 10 V or more?	Ignition switch is normal.	Check the harness for open circuits or shorts between the keyless entry control module and the ignition switch.

5. Front Inner Remote

A: REMOVAL

- 1) Remove the door trim. <Ref. to EI-34, REMOVAL, Front Door Trim.>
- 2) Remove the sealing cover. <Ref. to EB-13, REMOVAL, Front Sealing Cover.>
- 3) Remove the one screw and two cables.
- 4) Remove the front inner remote.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

1.5 N·m (0.15 kgf-m, 1.1 ft-lb)

NOTE:

Make sure the inner remote works properly after installation.

C: INSPECTION

- 1) Make sure the cable is not deformed.
- 2) Make sure the lever and cable move smoothly.

NOTE:

If the remote handle is a chrome plated type, check that there is plenty of grease applied to the cable joint of the remote handle.

If there is not enough grease, assemble the cable after applying additional grease.

6. Front Outer Handle

A: REMOVAL

1) Remove the door trim. <Ref. to EI-34, REMOVAL, Front Door Trim.>

CAUTION:

Do not apply excessive force to remove the door trim. This can deform the door panel.

2) Remove the sealing cover. <Ref. to EB-13, REMOVAL, Front Sealing Cover.>

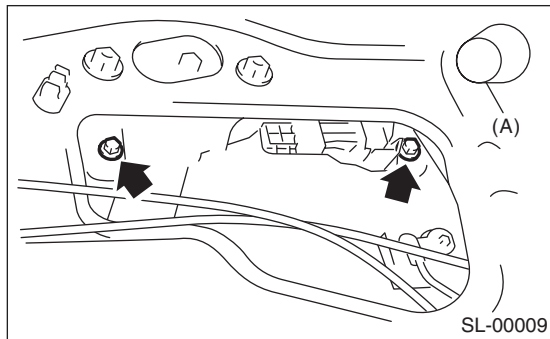
3) Remove the front inner remote. <Ref. to SL-29, REMOVAL, Front Inner Remote.>

4) Remove the cable from the cable holder and allow it to be free.

5) Remove the two bolts and the rod clamp to remove front outer handle.

NOTE:

The rear side bolt can be removed from the inner panel service hole (A) by adjusting the glass position.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

7.5 N·m (0.76 kgf·m, 5.5 ft·lb)

NOTE:

Make sure the outer handle works properly after installation.

C: INSPECTION

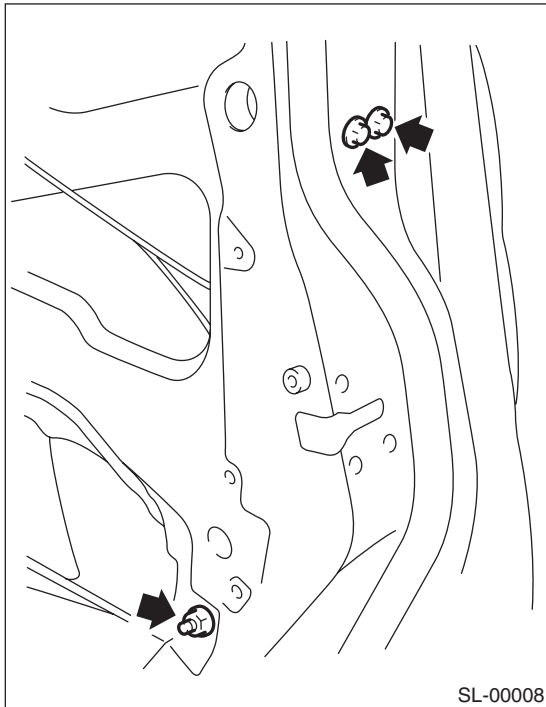
1) Make sure the rod is not deformed.

2) Make sure the lever and rod move smoothly.

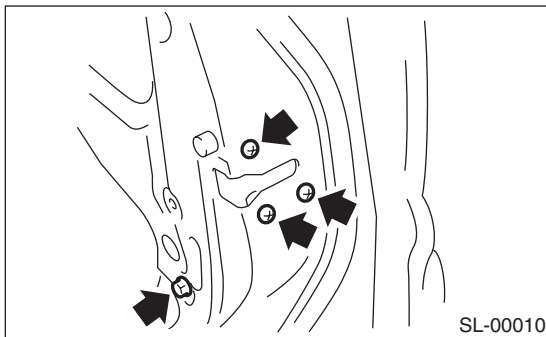
7. Front Door Latch and Door Lock Actuator Assembly

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the front door trim. <Ref. to EI-34, REMOVAL, Front Door Trim.>
- 3) Remove the sealing cover. <Ref. to EB-13, REMOVAL, Front Sealing Cover.>
- 4) Remove the front inner remote. <Ref. to SL-29, REMOVAL, Front Inner Remote.>
- 5) Remove the two bolts and one nut to remove the guide rail.



- 6) Remove the three screws and one bolt.



- 7) Remove the front door latch assembly, and disconnect the connector.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

Door latch mounting screw

6.5 N·m (0.66 kgf-m, 4.8 ft-lb)

Door lock actuator mounting bolt

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

NOTE:

Make sure the lock works properly after installation.

C: INSPECTION

- 1) Make sure the cable is not deformed.
- 2) Make sure the lever and cable move smoothly.

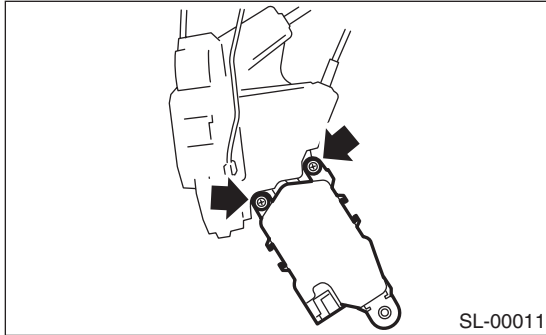
Front Door Lock Actuator

SECURITY AND LOCKS

8. Front Door Lock Actuator

A: REMOVAL

- 1) Remove the front door latch assembly. <Ref. to SL-31, REMOVAL, Front Door Latch and Door Lock Actuator Assembly.>
- 2) Loosen two screws to remove the front door lock actuator.



B: INSTALLATION

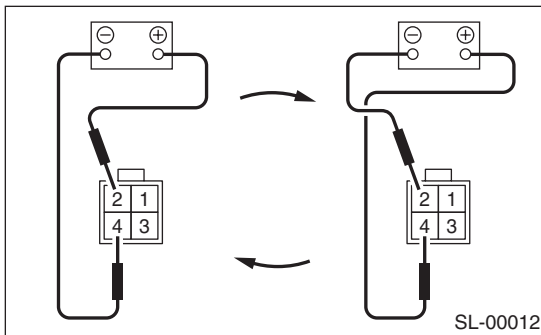
Install in the reverse order of removal.

NOTE:

Make sure the lock works properly after installation.

C: INSPECTION

- 1) Disconnect the door lock actuator harness connector.
- 2) Connect the battery to door lock actuator terminals.



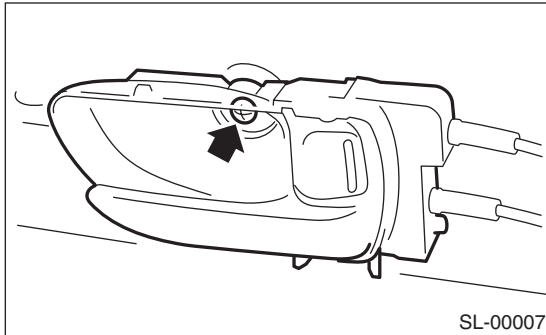
Terminal No.	Actuator operation
No. 2 (+) and No. 4 (-)	Unlock → Lock
No. 4 (+) and No. 2 (-)	Lock → Unlock

If defective, replace the door lock actuator.

9. Rear Inner Remote

A: REMOVAL

- 1) Remove the rear door trim. <Ref. to EI-35, REMOVAL, Rear Door Trim.>
- 2) Remove the sealing cover. <Ref. to EB-16, REMOVAL, Rear Sealing Cover.>
- 3) Remove the one screw and two cables.
- 4) Remove the inner remote.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

1.5 N·m (0.15 kgf-m, 1.1 ft-lb)

NOTE:

Make sure the inner remote works properly after installation.

C: INSPECTION

- 1) Make sure the cable is not deformed.
- 2) Make sure the lever and cable move smoothly.
- 3) Make sure that the rear door child safety locks operate properly.

NOTE:

If the remote handle is a chrome plated type, check that there is plenty of grease applied to the cable joint of the remote handle.

If there is not enough grease, assemble the cable after applying additional grease.

10.Rear Outer Handle

A: REMOVAL

1) Remove the rear door trim. <Ref. to EI-35, REMOVAL, Rear Door Trim.>

CAUTION:

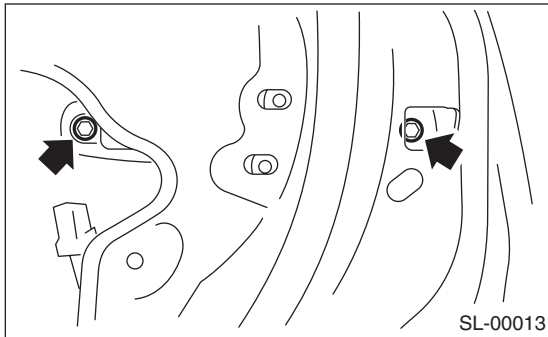
Do not apply excessive force to remove the door trim. This can deform the door panel.

2) Remove the sealing cover. <Ref. to EB-16, REMOVAL, Rear Sealing Cover.>

3) Remove the rear inner remote. <Ref. to SL-33, REMOVAL, Rear Inner Remote.>

4) Remove the rear door latch assembly. <Ref. to SL-35, REMOVAL, Rear Door Latch and Door Lock Actuator Assembly.>

5) Remove the two bolts, and then detach the rear outer handle.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

NOTE:

Make sure the outer handle works properly after installation.

C: INSPECTION

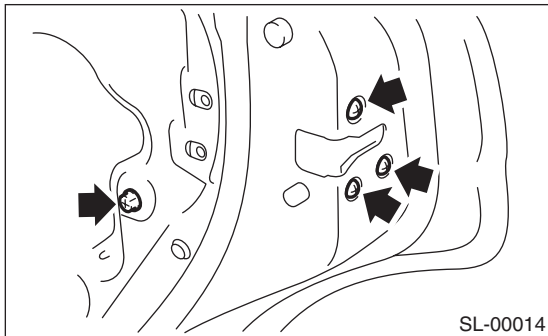
1) Make sure there are no cracks, breakage, and damage on plastic lever.

2) Make sure the plastic lever moves smoothly.

11. Rear Door Latch and Door Lock Actuator Assembly

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the rear door trim. <Ref. to EI-35, REMOVAL, Rear Door Trim.>
- 3) Remove the sealing cover. <Ref. to EB-16, REMOVAL, Rear Sealing Cover.>
- 4) Remove the rear inner remote. <Ref. to SL-33, REMOVAL, Rear Inner Remote.>
- 5) Remove the three screws and one bolt.



- 6) Disconnect the connector and then detach the rear door latch assembly.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

Door latch mounting screw

6.5 N·m (0.66 kgf-m, 4.8 ft-lb)

Door lock actuator mounting bolt

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

NOTE:

Make sure the lock works properly after installation.

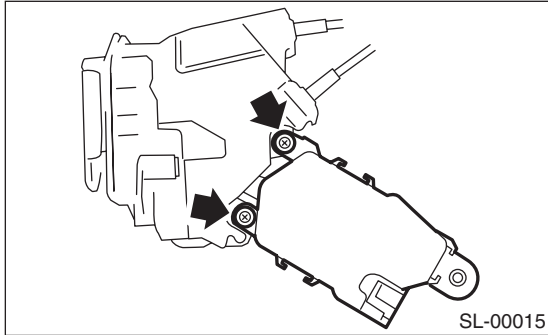
C: INSPECTION

- 1) Make sure the cable is not deformed.
- 2) Make sure the lever and cable move smoothly.

12.Rear Door Lock Actuator

A: REMOVAL

- 1) Remove the rear door latch assembly. <Ref. to SL-35, REMOVAL, Rear Door Latch and Door Lock Actuator Assembly.>
- 2) Loosen two screws to remove the rear door lock actuator.



B: INSTALLATION

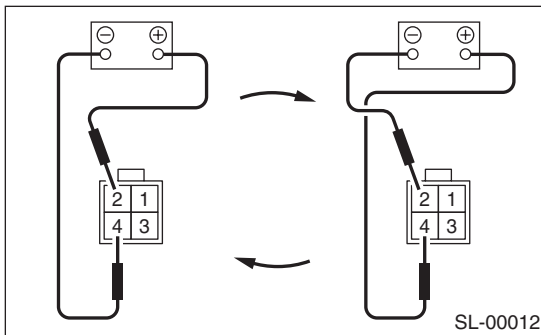
Install in the reverse order of removal.

NOTE:

Make sure the lock works properly after installation.

C: INSPECTION

- 1) Disconnect the door lock actuator harness connector.
- 2) Connect the battery to door lock actuator terminals.



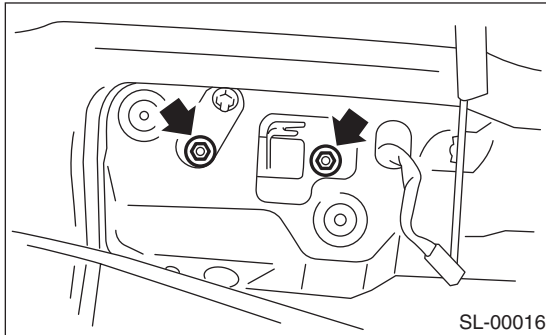
Terminal No.	Actuator operation
No. 2 (+) and No. 4 (-)	Unlock → Lock
No. 4 (+) and No. 2 (-)	Lock → Unlock

If defective, replace the door lock actuator.

13.Rear Gate Outer Handle

A: REMOVAL

- 1) Remove the rear gate trim. <Ref. to EI-47, REMOVAL, Rear Gate Trim.>
- 2) Remove the rear wiper motor assembly. <Ref. to WW-16, REMOVAL, Rear Wiper Motor.>
- 3) Remove the rear finisher light.
- 4) Remove the cable and the two nuts.



- 5) Remove the rear gate outer handle.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

7.5 N·m (0.76 kgf·m, 5.5 ft·lb)

NOTE:

Make sure the outer handle works properly after installation.

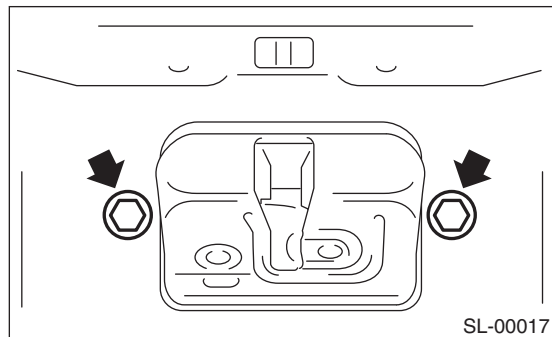
C: INSPECTION

- 1) Make sure the cable is not deformed.
- 2) Make sure the lever and cable move smoothly.

14. Rear Gate Latch Assembly

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the rear gate trim. <Ref. to EI-47, REMOVAL, Rear Gate Trim.>
- 3) Remove two bolts.



- 4) Remove the rear gate latch assembly and disconnect the connector.
- 5) Remove the rear gate outer handle cable, and then remove the rear gate latch assembly.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

25 N·m (2.5 kgf·m, 18.4 ft·lb)

NOTE:

Make sure the lock works properly after installation.

C: INSPECTION

- 1) Make sure the cable is not deformed.
- 2) Make sure that the lever and cable, rear gate latch switch, and door lock operate smoothly.

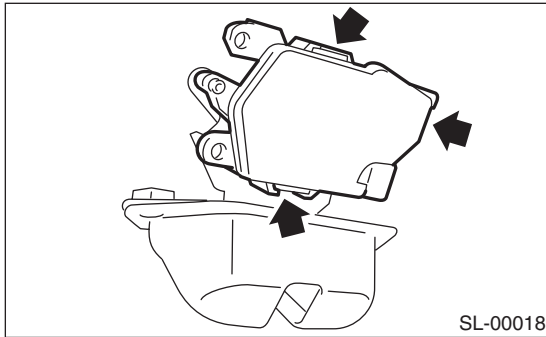
15. Rear Gate Latch Lock Actuator

A: REMOVAL

- 1) Remove the rear gate latch assembly. <Ref. to SL-38, REMOVAL, Rear Gate Latch Assembly.>
- 2) Disconnect the three claws, and then remove the rear gate latch lock actuator from the rear gate latch assembly.

CAUTION:

Do not apply excessive force to remove the actuator when removing it. This can deform the area around the rear gate latch assembly claws.



B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

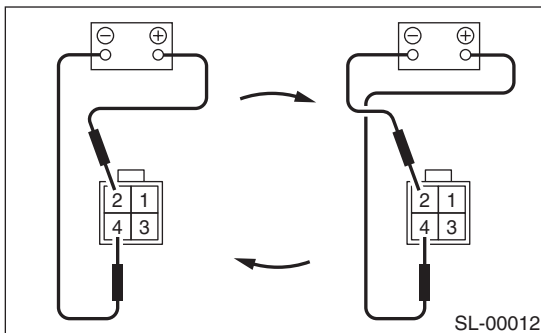
Align the rear gate latch assembly lever groove and actuator lever.

NOTE:

Make sure the lock works properly after installation.

C: INSPECTION

- 1) Disconnect the door lock actuator harness connector.
- 2) Connect the battery to door lock actuator terminals.



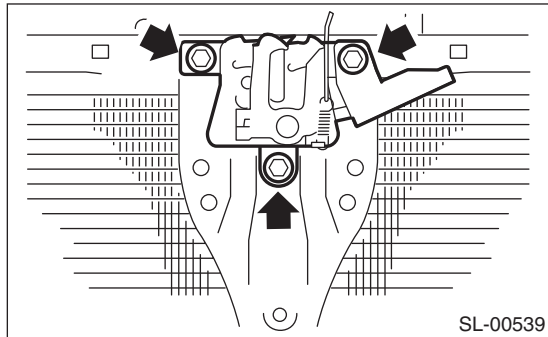
Terminal No.	Actuator operation
No. 4 (+) and No. 2 (-)	Unlock → Lock
No. 2 (+) and No. 4 (-)	Lock → Unlock

If NG, replace the rear gate latch lock actuator.

16. Front Hood Lock Assembly

A: REMOVAL

- 1) Open the front hood.
- 2) Remove the front grille.
- 3) Remove the bolts, and then detach the front hood lock assembly.
- 4) Remove the release cable from lock assembly.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

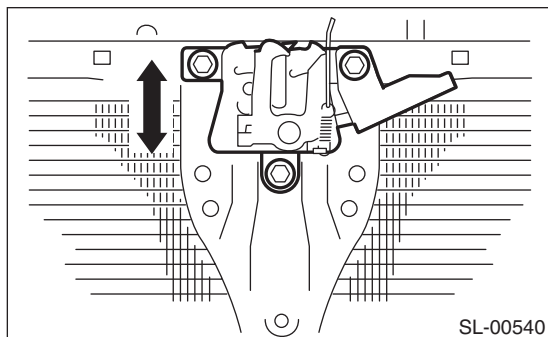
33 N·m (3.4 kgf·m, 24.6 ft·lb)

NOTE:

- Apply grease to the movable part.
- Make sure the release cable works properly after installation.

C: ADJUSTMENT

Loosen the bolt, and adjust the lock assembly while moving it up and down.



D: INSPECTION

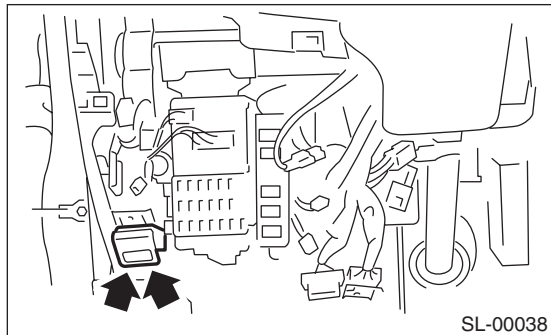
- 1) Check that there is no deformation or uneven wear in the striker.
- 2) Check the safety lever for improper movement.
- 3) Check other levers and the spring for rust formation and unsmooth movement.

17. Remote Openers

A: REMOVAL

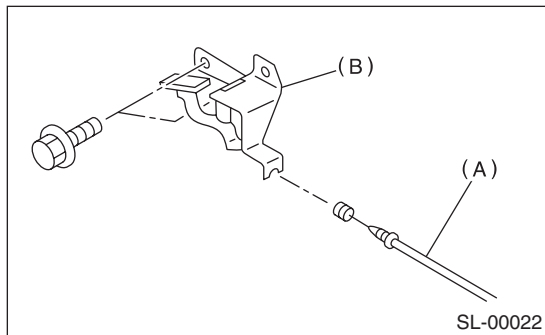
1. FRONT HOOD OPENER

- 1) Remove the hood lock assembly. <Ref. to SL-40, REMOVAL, Front Hood Lock Assembly.>
- 2) Remove the release cable from hood lock.
- 3) Remove the bolt, and then detach the opener lever.

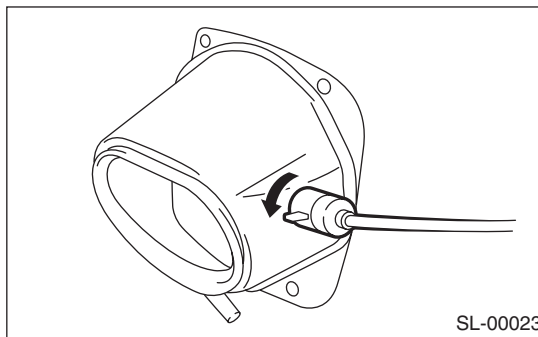


2. FUEL FLAP OPENER

- 1) Remove the rear seat. <Ref. to SE-17, REMOVAL, Rear Seat.>
- 2) Remove the center pillar lower trim and side sill cover. Remove the rear pillar lower trim. Remove the floor mat.
- 3) Remove the rear quarter trim RH. <Ref. to EI-44, REMOVAL, Rear Quarter Trim.>Remove the clip holding cable (A).
- 4) Remove the bolt, and then detach the opener pull handle (B).
- 5) Remove the cable (A) from opener pull handle (B).



- 6) Rotate the fuel lock inside the quarter panel to the left and remove.



B: INSTALLATION

1. FRONT HOOD OPENER

Install in the reverse order of removal.

2. FUEL FLAP OPENER

Install in the reverse order of removal.

Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

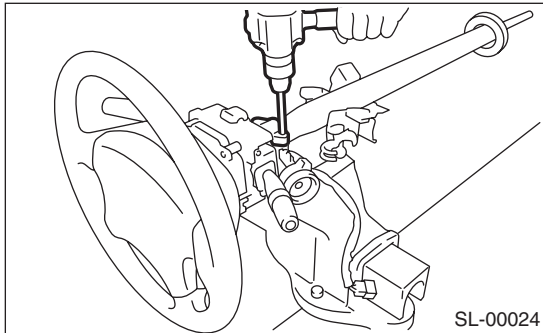
C: INSPECTION

Make sure the fuel flap opens and closes smoothly.

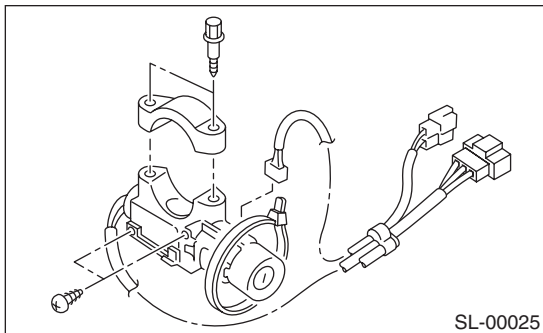
18. Ignition Key Lock

A: REPLACEMENT

- 1) Disconnect the ground cable from the battery.
- 2) Remove the steering column. <Ref. to PS-16, REMOVAL, Tilt Steering Column.>
- 3) Secure the steering column in a vise. Remove the bolt with a drill.



- 4) Remove the ignition starter and steering lock.
- 5) Use a new fixer bolt. Tighten the fixer bolt to the bolt head wrenched off.



B: INSPECTION

- 1) Remove the instrument panel lower panel.
- 2) Remove the lower column cover.
- 3) Unfasten the fixing clip which secures harness, and then disconnect the connector of the ignition switch from body harness.
- 4) Turn the ignition key plate to each position and check the continuity between terminals of ignition connector.

Switch	Terminal No.	Standard
LOCK	—	—
ACC	No. 1 and No. 2	Less than 1 Ω
ON	No. 1 and No. 2 No. 1 and No. 4 No. 2 and No. 4	Less than 1 Ω
ST	No. 1 and No. 3 No. 1 and No. 4 No. 3 and No. 4	Less than 1 Ω

If NG, replace the ignition switch.

19. Key Lock Cylinders

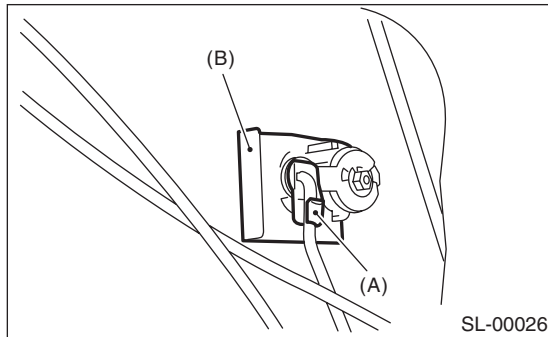
A: REPLACEMENT

1. FRONT DOOR

- 1) Remove the door trim. <Ref. to EI-34, REMOVAL, Front Door Trim.>
- 2) Remove the sealing cover. <Ref. to EB-13, REMOVAL, Front Sealing Cover.>
- 3) Completely close the front door glass.
- 4) Remove the rod clamps (A) and lock plate (B).
Replace the key cylinder.

NOTE:

Replace the lock plate (B) with a new part.



20.Security Control Unit

A: NOTE

The control of security system is carried out in keyless entry control module.

B: REMOVAL

<Ref. to SL-49, REMOVAL, Keyless Entry Control Module.>

C: INSTALLATION

<Ref. to SL-49, INSTALLATION, Keyless Entry Control Module.>

D: PROCEDURE

1. FUNCTION SETTING (ECM CUSTOMIZING)

- 1) Connect the Subaru Select Monitor to the data link connector.
 - 2) Turn the ignition switch to ON.
 - 3) On the «Main Menu» display screen, select the {Each System Check} and press the [YES] key.
 - 4) On the «System Selection Menu» display screen, select the {keyless unit mode} and press the [YES] key.
 - 5) On the «Keyless Unit Mode» display screen, select the {ECM customizing} and press the [YES] key.
 - 6) Change the setting with UP/DOWN key and press the [YES] key.
- List of function setting item (ECM customizing)

No.	Data	Initial setting value	Customize setting	Remarks
1	Security Alarm Setup	ON	ON	Security alarm (hazard and horn) in active condition.
			OFF	Security alarm in inactive condition
2	Alarm monitor delay setting	ON		After doors are locked by keyless entry system operation, alarm monitor starts in following time.
			ON	Delay time is 30 seconds.
			OFF	Delay time is 0 seconds.
3	Impact Sensor Setup	OFF	ON	Enabled when Impact Sensor Setup is set to "ON". Impact sensor function becomes activated.
			OFF	Impact sensor in inactive condition (Make sure to set models without the impact sensor to "OFF").
4	Impact Sensor Setup (OP)	OFF	ON	Vehicle is controlled in impact sensor equipped mode. (Make sure to set models without the impact sensor to "OFF". If impact sensor is set to "ON", hazard and/or horn operates after doors are locked by keyless entry system operation (Alarm monitor start).
			OFF	Vehicle is controlled in no impact sensor mode.
5	Passive arming	OFF	ON	An automatic arming feature which arms automatically even without the user intentionally locking (ARM)
			OFF	Enabled when passive arming is set to "ON."

- 7) After setting, make sure that vehicle equipment matches the changed settings in the {Current Data Display & Save}.

CAUTION:

- **The above settings most match the actual vehicle equipment for proper operation.**
- **Do not change settings other than the above while setting equipment.**
- **When installing a new keyless unit, perform initial setting again.**
- **In passive mode, the system will automatically activate the security alarm but WILL NOT automatically lock the doors. Failure to lock the doors manually will result in a high security risk.**

NOTE:

For details concerning the operation procedure, refer to "SUBARU SELECT MONITOR OPERATION MANUAL".

- 8) Turn the ignition switch to OFF, and then remove the Subaru Select Monitor.

Security Control Unit

SECURITY AND LOCKS

2. WARNING HISTORY NOTICE MODE

- 1) Turn the ignition switch to ON.
- 2) Indicator light will blink.

Check number of times indicator light blinked.	Condition of vehicle
Once	Minor WARNING has been activated by the impact sensor (OP). This may indicate that your vehicle has been subject to small shock from outside, or tampered with by an unauthorized person.
Twice	Strong WARNING has been activated by the impact sensor (OP). This may indicate that your vehicle has been subject to big shock from outside, or tampered with by an unauthorized person.
Three times	The ignition switch was turned ON.
Five times	One of the doors or the rear gate was opened.

NOTE:

- If ALARM/WARNING occurs during the armed mode, the indicator light will flash at ignition OFF → ON at the next DISARM.
- If ALARM/WARNING was not generated, the indicator light does not blink.
- If the warnings overlap, the warning with the largest number of blinks will have priority and will blink.
- For all ignition ON operation during DISARM mode, the indicator will blink, and the record is updated at the next ARM mode.

21. Impact Sensor

A: REMOVAL

NOTE:

The impact sensor is a dealer OP.

- 1) Remove the key from the ignition switch.
- 2) Close all the doors and the rear gate.
- 3) Press the UNLOCK button of the keyless transmitter.
- 4) Change the setting of impact sensor using Subaru Select Monitor.
- 5) Disconnect the ground cable from the battery.
- 6) Remove the impact sensor.

B: INSTALLATION

- 1) Remove the key from the ignition switch.
- 2) Close all the doors, trunk lid and rear gate.
- 3) Press the UNLOCK button of the keyless transmitter.
- 4) Disconnect the ground cable from the battery.
- 5) Install the impact sensor.
- 6) Connect the ground cable to the battery.
- 7) Change the setting of impact sensor using Subaru Select Monitor.

C: OPERATION

1. IMPACT SENSOR SETTING USING SUBARU SELECT MONITOR

- 1) Connect the Subaru Select Monitor to the data link connector.
- 2) Turn the ignition switch to ON.
- 3) Select {keyless unit} from the main menu.
- 4) Select {ECM customizing}.
- 5) Make a impact monitor setting.
 - When installing: ON
 - When removing: OFF
- 6) Make a impact monitor ON/OFF setting.
 - When installing: ON
 - When removing: OFF
- 7) Turn the ignition switch to OFF, and then remove the Subaru Select Monitor.

D: ADJUSTMENT

1. CHECK IMPACT SENSOR

- 1) Remove the key from the ignition switch.
- 2) Close all windows.
- 3) Close all the doors and the rear gate. Leave open the front hood.
- 4) Press the LOCK button of the keyless transmitter from outside of vehicle.
- 5) Check that after 30 seconds, the security indicator light blinks twice a second, repeating in 1 second intervals.
- 6) Hit the windshield with your palm continuously and check the security alarm operates. Lift up the front hood approx. 12 cm (4.7 in) or more, and then drop it off to check the operation of security alarm.
- 7) If NG, adjust the impact sensitivity.

2. IMPACT SENSITIVITY ADJUSTMENT

- 1) Connect the Subaru Select Monitor to the data link connector.
- 2) Turn the ignition switch to ON.
- 3) Select {Impact Sensor} from the main menu.
- 4) Make a {Sensitivity Adjustment Mode}
 - Sensitivity can be adjusted in 11 levels (0 to 10).
 - Initial setting is 5.
 - A smaller number means it will be more sensitive.
 - A larger number means it will be less sensitive.
- 5) Turn the ignition switch to OFF, and then remove the Subaru Select Monitor.

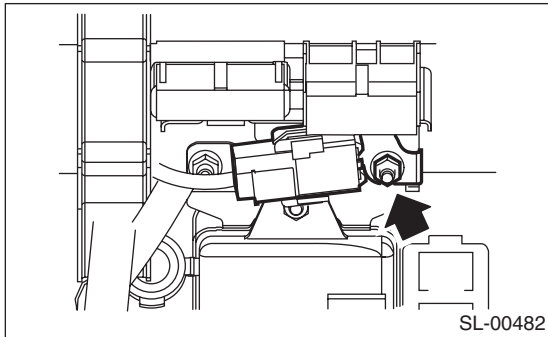
NOTE:

- Set the sensor so that it is not triggered by normal vibrations (someone reclining on the door, hit by a ball, etc.).
- Set the sensor to operate the alarm when the windshield glass or door is hit hard repeatedly, etc, where it can be assumed that there is an attempt to damage the car by a burglar, etc.
- Even if there is no attempt to steal or burglarize the car, if the vehicle is subject to an equivalent shock or vibration (from road construction, etc.), the alarm will sound. Discuss with the customer their parking environment to make sensitivity settings accordingly.

22. Interrupt Relay

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the instrument panel lower cover. <Ref. to EI-39, REMOVAL, Instrument Panel Assembly.>
- 3) Remove the mounting bolt and detach the interrupt relay (Tightened together with the fuse & relay box bracket).



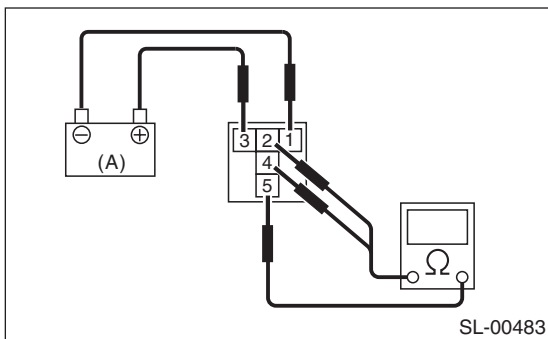
B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the interrupt relay resistance between terminals (indicated in the table below) when connecting terminal No. 3 to battery positive terminal and terminal No. 1 to battery ground terminal.

Current	Terminal No.	Standard
Flow	5 — 2	1 M Ω or more
	5 — 4	Less than 1 Ω
No flow	5 — 2	Less than 1 Ω
	5 — 4	1 M Ω or more



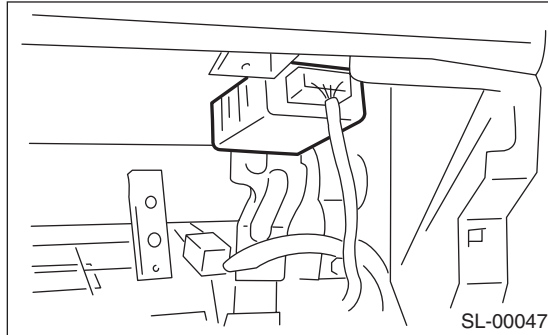
(A) Battery

If NG, replace the interrupt relay.

23. Keyless Entry Control Module

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the glove box. <Ref. to EI-36, REMOVAL, Glove Box.>
- 3) Remove the nut, then disconnect the connector to remove the keyless entry control module.



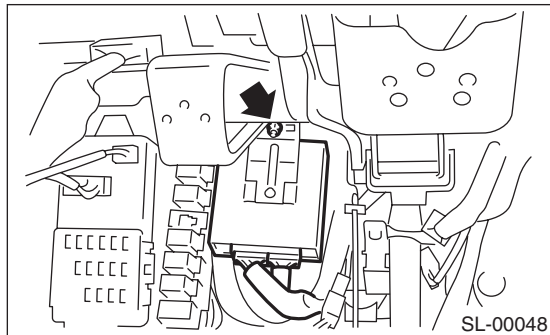
B: INSTALLATION

Install in the reverse order of removal.

24. Body Integrated Unit

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the instrument panel lower cover. <Ref. to EI-39, REMOVAL, Instrument Panel Assembly.>
- 3) Remove the nut, then disconnect the connector to remove the body integrated unit.



B: INSTALLATION

Install in the reverse order of removal.

25. Transmitter

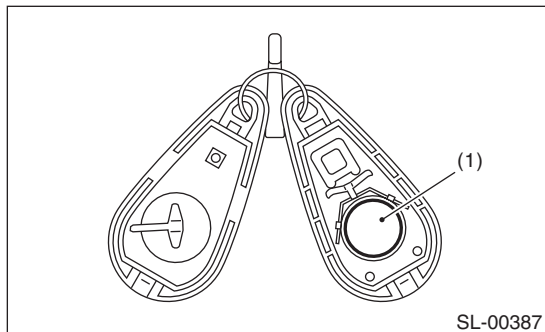
A: REMOVAL

1. KEYLESS TRANSMITTER BATTERY

Remove the battery from the keyless transmitter.

NOTE:

Before disassembling the keyless transmitter, prevent damage by static electricity to the transmitter's printed circuit board by touching a steel piece of a building etc. with your hand to discharge any static from your body and clothes.



B: INSTALLATION

1. KEYLESS TRANSMITTER BATTERY

Install in the reverse order of removal.

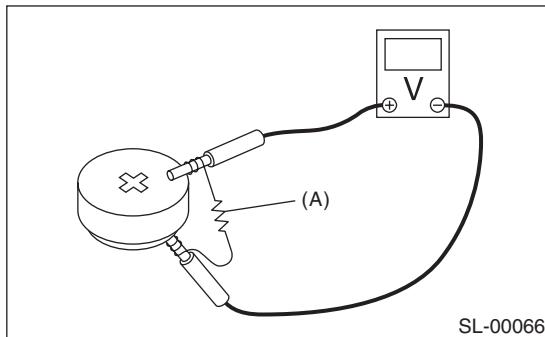
C: INSPECTION

1. KEYLESS TRANSMITTER BATTERY

Measure the voltage between the battery (+) terminal and (-) terminal.

NOTE:

The battery will discharge during the measurement. Complete the measurement within 5 seconds.



(A) Resistance (47 Ω)

Tester connection		Standard
(+)	(-)	
Battery (+) terminal	Ground terminal	2.5 — 3.0 V

If NG, replace the battery. (Use CR2025 or equivalent.)

D: REPLACEMENT

1. REGISTRATION OF KEYLESS TRANSMITTER WITH SUBARU SELECT MONITOR

NOTE:

- A maximum of four keyless transmitters can be registered for each individual vehicle.
- When replacing or adding a keyless transmitter, new registration of the transmitter is necessary.

- 1) Connect the Subaru Select Monitor to the vehicle.
- 2) Turn the ignition switch to ON.
- 3) From the «Main menu» on the Subaru Select Monitor, select the {2. Check individual system} → {7. Keyless unit mode} → {8. Keyless transmitter ID registration}.
- 4) Input the 8-digit ID number from the left, which is attached to the plastic bag of the keyless transmitter or to the transmitter inner circuit board, then select the [OK].

NOTE:

Select the [▲] on the Subaru Select Monitor to increase the number, and the [▼] to decrease. Select the [<] to move to the digit in the left, and [>] to the right.

- 5) The ID number you have entered will be shown. Make sure that the ID number shown is the same as the plastic bag.
- 6) Select the [OK] if the ID number is correct. If incorrect, select the [NO] to return to the step 3) and try again.
- 7) «ID registration in process...» is displayed and registration starts.
- 8) «ID registration done » will be displayed when the registration process is done.
- 9) To exit, select «END: NO», and select the [NO] to return to {8. Keyless transmitter ID registration}. If there are additional keyless transmitters to be registered, select «Next registration: OK», and select the [OK] to return to the step 3).

NOTE:

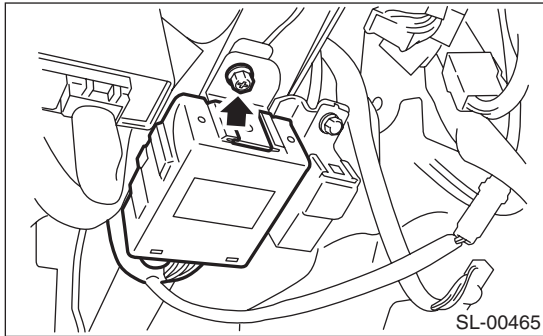
- If the registration fails, «ID registration failed. Try again.» will be shown. Select the [OK] to return to the {8. Transmitter ID registration}. And retry from the step 2).
- «END: NO» is shown on the Subaru Select Monitor when fourth keyless transmitter has been registered. Select the [NO] to return to {8. Keyless transmitter ID registration}.

26. Immobilizer Control Module

A: REMOVAL

NOTE:

- Prepare the security ID plate.
 - Prepare all registered immobilizer keys for the model with immobilizer.
 - When replacing the immobilizer control module, register the immobilizer. At that time, a new immobilizer key is required. Refer to the REGISTRATION MANUAL FOR IMMOBILIZER.
 - If not replacing the immobilizer control module, re-registration of a key used before is not required.
 - If not replacing the immobilizer control module, a maximum of four keys, including the added key, can be registered.
- 1) Disconnect the ground cable from the battery.
 - 2) Remove the instrument panel lower cover. <Ref. to EI-39, REMOVAL, Instrument Panel Assembly.>
 - 3) Disconnect the connector from immobilizer control module.
 - 4) Remove the immobilizer control module.



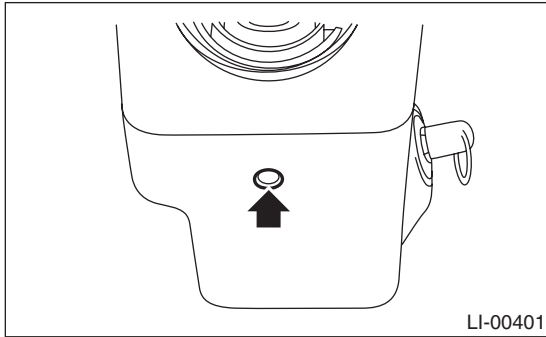
B: INSTALLATION

Install in the reverse order of removal.

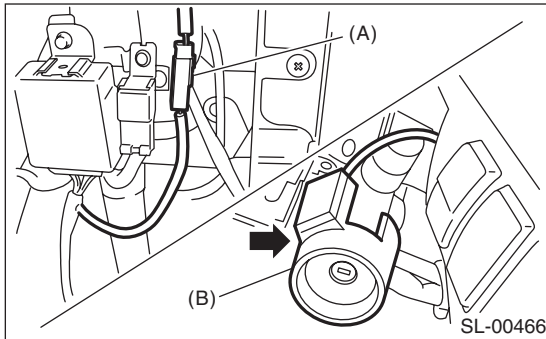
27. Immobilizer Antenna

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the instrument panel lower cover. <Ref. to EI-39, REMOVAL, Instrument Panel Assembly.>
- 3) Remove the screws, and detach the upper column cover and lower column cover.



- 4) Disconnect the immobilizer antenna connector (A) from body harness.
- 5) Remove the screws and detach the immobilizer antenna (B).



B: INSTALLATION

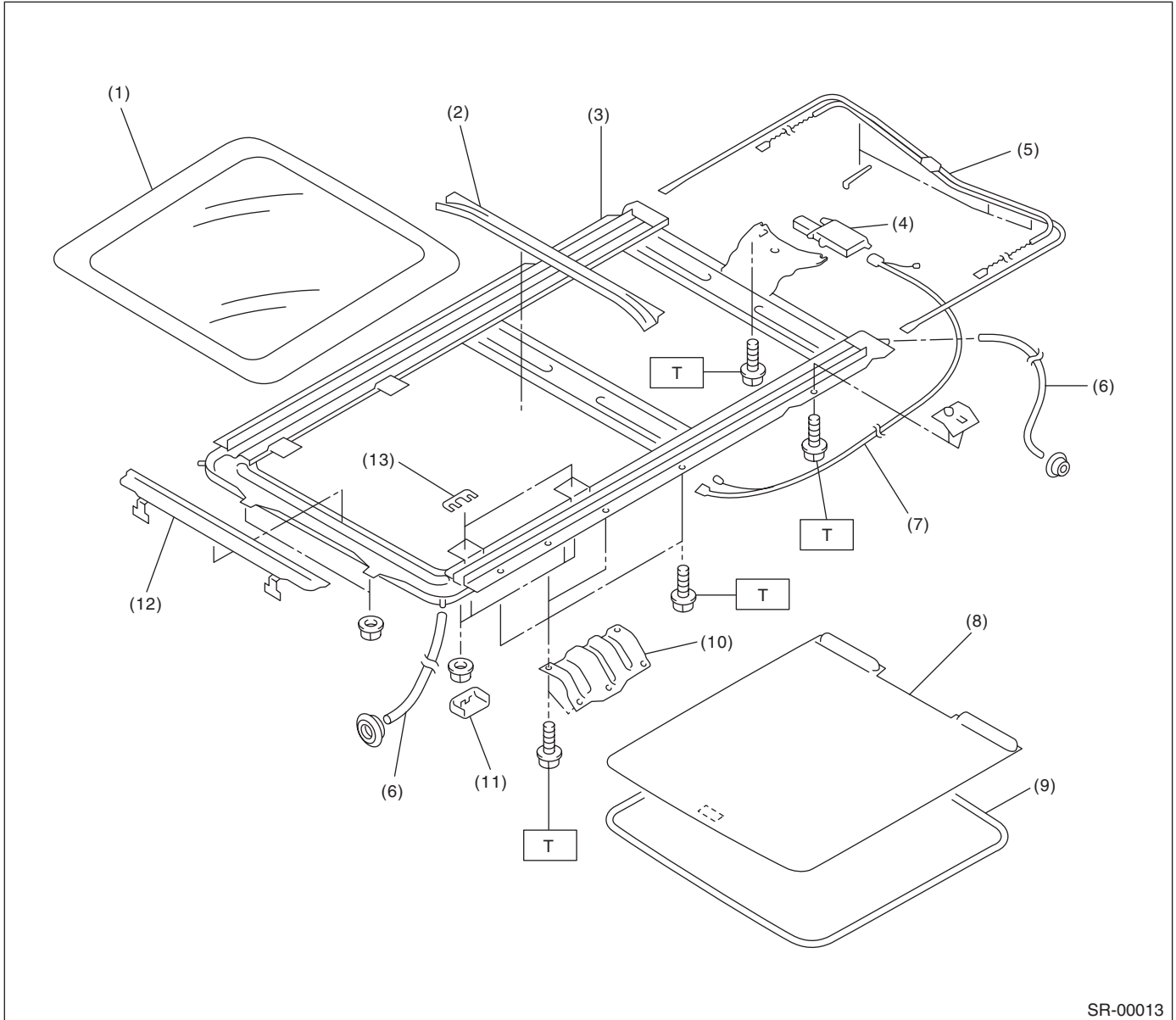
Install in the reverse order of removal.

General Description

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

1. General Description

A: COMPONENT



SR-00013

- (1) Sunroof lid
- (2) Rear drain ASSY
- (3) Sunroof frame
- (4) Sunroof motor
- (5) Drive unit
- (6) Drain tube

- (7) Harness
- (8) Sunshade
- (9) Garnish
- (10) Frame bracket
- (11) Cover

- (12) Deflector
- (13) Shim

Tightening torque: N·m (kgf·m, ft·lb)

T: 7.4 (0.75, 5.4)

General Description

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

B: CAUTION

- Before disassembling or reassembling parts, always disconnect the battery ground cable from battery. When replacing the radio, control unit, and other parts provided with memory functions, record the memory contents before disconnecting the battery ground cable in order to prevent memory deletion.
- Reassemble the parts in the reverse order of disassembly unless otherwise indicated.
- Adjust parts to the given specifications.
- Connect the connectors and hoses securely during reassembly.
- After reassembly, make sure functional parts operate smoothly.

C: PREPARATION TOOL

1. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.

Sunroof Control System

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

2. Sunroof Control System

A: WIRING DIAGRAM

1. SUNROOF

<Ref. to WI-147, WIRING DIAGRAM, Sunroof Control System.>

B: INSPECTION

Symptom	Inspection order
Water leakage	<ol style="list-style-type: none">1. Check roof panel and sunroof lid for improper or poor sealing.2. Check drain tube for clogging.3. Check sunroof frame seal and body for improper fit.
Wind noise	<ol style="list-style-type: none">1. Check sunroof lid and roof panel for improper clearance.2. Check sunshade and roof trim for improper clearance.
Abnormal motor noise	<ol style="list-style-type: none">1. Check the motor mounting screws for looseness.2. Check gears and bearings for wear.3. Check cable for wear.4. Check cable pipe for deformities.
Failure of sunroof (Motor operates properly.)	<ol style="list-style-type: none">1. Check sunroof frame for foreign particles.2. Check sunroof frame for improper installation.3. Check parts for mutual interference.4. Check cable slider for improper clinching.5. Check cable for improper installation.6. Check clutch adjusting nut for improper tightness.
Motor does not rotate or it rotates improperly.	<ol style="list-style-type: none">1. Check fuse for blown out.2. Check switch for improper function.3. Check motor for incorrect terminal voltage.4. Check the relay for improper operation.5. Check poor grounding system.6. Check harness for open or short and terminals for poor connections.7. Check limit switch for improper operation.

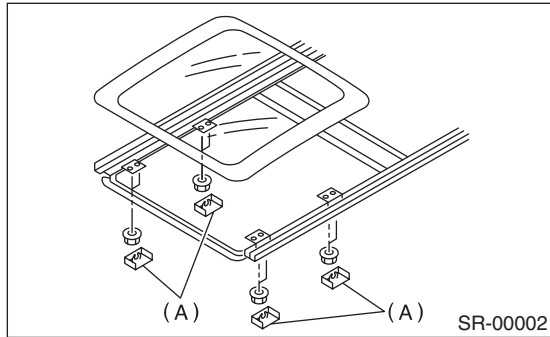
Sunroof Lid

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

3. Sunroof Lid

A: REMOVAL

- 1) Completely close the sunroof lid, and then open the sunshade.
- 2) Remove the four covers (A), and then remove the eight nuts.



- 3) Remove the sunroof lid carefully.

B: INSTALLATION

Install in the reverse order of removal.

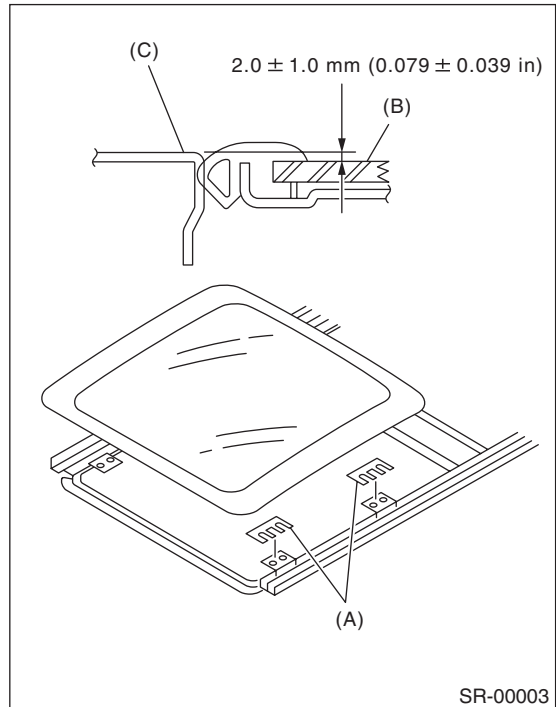
C: ADJUSTMENT

1. ALIGNMENT OF HEIGHT BETWEEN SUNROOF LID AND ROOF PANEL

Loosen the sunroof lid nuts, and then adjust the height by adding (max: four pieces) or extracting (min: zero pieces) shims (normally two pieces) which are installed between the sunroof lid and the roof panel.

Difference of height between sunroof lid and roof panel:

2.0±1.0 mm (0.079±0.039 in)



- (A) Shim
- (B) Sunroof lid
- (C) Roof panel

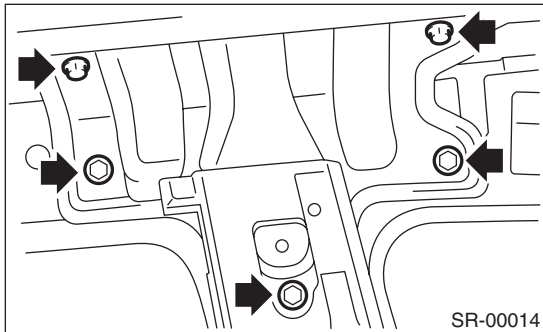
Sunroof Assembly

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

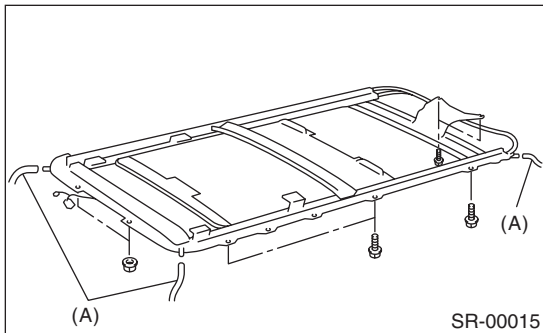
4. Sunroof Assembly

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the roof trim. <Ref. to EI-46, REMOVAL, Roof Trim.>
- 3) Remove the sunroof lid. <Ref. to SR-5, REMOVAL, Sunroof Lid.>
- 4) Disconnect the four drain tubes (A) from the sunroof frame.
- 5) Disconnect the sunroof harness connector.
- 6) Remove the bolts and then remove the frame bracket.



- 7) Remove the nuts and bolts to remove the sunroof frame.



B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

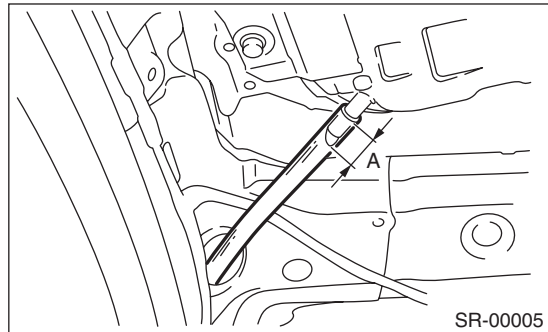
Be careful not to snag the harness.

NOTE:

- Be sure to connect the harness connector.
- When installing the drain tube, insert it securely into drain pipe.

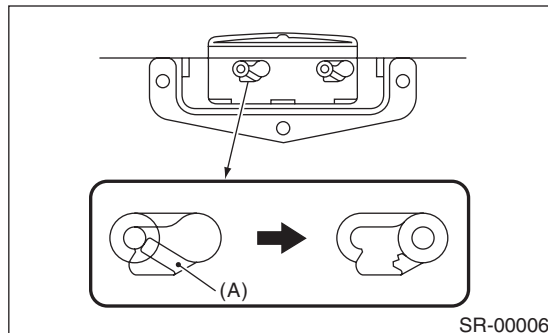
Length A:

15 mm (0.59 in) or more

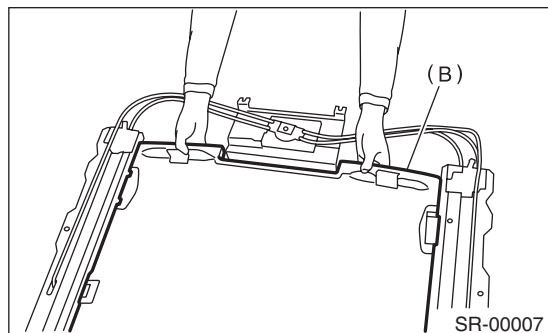


C: DISASSEMBLY

- 1) Remove the sunroof frame.
- 2) Cut the right front side sunshade claw (A).
- 3) Remove the right front slider.



- 4) Pull out the sunshade (B) from sunroof frame.



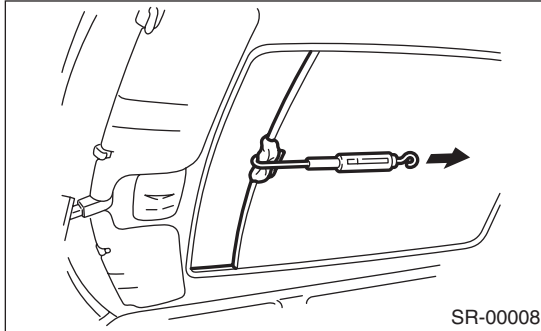
D: ASSEMBLY

Assemble in the reverse order of disassembly.

E: INSPECTION

1. CHECK FOR MOVING LOAD OF SUNSHADE

1) Attach a spring balance to sunshade edge using a cloth.



2) Pull the spring balance to measure moving load of the sunshade.

Moving load of sunshade:

Less than 25 N (2.5 kgf, 5.5 lb)

NOTE:

Moving load is larger at the beginning of pulling a spring balance, so take a spring balance reading while sunshade sliding smoothly.

3) If moving load exceeds specifications, check the sunroof lid, sunshade, deflector and sunroof frame for improper installation.

Sunroof Motor

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

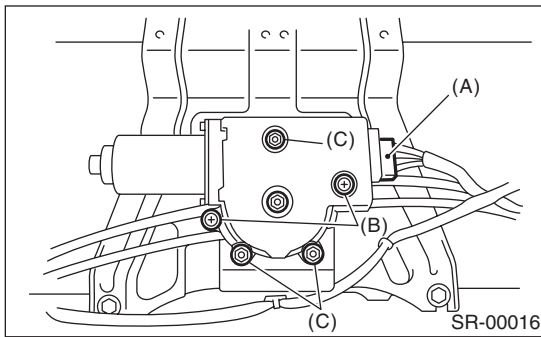
5. Sunroof Motor

A: REMOVAL

CAUTION:

- When removing the sunroof motor, completely close the sunroof.
- When removing the clip, use great care not to damage the roof trim.

- 1) Completely close the sunroof lid.
- 2) Disconnect the ground cable from the battery.
- 3) Remove the roof trim. <Ref. to EI-46, REMOVAL, Roof Trim.>
- 4) Disconnect the harness connector (A), and then remove the sunroof motor mounting screws (B) and nuts (C).



B: INSTALLATION

CAUTION:

When installing the sunroof motor assembly, be careful not to move the sunroof cable.

- 1) Install the sunroof motor.
- 2) Connect the sunroof motor harness connector of motor assembly, and then connect the battery ground cable to battery.
- 3) Reset the sunroof motor. <Ref. to SR-8, ADJUSTMENT, Sunroof Motor.>
- 4) Check the sunroof operation as follows:

Inspection order	Switch position
(1) Sunroof closes completely.	Close
(2) Sunroof opens 500 mm (19.7 in) away from completely closed position.	Open
(3) Sunroof opens completely.	Open
(4) Sunroof closes 200 mm (7.87 in) in front of the completely closed position.	Close
(5) Sunroof closes completely.	Close

- 5) Install the roof trim. <Ref. to EI-46, INSTALLATION, Roof Trim.>

C: ADJUSTMENT

- 1) Reset the sunroof motor.
 - (1) Completely close the sunroof lid. At this time, it operates intermittently in 50 mm (1.97 in) amounts. The switch must be pressed several times.
 - (2) Then continue pushing the switch for more than one second to the CLOSE side.
 - (3) Open the sunroof lid approximately 400 mm (15.75 in) out.
 - (4) Completely close the sunroof lid, then continue pushing the switch for more than one second to the CLOSE side. (This operation enables the auto operation.)

D: INSPECTION

1. WINDOW AUTO-REVERSE MECHANISM

- 1) Open the sunroof lid.
- 2) Forcefully push the sunroof lid in the opening direction while auto-closing, to check whether the window auto-reverse mechanism functions.
- 3) Check whether the window auto-reverse mechanism operates and the roof moves back 150 mm (5.91 in) in the opening direction.

CAUTION:

Do not place objects in the way to check the auto-reverse mechanism.

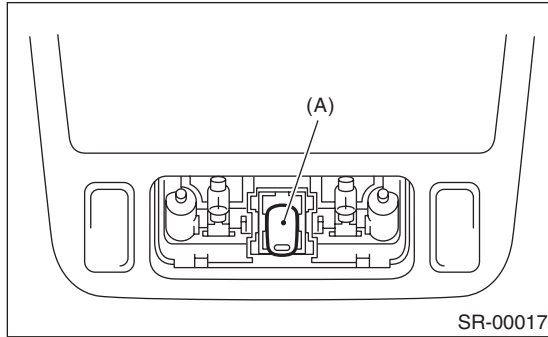
NOTE:

- The auto-function is cancelled when the window auto-reverse mechanism is activated more than five times.
- If the auto function is cancelled, reset it. <Ref. to SR-8, ADJUSTMENT, Sunroof Motor.>

6. Sunroof Switch

A: REMOVAL

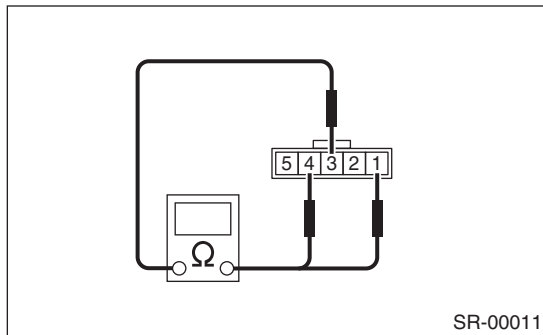
- 1) Disconnect the ground cable from the battery.
- 2) Remove the spot map light. <Ref. to LI-29, REMOVAL, Spot Map Light.>
- 3) Disconnect the harness connector, and then remove the sunroof switch (A).



B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION



Inspect the continuity between each terminal during operation of the switches.

Switch	Terminal No.	Standard
Open	1 and 3	Less than 1 Ω
Close	3 and 4	Less than 1 Ω

Sunroof Switch

SUNROOF/T-TOP/CONVERTIBLE TOP (SUNROOF)

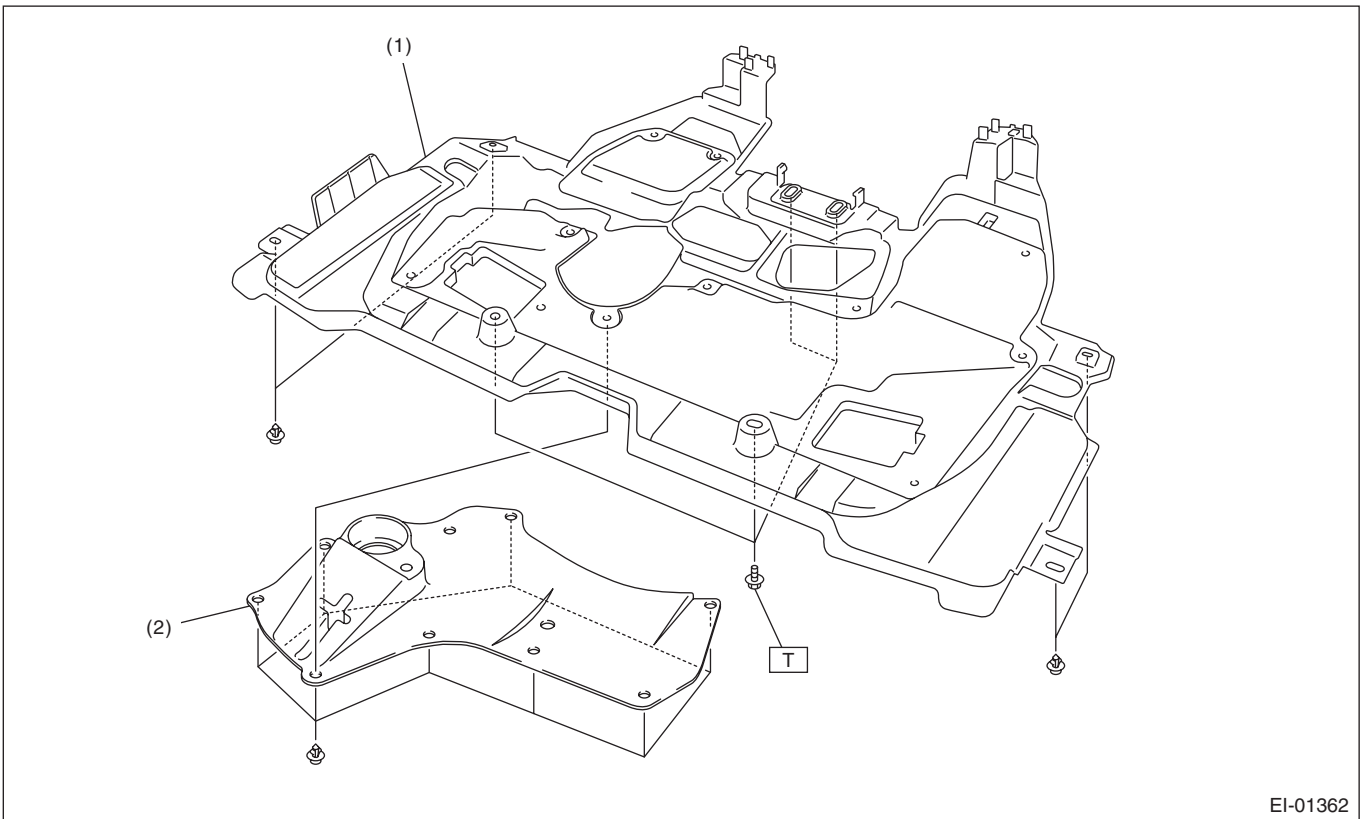
General Description

EXTERIOR/INTERIOR TRIM

1. General Description

A: COMPONENT

1. UNDER COVER



EI-01362

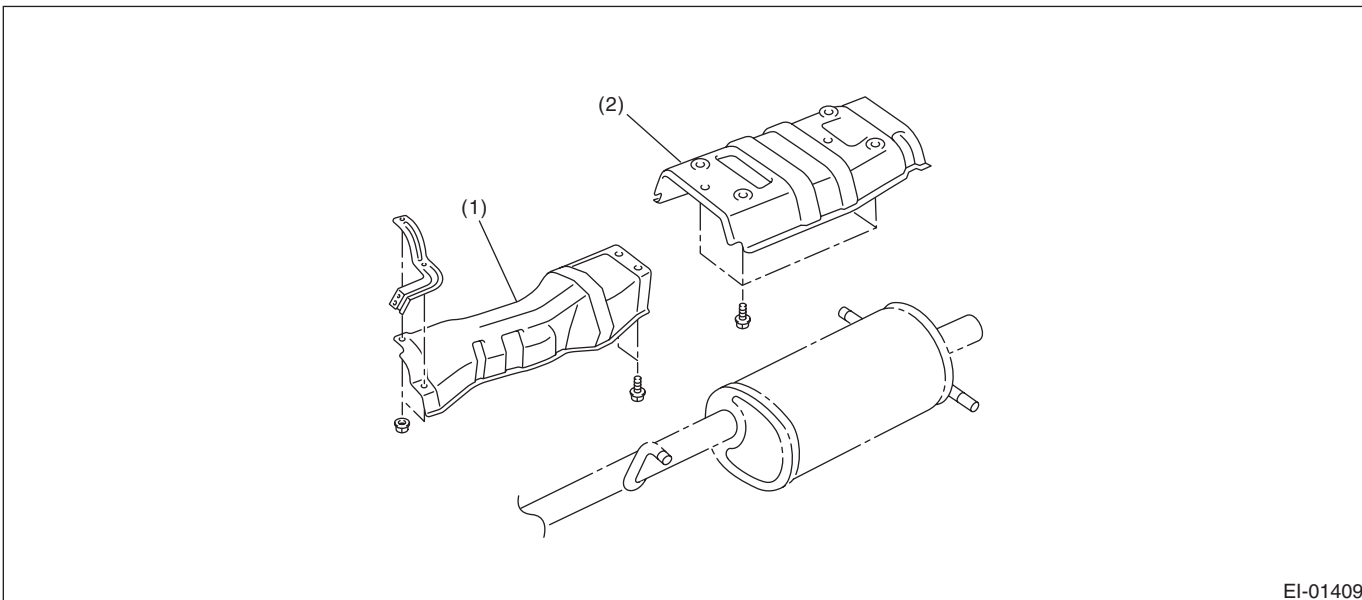
(1) Front under cover

(2) Service hole cover

Tightening torque: N·m (kgf·m, ft·lb)

T: 18 (1.84, 13.3)

2. HEAT SHIELD COVER

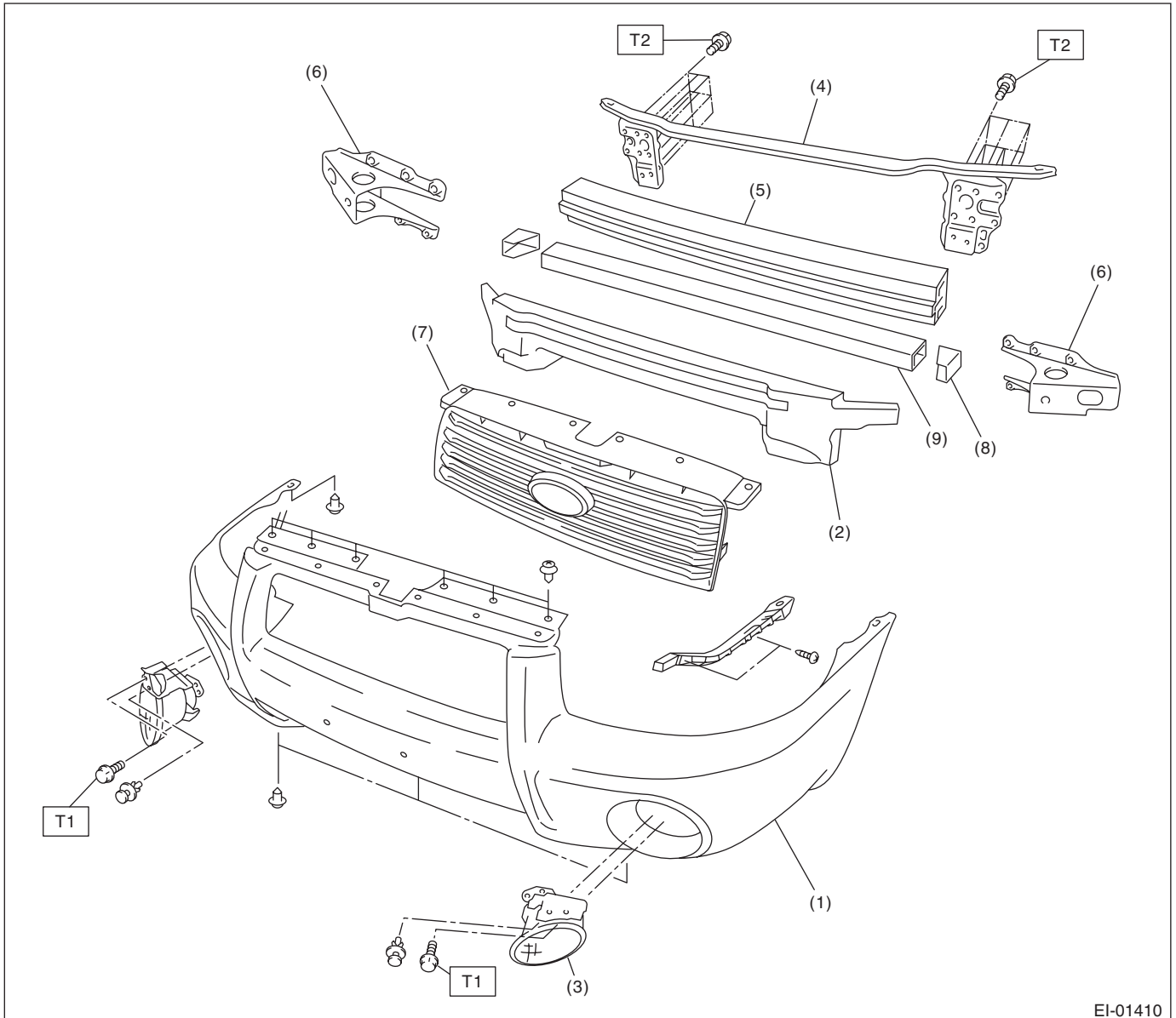


EI-01409

(1) Center heat shield cover

(2) Rear heat shield cover

3. FRONT BUMPER



EI-01410

- | | |
|-----------------|------------------------------|
| (1) Bumper face | (6) Side bracket |
| (2) E/A Form | (7) Front grille |
| (3) Fog light | (8) Lower beam reinforcement |
| (4) Upper beam | (9) Lower beam |
| (5) Main beam | |

Tightening torque: N·m (kgf·m, ft·lb)

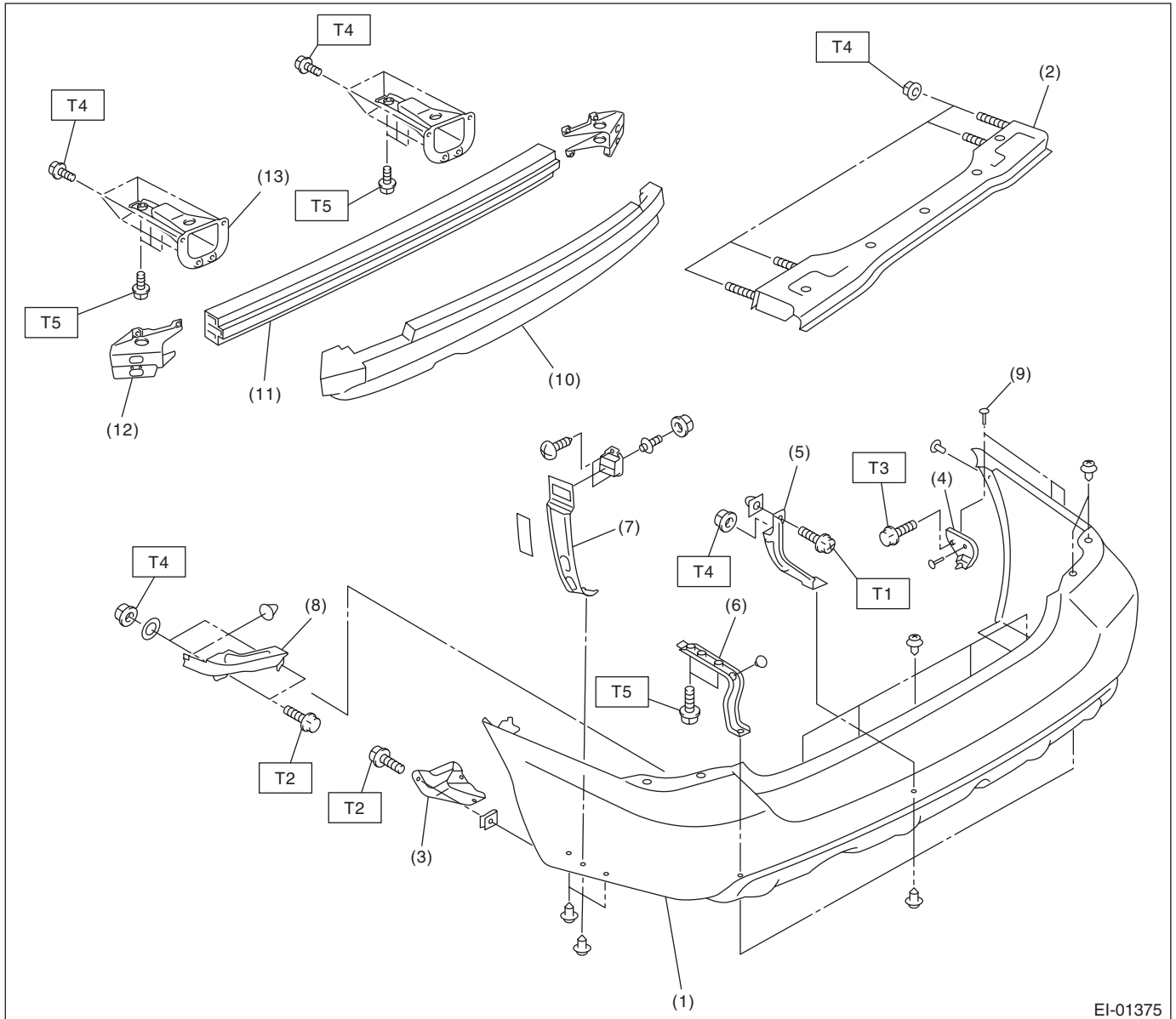
T1: 7.5 (0.76, 5.53)

T2: 70 (7.1, 51)

General Description

EXTERIOR/INTERIOR TRIM

4. REAR BUMPER



EI-01375

- | | |
|------------------------------------|---------------------------------|
| (1) Bumper face | (8) Rear bumper upper beam side |
| (2) Rear bumper upper beam | (9) Rivet |
| (3) Cover rear arch | (10) E/A Form |
| (4) Bracket side rear bumper front | (11) Main beam |
| (5) Bracket center | (12) Side bracket |
| (6) Stay COMPL | (13) Bumper stay |
| (7) Bracket bumper side rear ASSY | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 1.8 (0.18, 1.3)

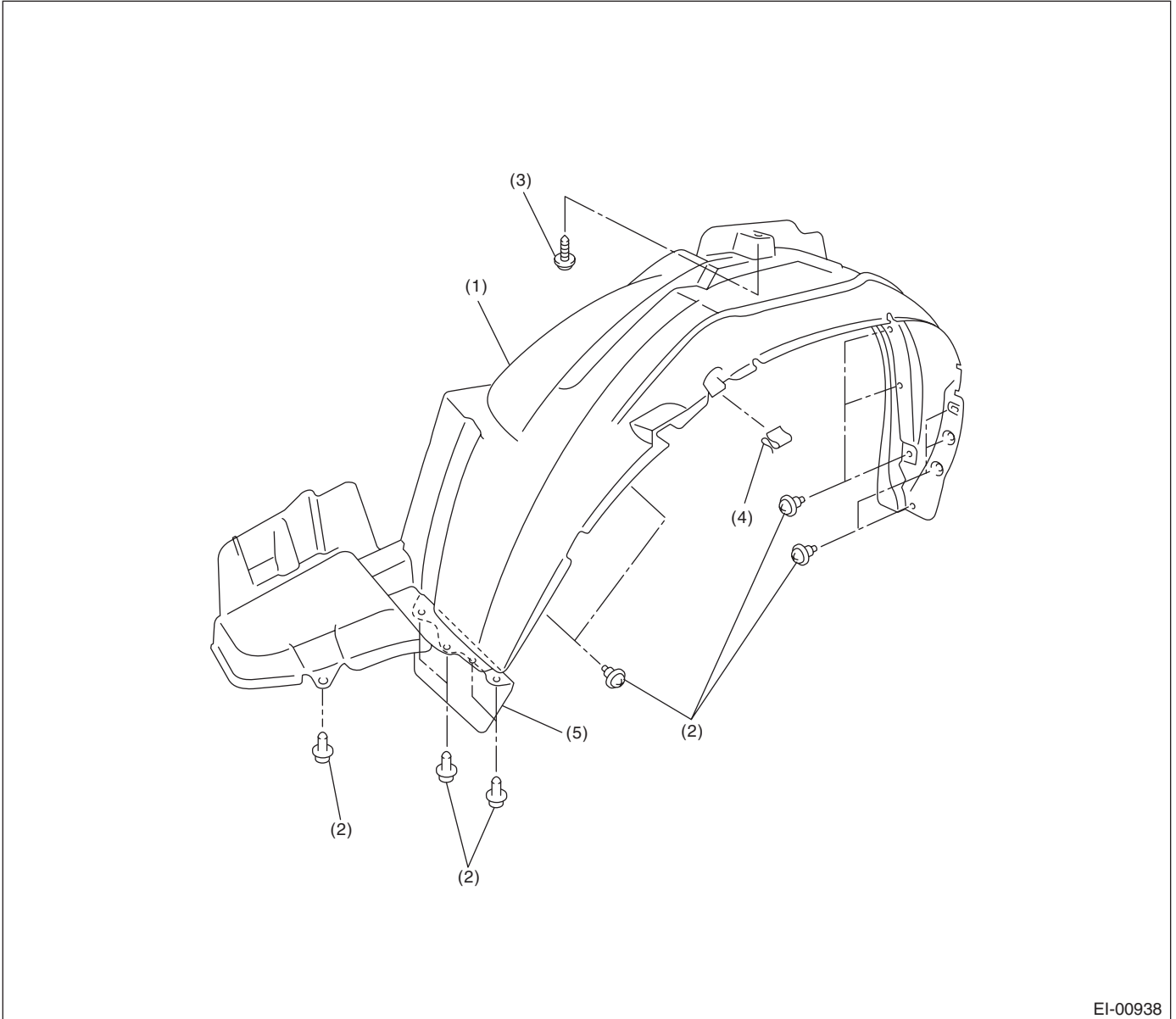
T2: 4.4 (0.45, 3.26)

T3: 7.4 (0.75, 5.46)

T4: 32 (3.3, 24)

T5: 93 (9.5, 68.7)

5. MUD GUARD



EI-00938

(1) Mud guard

(2) Clip

(3) Screw

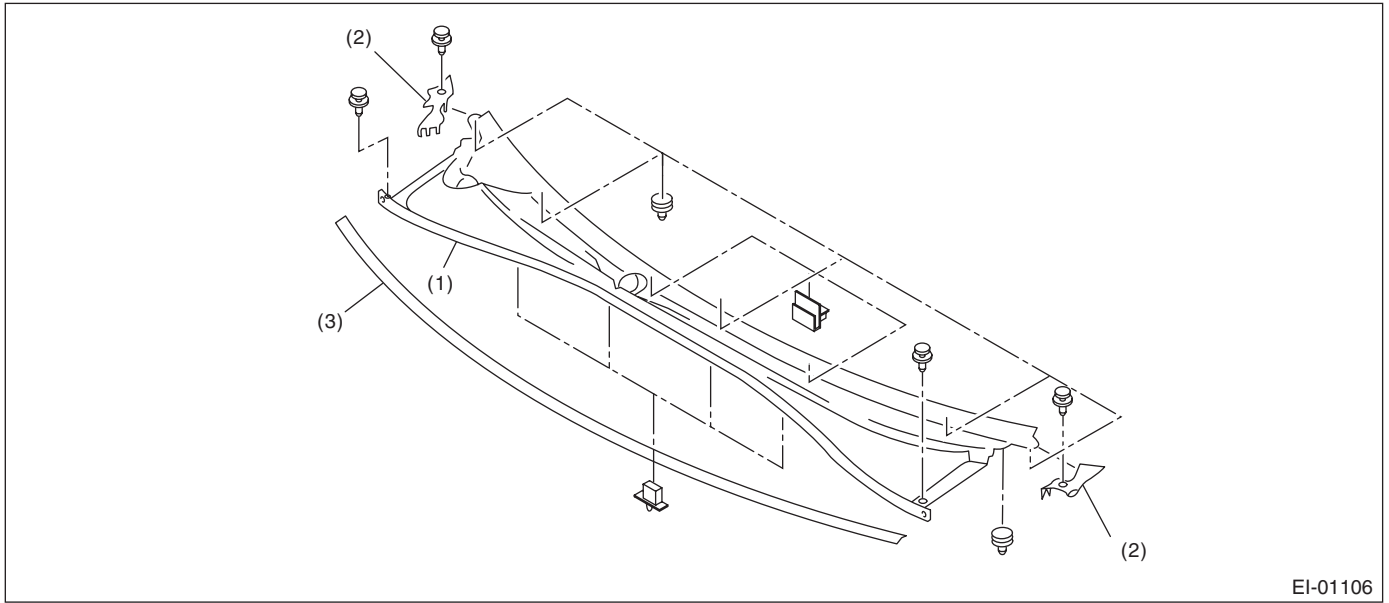
(4) Clip (S-shaped)

(5) Air flap

General Description

EXTERIOR/INTERIOR TRIM

6. COWL PANEL



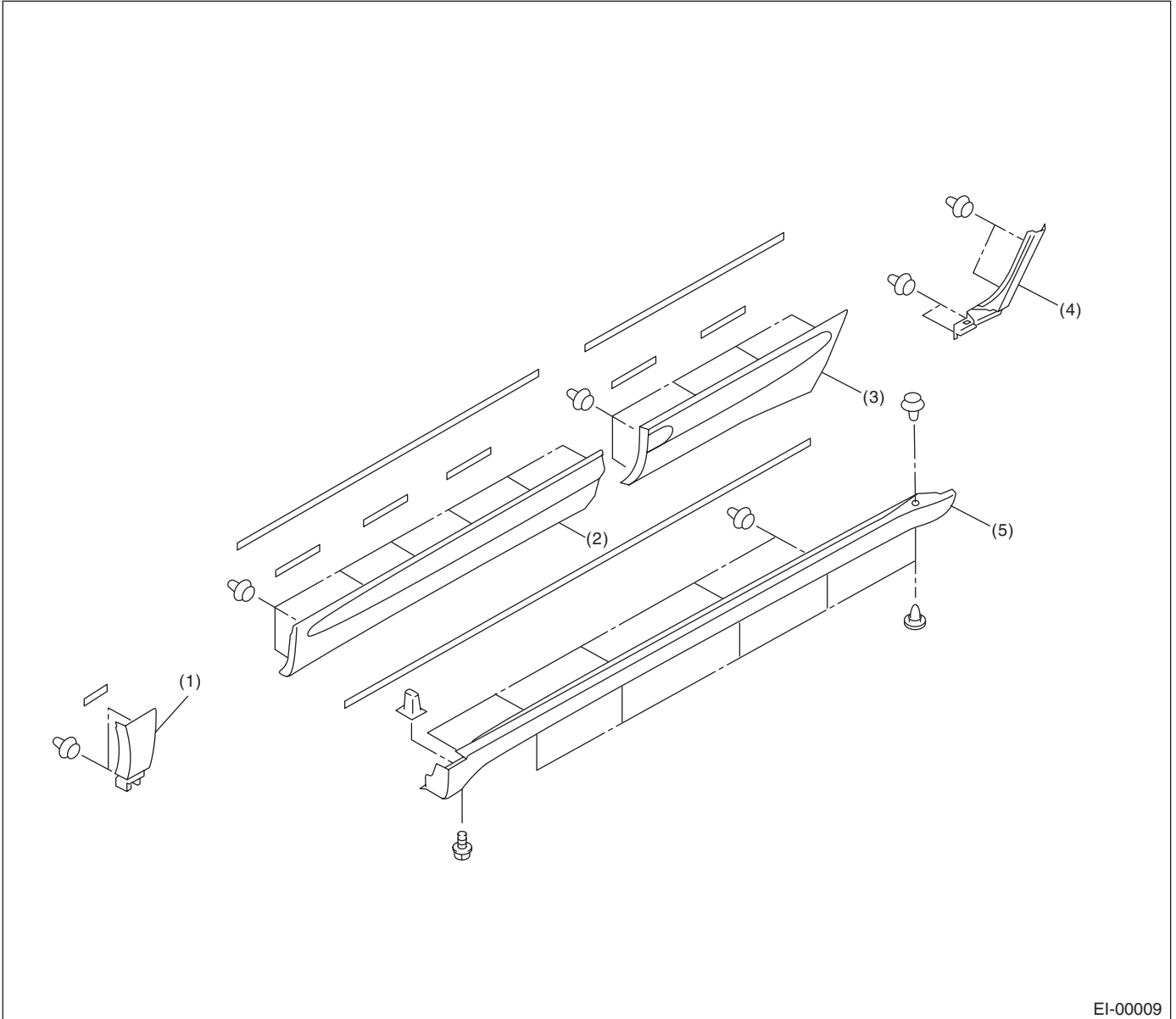
EI-01106

(1) Cowl panel

(2) Cowl panel side

(3) Seal

7. SIDE SILL SPOILER



EI-00009

(1) Side garnish (Front fender)
(2) Side garnish (Front door)

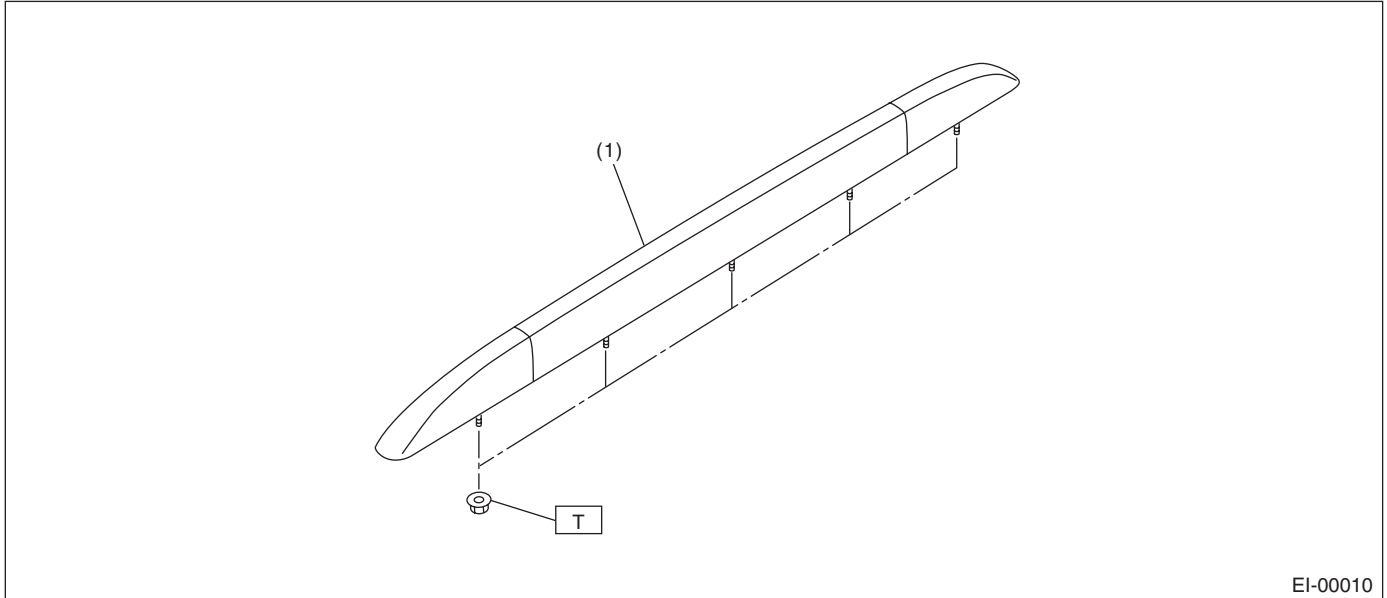
(3) Side garnish (Rear door)
(4) Side garnish (Rear quarter)

(5) Side garnish (Side sill)

General Description

EXTERIOR/INTERIOR TRIM

8. ROOF RAIL



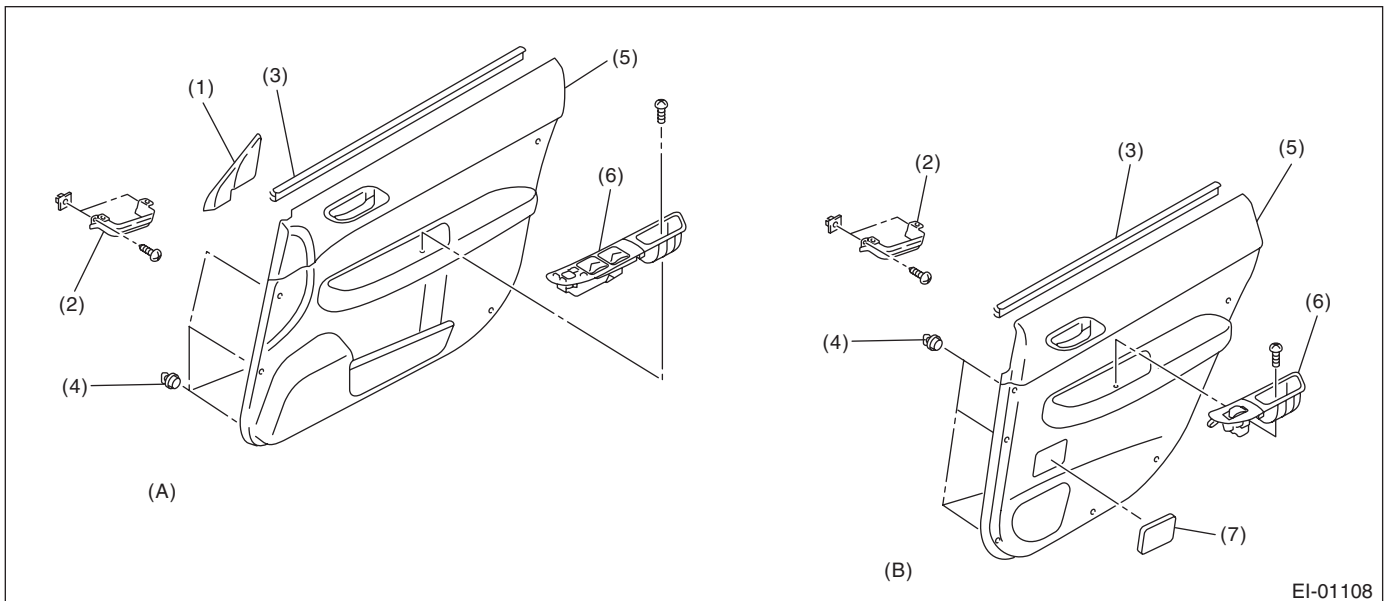
EI-00010

(1) Roof rail

Tightening torque: N·m (kgf·m, ft·lb)

T: 7.5 (0.76, 5.53)

9. DOOR TRIM



EI-01108

(A) Front door trim

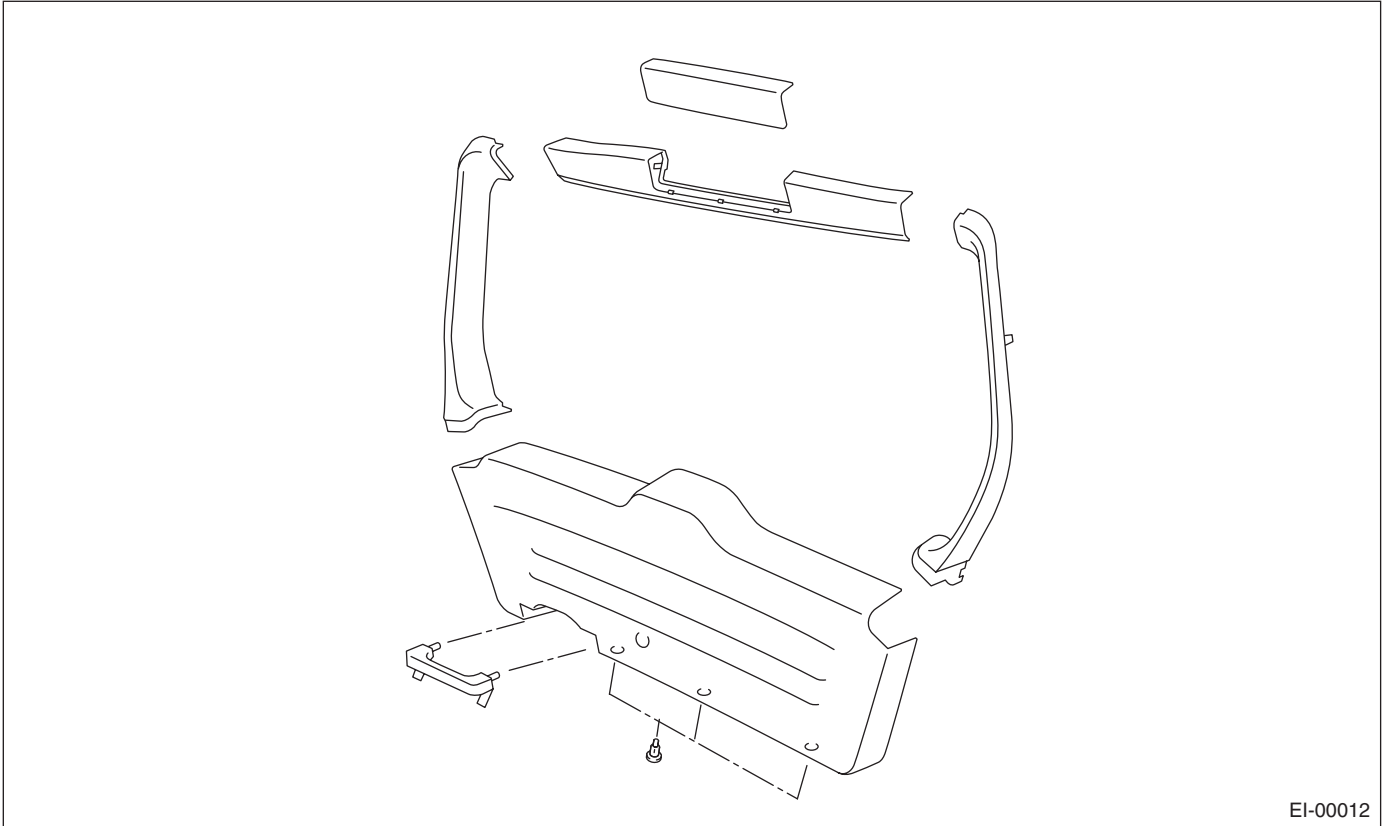
(B) Rear door trim

- (1) Gusset cover
- (2) Bracket
- (3) Upper weather strip

- (4) Clip
- (5) Trim panel
- (6) Power window switch cover

(7) Cover

10.REAR GATE TRIM

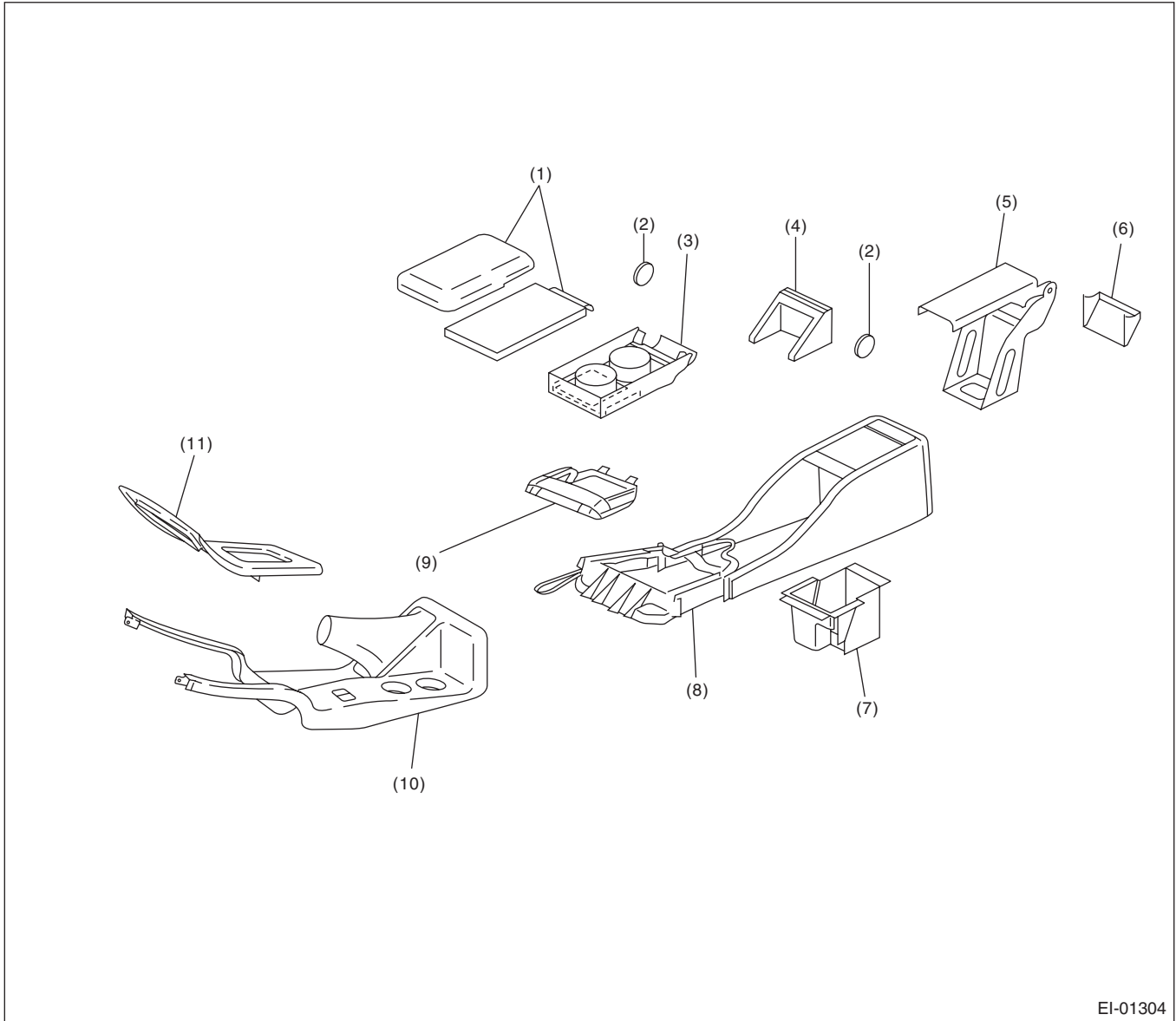


EI-00012

General Description

EXTERIOR/INTERIOR TRIM

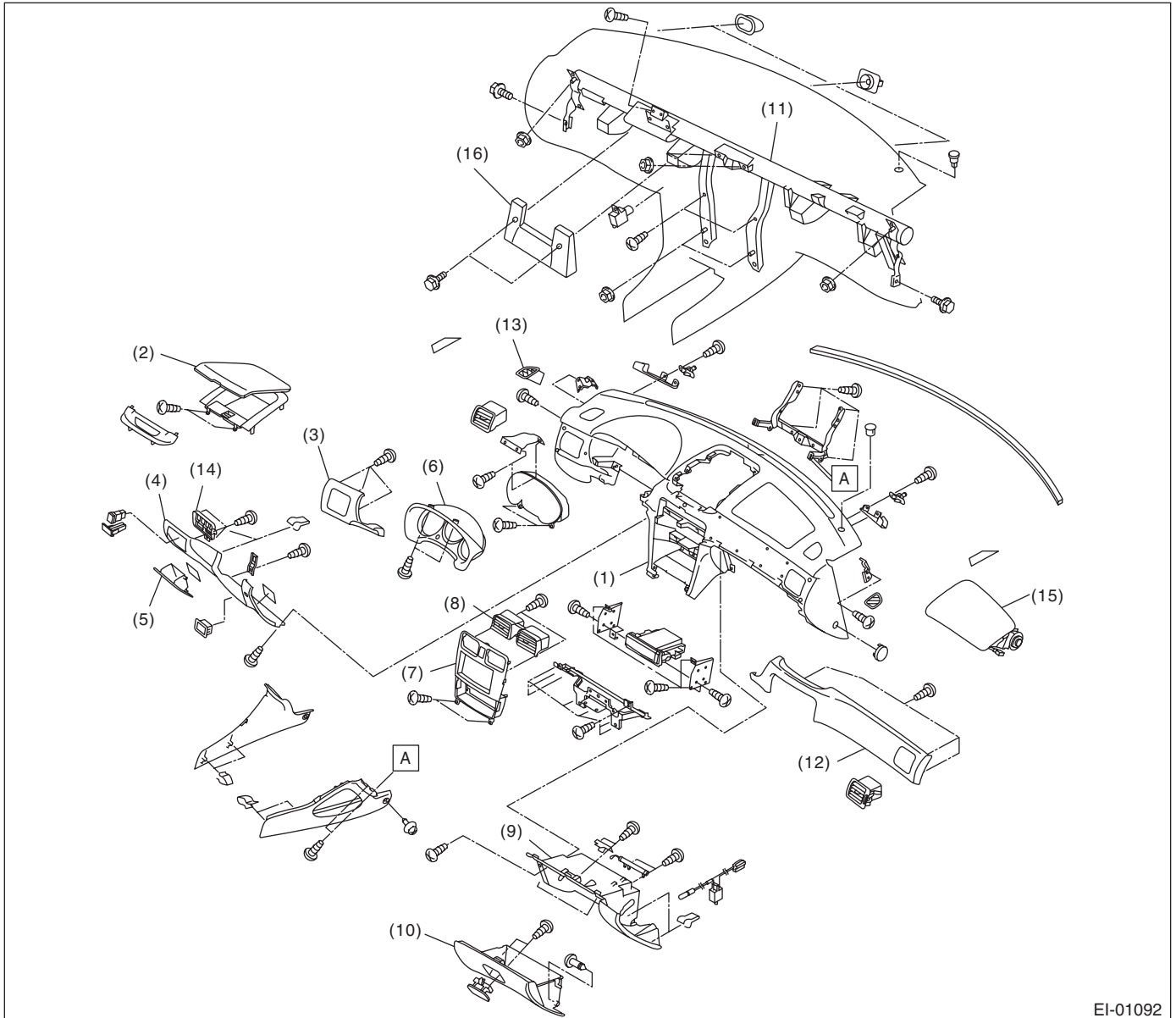
11.CONSOLE BOX



EI-01304

- | | | |
|-----------------------|----------------------|--------------------------|
| (1) Arm cover | (5) Armrest frame | (9) Console lid and tray |
| (2) Hinge cover | (6) Hinge rear cover | (10) Console cover |
| (3) Cup holder | (7) Console pocket | (11) Front cover |
| (4) Hinge front cover | (8) Console box | |

12. INSTRUMENT PANEL



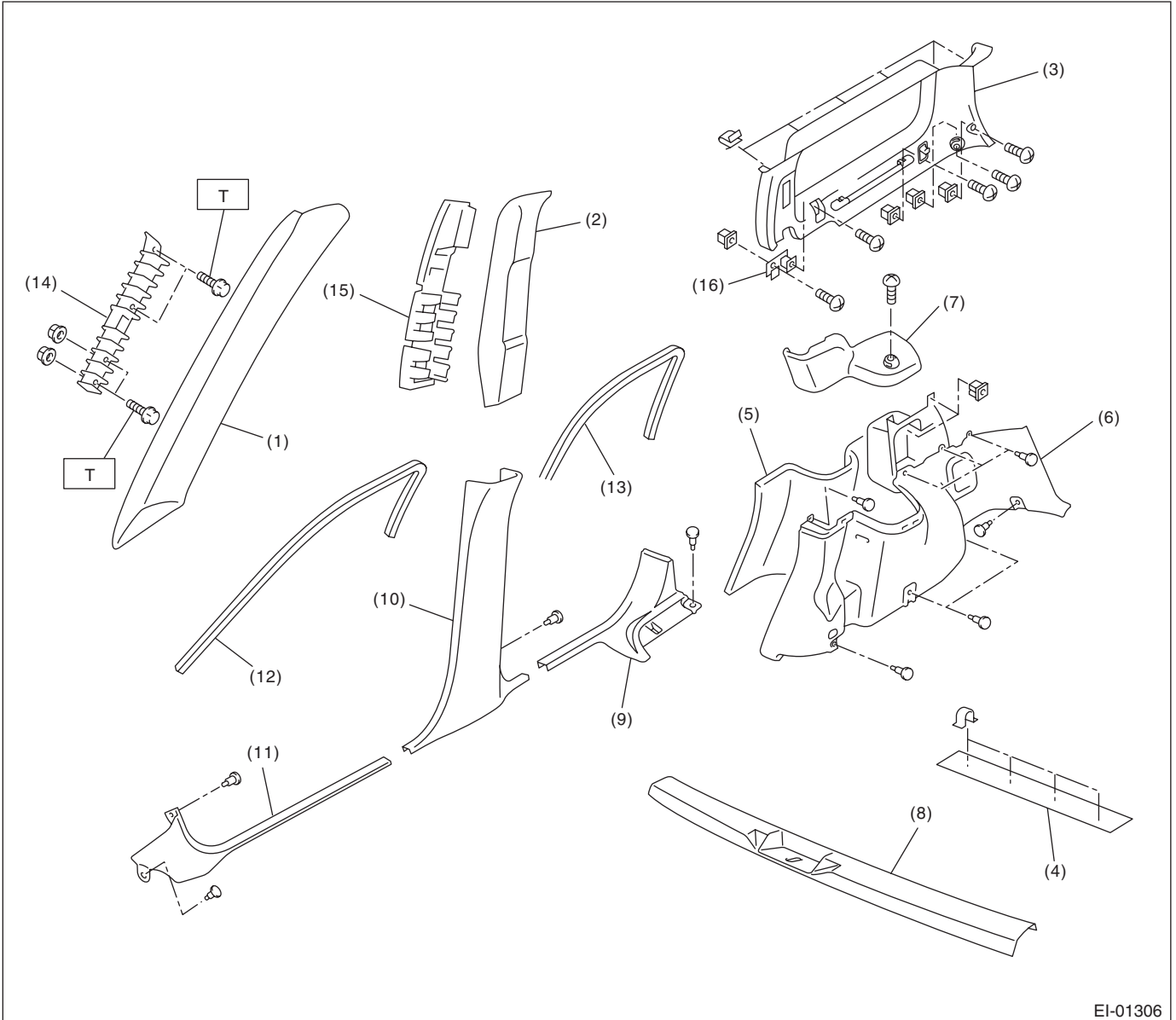
EI-01092

- | | | |
|--|---------------------|----------------------------------|
| (1) Pad and frame | (6) Meter visor | (12) Grille cover |
| (2) Center compartment (Model without navigation system) | (7) Center panel | (13) Air vent grille (Defroster) |
| (3) Grille cover | (8) Air vent grille | (14) Switch panel |
| (4) Lower cover | (9) Glove box panel | (15) Passenger's airbag module |
| (5) Coin box | (10) Glove box lid | (16) Knee guard panel |
| | (11) Steering beam | |

General Description

EXTERIOR/INTERIOR TRIM

13.INNER TRIM



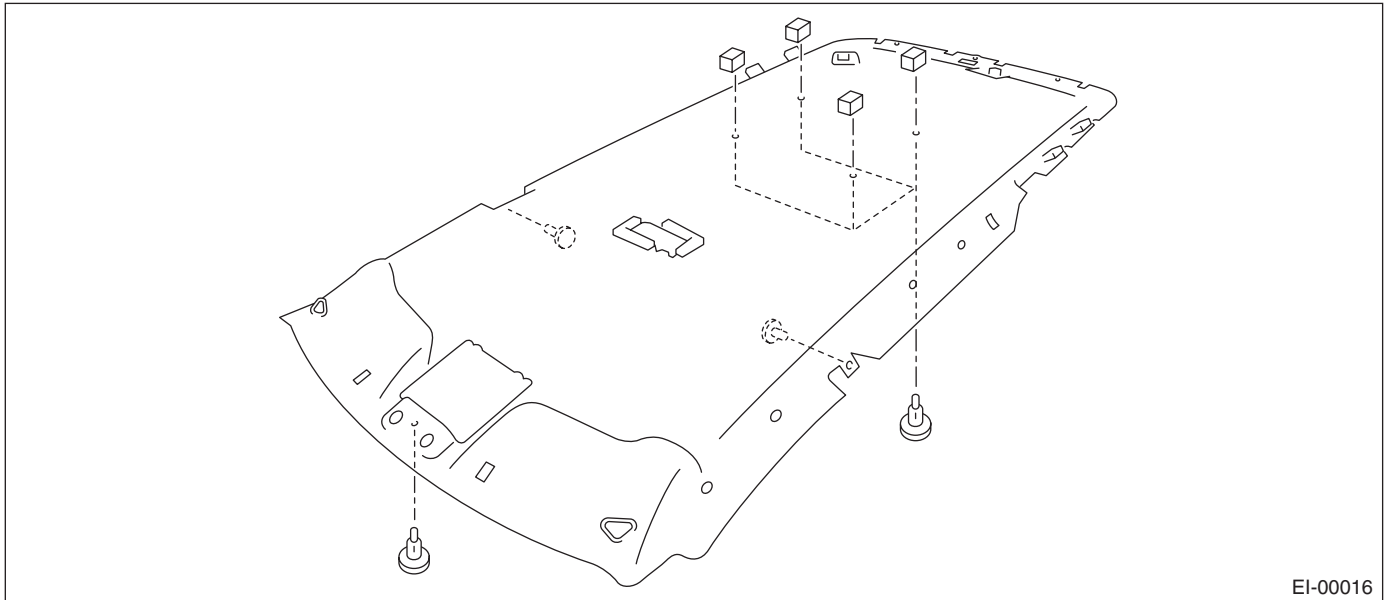
EI-01306

- | | | |
|------------------------------|-------------------------------|------------------------------|
| (1) Front pillar upper trim | (8) Rear skirt trim | (14) Front pillar inner rib |
| (2) Center pillar upper trim | (9) Side sill rear cover | (15) Center pillar inner rib |
| (3) Rear pillar upper trim | (10) Center pillar lower trim | (16) Bracket |
| (4) Rear rail trim | (11) Side sill front cover | |
| (5) Insulator | (12) Front garnish | |
| (6) Rear quarter lower trim | (13) Rear garnish | |
| (7) Strut cap | | |

Tightening torque: N·m (kgf·m, ft·lb)

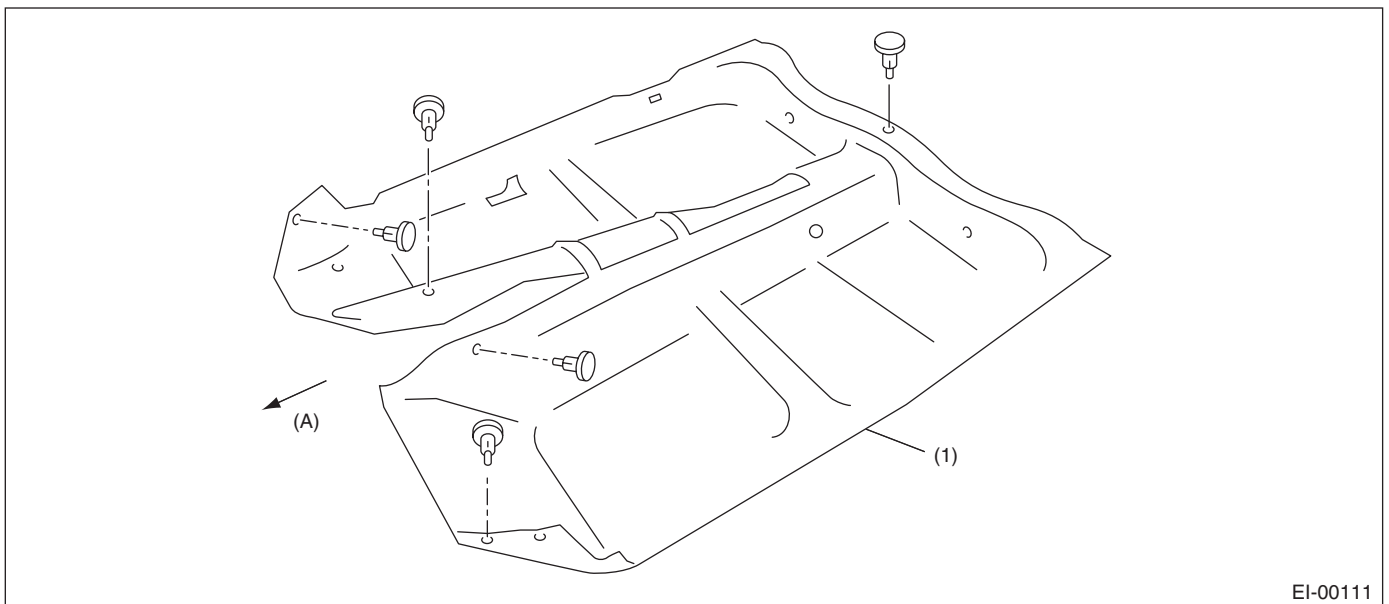
T: 2 (0.20, 1.46)

14. ROOF TRIM



EI-00016

15. FLOOR MAT



EI-00111

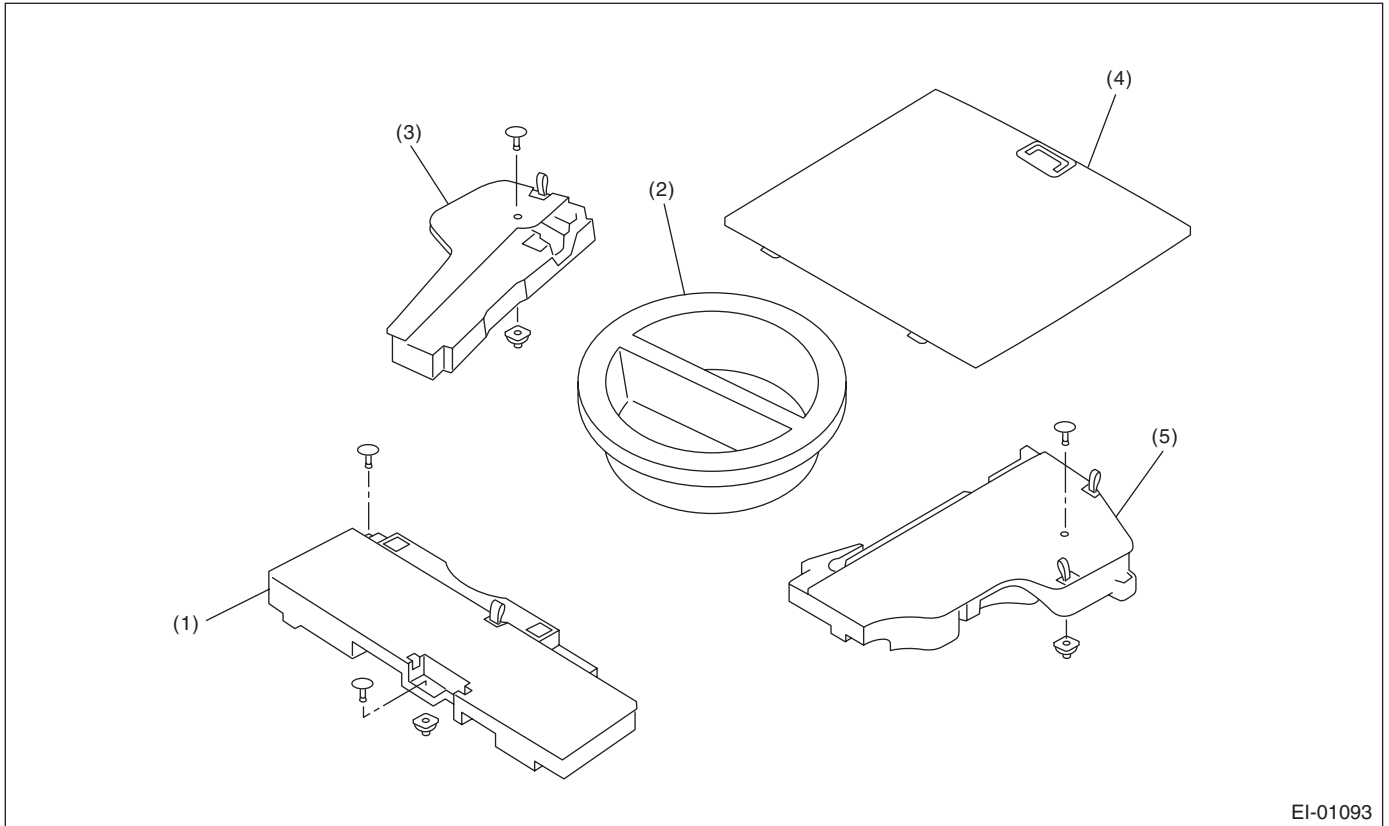
(A) Front side of vehicle

(1) Floor mat

General Description

EXTERIOR/INTERIOR TRIM

16.LUGGAGE FLOOR MAT



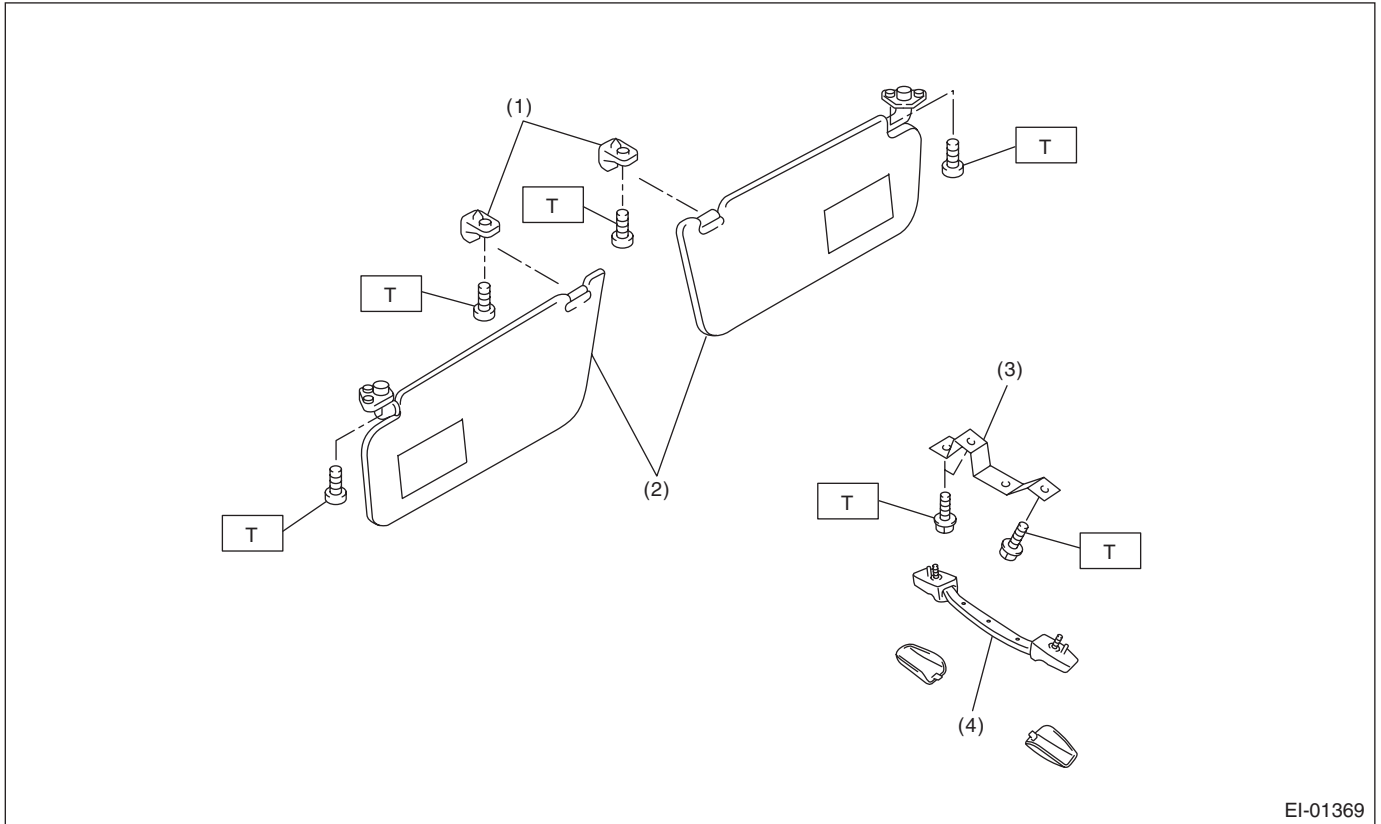
EI-01093

(1) Front floor mat
(2) Floor box

(3) Side floor mat RH
(4) Center floor mat

(5) Side floor mat LH

17.COMPARTMENT ACCESSORIES



- (1) Hook
- (2) Sun Visor
- (3) Assist rail bracket
- (4) Assist grip (Retractable)

Tightening torque: N·m (kgf·m, ft·lb)
T: 2 (0.20, 1.46)

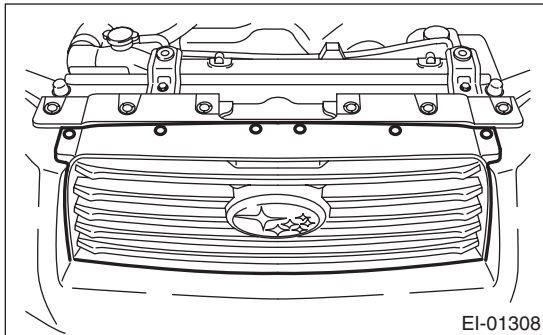
B: PREPARATION TOOL

TOOL NAME	REMARKS
Clip remover	Used for removing trim.
Clip clamp pliers	Used for removal of various clips and clamps.

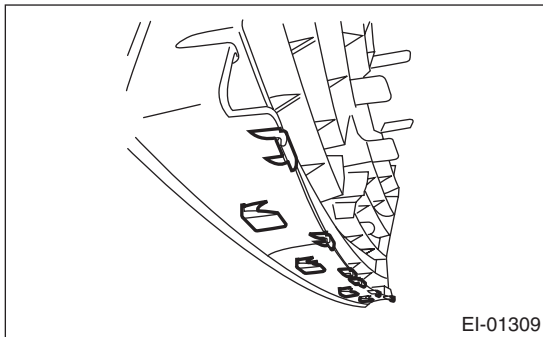
2. Front Grille

A: REMOVAL

- 1) Open the front hood.
- 2) Remove the upper six clips of front grille.

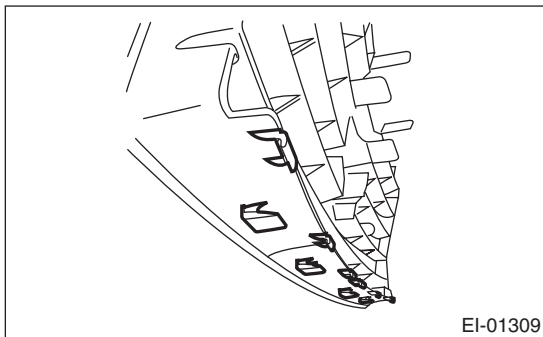


- 3) Pull the front grille out toward the front of the vehicle.



B: INSTALLATION

- 1) Install in the reverse order of removal.



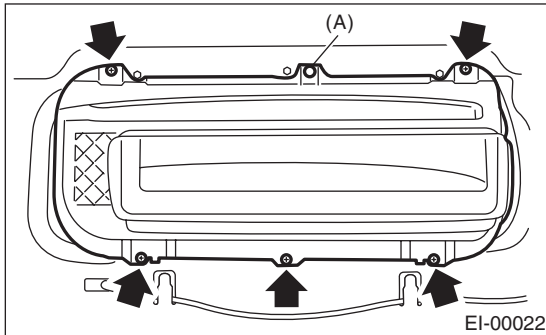
NOTE:

Be careful with the hook position.

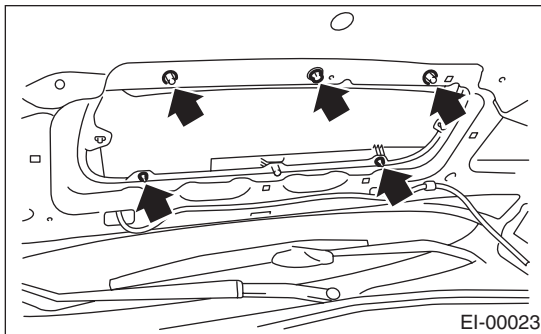
3. Front Hood Grille

A: REMOVAL

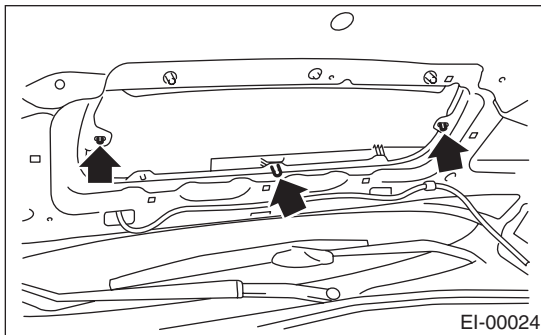
1) Remove five screws and clip (A) to remove the front hood duct.



2) Remove the five nuts.



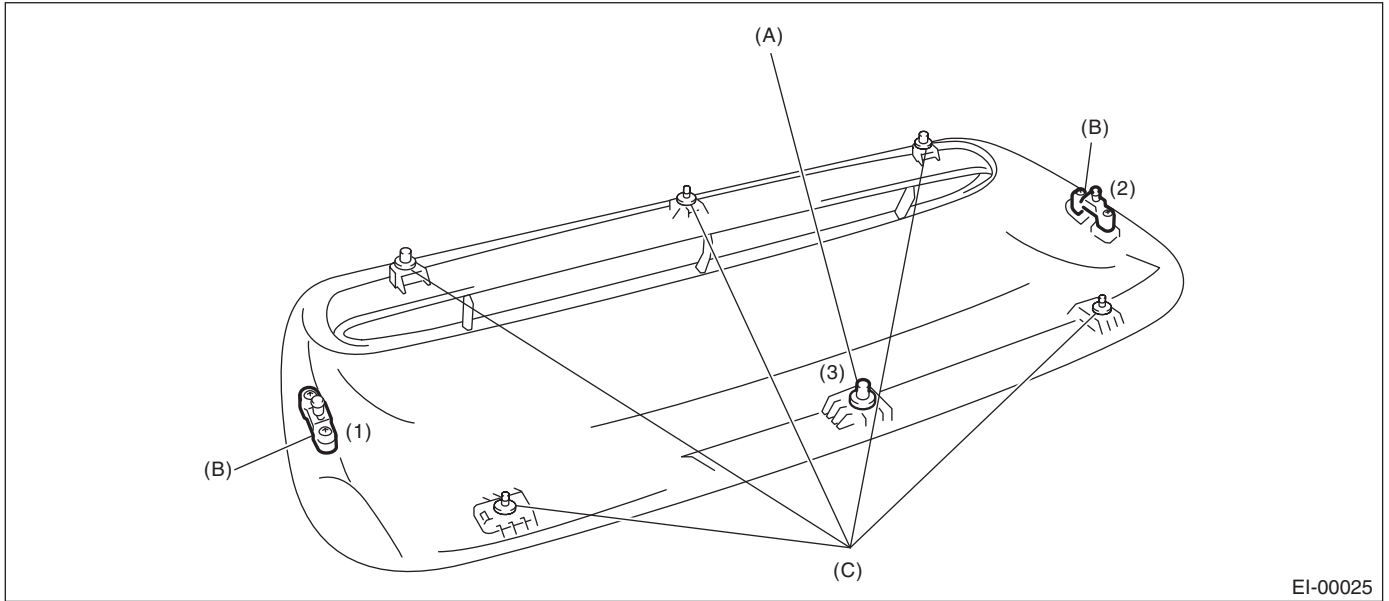
3) Remove three black clips and remove the front hood grille.



Front Hood Grille

EXTERIOR/INTERIOR TRIM

B: INSTALLATION



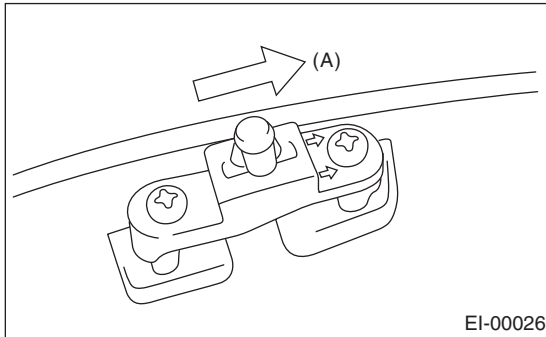
EI-00025

(A) Black clip

(B) Black clip

(C) Bolt

1) Replace the black clips (1) and (2) with new parts. Install the clip with arrow mark facing the front side of grille (A).

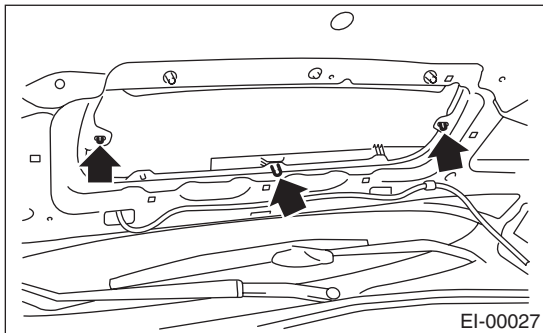


EI-00026

2) Replace the black clips (3) with a new part.
3) Insert the front hood grille clip and engage the three clips.

NOTE:

Make sure that the anchor portion of each clip is firmly engaged.

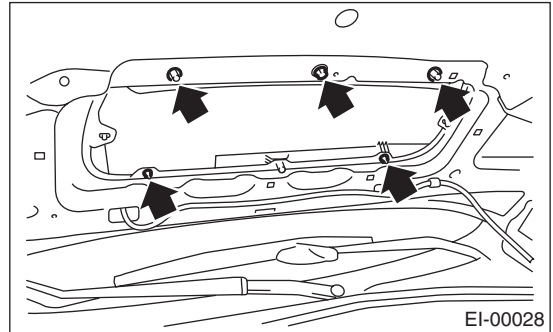


EI-00027

4) Install the five nuts.

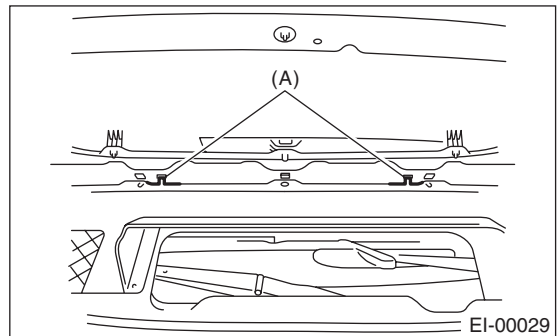
Tightening torque:

4.4 N·m (0.45 kgf·m, 3.25 ft·lb)



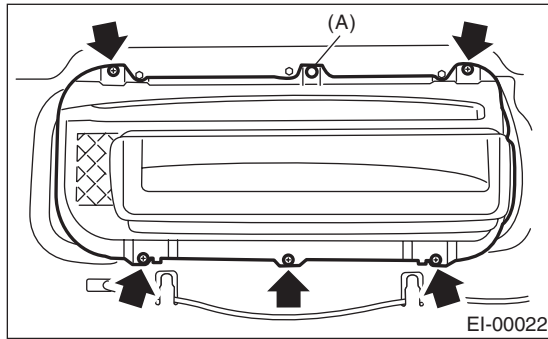
EI-00028

5) Hook the two hooks (A) of hood duct to the hood holes.



EI-00029

6) Install the front hood duct with the five screws and clip (A).



C: INSPECTION

Make sure that the clip is firmly engaged.
Make sure that there is no abnormal gap at whole periphery of hood grille.
Check that there is no damage on the front hood grille.

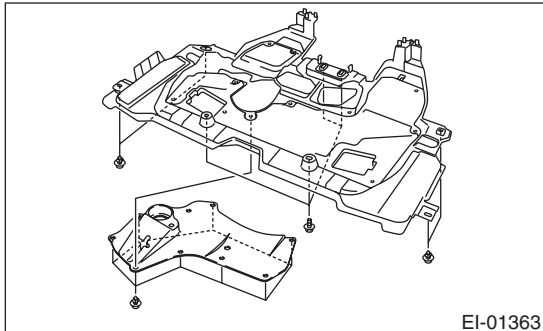
Front Under Cover

EXTERIOR/INTERIOR TRIM

4. Front Under Cover

A: REMOVAL

- 1) Lift-up the vehicle.
- 2) Loosen the bolts, then remove the clip and under cover.



B: INSTALLATION

Install in the reverse order of removal.

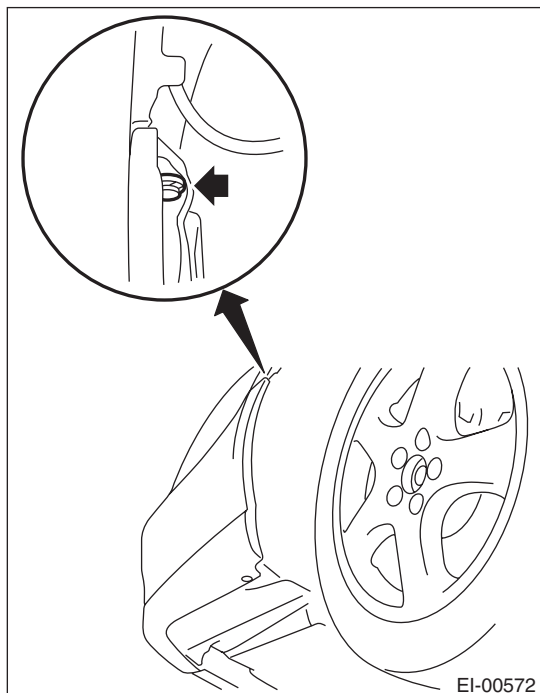
Tightening torque:

18 N·m (1.84 kgf-m, 13.3 ft-lb)

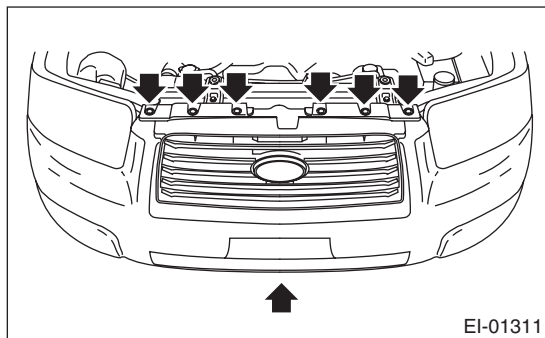
5. Front Bumper

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the six clips from underside of the bumper (both left and right).
- 3) Turn over the mud guard, and remove one inside clip that secure the front bumper to the fender.



- 4) Turn over the mud guard and disconnect the fog light connector.
- 5) Remove the seven clips.



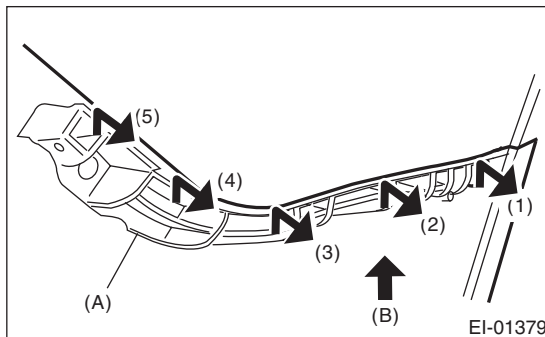
- 6) Remove the bumper face side claws from guide bracket (A), and remove the bumper face.

CAUTION:

Do not pull them by force. The bumper face side claws can be damaged.

NOTE:

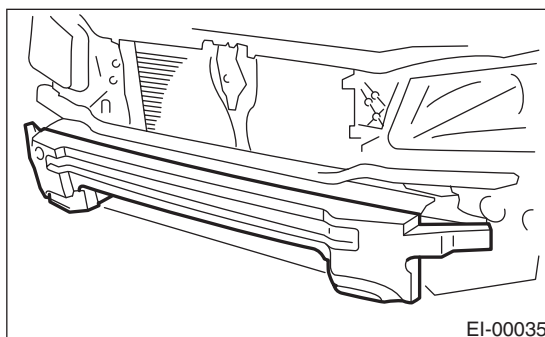
The bumper can be easily pulled out by removing in the order of (1) — (5) from the fender side while lifting the bumper face upward (B).



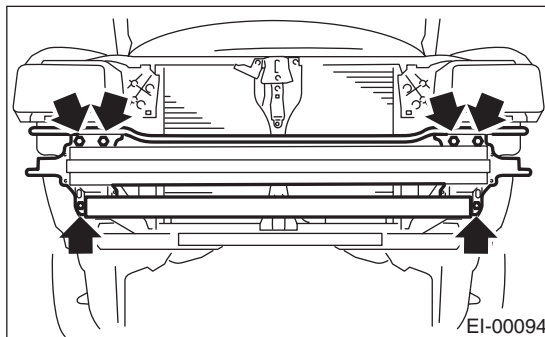
- 7) Remove the E/A form from bumper beam.

NOTE:

Do not apply excessive force to remove the E/A form because it is easily damaged.



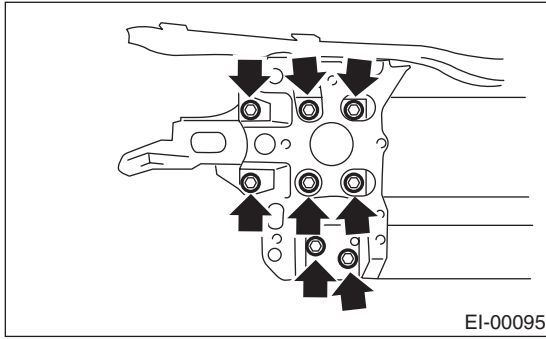
- 8) Remove the bumper beam.



Front Bumper

EXTERIOR/INTERIOR TRIM

9) Remove the 8 bolts and disassemble the front bumper beam.



B: INSTALLATION

Install in the reverse order of removal.

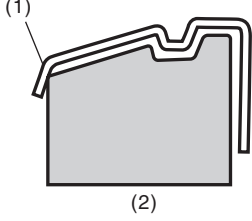
Tightening torque:

Refer to "COMPONENT" of "General Description".

<Ref. to EI-3, FRONT BUMPER, COMPONENT, General Description.>

C: REPAIR

1. COATING METHOD FOR PP BUMPER

Process No.	Process name	Job contents	
1	Bumper installation	Place the bumper on a paint worktable as required. Use the paint worktable conforming to inner shape of bumper if possible.	 <p style="text-align: right;">EI-00038</p>
2	Masking	Mask specified part (black base) with masking tape. Use masking tape for PP (For example, Nichiban No. 533, etc.).	
3	Degreasing/ cleaning	Clean all parts to be painted with white gasoline, normal alcohol, etc. to remove dirt, oil, fat, etc.	
4	Primer paint	Apply primer one to all parts to be painted, using air gun. Use primer (clear).	
5	Drying	Dry at normal temperature [10 to 15 min. at 20°C (68°F)]. In half-dried condition, PP primer paint is dissolved by solvent, e.g. thinner, etc. Therefore, if dust or dirt must be removed, use ordinary alcohol etc.	
6	Top coat paint (I)	Solid paint	Metallic paint
		Use section (block) paint for top coat. • Paint to be used (for each color): Solid paint Hardener PB Thinner T-301 • Mixture ratio: Main agent : Hardener = 4 : 1 • Viscosity: 10 to 13 seconds/20°C (68°F) • Film thickness: 35 — 45 μ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm ² , 36 — 50 psi)	Use section (block) paint for top coat. • Paint to be used (for each color): Metallic paint Hardener PB Thinner T-306 • Mixture ratio: Main agent : Hardener = 10 : 1 • Viscosity: 10 to 13 seconds/20°C (68°F) • Film thickness: 15 — 20 μ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm ² , 36 — 50 psi)
7	Drying	Not required.	Dry at normal temperature [at least 10 min. at 20°C (68°F)]. In half-dried condition, avoid dust, dirt.
8	Top coat paint (II)	Not required.	Apply a clear coat to parts with top coat paint (I), three times, at 5 — 7 minutes intervals. • Paint to be used: Metallic paint Hardener PB Thinner T-301 • Mixture ratio: Clear coat : Hardener = 6 : 1 • Viscosity: 14 to 16 seconds/20°C (68°F) • Film thickness: 25 — 30 μ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm ² , 36 — 50 psi)
9	Drying	60°C (140°F), 60 min. or 80°C (176°F), 30 min. If higher than 80°C (176°F), PP may be deformed. Keep maximum temperature of 80°C (176°F).	
10	Inspection	Check paint.	
11	Removal of masking	Remove the masking tape applied in procedure 2.	

Front Bumper

EXTERIOR/INTERIOR TRIM

2. REPAIR INSTRUCTIONS FOR COLORED PP BUMPER

NOTE:

All PP bumpers are provided with a grained surface, and if the surface is damaged, it cannot normally be restored to its former condition. Damages limited to the shallow scratches that cause only a change in the luster of the base material or coating, can be almost fully restored. Before repairing a damaged area, explain this point to the customer and obtain an understanding about the matter. Repair methods are outlined below, based on a classification of the extent of damage.

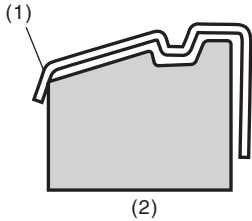
1) Minor damage causing only a change in the luster of the bumper due to a light touch
Almost restorable.

Process No.	Process name	Job contents	
1	Cleaning	Clean the area to be repaired using water.	
2	Sanding	Grind the repairing area with #500 sand paper in a "feathering" motion.	
3	Finish	Resin section	Coated section
		Repeatedly apply wax to the affected area using soft cloth (such as flannel). Recommended wax: NITTO KASEI Soft 99 TIRE WAX BLACK, or equivalent.	Perform either the same process as for the resin section or process No. 18 and subsequent in the 3) section, depending on the degree and nature of damage.
		Polish the waxed area with clean cloth after 5 — 10 minutes.	

2) Deep damage caused by scratching with fences etc.
A dent cannot be repaired but a whitened or swelled part can be removed.

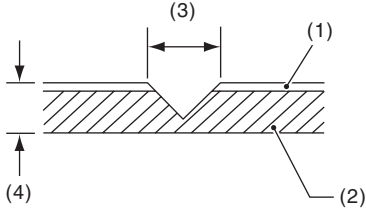
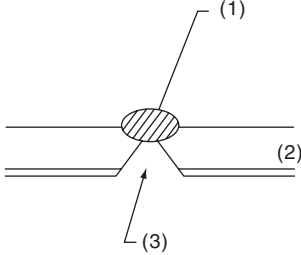
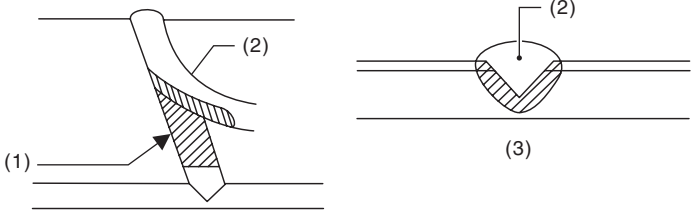
Process No.	Process name	Job contents	
1	Cleaning	Clean the damaged area with water.	
2	Removal of damaged area	Cut off protruding area, if any, due to collision, using a putty knife.	
3	Sanding	Grind the affected area with #100 — #500 sand paper.	
4	Finish	Resin section	Coated section
		Same as Process No. 3 in the "1)" section.	Perform Process No. 12 and subsequent operations in the "3)" section.

3) Deep damage such as a break or hole that requires filling
Much of the peripheral grained surface must be sacrificed for repair. The degree of restoration is not really worth the expense. (The surface, however, will become almost flush with adjacent areas.)
Recommended repair kit: PP Part Repair Kit (NRM)

Process No.	Process name	Job contents	
1	Bumper removal	Remove the bumper as required.	
2	Removal of parts	Remove the parts built into bumper as required.	
3	Bumper placement	Place the bumper on a paint worktable as required. It is recommended to use the paint worktable conforming to internal shape of bumper.	 <p>(1) Bumper (2) Set bumper section</p> <p style="text-align: right;">EI-00038</p>
4	Surface preparation	Remove dust, oil, etc. from areas to be repaired and surrounding areas, using a suitable solvent (NRM No. 900 Precleno, white gasoline, or alcohol, etc.).	

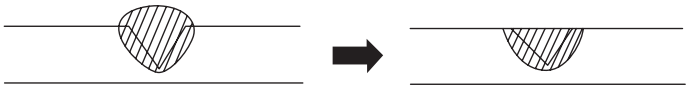
Front Bumper

EXTERIOR/INTERIOR TRIM

Process No.	Process name	Job contents	
5	Cutting	<p>If nature of damage are cracks or holes, cut a guide slit of 20 to 30 mm (0.79 to 1.18 in) in length along the crack or hole up to the bumper's base surface. Next, use a knife or grinder to carve a V-shaped groove in the area for repair.</p>	 <p>EI-00235</p> <p>(1) Paint surface (2) PP base surface (3) 20 — 30 mm (0.79 — 1.18 in) (4) 3 mm (0.12 in)</p>
6	Sanding (I)	Grind beveled surface with sand paper (#40 — #60) to smooth finish.	
7	Cleaning	Clean the sanded surface with the same solvent as used in Procedure 4.	
8	Temporary welding	<p>Grind the side just opposite the beveled area with sand paper (#40 — #60) and clean using a solvent.</p> <p>Temporarily spot-weld the side, using PP welding rod and heater gun.</p>	 <p>EI-00236</p> <p>(1) Welded point (Use heater gun and PP welding rod) (2) PP base surface (3) Beveled section</p> <p>NOTE:</p> <ul style="list-style-type: none"> Do not melt welding rod until it flows out. This results in reduced strength. Leave the welded spot unattended until it cools completely.
9	Welding	<p>Using a heater gun and PP welding rod, weld the beveled spot while melting the rod and damaged area.</p>	 <p>EI-00237</p> <p>(1) Melt hatched area (2) Welding rod (3) Section</p> <p>NOTE:</p> <ul style="list-style-type: none"> Melt the sections indicated by hatched area. Do not melt the welding rod until it flows out, in order to provide strength. Always keep the heater gun 1 to 2 cm (0.4 to 0.8 in) away from the welding spot. Leave the welded spot unattended until it cools completely.

Front Bumper

EXTERIOR/INTERIOR TRIM

Process No.	Process name	Job contents
10	Sanding (II)	Remove excess part of weld with a putty knife. If a drill or disc wheel is used instead of the knife, operate it at a rate lower than 1,500 rpm and grind the excess part little by little. A higher rpm will cause the PP substrate to melt from the heat.
		
		EI-00042
		Sand the welded spot smooth with #240 sand paper.
11	Masking	Mask the black substrate section using masking tape. Recommended masking tape: Nichiban No. 533 or equivalent
12	Cleaning/ degreasing	Completely clean the entire coated area, using solvent similar to that used in Procedure 4.
13	Primer coating	Apply a coat of primer to the repaired surface and its surrounding areas. Mask these areas, if necessary. Recommended primer: Mp/ 364 PP Primer NOTE: Always use a spray gun with spraying pressure of 245 to 343 kPa (2.5 to 3.5 kg/cm ² , 36 to 50 psi) for primer coating.
14	Leave unattended	Leave the repaired area unattended at 20°C (68°F) for 10 to 15 minutes until primer is half-dry. NOTE: If dirt or dust comes in contact with the coated area, wipe it off with a cloth dampened with alcohol. (Do not use thinner since the coated area tends to melt.)
15	Primer surfacer coating	Apply primer surfacer to the repaired area two or three times at an interval of 3 — 5 minutes. Recommended surfacer: <ul style="list-style-type: none"> • UPS 300 Flex Primer • No. 303 UPS 300 Exclusive hardener • NPS 725 Exclusive Reducer (thinner) • Mixture ratio: 2 : 1 (UPS 300 : No. 303) • Viscosity: 12 to 14 seconds/20°C (68°F) • Coating film thickness: 40 — 50 μ
16	Drying	Allow the coated surface to dry for 20 minutes at 20°C (68°F) [or 30 minutes at 60°C (140°F)].
17	Sanding (III)	Sand the coated surface and its surrounding areas using #400 sand paper and water.
18	Cleaning/ degreasing	Same as Process No. 12.
19	Top coat (I)	Solid paint
		Use a “block” coating method. <ul style="list-style-type: none"> • Recommended paint: Suncryl (SC) • No. 307 Flex Hardener • SC Reducer (thinner) • Mixture ratio: 3: 1 • Suncryl (SC) : No. 307 Flex Hardener • Viscosity: 11 to 13 seconds/20°C (68°F) • Coating film thickness: 40 — 50 μ • Spraying thickness: 245 — 343 kPa (2.5 — 3.5 kg/cm², 36 — 50 psi)
		Metallic paint
		Use a “block” coating method. <ul style="list-style-type: none"> • Recommended paint: Suncryl (SC) • No. 307 Flex Hardener • SC Reducer (thinner) • Mixture ratio: 3: 1 • Suncryl (SC) : No. 307 Flex Hardener • Viscosity: 11 to 13 seconds/20°C (68°F) • Coating film thickness: 20 — 30 μ • Spraying thickness: 245 — 343 kPa (2.5 — 3.5 kg/cm², 36 — 50 psi)
20	Leave unattended	Not required. Leave unattended at 20°C (68°F) for at least 10 minutes until the topcoated area is half-dry. NOTE: Be careful to keep dust or dirt from coming in contact with the affected area.

Front Bumper

EXTERIOR/INTERIOR TRIM

Process No.	Process name	Job contents
21	Top coat (II)	<p>Not required.</p> <p>Apply a clear coat three times at an interval of 3 to 5 minutes.</p> <ul style="list-style-type: none"> • Recommended paint: SC710 Overlay Clear No. 307 Flex Hardener SC Reducer (thinner) • Mixture ratio: 3 : 1 Suncryl (SC) : No. 307 Flex Hardener • Viscosity: 10 to 13 seconds/20°C (68°F) • Coating film thickness: 20 — 30 μ • Spraying pressure: 245 — 343 kPa (2.5 — 3.5 kg/cm², 36 — 50 psi)
22	Drying	<p>Allow the coated surface to dry for two hours at 20°C (68°F) [or 30 minutes at 60°C (140°F)].</p> <p>NOTE: Do not allow the temperature to exceed 80°C (176°F) since this will deform the PP substrate.</p>
23	Inspection	Carefully check the condition of the repaired area.
24	Removal of masking	Remove the masking tape applied in Process No. 11 and 13.
25	Parts installation	Install parts on the bumper in reverse order of removal.
26	Bumper installation	Install the bumper.

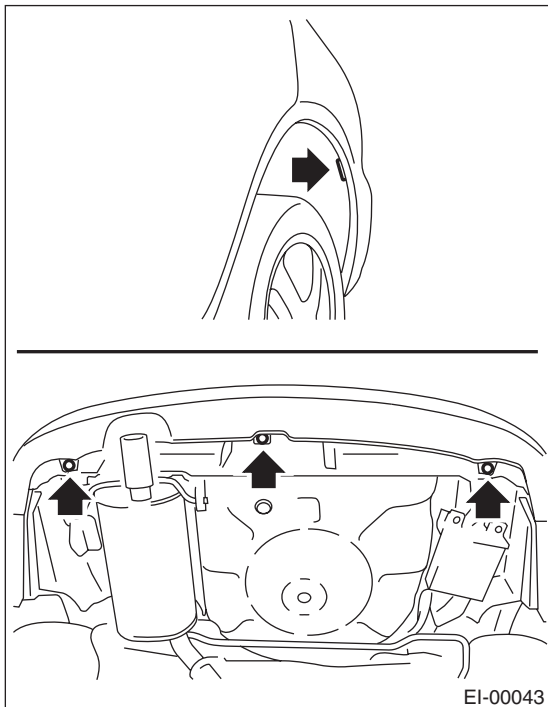
Rear Bumper

EXTERIOR/INTERIOR TRIM

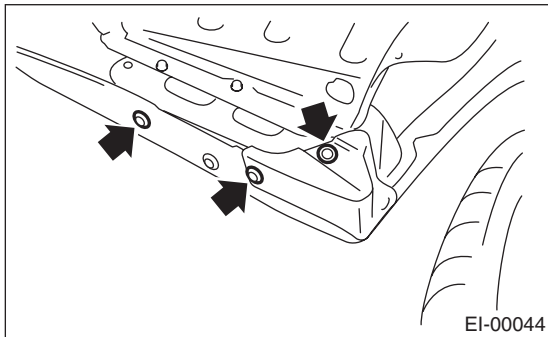
6. Rear Bumper

A: REMOVAL

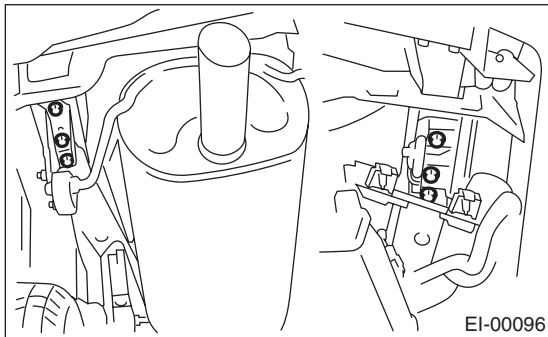
- 1) Disconnect the ground cable from the battery.
- 2) Remove the bolts and clips.



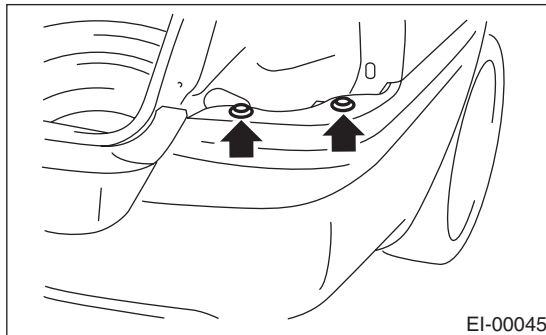
- 3) Remove the clips from the bumper and bracket.



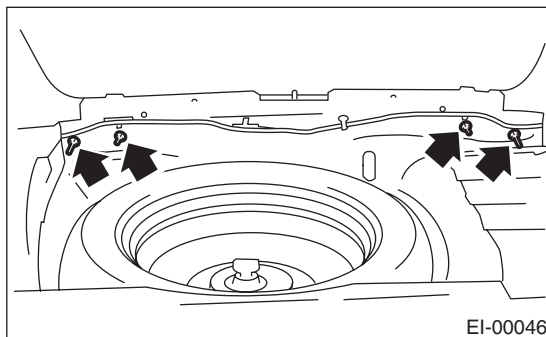
- 4) When removing the rear bumper beam assembly, remove the six bolts from bumper stay.



- 5) Remove the rear combination light assembly on both sides. <Ref. to LI-22, REMOVAL, Rear Combination Light Assembly.>
- 6) Remove the two clips on both sides.



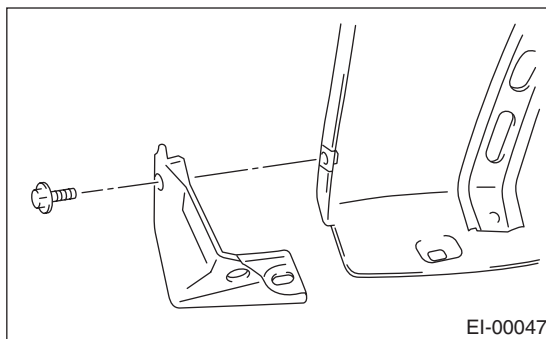
- 7) Remove the floor box.
- 8) Remove the rear skirt trim.
- 9) Remove four nuts to remove the rear bumper.



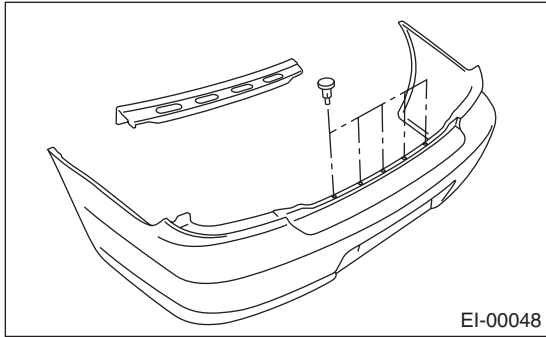
NOTE:

Rear bumper beam assembly is heavy. When removing the rear bumper beam assembly, two persons are necessary to do the work.

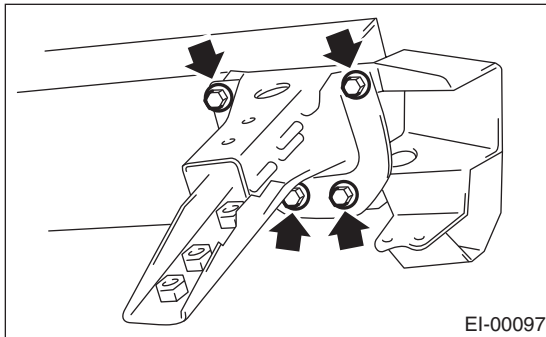
- 10) Remove the bolts, and then remove the bracket from bumper.



11) Remove the clips to remove the bumper upper beam.



12) Remove the four bolts, and then remove the side bracket and bumper stay.



B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

Refer to "COMPONENT" of "General Description".

<Ref. to EI-4, REAR BUMPER, COMPONENT, General Description.>

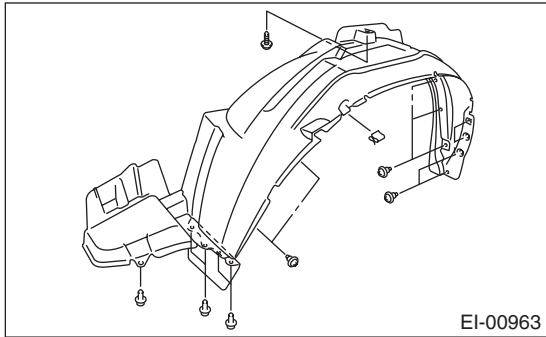
C: REPAIR

Refer to front bumper repair. <Ref. to EI-23, REPAIR, Front Bumper.>

7. Mud Guard

A: REMOVAL

- 1) Jack-up the vehicle.
- 2) Remove the wheels. <Ref. to WT-5, REMOVAL, Steel Wheel.> or <Ref. to WT-6, REMOVAL, Aluminum Wheel.>
- 3) Remove the clips to remove the air flap.
- 4) Remove the screws and clips to remove the mud guard.



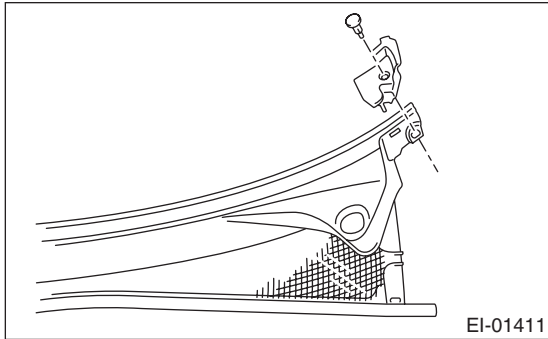
B: INSTALLATION

Install in the reverse order of removal.

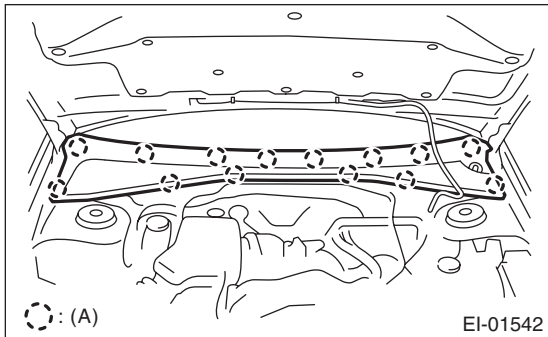
8. Cowl Panel

A: REMOVAL

- 1) Open the front hood.
- 2) Remove the wiper arm. <Ref. to WW-11, REMOVAL, Front Wiper Arm.>
- 3) Remove the clip and remove the cowl side panel.



- 4) Loosen the clips to remove the cowl panel.



(A) Clip

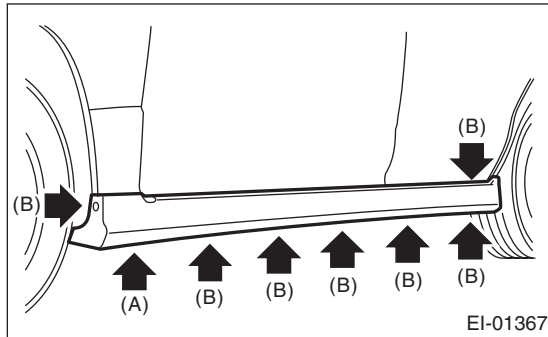
B: INSTALLATION

Install in the reverse order of removal.

9. Side Sill Spoiler

A: REMOVAL

Remove the screw (A) and clips (B), and remove the side spoiler.



B: INSTALLATION

Install in the reverse order of removal.

10.Side Garnish

A: REMOVAL

1) Make a cut in the edge of the garnish using a cutter, then manually remove the garnish by pulling it.

NOTE:

Be careful because the garnish and clip can be damaged if you pull unnecessarily hard on them.

2) Apply masking tape around the position where the double-sided tape is affixed on the side garnish.

3) Apply solvent (SUMITOMO 3M 4000 or the equivalent) to the position where the double-sided tape is affixed.

NOTE:

- Wipe immediately when the solvent is applied to the garnish surface.

- Do not use solvent to the body which has been repaired with lacquer paint.

4) Cover the area where solvent is applied using plastic wrap, and then heat the double-sided tape for 5 to 15 minutes in 40 — 60°C (104 — 140°F) using a heat light.

5) Peel the double-sided tape on the side garnish using steps 3 and 4.

NOTE:

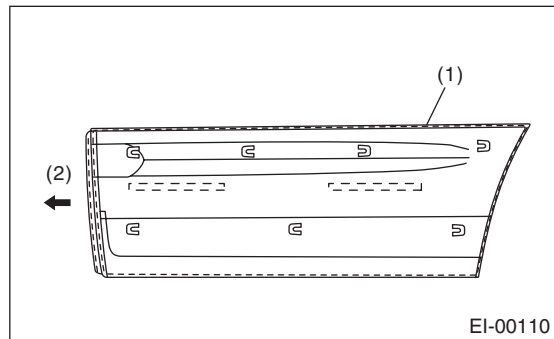
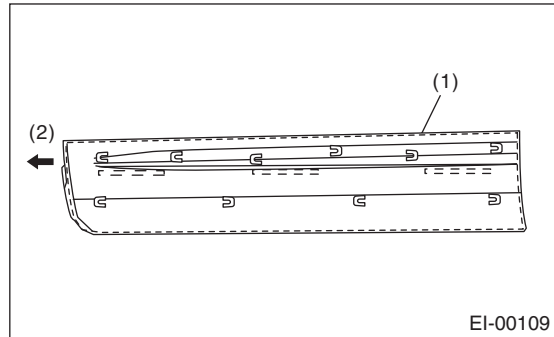
If the double-sided tape does not come completely off using the steps outlined above, use a scraper.

B: INSTALLATION

1) Affix the double-sided tape (SUMITOMO 3M 5305 or the equivalent) after applying the primer (SUMITOMO 3M K-500 or the equivalent) widely around the area where the double-sided tape is affixed.

NOTE:

Use the double-sided tape with 1 mm (0.04 in) thickness and 5 mm (0.2 in) width.



(1) Double-sided tape

(2) Front side

2) Heat the vehicle to 40 to 60°C (104 — 140°F), and the garnish 20 to 30°C (68 — 86°F) using a heat light.

3) Peel the backing paper off the double-sided tape and position the clip with the body hole. Be careful not to let air enter the adhesive surface. Manually push on the tape with approximately 69 — 98 N (7 — 10 kgf, 15 — 22 lbf) of force.

NOTE:

- To keep the adhesion, do not wash the vehicle within 24 hours from installation.

- Be careful not to move it up or down after application.

C: INSPECTION

- Make sure the side garnish is not greatly scratched or cracked.

- Make sure the clip is not damaged.

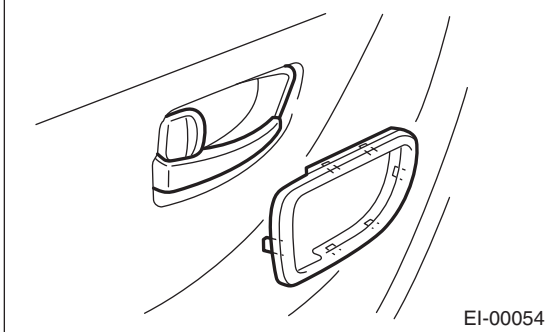
11. Front Door Trim

A: REMOVAL

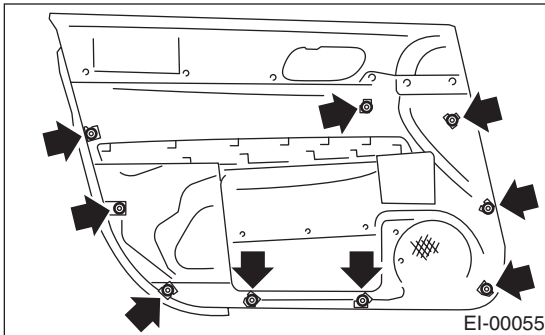
CAUTION:

Do not apply excessive force to the clip. There is the possibility of the clip being damaged.

- 1) Disconnect the ground cable from the battery.
- 2) Remove the gusset cover.
- 3) Pull up the inner remote cover to remove upper hook. Pull down the inner remote cover to remove lower hook. Remove the inner remote cover.



- 4) Remove the power window control switch. <Ref. to GW-8, REMOVAL, Power Window Control Switch.>
- 5) Remove the clips of trim panel using clip remover to remove the trim panel.



B: INSTALLATION

Install in the reverse order of removal.

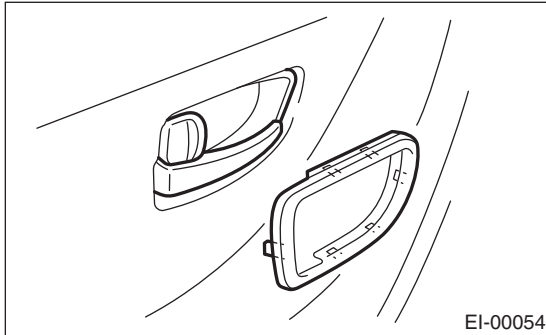
12.Rear Door Trim

A: REMOVAL

CAUTION:

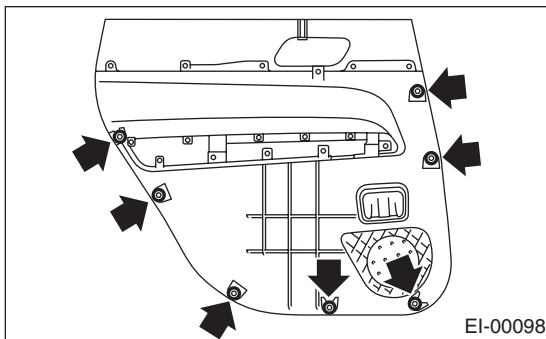
Do not apply excessive force to the clip. There is the possibility of the clip being damaged.

- 1) Disconnect the ground cable from the battery.
- 2) Pull up the inner remote cover to remove upper hook. Pull down the inner remote cover to remove lower hook. Remove the inner remote cover.



- 3) Remove the power window control switch. <Ref. to GW-8, REMOVAL, Power Window Control Switch.>

- 4) Remove the clips of trim panel using clip remover to remove the trim panel.



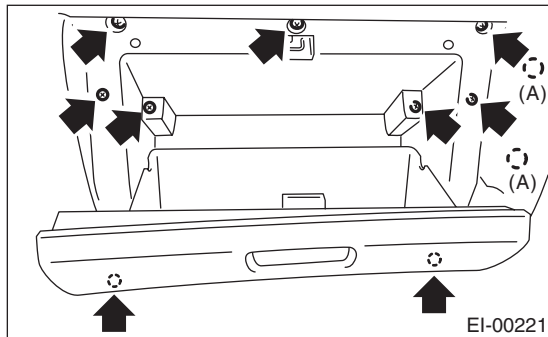
B: INSTALLATION

Install in the reverse order of removal.

13. Glove Box

A: REMOVAL

- 1) Open the glove box.
- 2) Loosen the screws to remove glove box.



(A) Clip

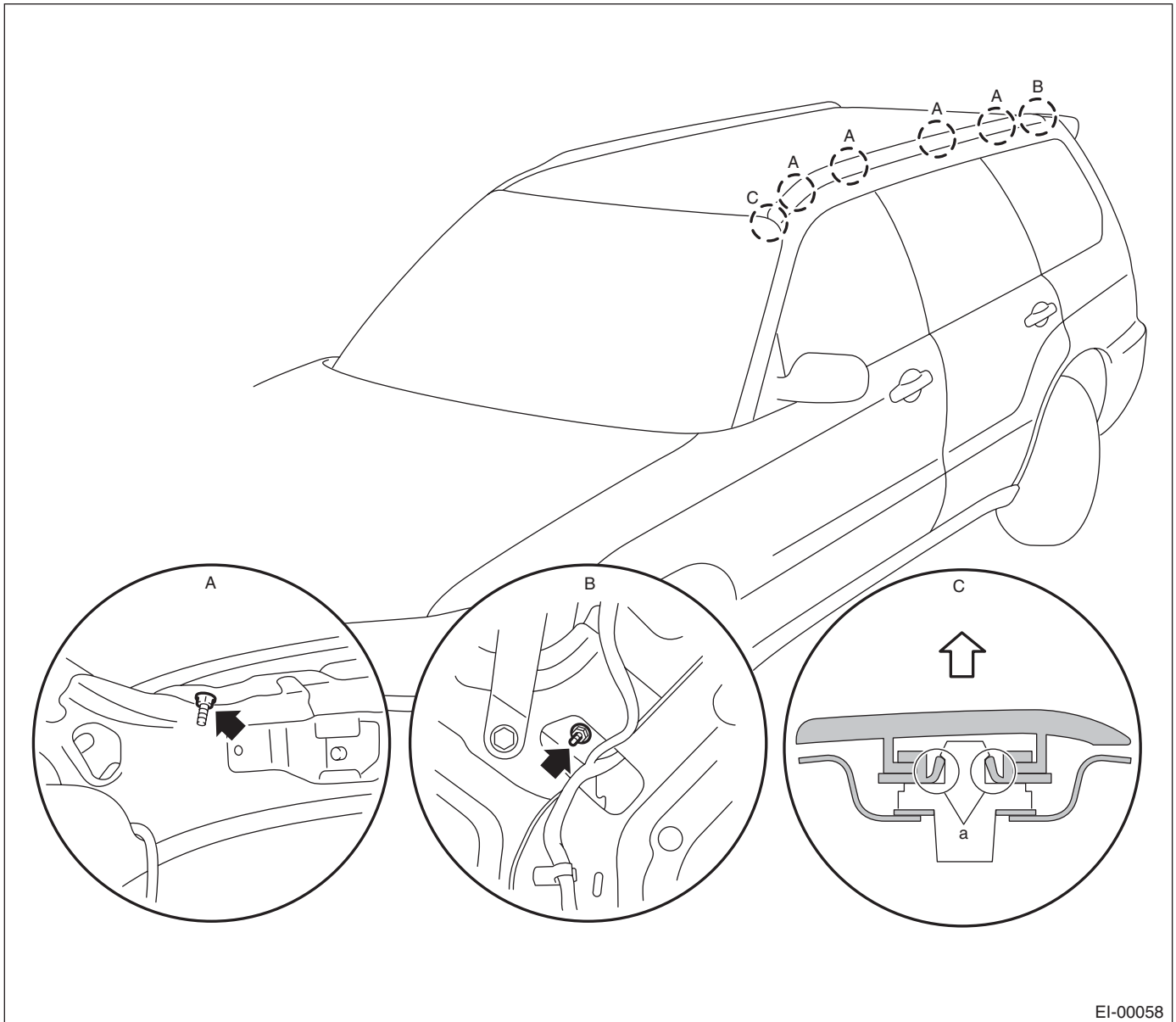
B: INSTALLATION

Install in the reverse order of removal.

14. Roof Rail

A: REMOVAL

- 1) Remove the roof trim. <Ref. to EI-46, REMOVAL, Roof Trim.>
- 2) Remove the five installing nuts.
- 3) Carefully remove the clip on the front end in the horizontal direction, then remove the roof rail in the upward direction.



EI-00058

NOTE:

When removing the C clip, apply force to it in the horizontal direction and then remove in the upward direction while bending the a section side claw out of the way.

B: INSTALLATION

Install in the reverse order of removal.

Tightening torque:

7.5 N·m (0.76 kgf-m, 5.53 ft-lb)

CAUTION:

When removing or installing the roof rail, be careful not to scratch the body panel with the stud bolt of roof rail.

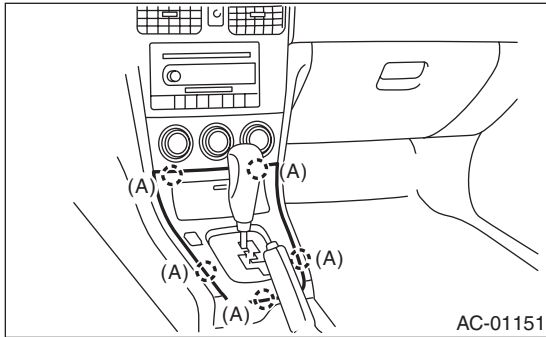
Console Box

EXTERIOR/INTERIOR TRIM

15. Console Box

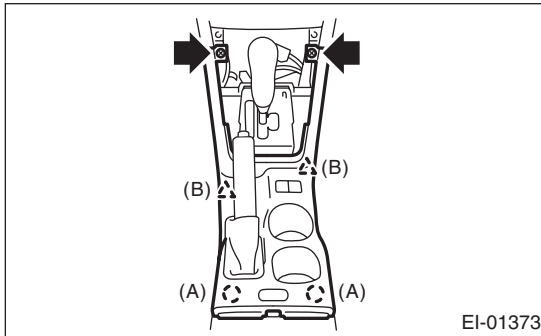
A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the console front cover.



(A) Hook

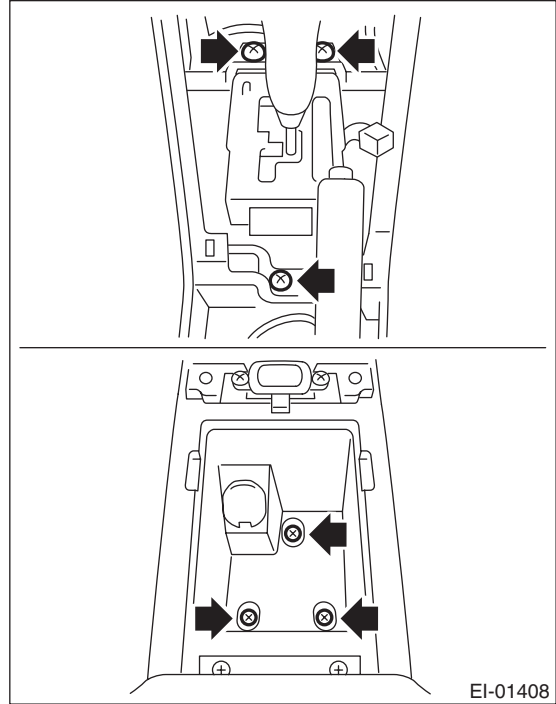
- 3) Remove the shift knob. (MT model)
- 4) Loosen the screws to remove console cover.



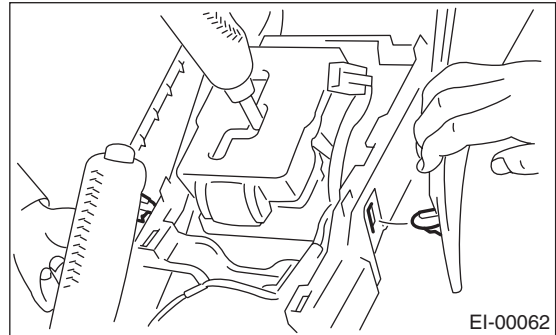
(A) Clip

(B) Clip

- 5) Loosen the screws.



- 6) Remove the console side panel hooks to remove the console box.



B: INSTALLATION

Install in the reverse order of removal.

16. Instrument Panel Assembly

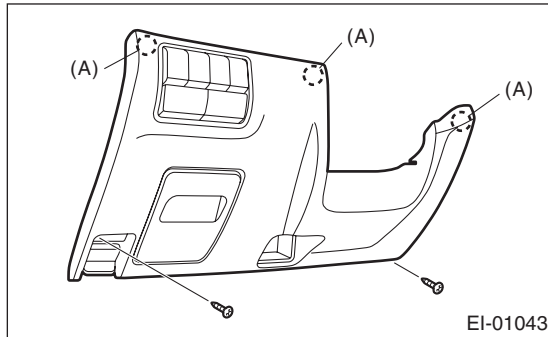
A: REMOVAL

CAUTION:

- All airbag system wiring harnesses and connectors are yellow. Do not use the electrical test equipment on these circuits.
- Be careful not to damage the airbag system harness when servicing the instrument panel.

1. REMOVING ONLY THE INSTRUMENT PANEL

- 1) Disconnect the ground cable from the battery.
- 2) Loosen the screws to remove lower cover.

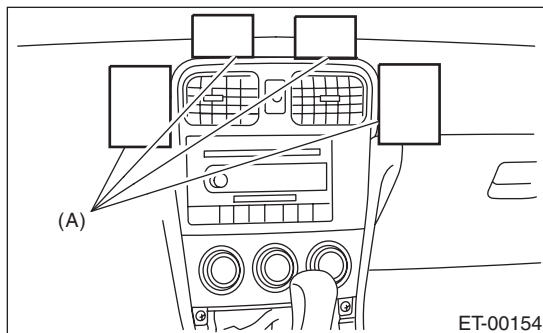


(A) Clip

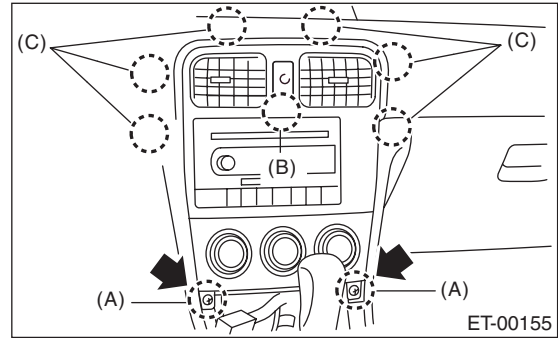
- 3) Disconnect the in-vehicle sensor hose and connector.
- 4) Remove the console front cover and console cover. <Ref. to EI-38, REMOVAL, Console Box.>
- 5) Affix the thick protective tape (A) to the instrument panel pad to protect the surface.

NOTE:

Affix the protective tape so that it covers the vertical wall in the back of the gap between the panel center and the pad.



- 6) Remove the screws.

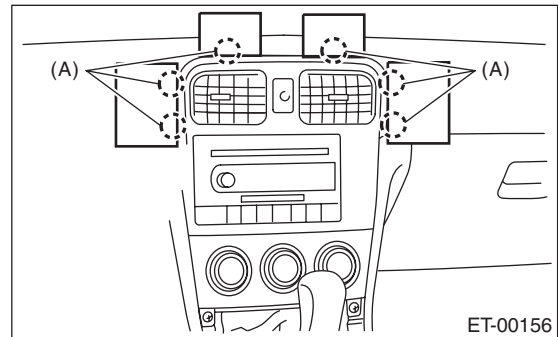


- (A) Screw
(B) Clip
(C) Claw

- 7) While pulling on the lower portion of the center console panel, insert a flat tip screwdriver into the portion (A) to remove the claw.

CAUTION:

Be very careful because it is possible to damage the instrument panel if the flat tip screwdriver is inserted into any other area than specified.



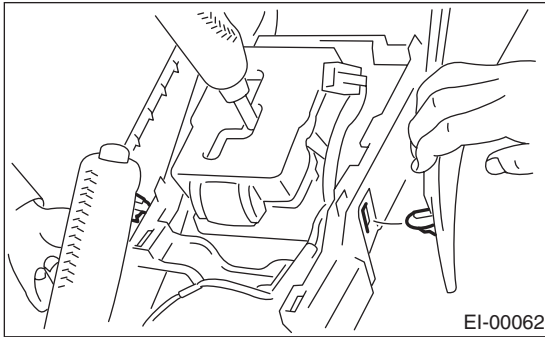
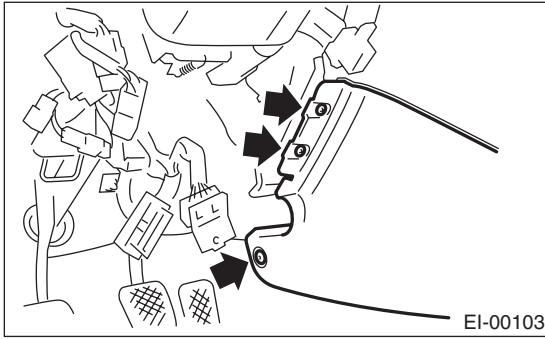
(A) Position for inserting the flat tip screwdriver

- 8) Disconnect the A/C control panel and hazard switch connectors.

Instrument Panel Assembly

EXTERIOR/INTERIOR TRIM

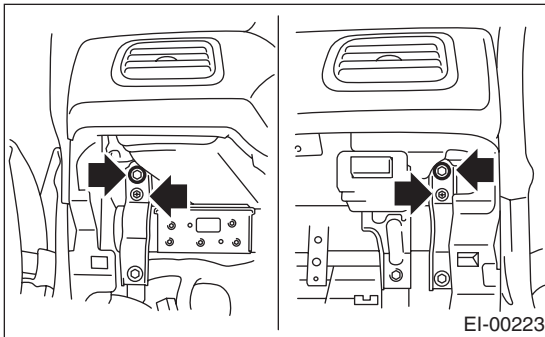
- 9) Remove the screws and clips to remove the side console panel.



- 10) Remove the passenger airbag module. <Ref. to AB-15, REMOVAL, Passenger's Airbag Module.>

- 11) Remove the two bolts which secure steering column. <Ref. to PS-16, REMOVAL, Tilt Steering Column.>

- 12) Loosen the four bolts that secure the instrument panel. (The lower bolt should not be removed as it is used for alignment.)



- 13) Remove the combination meter assembly. <Ref. to IDI-10, REMOVAL, Combination Meter.>

- 14) Loosen the instrument panel attaching screws.

- 15) Remove the instrument panel center compartment. <Ref. to EI-50, REMOVAL, Instrument Panel Center Compartment.>

- 16) Remove the radio. <Ref. to ET-6, REMOVAL, Radio Body.>

- 17) Remove the instrument panel side cover (both sides), the loosen the two bolts.

- 18) Remove the instrument panel assembly.

NOTE:

Remove the front pillar upper trim as required. <Ref. to EI-42, REMOVAL, Upper Inner Trim.>

- 19) Disconnect the harness connector of the combination meter.

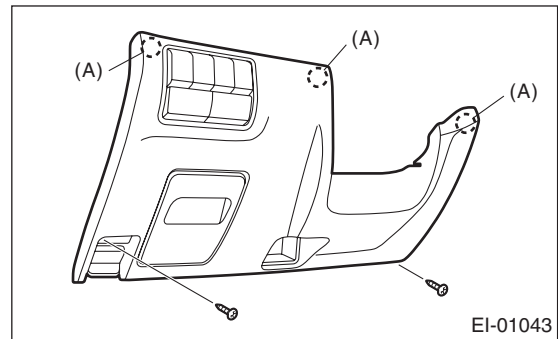
CAUTION:

Do not pull the harness when disconnecting connector.

2. REMOVAL OF INSTRUMENT PANEL WITH THE STEERING BEAM

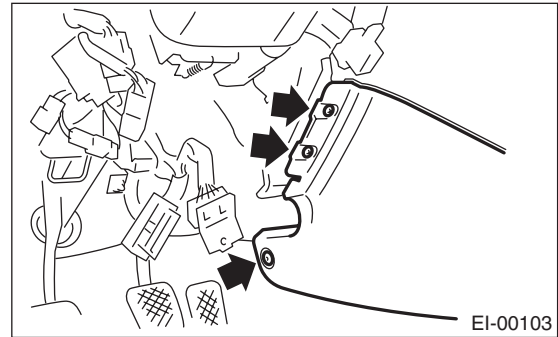
- 1) Disconnect the ground cable from the battery.

- 2) Loosen the screws and clips (A) to remove the lower cover.



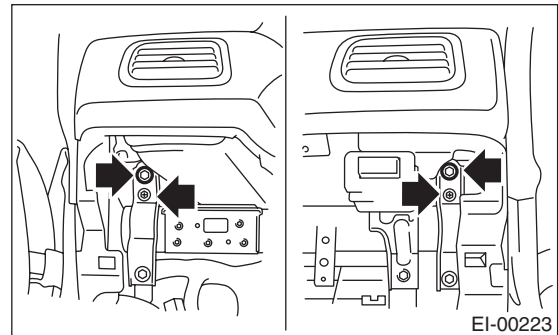
- 3) Remove the console front cover and console cover. <Ref. to EI-38, REMOVAL, Console Box.>

- 4) Loosen the screws and clip to remove the side console panel.



- 5) Remove the steering column.

- 6) Loosen the four bolts that secure the instrument panel.



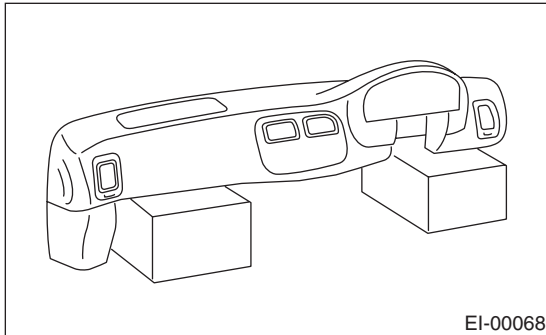
- 7) Remove the driver's and passenger's side airbag modules. <Ref. to AB-14, REMOVAL, Driver's Airbag Module.> <Ref. to AB-15, REMOVAL, Passenger's Airbag Module.>
- 8) Loosen the steering beam bolts.
- 9) Loosen the brake pedal attaching bolts. <Ref. to BR-47, REMOVAL, Brake Pedal.>
- 10) Remove the two clips on the leading end of the instrument panel assembly.
- 11) Remove the instrument panel assembly.

CAUTION:

Do not pull the harness when disconnecting connector.

NOTE:

- If necessary, make alignment marks for easy re-assembly.
- When storing the removed instrument panel, place it standing up on the floor.



EI-00068

B: INSTALLATION

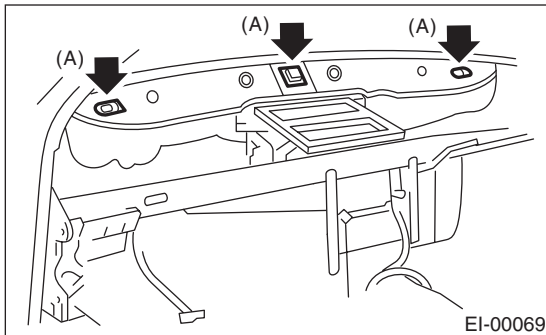
Install in the reverse order of removal.

CAUTION:

- **Be careful not to snag the harness.**
- **Make sure to connect the harness connector.**

NOTE:

When setting the instrument panel into position, push the hook into grommet (A) on the body panel.

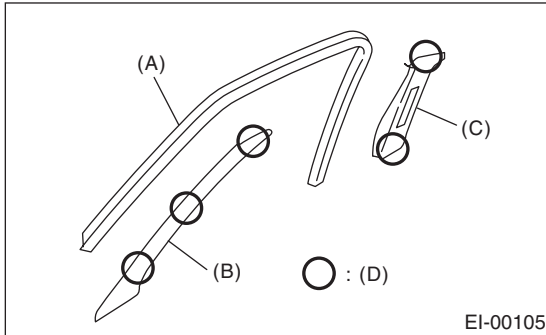


EI-00069

17.Upper Inner Trim

A: REMOVAL

- 1) Remove the lower inner trim. <Ref. to EI-43, REMOVAL, Lower Inner Trim.>
- 2) Remove the front moulding (A).
- 3) Remove the front pillar upper trim (B).
- 4) Detach the front seat belt shoulder anchor, then remove the center pillar upper trim (C).



(D) Clip

B: INSTALLATION

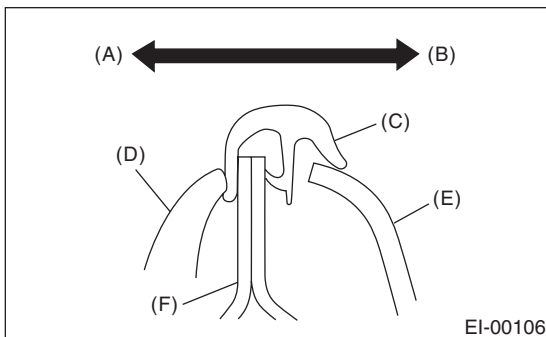
Install in the reverse order of removal.

CAUTION:

Be sure to securely hook claws of inner trim panel to body flange.

NOTE:

When installing the center pillar upper trim and the front pillar upper trim, be sure to set the front moulding as shown in figure.

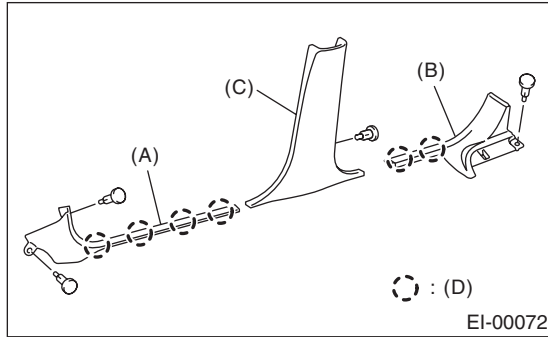


- (A) Outside
- (B) Inside
- (C) Molding
- (D) Weather strip
- (E) Trim
- (F) Body

18. Lower Inner Trim

A: REMOVAL

- 1) Remove the side sill front cover (A).
- 2) Remove the rear seat cushion <Ref. to SE-17, REMOVAL, Rear Seat.>, and then remove the side sill rear cover (B).
- 3) Remove the center pillar lower trim (C).



(D) Clip

B: INSTALLATION

Install in the reverse order of removal.

CAUTION:

Be sure to securely hook claws of inner trim panel to body flange.

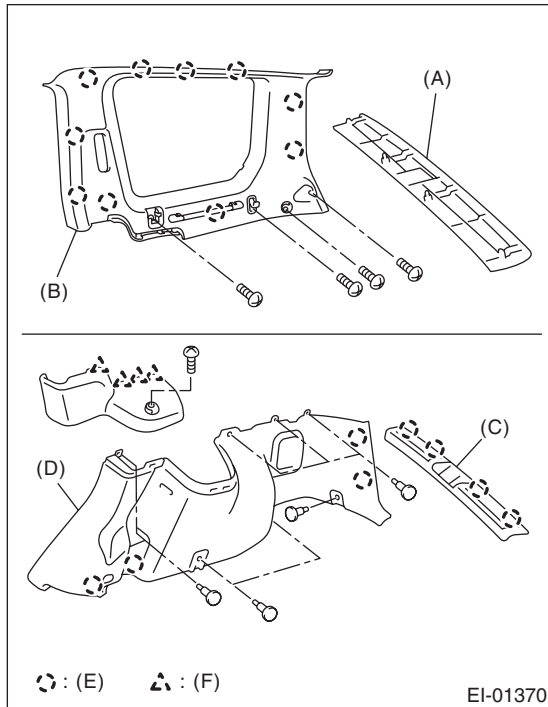
Rear Quarter Trim

EXTERIOR/INTERIOR TRIM

19.Rear Quarter Trim

A: REMOVAL

- 1) Remove the rear seat. <Ref. to SE-17, REMOVAL, Rear Seat.>
- 2) Remove the side sill rear cover.
- 3) Remove the rear rail trim (A).
- 4) Loosen the screws to remove the strut cap.
- 5) Remove the rear seat belt shoulder anchor.
- 6) Loosen the screws and clips to remove the rear quarter upper trim (B).
- 7) Remove the rear skirt trim (C).
- 8) Loosen the screws and clips to remove the rear quarter lower trim (D).



- (E) Clip
- (F) Hook

B: INSTALLATION

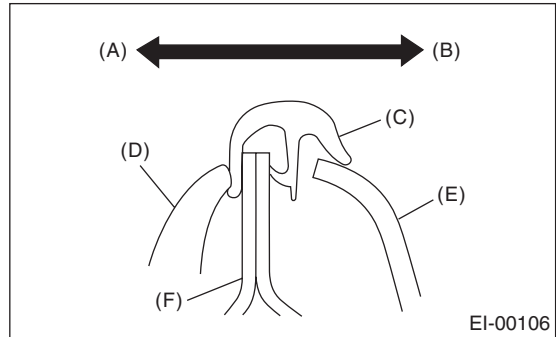
Install in the reverse order of removal.

CAUTION:

Be sure to securely hook claws of inner trim panel to body flange.

NOTE:

When installing the rear quarter upper trim, be sure to set the rear molding as shown in the figure.

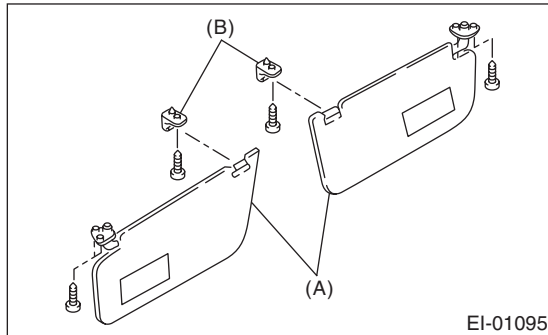


- (A) Outside
- (B) Inside
- (C) Molding
- (D) Weather strip
- (E) Trim
- (F) Body

20.Sun Visor

A: REMOVAL

Remove the mounting screws and detach the sun visor (A) and hook (B).



B: INSTALLATION

Install in the reverse order of removal.

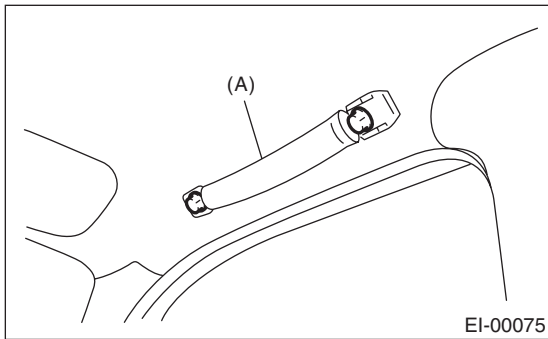
21. Roof Trim

A: REMOVAL

CAUTION:

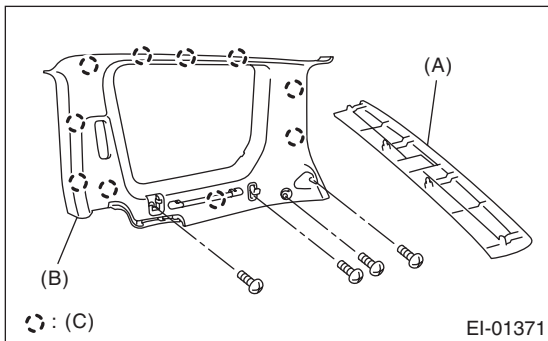
When removing the clip, use great care not to damage the roof trim.

- 1) Disconnect the ground cable from the battery.
- 2) Remove the overhead console. (Model with sun-roof) <Ref. to SR-9, REMOVAL, Sunroof Switch.>
- 3) Remove the room light. <Ref. to LI-30, REMOVAL, Room Light.>
- 4) Remove the sun visor and hook on both sides. <Ref. to EI-45, REMOVAL, Sun Visor.>
- 5) Remove the assist grip cap, and remove the assist grip (A).



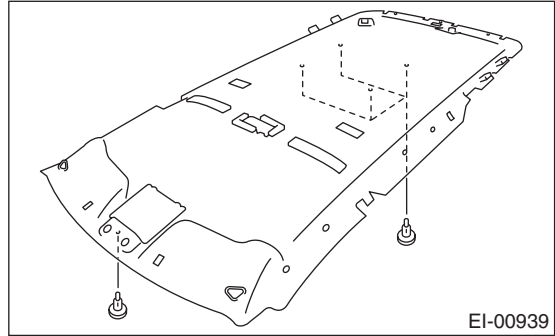
- 6) Remove the upper inner trim. <Ref. to EI-42, REMOVAL, Upper Inner Trim.>
- 7) Remove the rear quarter upper trim shown in the figure. <Ref. to EI-44, REMOVAL, Rear Quarter Trim.>

- (1) Remove the rear rail trim (A).
- (2) Remove the rear quarter upper trim (B) of both sides.



(C) Clip

- 8) Remove the clips, and then remove the roof trim.



B: INSTALLATION

Install in the reverse order of removal.

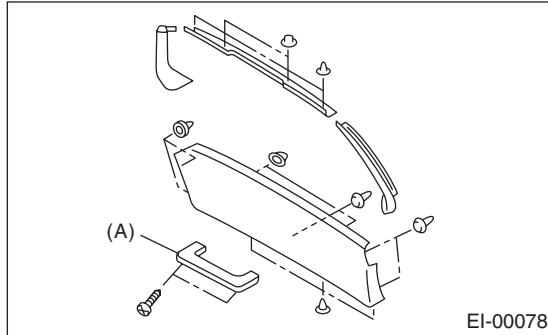
22.Rear Gate Trim

A: REMOVAL

CAUTION:

Be careful not to damage the clips or their holes.

Remove the rear gate inner handle (A) from the rear gate, and remove the trim panel.



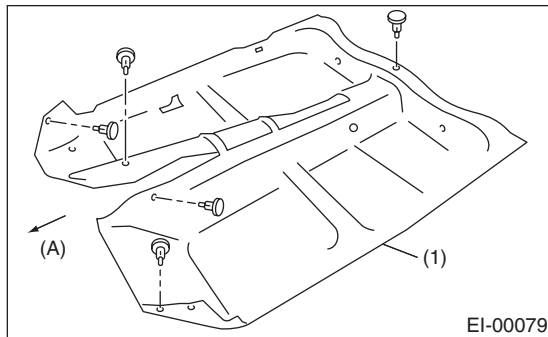
B: INSTALLATION

Install in the reverse order of removal.

23. Floor Mat

A: REMOVAL

- 1) Remove the front seats. <Ref. to SE-7, REMOVAL, Front Seat.>
- 2) Remove the rear seat cushion. <Ref. to SE-17, REMOVAL, Rear Seat.>
- 3) Remove the console box. <Ref. to EI-38, Console Box.>
- 4) Remove the side sill front cover, side sill rear cover and center pillar lower trim. <Ref. to EI-43, REMOVAL, Lower Inner Trim.>
- 5) Remove the footrest and clip from the floor mat.
- 6) Remove the mat hook.
- 7) Remove the mat from toe board area.
- 8) Remove the mat from rear heater duct.
- 9) Roll the mat, and then take it out of opened rear door.



- (A) Front side of vehicle
(1) Floor mat

B: INSTALLATION

Install in the reverse order of removal.

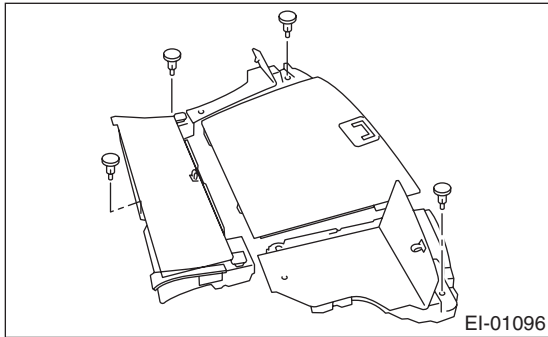
NOTE:

- Secure the mat firmly with hook and Velcro tape.
- Insert the mat edge firmly into the groove of side sill cover.

24. Luggage Floor Mat

A: REMOVAL

- 1) Remove the backside mat from the rear seat backrest.
- 2) Remove the clips, then detach the rear floor mats and boxes.



B: INSTALLATION

Install in the reverse order of removal.

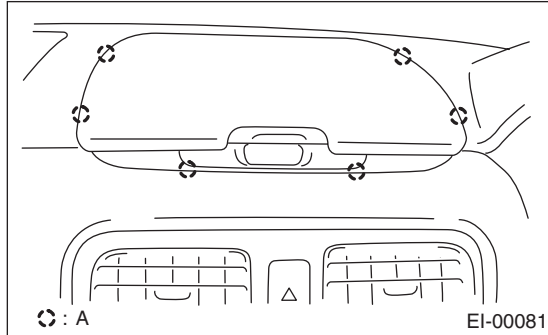
Instrument Panel Center Compartment

EXTERIOR/INTERIOR TRIM

25. Instrument Panel Center Compartment

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Use a flat tip screwdriver to pry off the clip.



(A) Clip

- 3) Remove the instrument panel center compartment from the instrument panel.
- 4) Disconnect the clock connector.

B: INSTALLATION

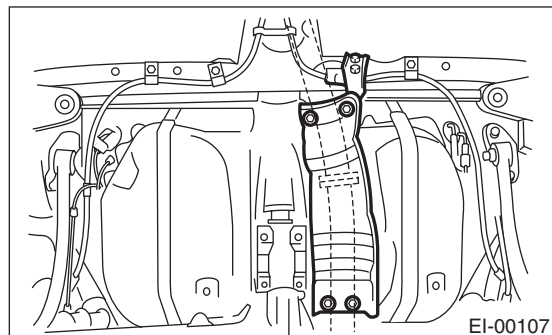
Install in the reverse order of removal.

26. Heat Shield Cover

A: REMOVAL

1. CENTER HEAT SHIELD COVER

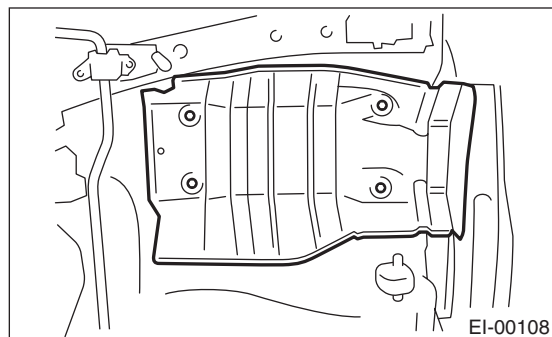
Loosen four bolts to remove the center heat shield cover.



2. REAR HEAT SHIELD COVER

1) Remove the muffler. <Ref. to EX (H4SO)-9, REMOVAL, Muffler.>

2) Loosen the four bolts to remove the rear heat shield cover.



B: INSTALLATION

Install in the reverse order of removal.

Heat Shield Cover

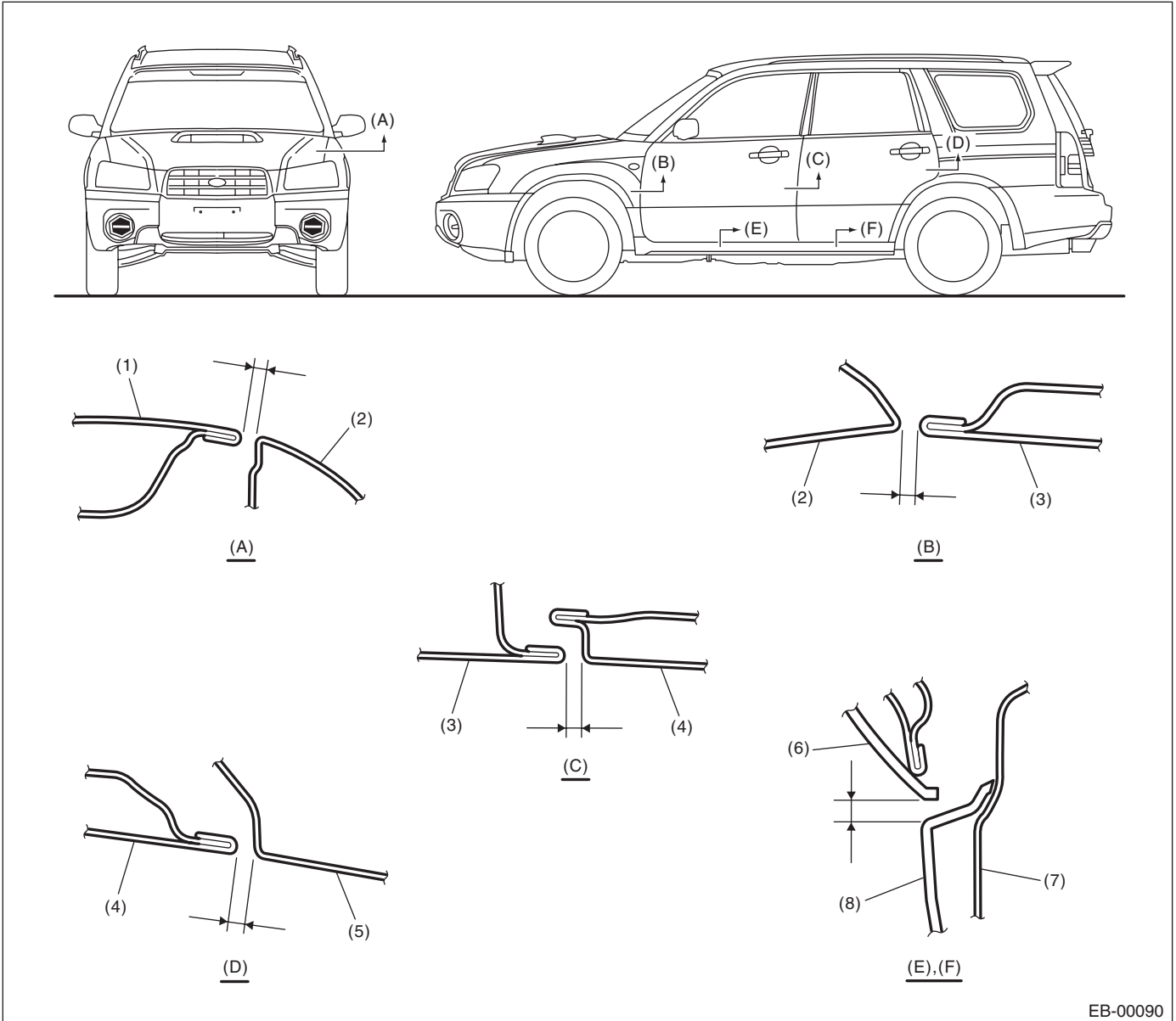
EXTERIOR/INTERIOR TRIM

General Description

EXTERIOR BODY PANELS

1. General Description

A: SPECIFICATION

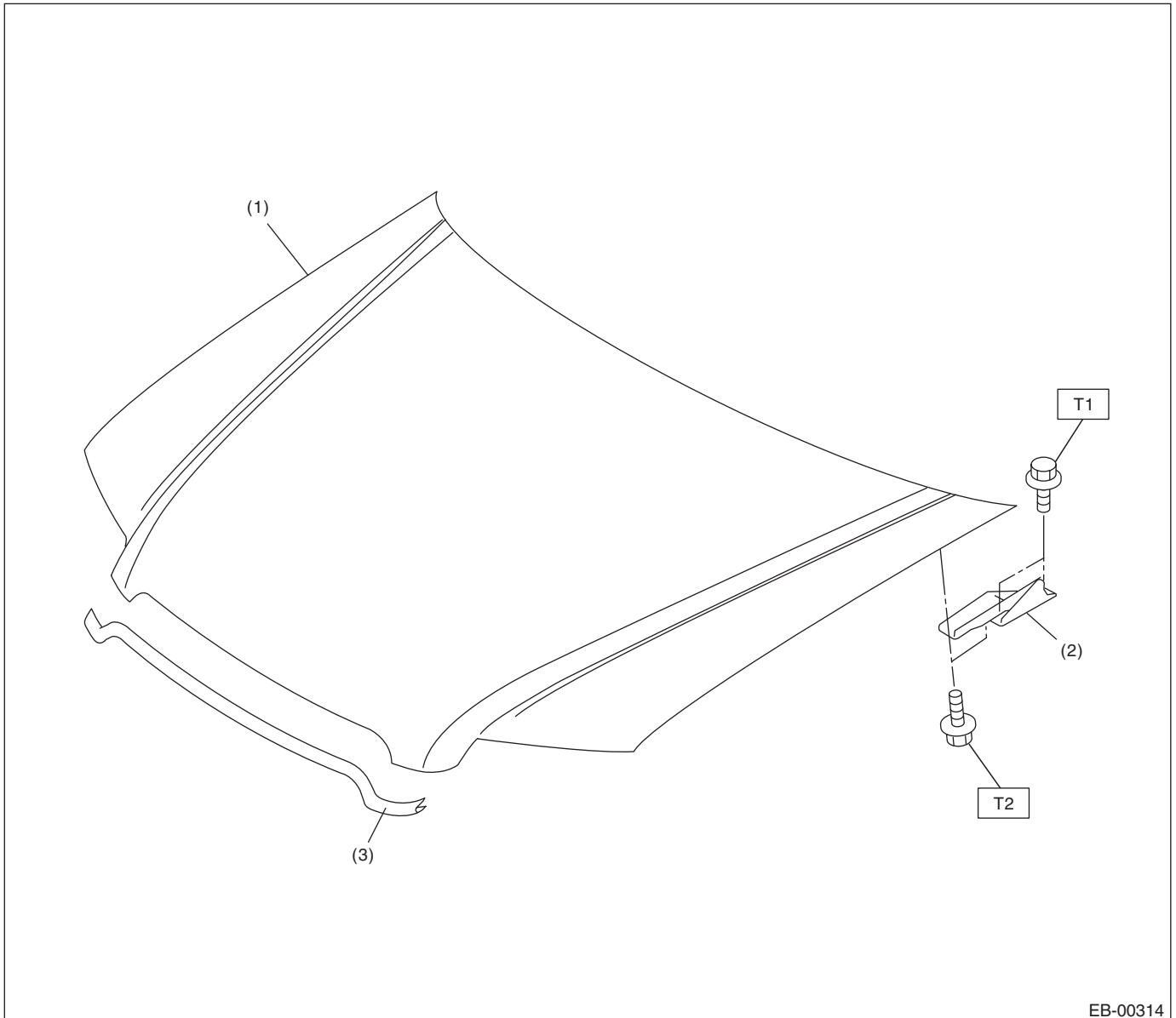


- | | | |
|------------------------|------------------------|-----------------------|
| (1) Front hood panel | (4) Rear door panel | (7) Side sill |
| (2) Front fender panel | (5) Rear quarter panel | (8) Side sill garnish |
| (3) Front door panel | (6) Door panel | |

Section	Part	Standard
(A)	Front hood panel to Front fender panel	3.5±1.0 mm (0.14±0.04 in)
(B)	Front fender panel to Front door panel	4.7±1.0 mm (0.19±0.04 in)
(C)	Front door panel to Rear door panel	5.1±1.0 mm (0.20±0.04 in)
(D)	Rear door panel to Rear quarter panel	4.6±1.0 mm (0.18±0.04 in)
(E), (F)	Door panel to Side sill	7.0±1.5 mm (0.28±0.06 in)

B: COMPONENT

1. FRONT HOOD



- (1) Front hood panel
- (2) Hinge
- (3) Seal

Tightening torque: N-m (kgf-m, ft-lb)

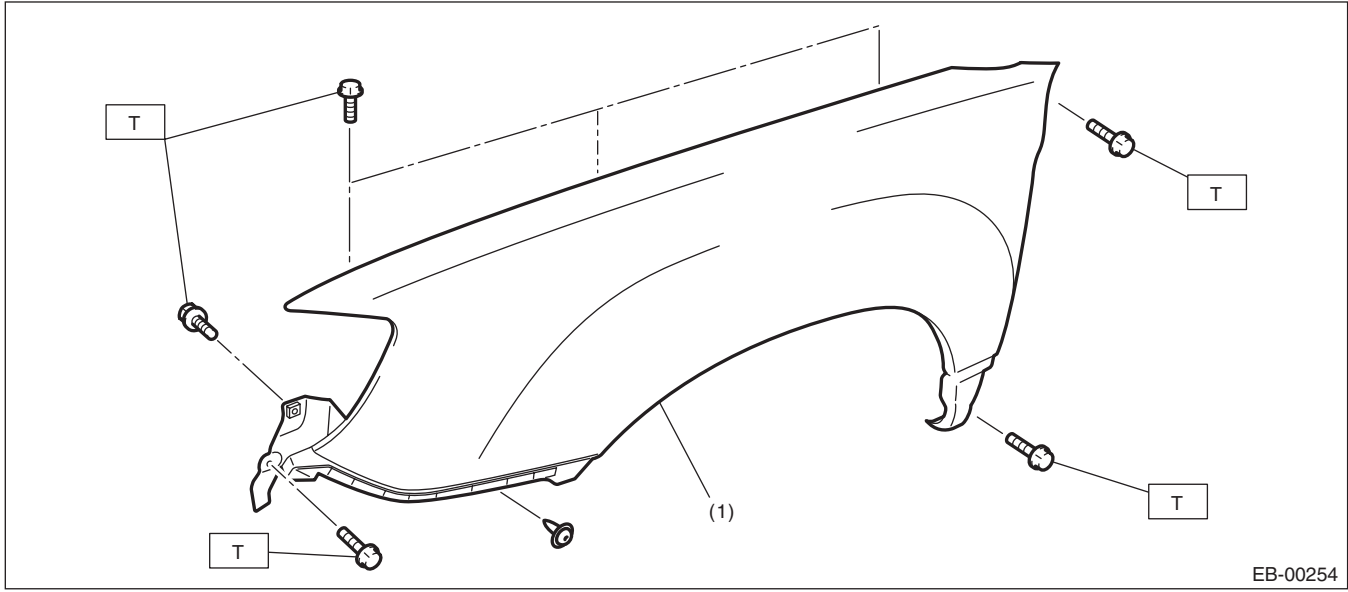
T1: 25 (2.5, 18)

T2: 37 (3.8, 27)

General Description

EXTERIOR BODY PANELS

2. FRONT FENDER

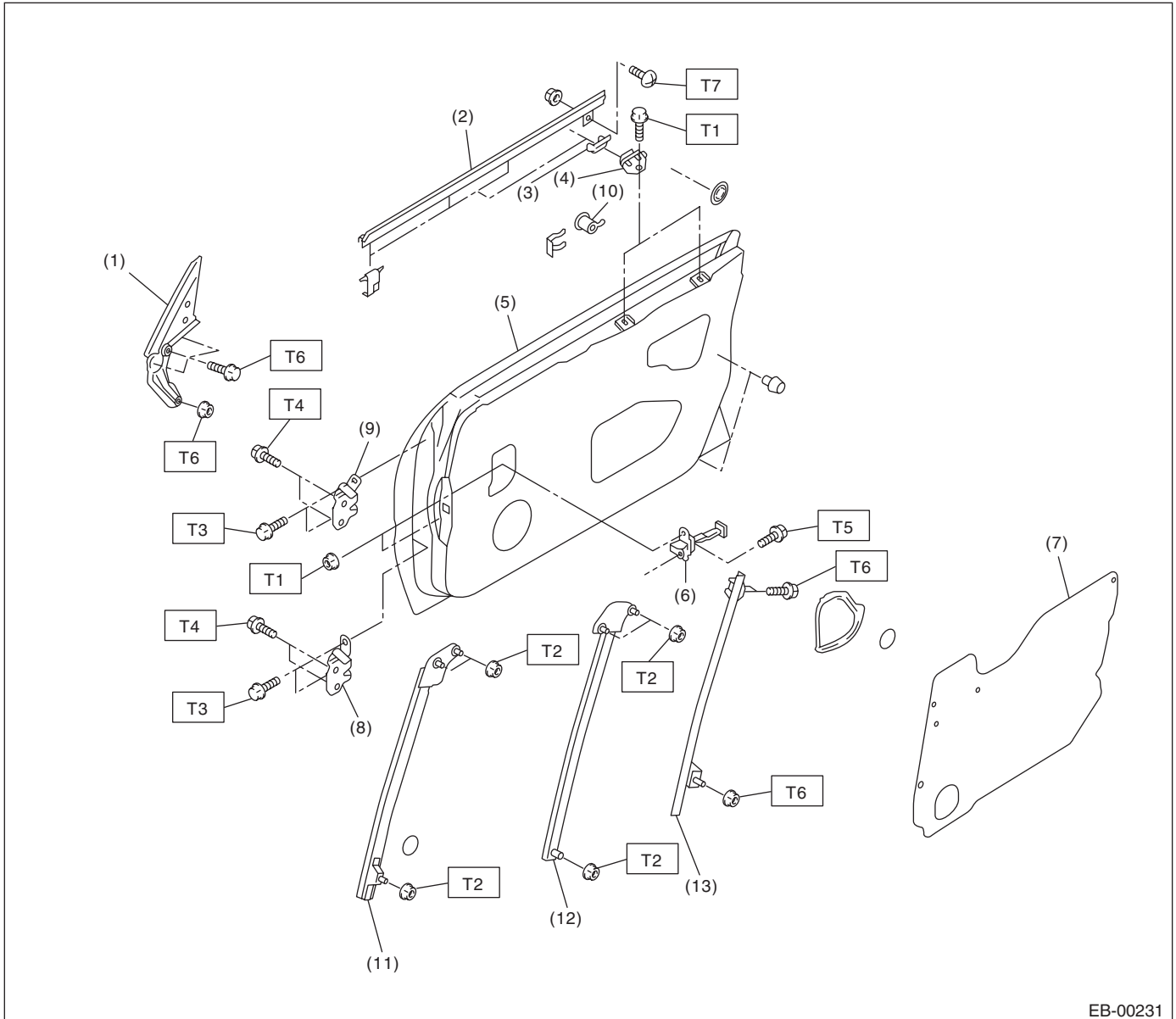


(1) Front fender panel

Tightening torque: N·m (kgf·m, ft·lb)

T: 7.5 (0.76, 5.5)

3. FRONT DOOR



EB-00231

- | | |
|------------------------|--|
| (1) Gusset | (8) Lower hinge |
| (2) Weather strip | (9) Upper hinge |
| (3) Stabilizer (outer) | (10) Key cylinder (Driver's side only) |
| (4) Stabilizer (inner) | (11) Front sash |
| (5) Door panel | (12) Rear sash |
| (6) Checker | (13) Guide rail |
| (7) Sealing cover | |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 7.5 (0.76, 5.5)

T2: 14 (1.4, 10.3)

T3: 25 (2.5, 18.1)

T4: 30 (3.1, 22)

T5: 33 (3.4, 24)

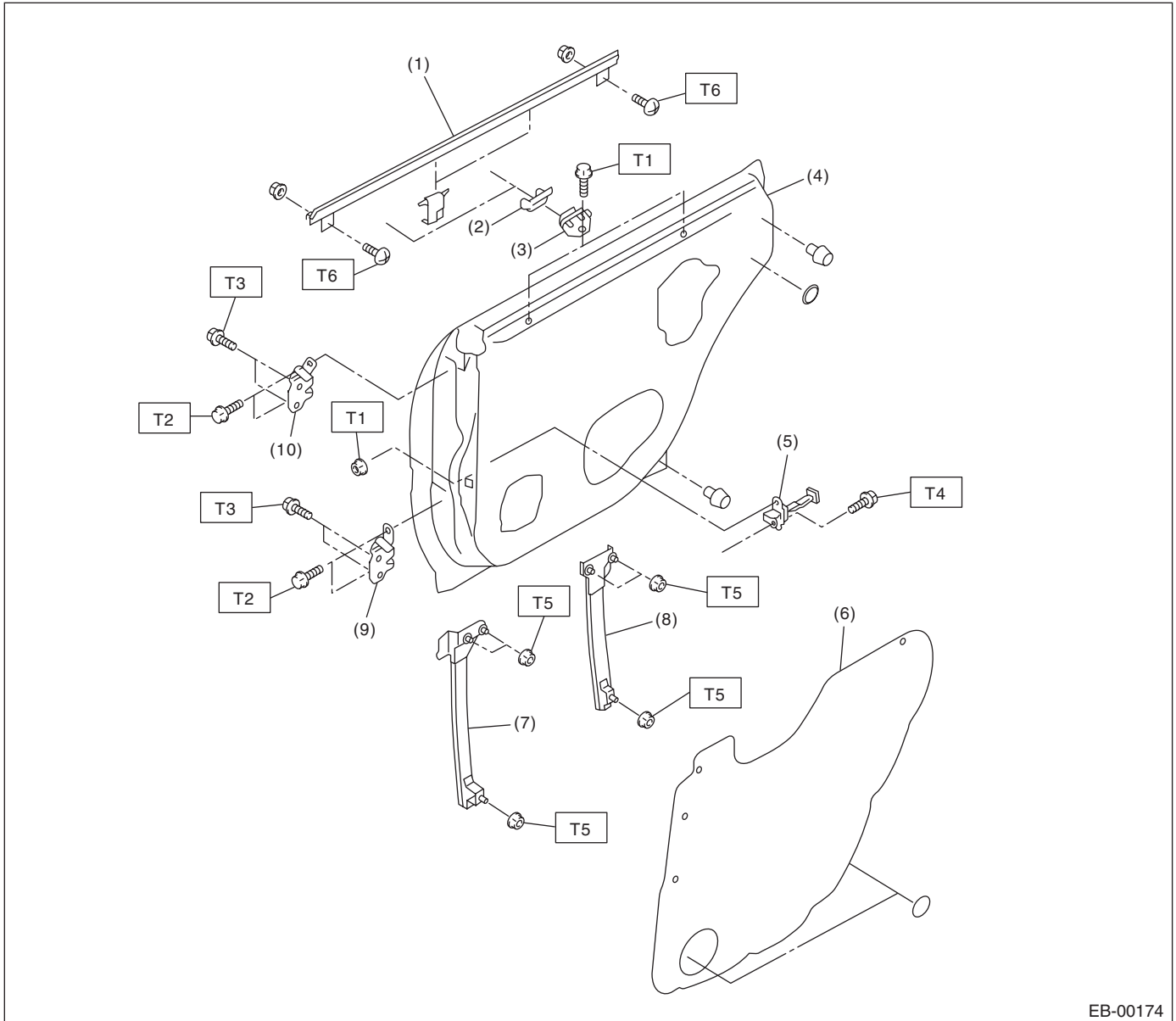
T6: 6 (0.6, 4.4)

T7: 1.5 (0.15, 1.1)

General Description

EXTERIOR BODY PANELS

4. REAR DOOR



EB-00174

- | | |
|------------------------|-------------------|
| (1) Weather strip | (6) Sealing cover |
| (2) Stabilizer (outer) | (7) Front sash |
| (3) Stabilizer (inner) | (8) Rear sash |
| (4) Door panel | (9) Lower hinge |
| (5) Checker | (10) Upper hinge |

Tightening torque: N·m (kgf·m, ft·lb)

T1: 7.5 (0.76, 5.5)

T2: 25 (2.5, 18)

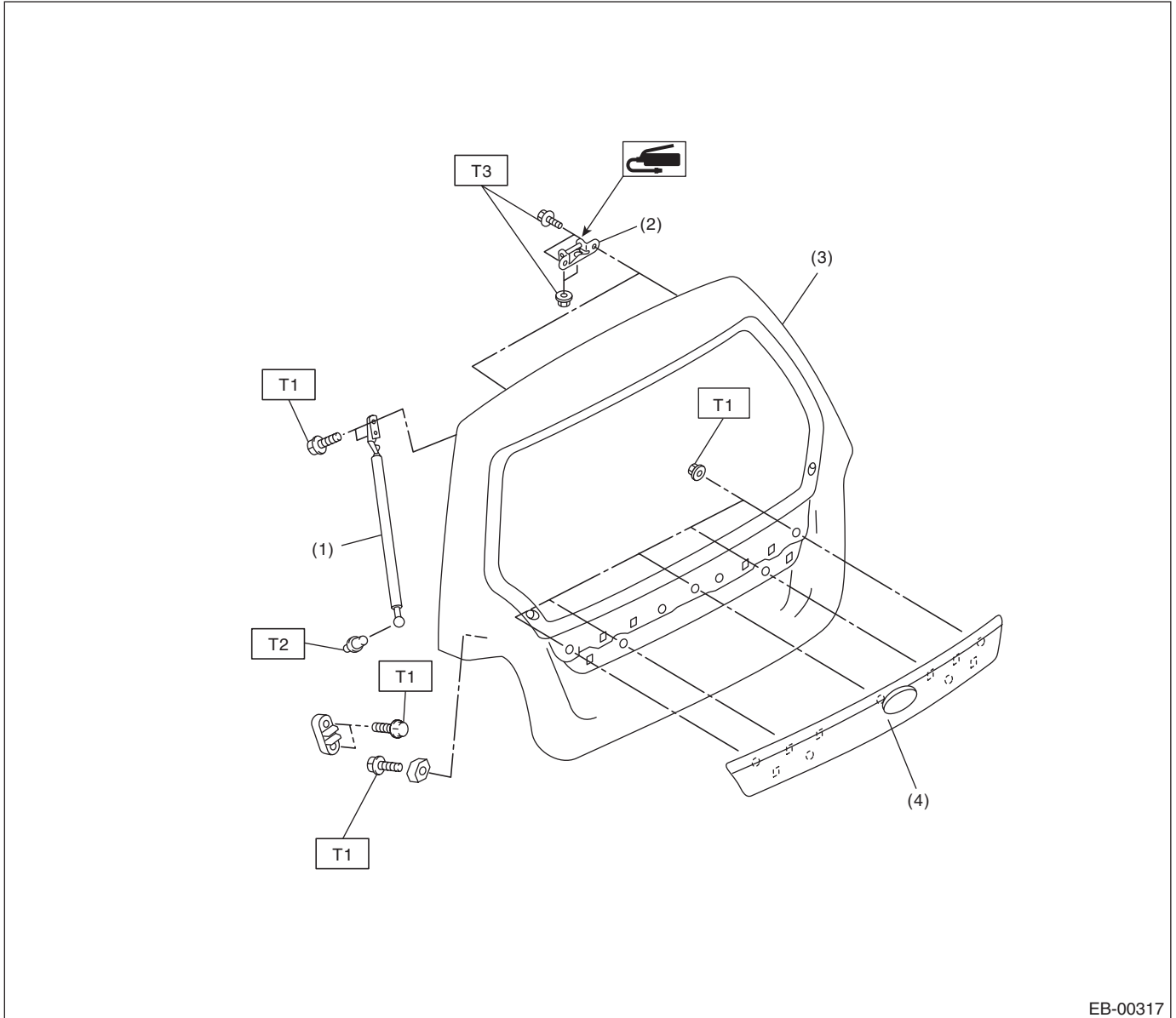
T3: 30 (3.1, 22)

T4: 33 (3.4, 24)

T5: 14 (1.4, 10.3)

T6: 1.5 (0.15, 1.1)

5. REAR GATE



EB-00317

- (1) Damper stay
- (2) Hinge

- (3) Rear gate panel
- (4) Rear gate garnish

Tightening torque: N·m (kgf·m, ft·lb)

T1: 7.5 (0.76, 5.5)

T2: 14 (1.4, 10.3)

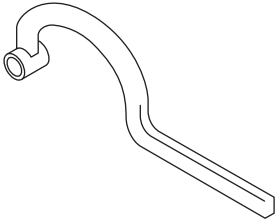
T3: 25 (2.5, 18.1)

General Description

EXTERIOR BODY PANELS

C: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 <p>ST-925610000</p>	925610000	WRENCH	Used for removing and installing door hinge.

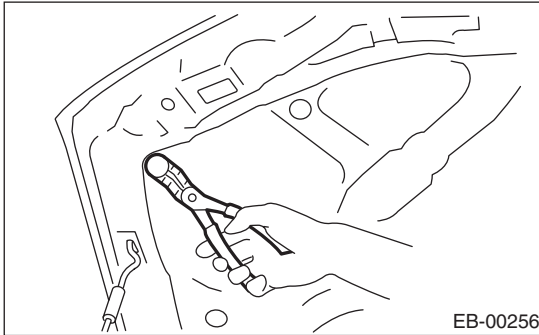
2. GENERAL TOOL

TOOL NAME	REMARKS
Support jack	Used for supporting door panel.
Support stand	Used for supporting the rear gate panel.

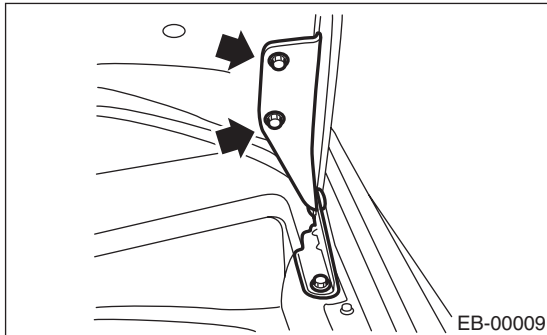
2. Front Hood

A: REMOVAL

- 1) Open the front hood to remove the washer nozzles.
- 2) Release the clips to remove the front hood insulator.



- 3) Remove the bolts to disconnect the hood from hinges.



B: INSTALLATION

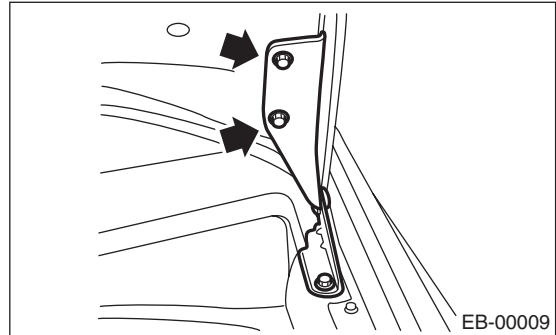
- 1) Install in the reverse order of removal.
- 2) Adjust the clearance between front hood panel and front fender panel. Clearance must be equal at both sides.

Tightening torque:

Refer to "COMPONENT" of "General Description". <Ref. to EB-3, FRONT HOOD, COMPONENT, General Description.>

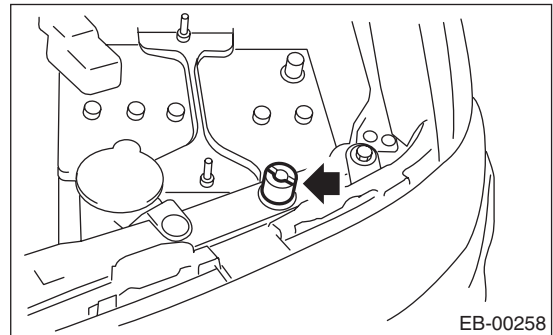
C: ADJUSTMENT

- 1) Use a hinge mounting holes to align the front hood longitudinally and laterally.



- 2) Adjust the height at the front end of front hood. <Ref. to SL-40, ADJUSTMENT, Front Hood Lock Assembly.>

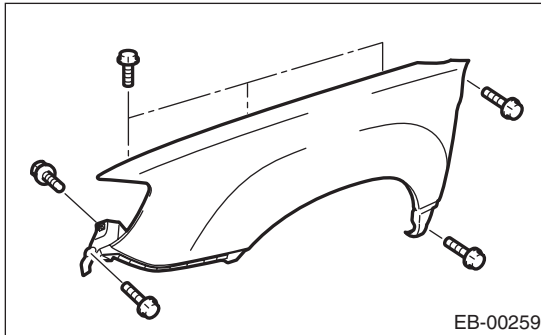
- 3) Rotate the front hood buffer to adjust lateral height.



3. Front Fender

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the front bumper face. <Ref. to EI-21, REMOVAL, Front Bumper.>
- 3) Remove the mud guard. <Ref. to EI-30, REMOVAL, Mud Guard.>
- 4) Remove the side sill spoilers. <Ref. to EI-32, REMOVAL, Side Sill Spoiler.>
- 5) Remove the side protector. <Ref. to EI-33, REMOVAL, Side Garnish.>
- 6) Loosen the bolts and clips to remove the front fender panel.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) When the front fender panel is installed, the clearance between front fender panel and front hood panel must be equal.

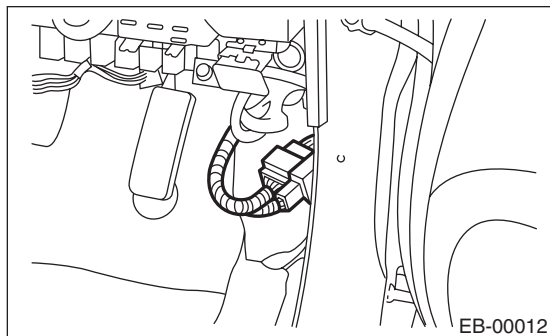
Tightening torque:

7.5 N·m (0.76 kgf-m, 5.5 ft-lb)

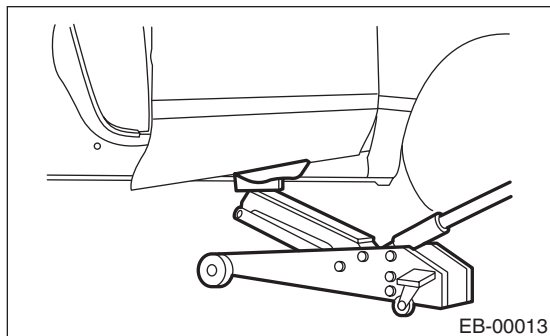
4. Front Door

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the front door trim. <Ref. to EI-34, REMOVAL, Front Door Trim.>
- 3) Remove the outer mirror assembly. <Ref. to GW-12, REMOVAL, Outer Mirror Assembly.>
- 4) Remove the front sealing cover. <Ref. to EB-13, REMOVAL, Front Sealing Cover.>
- 5) Remove the front door glass. <Ref. to GW-16, REMOVAL, Front Door Glass.>
- 6) Remove the front door regulator and motor. <Ref. to GW-20, REMOVAL, Front Regulator and Motor Assembly.>
- 7) Remove the front door latch assembly. <Ref. to SL-31, REMOVAL, Front Door Latch and Door Lock Actuator Assembly.>
- 8) Remove the front outer handle. <Ref. to SL-30, REMOVAL, Front Outer Handle.>
- 9) Remove the front pillar lower trim to disconnect connector from the body harness.



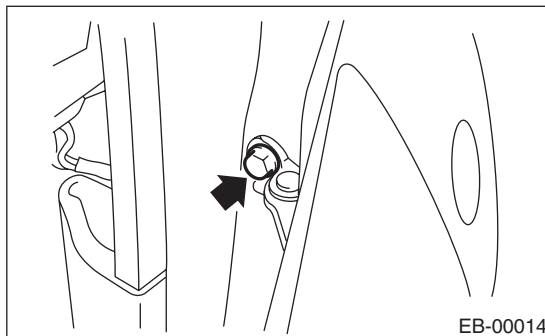
- 10) Put a wooden block on jack and place jack under the door. Support the door with a jack to protect it from damage.



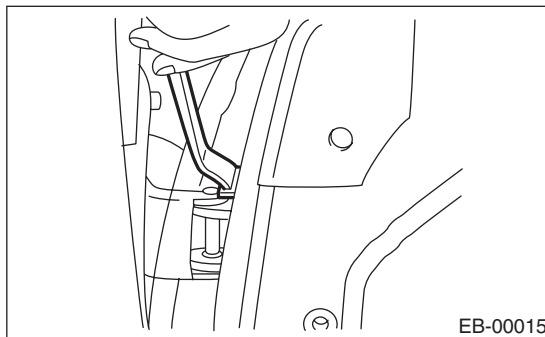
NOTE:

When supporting the door with jack, work carefully so that you do not deform the hinge portion of door during work.

- 11) Remove the checker bolts.

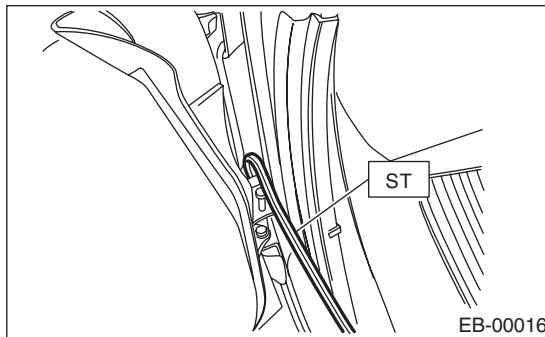


- 12) Remove the door-side bolts for upper and lower hinges to remove front door panel.



- 13) Remove the attaching bolts (on the body side) for the upper and lower hinges using the ST to remove the door hinges.

ST 925610000 WRENCH



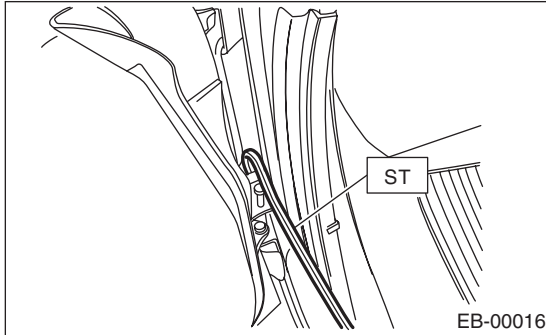
B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Apply grease to the moving part of door hinges.
- 3) Refer to "COMPONENT" of "General Description" for tightening torque. <Ref. to EB-5, FRONT DOOR, COMPONENT, General Description.>

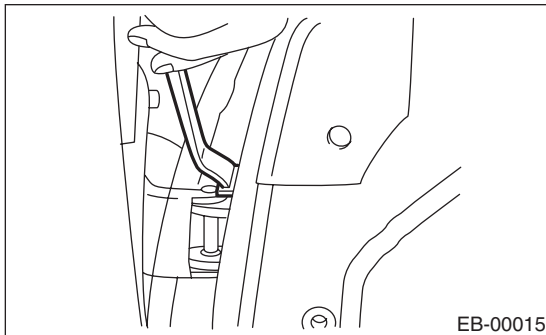
C: ADJUSTMENT

- 1) Using the ST, loosen the body-side bolts of the upper and lower hinges to align the position for vertical and horizontal direction of the front door panel.

ST 925610000 WRENCH



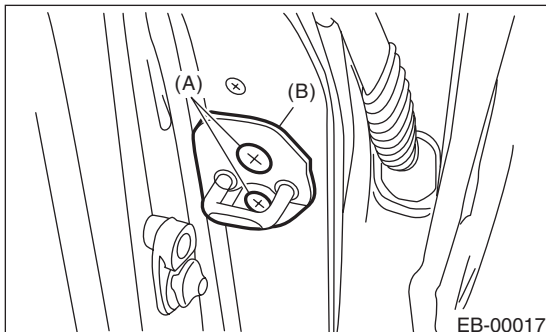
- 2) Loosen the door-side bolts of the upper and lower hinges to align the position for vertical and horizontal direction of front door panel on the front side.



- 3) Loosen the screws (A) and tap striker (B) using a plastic hammer to adjust the striker to align the position of front door panel vertically and laterally at the rear end.

CAUTION:

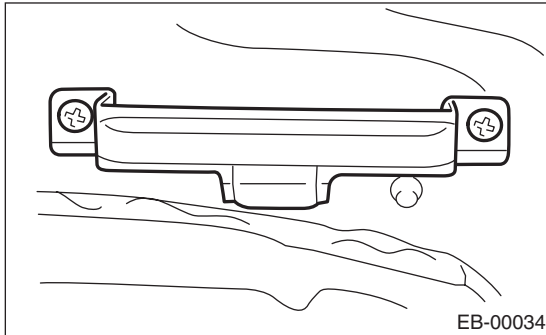
Do not use an impact wrench. Welding area on the striker nut plate is easily broken.



5. Front Sealing Cover

A: REMOVAL

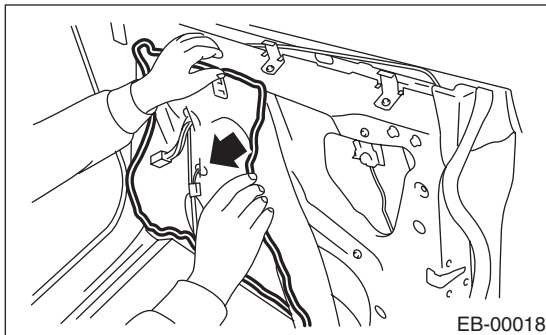
- 1) Disconnect the ground cable from the battery.
- 2) Remove the front door trim. <Ref. to EI-34, REMOVAL, Front Door Trim.>
- 3) Remove the front speaker. <Ref. to ET-8, REMOVAL, Front Speaker.>
- 4) Remove the door trim bracket.



- 5) Remove the sealing cover.

NOTE:

- Carefully remove the butyl tape. Excessive force will easily break the cover.
- If cover gets broken, replace it with a new part.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) When replacing the sealing cover, use the butyl tape.
- 3) Press the butyl tape-applied area firmly to prevent any floating on surface.

Butyl tape:

3M8626 or equivalent

NOTE:

- Apply a uniform bead of butyl tape.
- Attach the sealing cover, keeping it from becoming wrinkled.
- Breaks in the bead will allow water leakage and contamination.

C: INSPECTION

If the sealing cover gets damaged, replace it with a new part.

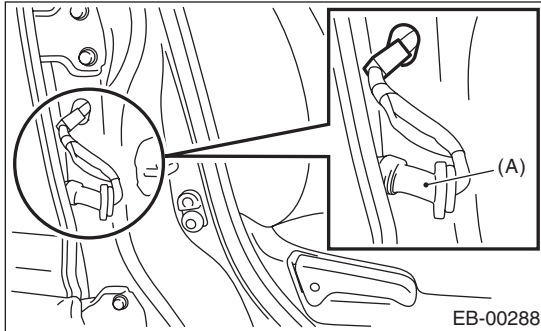
Rear Door

EXTERIOR BODY PANELS

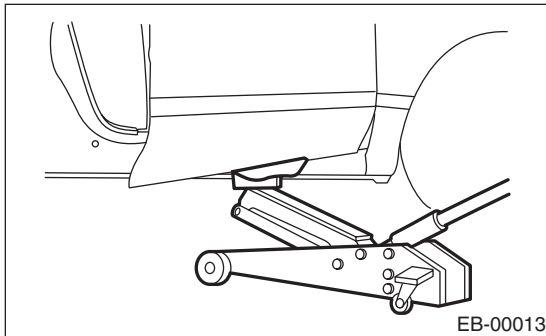
6. Rear Door

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Remove the rear door trim. <Ref. to EI-35, REMOVAL, Rear Door Trim.>
- 3) Remove the rear sealing cover. <Ref. to EB-16, REMOVAL, Rear Sealing Cover.>
- 4) Remove the rear door glass. <Ref. to GW-21, REMOVAL, Rear Door Glass.>
- 5) Remove the rear door regulator and motor. <Ref. to GW-23, REMOVAL, Rear Regulator and Motor Assembly.>
- 6) Remove the rear door latch. <Ref. to SL-35, REMOVAL, Rear Door Latch and Door Lock Actuator Assembly.>
- 7) Remove the rear outer handle. <Ref. to SL-34, REMOVAL, Rear Outer Handle.>
- 8) Remove the rubber duct (A) from center pillar, and disconnect the connector of the door harness.



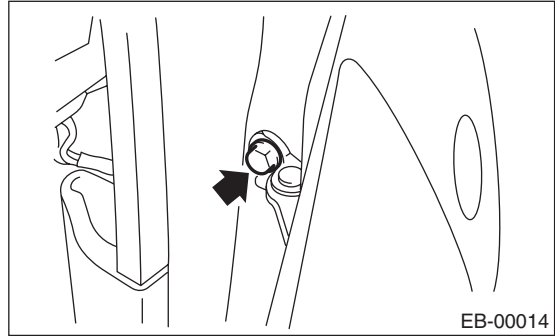
- 9) Put a wooden block on jack and place jack under the door. Support the door with a jack to protect it from damage.



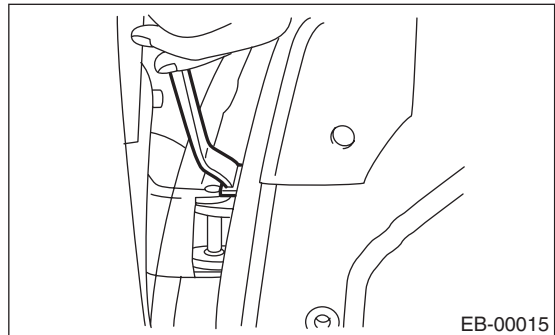
NOTE:

When supporting the door with jack, work carefully so that you do not deform the hinge portion of door during work.

- 10) Remove the checker bolts.



- 11) Remove the door-side bolts for upper and lower hinges to remove the rear door panel.



- 12) Remove the attaching bolts (on the body side) for the upper and lower hinges using the ST to remove the door hinges.

ST 925610000 WRENCH

B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) Apply grease to the moving part of door hinges.
- 3) Refer to "COMPONENT" of "General Description" for tightening torque. <Ref. to EB-6, REAR DOOR, COMPONENT, General Description.>

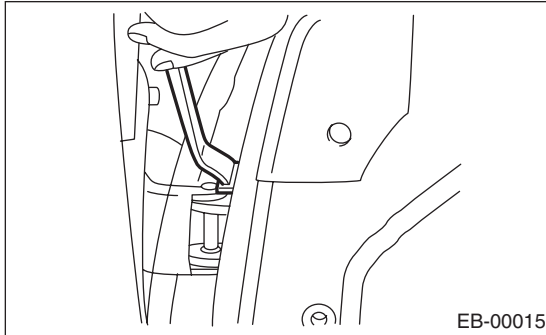
C: ADJUSTMENT

1) Using the ST, loosen the body-side bolts of the upper and lower hinges to align the position for vertical and horizontal direction of the rear door panel.

ST 925610000 WRENCH



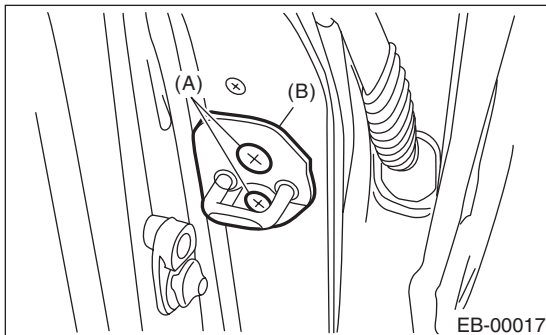
2) Loosen the door-side bolts of the upper and lower hinges to align the position for vertical and horizontal direction of rear door panel on the front side.



3) Loosen the screws (A) and tap the striker (B) using a plastic hammer to adjust the striker to align the position of rear door panel vertically and laterally at the rear end.

CAUTION:

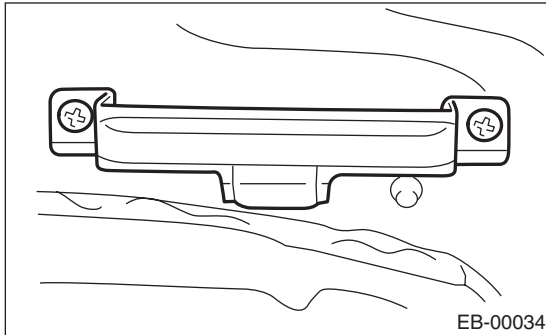
Do not use an impact wrench. Welding area on the striker nut plate is easily broken.



7. Rear Sealing Cover

A: REMOVAL

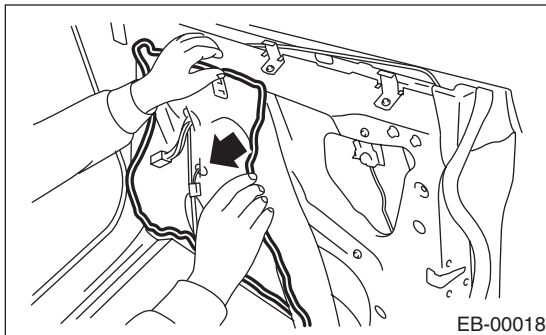
- 1) Disconnect the ground cable from the battery.
- 2) Remove the rear door trim. <Ref. to EI-35, REMOVAL, Rear Door Trim.>
- 3) Remove the rear speaker. <Ref. to ET-9, REMOVAL, Rear Speaker.>
- 4) Remove the door trim bracket.



- 5) Remove the sealing cover.

NOTE:

- Carefully remove the butyl tape. Excessive force will easily break the cover.
- If cover gets broken, replace it with a new part.



B: INSTALLATION

- 1) Install in the reverse order of removal.
- 2) When replacing the sealing cover, use the butyl tape.
- 3) Press the butyl tape-applied area firmly to prevent any floating on surface.

Butyl tape:

3M8626 or equivalent

NOTE:

- Apply a uniform bead of butyl tape.
- Attach the sealing cover, keeping it from becoming wrinkled.
- Breaks in the bead will allow water leakage and contamination.

C: INSPECTION

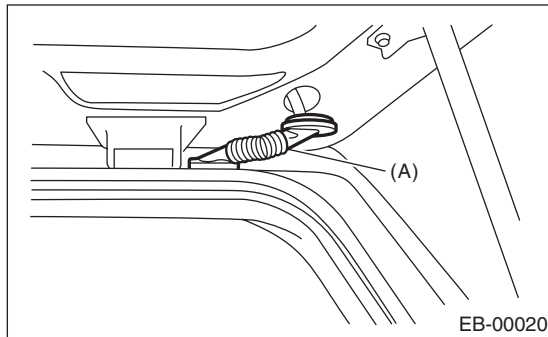
If the sealing cover gets damaged, replace it with a new part.

8. Rear Gate

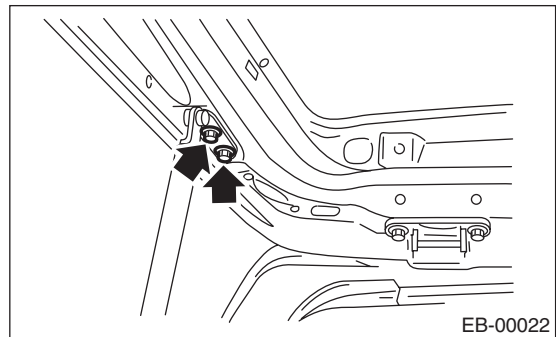
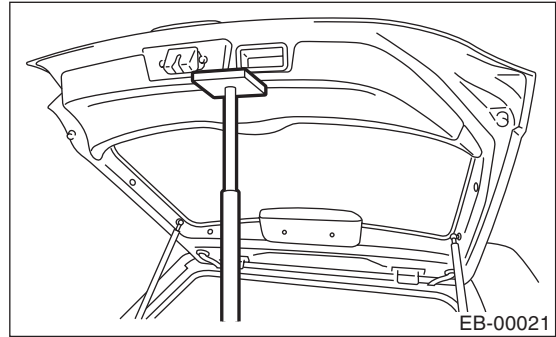
A: REMOVAL

1. REAR GATE PANEL

- 1) Disconnect the ground cable from the battery.
- 2) Open the rear gate.
- 3) Remove the rear gate trim. <Ref. to EI-47, REMOVAL, Rear Gate Trim.>
- 4) Remove the rear wiper motor. <Ref. to WW-16, REMOVAL, Rear Wiper Motor.>
- 5) Remove the rear gate garnish assembly. <Ref. to EB-20, REMOVAL, Rear Gate Garnish.>
- 6) Remove the rear gate outer handle. <Ref. to SL-37, REMOVAL, Rear Gate Outer Handle.>
- 7) Remove the rear gate latch assembly. <Ref. to SL-38, REMOVAL, Rear Gate Latch Assembly.>
- 8) Disconnect the connectors of rear wiper, rear defogger, and other lighting devices.
- 9) Disconnect the washer hose.
- 10) Remove the rubber duct (A) connection, and pull out the harness and washer hose from the rear gate.



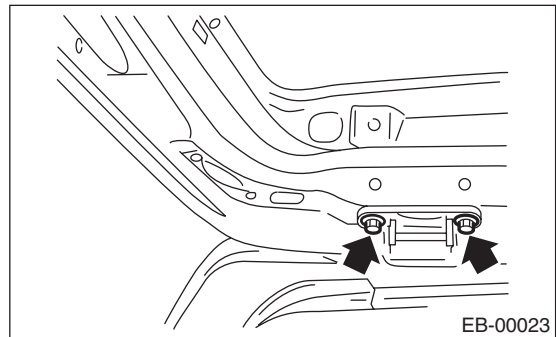
- 11) Support the rear gate using a support stand while removing the rear gate damper stay mounting bolts.



NOTE:

When the support stand that is supporting the rear gate is released, rear gate may hit and damage the body. To prevent this, place a shop cloth between body and rear gate.

- 12) Loosen the rear gate bolts to remove the rear gate.

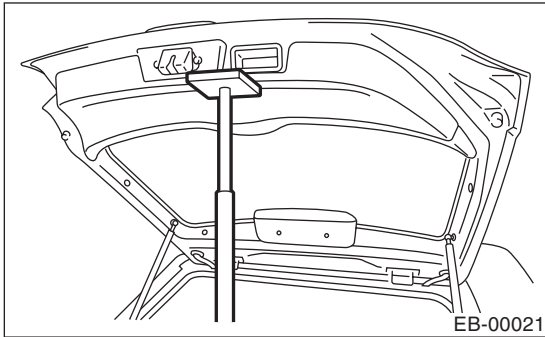


Rear Gate

EXTERIOR BODY PANELS

2. REAR GATE DAMPER STAY

1) Open the rear gate. Support the rear gate using the support stand.



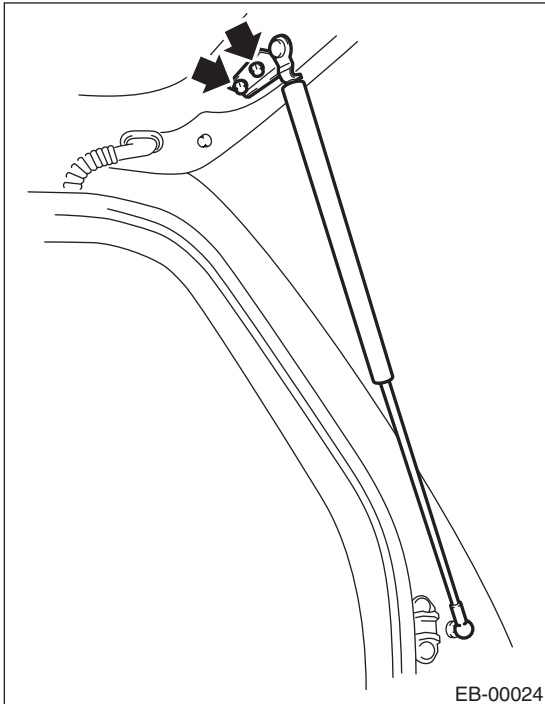
NOTE:

After the rear gate damper stay is removed, the rear gate cannot stay in the open position. Support the rear gate with a support stand when removing the bolts.

CAUTION:

- Do not damage piston rods and oil seals.
- Never disassemble cylinders: They contain gas.

2) Loosen the bolts to remove rear gate damper stay from the rear gate.



B: INSTALLATION

1. REAR GATE PANEL

- 1) Install in the reverse order of removal.
- 2) Install the rear gate panel with uniform clearance to the body.
- 3) Refer to "COMPONENT" of "General Description" for tightening torque. <Ref. to EB-7, REAR GATE, COMPONENT, General Description.>

NOTE:

Support the rear gate with a support stand before starting the work.

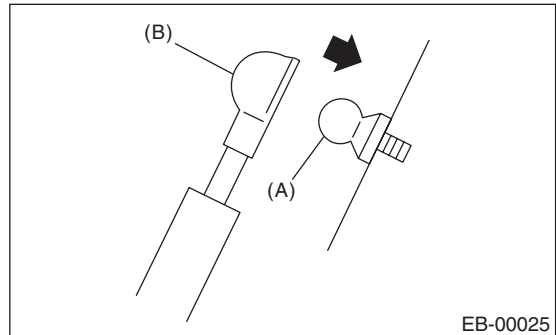
2. REAR GATE DAMPER STAY

- 1) Install mounting bolt (A) to the rear gate panel and body.

Tightening torque:

14 N·m (1.4 kgf-m, 10.3 ft-lb)

- 2) Securely install the rear gate damper stay (B) to the mounting bolt (A).



- 3) Tighten the upper side bolt of the rear gate damper stay.

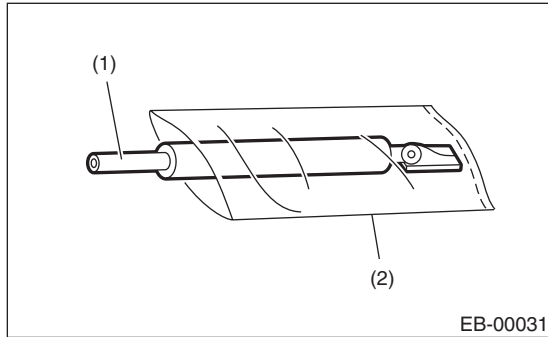
Tightening torque:

10 N·m (1.0 kgf-m, 7.2 ft-lb)

C: DISPOSAL**1. REAR GATE DAMPER STAY****CAUTION:**

Gas is colorless, odorless, and harmless. However, gas pressure may spray cutting powder or oil. Be sure to wear dust-resistant goggles.

1) Cover with a vinyl sack as shown in the figure.

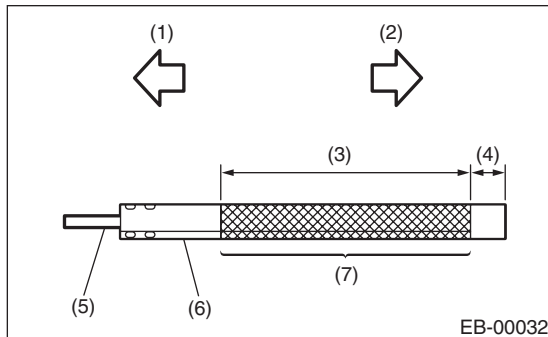


- (1) Rear gate damper stay
- (2) Vinyl sack

NOTE:

Prevent the vinyl sack from being caught by drill cutting edge

2) Lift the body side slightly with piston rods fully extended, and secure the body side on vise stand. Drill a hole in 2 to 3 mm (0.08 to 0.12 in) diameter at a point 10 to 200 mm (0.39 to 7.87 in) from door side, and bleed rear gate damper stay gas stay completely.



- (1) Body side
- (2) Door side
- (3) 190 mm (7.48 in)
- (4) 10 mm (0.39 in)
- (5) Piston rod
- (6) Cylinder
- (7) Portion to be drilled

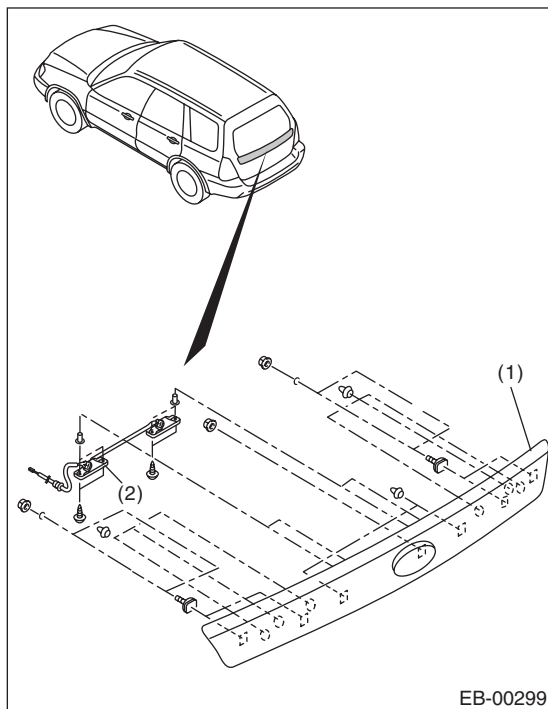
9. Rear Gate Garnish

A: REMOVAL

- 1) Remove the rear gate trim. <Ref. to EI-47, REMOVAL, Rear Gate Trim.>
- 2) Remove the 5 flange nuts from the rear gate panel inner side (vehicle side).
- 3) Remove the license plate light assembly connector from the rear gate panel inner side (luggage compartment side).
- 4) Close the gate and then remove the rear gate garnish assembly by pulling it manually.

CAUTION:

Be careful not to pull by force. It may damage the clip and license plate light harness.



- (1) Rear garnish ASSY
- (2) License plate light

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

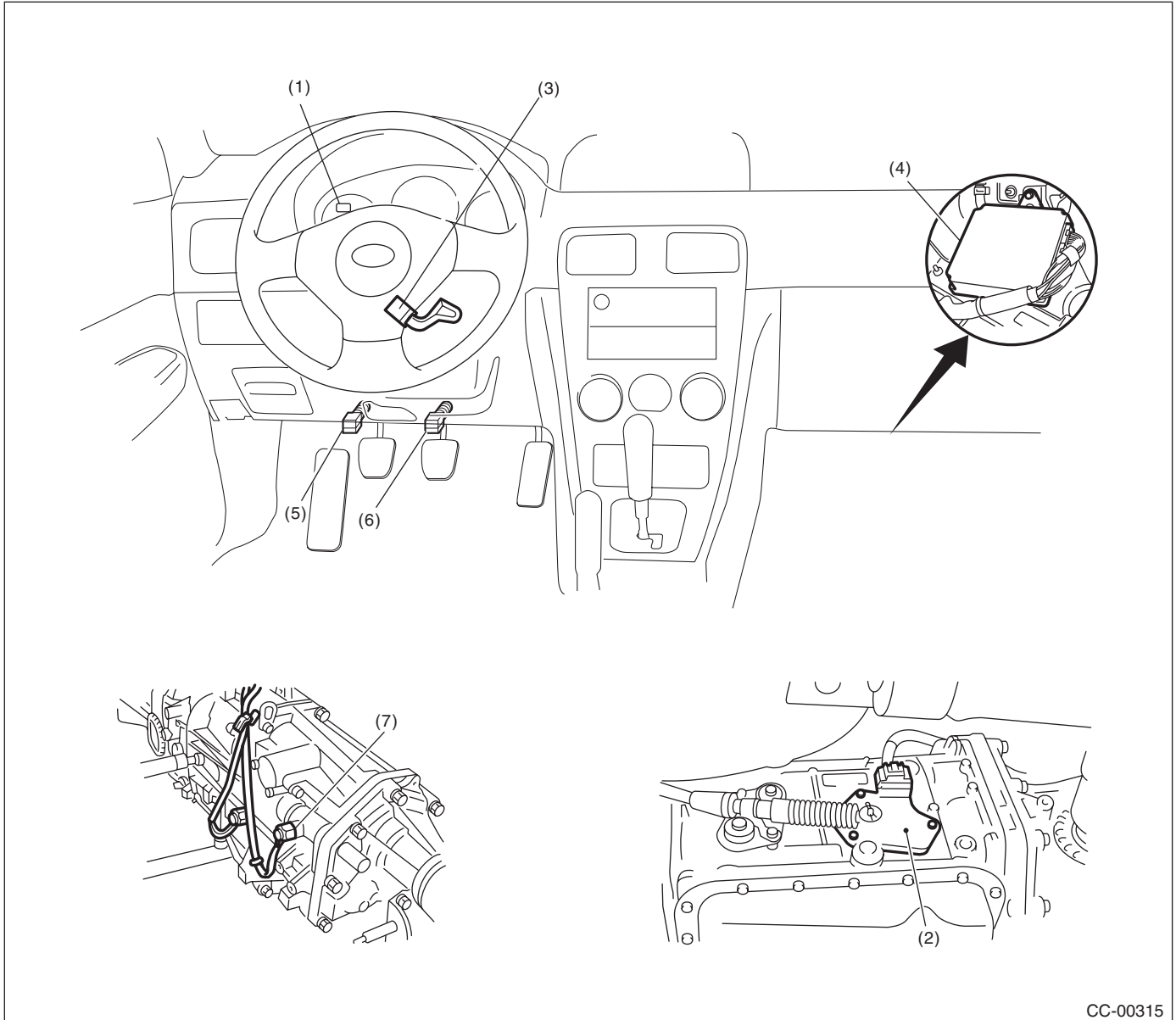
Make sure the rear gate garnish is not greatly scratched or cracked.

General Description

CRUISE CONTROL SYSTEM

1. General Description

A: COMPONENT



CC-00315

- | | | |
|---|-----------------------------------|--|
| (1) Cruise indicator and cruise set indicator light | (3) Cruise control command switch | (6) Stop light & brake switch |
| (2) Inhibitor switch (AT model) | (4) Engine control module (ECM) | (7) Neutral position switch (MT model) |
| (5) Clutch switch (MT model) | | |

B: CAUTION

- Before disassembling or reassembling parts, always disconnect the battery ground cable from battery. When repairing the radio, control module, etc. which are provided with memory functions, record the memory contents before disconnecting the ground cable from battery. All memory is cleared.
- Reassemble the parts in the reverse order of disassembly unless otherwise indicated.
- Adjust the parts to specifications specified in this manual.
- Connect the connectors and hoses securely during reassembly.
- After reassembly, ensure functional parts operate properly.

C: PREPARATION TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance and voltage.
TORX® bit T30	Used for removing the cruise control command switch.

2. Cruise Control Unit

A: NOTE

The control of cruise control system is carried out in engine control module (ECM).

B: REMOVAL

<Ref. to FU(H4SO)-40, REMOVAL, Engine Control Module (ECM).> <Ref. to FU(H4DOTC)-44, REMOVAL, Engine Control Module (ECM).>

C: INSTALLATION

<Ref. to FU(H4SO)-40, INSTALLATION, Engine Control Module (ECM).> <Ref. to FU(H4DOTC)-44, INSTALLATION, Engine Control Module (ECM).>

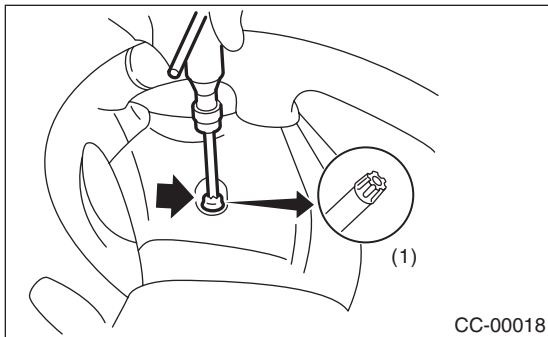
3. Cruise Control Command Switch

A: REMOVAL

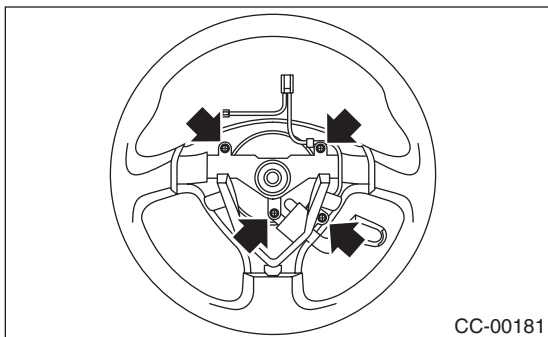
WARNING:

Before servicing, be sure to read the notes in the “AB” section for proper handling of the driver’s airbag module. <Ref. to AB-4, CAUTION, General Description.>

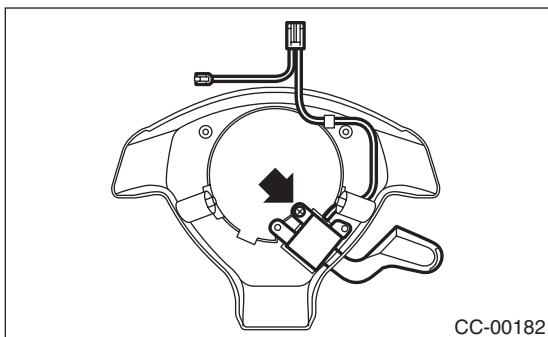
- 1) Set the front wheels in straight ahead position.
- 2) Turn the ignition switch to OFF.
- 3) Disconnect the ground cable from battery and wait for at least 20 seconds before starting work.
- 4) Using TORX® BIT T30 (1), loosen the two TORX® bolts which secure driver’s airbag module.



- 5) Disconnect the airbag module connector on back of the airbag module.
- 6) Remove the steering wheel. <Ref. to PS-13, REMOVAL, Steering Wheel.>
- 7) Remove the four screws to remove the lower cover from steering wheel.



- 8) Remove one screw to remove the cruise control command switch from lower cover.

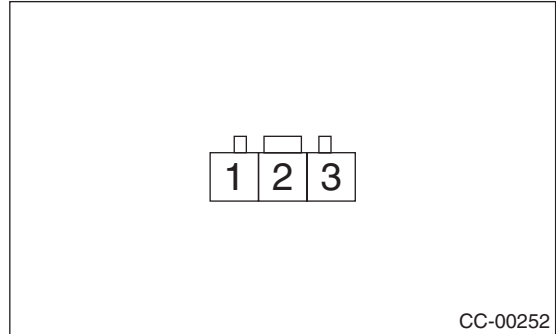


B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the cruise control command switch resistance.



Switch	Position	Terminal No.	Standard value
CANCEL SET/COAST RESUME/ ACCEL	All OFF	2 and 3	Approx. 4 kΩ
CANCEL	ON	2 and 3	Less than 1 Ω
SET/COAST	ON	2 and 3	Approx. 250 Ω
RESUME/ ACCEL	ON	2 and 3	Approx. 1500 Ω
MAIN	OFF	1 and 2	1 MΩ or more
	ON	1 and 2	Less than 1 Ω

If NG, replace the cruise control command switch.

Stop Light & Brake Switch

CRUISE CONTROL SYSTEM

4. Stop Light & Brake Switch

A: REMOVAL

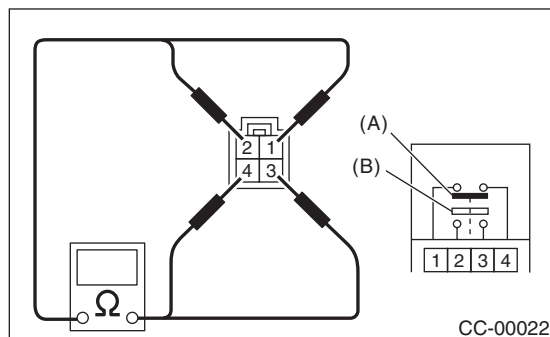
- 1) Disconnect the ground cable from the battery.
- 2) Disconnect the connector from the stop & brake switch, and then remove the switch. <Ref. to BR-50, REMOVAL, Stop Light Switch.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the resistance of brake switch (A) and stop light switch (B).



Switch	Pedal	Terminal No.	Standard value
Brake	Released	1 and 4	Less than 1 Ω
	Depressed	1 and 4	1 M Ω or more
Stop light	Released	2 and 3	1 M Ω or more
	Depressed	2 and 3	Less than 1 Ω

If NG, replace the stop & brake switch.

5. Clutch Switch

A: REMOVAL

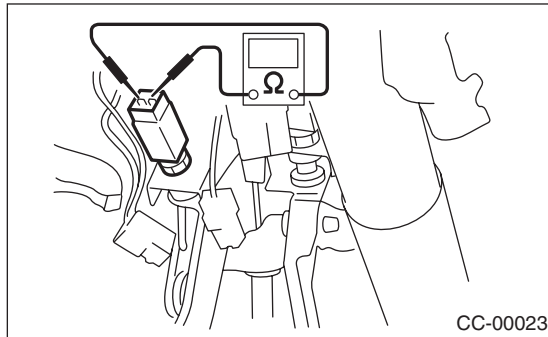
- 1) Disconnect the ground cable from the battery.
- 2) Disconnect the connector from the clutch switch, and then remove the switch. <Ref. to CL-24, REMOVAL, Clutch Pedal.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the clutch switch resistance.



Switch	Pedal	Terminal No.	Standard value
Clutch	Released	1 and 2	Less than 1 Ω
	Depressed	1 and 2	1 M Ω or more

If NG, replace the clutch switch.

Inhibitor Switch

CRUISE CONTROL SYSTEM

6. Inhibitor Switch

A: REMOVAL

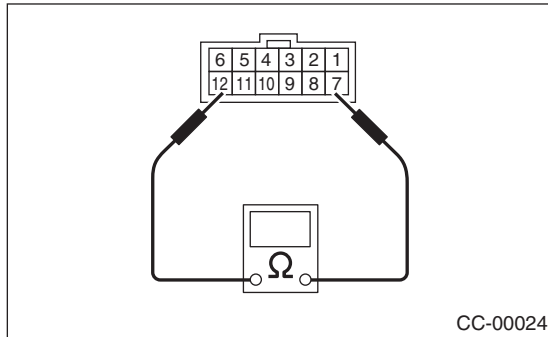
- 1) Disconnect the ground cable from the battery.
- 2) Disconnect the connector from inhibitor switch, then remove the switch. <Ref. to 4AT-48, REMOVAL, Inhibitor Switch.>

B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

Measure the inhibitor switch resistance.



Select lever Position	Terminal No.	Standard value
P	7 and 12	Less than 1 Ω
N		Less than 1 Ω
Other than P or N		1 M Ω or more

If NG, replace the inhibitor switch.

7. Neutral Position Switch

A: REMOVAL

- 1) Disconnect the ground cable from the battery.
- 2) Disconnect the connector from the neutral position switch, and remove the switch. <Ref. to 5MT-35, BACK-UP LIGHT SWITCH AND NEUTRAL POSITION SWITCH, REMOVAL, Switches and Harness.>

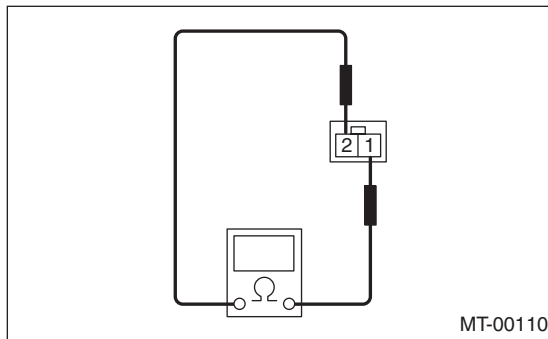
B: INSTALLATION

Install in the reverse order of removal.

C: INSPECTION

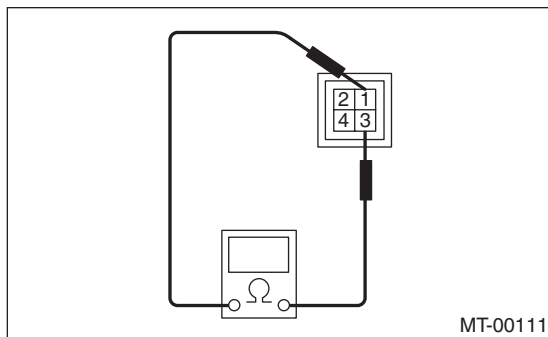
Measure the resistance of neutral position switch.

- Non-turbo model



Gear shift position	Terminal No.	Specified resistance
Neutral position	1 and 2	Less than 1 Ω
Other positions		Over 1 M Ω

- Turbo model



Gear shift position	Terminal No.	Specified resistance
Neutral position	1 and 3	Less than 1 Ω
Other positions		Over 1 M Ω

If NG, replace the neutral position switch.

Neutral Position Switch

CRUISE CONTROL SYSTEM

Basic Diagnostic Procedure

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

	Step	Check	Yes	No
1	CHECK MALFUNCTION INDICATOR LIGHT. Check that malfunction indicator light illuminates.	Does the malfunction indicator light illuminate?	Go to step 5.	Go to step 2.
2	CHECK CRUISE INDICATOR LIGHT. Make sure the cruise indicator light blinks.	Does the cruise indicator light blink?	Go to step 5.	Go to step 3.
3	CHECK CRUISE CONTROL MAIN SWITCH OPERATION. Check cruise control main switch operation. (Ensure the cruise indicator light illuminates.)	Is the cruise control main switch turned on? (Does the cruise indicator light illuminate?)	Go to step 4.	Go to symptom 1. <Ref. to CC(ETC)(diag)-9, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.>
4	CHECK CRUISE CONTROL SET OPERATION. Check the cruise control set operation.	Can the cruise control be set while driving at more than 40 km/h (25 MPH)?	Go to step 6.	Go to step 5.
5	PERFORM CRUISE CONTROL CANCEL CONDITIONS DIAGNOSIS. Perform the cruise cancel conditions diagnosis.	Is DTC displayed?	Go to "List of Diagnostic Trouble Code (DTC)." <Ref. to CC(ETC)(diag)-13, List of Diagnostic Trouble Code (DTC).>	Go to symptom 2. <Ref. to CC(ETC)(diag)-9, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.>
6	CHECK VEHICLE SPEED IS HELD WITHIN SET SPEED. Make sure the vehicle speed is held within set speed.	Is the vehicle speed kept within setting speed ± 3 km/h (± 2 MPH) ? (Make sure that on a level road.)	Go to step 7.	Go to symptom 3. <Ref. to CC(ETC)(diag)-9, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.>
7	CHECK RESUME/ACCEL OPERATION. Check the RESUME/ACCEL switch operation.	Does the vehicle speed increase or return to set speed after RESUME/ACCEL switch has been pressed?	Go to step 8.	Go to symptom 4. <Ref. to CC(ETC)(diag)-9, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.>
8	CHECK SET/COAST OPERATION. Check the SET/COAST switch operation.	Does the vehicle speed decrease after SET/COAST switch has been pressed?	Go to step 9.	Go to symptom 5. <Ref. to CC(ETC)(diag)-9, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.>

Basic Diagnostic Procedure

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
9 CHECK CANCEL OPERATION. Check the CANCEL switch operation.	Is the cruise control released after CANCEL switch has been pressed?	Go to step 10 .	Go to symptom 6. <Ref. to CC(ETC)(diag)-9, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.>
10 CHECK CRUISE CONTROL RELEASE OPERATION. Check the cruise control release operation.	Is the cruise control released after brake pedal has been depressed?	Go to step 11 .	Go to symptom 7. <Ref. to CC(ETC)(diag)-9, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.>
11 CHECK CRUISE CONTROL RELEASE OPERATION. Check the cruise control release operation.	Is the cruise control released after depressing the clutch pedal?	Go to step 12 .	Go to symptom 8. <Ref. to CC(ETC)(diag)-9, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.>
12 CHECK CRUISE CONTROL RELEASE OPERATION. Check the cruise control release operation.	Is the cruise control released after shifting to the neutral position?	Finish the diagnosis.	Go to symptom 9. <Ref. to CC(ETC)(diag)-9, DIAGNOSTIC PROCEDURE WITH PHENOMENON, Diagnostics with Phenomenon.>

General Description

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

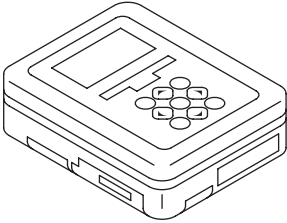
2. General Description

A: CAUTION

- All airbag system wiring harnesses and connectors are yellow. Do not use the electrical test equipment on these circuits.
- Be careful not to damage the airbag system wiring harness when servicing the cruise control command switch. Airbag system wiring harness is routed near the cruise control command switch.

B: PREPARATION TOOL

1. SPECIAL TOOL

ILLUSTRATION	TOOL NUMBER	DESCRIPTION	REMARKS
 ST1B020XU0	1B020XU0	SUBARU SELECT MONITOR KIT	Troubleshooting for the electrical system.

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.

C: INSPECTION

1. BATTERY

Measure the battery voltage and specific gravity of electrolyte.

Standard voltage:

12 V or more

Specific gravity:

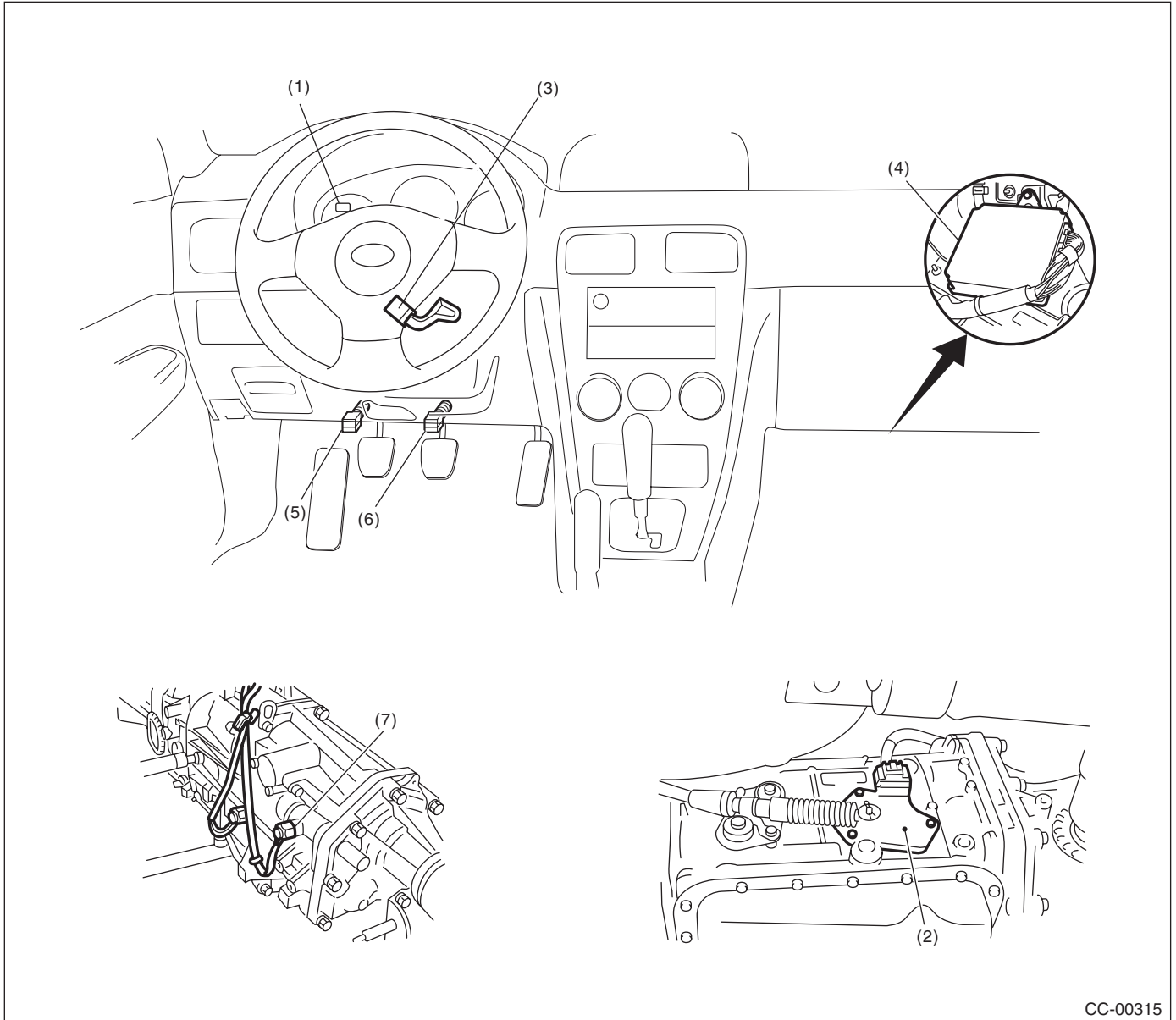
1.260 or more

Electrical Component Location

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

3. Electrical Component Location

A: LOCATION



(1) Cruise indicator light and cruise set indicator light

(3) Cruise control command switch

(6) Stop light & brake switch

(2) Inhibitor switch (AT model)

(5) Clutch switch (MT model)

(7) Neutral position switch (MT model)

Engine Control Module (ECM) I/O Signal

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

4. Engine Control Module (ECM) I/O Signal

A: WIRING DIAGRAM

<Ref. to WI-90, NON-TURBO MODEL, WIRING DIAGRAM, Cruise Control System.>

<Ref. to WI-93, TURBO MODEL, WIRING DIAGRAM, Cruise Control System.>

5. Subaru Select Monitor

A: OPERATION

1. GENERAL DESCRIPTION

The on-board diagnosis function of the cruise control system uses Subaru Select Monitor.

The on-board diagnosis function operates in two categories, which are used depending on the type of problems;

1) Cruise Control Cancel Conditions Diagnosis:

(1) This category of diagnosis requires actual vehicle driving in order to determine the cause, as when cruise speed is cancelled during driving although cruise cancel condition is not entered.

(2) Cruise control memory in ECM stores the cancel condition (Code No.) which occurred during driving. When there are multiple cancel conditions (Code No.), they are shown on the Subaru Select Monitor.

CAUTION:

- The cruise control memory stores not only the cruise “cancel” which occurred (although “cancel” operation is not entered by the driver), but also the “cancel” condition input by the driver.

- The latest content of memory (current code) is cleared when ignition switch is turned to OFF. However, the content of memory for troubleshooting switches related to the system or cruise control, is stored as a diagnostic history (memory code) even after the ignition switch has been turned to OFF.

2) Real-time Diagnosis:

Real-time diagnosis function is used to determine whether or not the input signal system is in good order, according to signal emitted from switches, sensors, etc.

(1) Vehicle cannot be driven at cruise speed when the problem occurs in the cruise control system or relevant circuits.

(2) Monitor the signal conditions from switches and sensors.

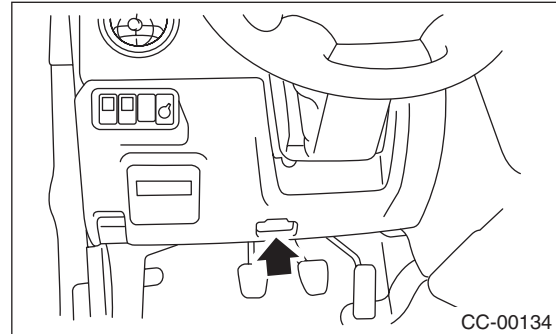
2. CRUISE CONTROL CANCEL CONDITIONS DIAGNOSIS

1) Prepare the Subaru Select Monitor kit.

2) Connect the diagnosis cable to the Subaru Select Monitor.

3) Connect the Subaru Select Monitor to the data link connector.

(1) Data link connector is located in the lower portion of the instrument panel (on the driver's side).



(2) Connect the diagnosis cable to the data link connector.

4) Start the engine and turn the cruise control main switch to ON.

5) Run the Subaru Select Monitor.

6) On the «Main Menu» display screen, select the {2. Each System Check}.

On the system selection display screen, select the {Engine Control System}. Select the [OK] after the information of engine type is displayed.

7) Drive vehicle at 40 km/h (25 MPH) or more and set the cruise control.

CAUTION:

- When performing diagnosis, observe the legal speed limit on the road.

- DTC will also appear when cruise control is cancelled by the driver's operation. Do not confuse them.

- Make sure an assistant is present in order to support diagnosis while driving. Have the assistant operate the select monitor.

8) If the set cruise speed is canceled by itself (without any cancel operations) or if the cruise control cannot be set by performing the set operation, a DTC will appear on select monitor display when {Check Cancel Code} is selected on the engine malfunction diagnosis display screen.

NOTE:

The DTC has a {Current code} and {Memory code}. {Current code} displays the latest code that occurred in this check drive, and {Memory code} displays the code recorded in the previous driving condition. Also, DTC's for diagnosis of switches relating to the system and cruise control are listed in the {Memory code}.

Subaru Select Monitor

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

9) Clear the engine DTC memory. <Ref. to EN(H4SO)(diag)-44, OPERATION, Clear Memory Mode.> <Ref. to EN(H4DOTC)(diag)-50, OPERATION, Clear Memory Mode.>

The DTC of system and cruise control switches are cleared by a memory clear operation for the engine.

NOTE:

DTC will be cleared by turning ignition switch to OFF.

3. REAL-TIME DIAGNOSIS

- 1) Connect the Subaru Select Monitor.
- 2) Turn the ignition switch and cruise control main switch to ON.
- 3) Run the Subaru Select Monitor.
- 4) On the «Main Menu» display screen, select the {2. Each System Check}.
- 5) On the «System Selection Menu» display screen, select the {Engine Control System}.
- 6) Select the [OK] after the information of engine type has been displayed.
- 7) On the «Engine Diagnosis» screen, select the {Current Data Display/Save}.
- 8) Make sure that normal indication is displayed when controls are operated as indicated below:
 - Depress and release the brake pedal. (Stop light switch and brake switch are turned to ON.)
 - Turn the «SET/COAST» switch to ON.
 - Turn the «RESUME/ACCEL» switch to ON.
 - Turn the «CANCEL» switch to ON. (The «SET/COAST» switch and «RESUME/ACCEL» switch are turned to ON at the same time.)
 - Depress or release the clutch pedal.
 - Place the shift lever in any position other than neutral.

NOTE:

- For details concerning the operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.
- For the DTC, refer to the List of Diagnostic Trouble Code (DTC). <Ref. to CC(ETC)(diag)-13, List of Diagnostic Trouble Code (DTC).>

6. Diagnostics with Phenomenon

A: DIAGNOSTIC PROCEDURE WITH PHENOMENON

Symptom		Repair area	Reference
1	Cruise control main switch is not turned to ON. (Cruise indicator light does not illuminate.)	(1) Check the cruise indicator light.	<Ref. to CC(ETC)(diag)-11, CHECK CRUISE INDICATOR LIGHT., Diagnostics with Phenomenon.>
		(2) Check the cruise control command switch.	<Ref. to CC(ETC)(diag)-15, DTC 11, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to CC(ETC)(diag)-23, DTC 15, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to CC(ETC)(diag)-25, DTC 21, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to CC(ETC)(diag)-25, DTC 24, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to CC(ETC)(diag)-26, DTC 65, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
2	Cruise control cannot be set.	(1) Check the cruise control command switch.	<Ref. to CC(ETC)(diag)-15, DTC 11, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to CC(ETC)(diag)-23, DTC 15, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to CC(ETC)(diag)-25, DTC 21, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to CC(ETC)(diag)-25, DTC 24, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to CC(ETC)(diag)-26, DTC 65, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
		(2) Check stop light switch and brake switch.	<Ref. to CC(ETC)(diag)-17, DTC 12, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to CC(ETC)(diag)-25, DTC 25, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to CC(ETC)(diag)-26, DTC 61, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
		(3) Check clutch switch.	<Ref. to CC(ETC)(diag)-19, DTC 13, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
		(4) Check the neutral switch.	<Ref. to CC(ETC)(diag)-21, DTC 14, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to CC(ETC)(diag)-26, DTC 62, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
		(5) Check vehicle speed sensor.	<Ref. to CC(ETC)(diag)-25, DTC 22, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to CC(ETC)(diag)-25, DTC 32, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to CC(ETC)(diag)-26, DTC 63, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
3	Vehicle speed is not held within set speed ± 3 km/h (± 2 MPH).	Check the vehicle speed sensor.	<Ref. to CC(ETC)(diag)-25, DTC 22, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to CC(ETC)(diag)-25, DTC 32, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> <Ref. to CC(ETC)(diag)-26, DTC 63, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostics with Phenomenon

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Symptom		Repair area	Reference
4	Vehicle speed does not increase or does not return to set speed after RESUME/ACCEL switch has been pressed.	Check the RESUME/ACCEL switch.	<p><Ref. to CC(ETC)(diag)-15, DTC 11, Diagnostic Procedure with Diagnostic Trouble Code (DTC).></p> <p><Ref. to CC(ETC)(diag)-23, DTC 15, Diagnostic Procedure with Diagnostic Trouble Code (DTC).></p> <p><Ref. to CC(ETC)(diag)-25, DTC 21, Diagnostic Procedure with Diagnostic Trouble Code (DTC).></p> <p><Ref. to CC(ETC)(diag)-25, DTC 24, Diagnostic Procedure with Diagnostic Trouble Code (DTC).></p> <p><Ref. to CC(ETC)(diag)-26, DTC 65, Diagnostic Procedure with Diagnostic Trouble Code (DTC).></p>
5	Vehicle speed does not decrease after SET/COAST switch has been pressed.	Check the SET/COAST switch.	<p><Ref. to CC(ETC)(diag)-15, DTC 11, Diagnostic Procedure with Diagnostic Trouble Code (DTC).></p> <p><Ref. to CC(ETC)(diag)-23, DTC 15, Diagnostic Procedure with Diagnostic Trouble Code (DTC).></p> <p><Ref. to CC(ETC)(diag)-25, DTC 21, Diagnostic Procedure with Diagnostic Trouble Code (DTC).></p> <p><Ref. to CC(ETC)(diag)-25, DTC 24, Diagnostic Procedure with Diagnostic Trouble Code (DTC).></p> <p><Ref. to CC(ETC)(diag)-26, DTC 65, Diagnostic Procedure with Diagnostic Trouble Code (DTC).></p>
6	Cruise control is not released after CANCEL switch has been pressed.	Check the CANCEL switch.	<p><Ref. to CC(ETC)(diag)-15, DTC 11, Diagnostic Procedure with Diagnostic Trouble Code (DTC).></p> <p><Ref. to CC(ETC)(diag)-23, DTC 15, Diagnostic Procedure with Diagnostic Trouble Code (DTC).></p> <p><Ref. to CC(ETC)(diag)-25, DTC 21, Diagnostic Procedure with Diagnostic Trouble Code (DTC).></p> <p><Ref. to CC(ETC)(diag)-25, DTC 24, Diagnostic Procedure with Diagnostic Trouble Code (DTC).></p> <p><Ref. to CC(ETC)(diag)-26, DTC 65, Diagnostic Procedure with Diagnostic Trouble Code (DTC).></p>
7	Cruise control is not released after brake pedal has been depressed.	Check the stop light switch and brake switch.	<p><Ref. to CC(ETC)(diag)-17, DTC 12, Diagnostic Procedure with Diagnostic Trouble Code (DTC).></p> <p><Ref. to CC(ETC)(diag)-25, DTC 25, Diagnostic Procedure with Diagnostic Trouble Code (DTC).></p> <p><Ref. to CC(ETC)(diag)-26, DTC 61, Diagnostic Procedure with Diagnostic Trouble Code (DTC).></p>
8	Cruise control is not released after clutch pedal has been depressed.	Check the clutch switch.	<p><Ref. to CC(ETC)(diag)-19, DTC 13, Diagnostic Procedure with Diagnostic Trouble Code (DTC).></p>
9	Cruise control is not released after shifting to the neutral position.	Check the neutral switch.	<p><Ref. to CC(ETC)(diag)-21, DTC 14, Diagnostic Procedure with Diagnostic Trouble Code (DTC).></p> <p><Ref. to CC(ETC)(diag)-26, DTC 62, Diagnostic Procedure with Diagnostic Trouble Code (DTC).></p>

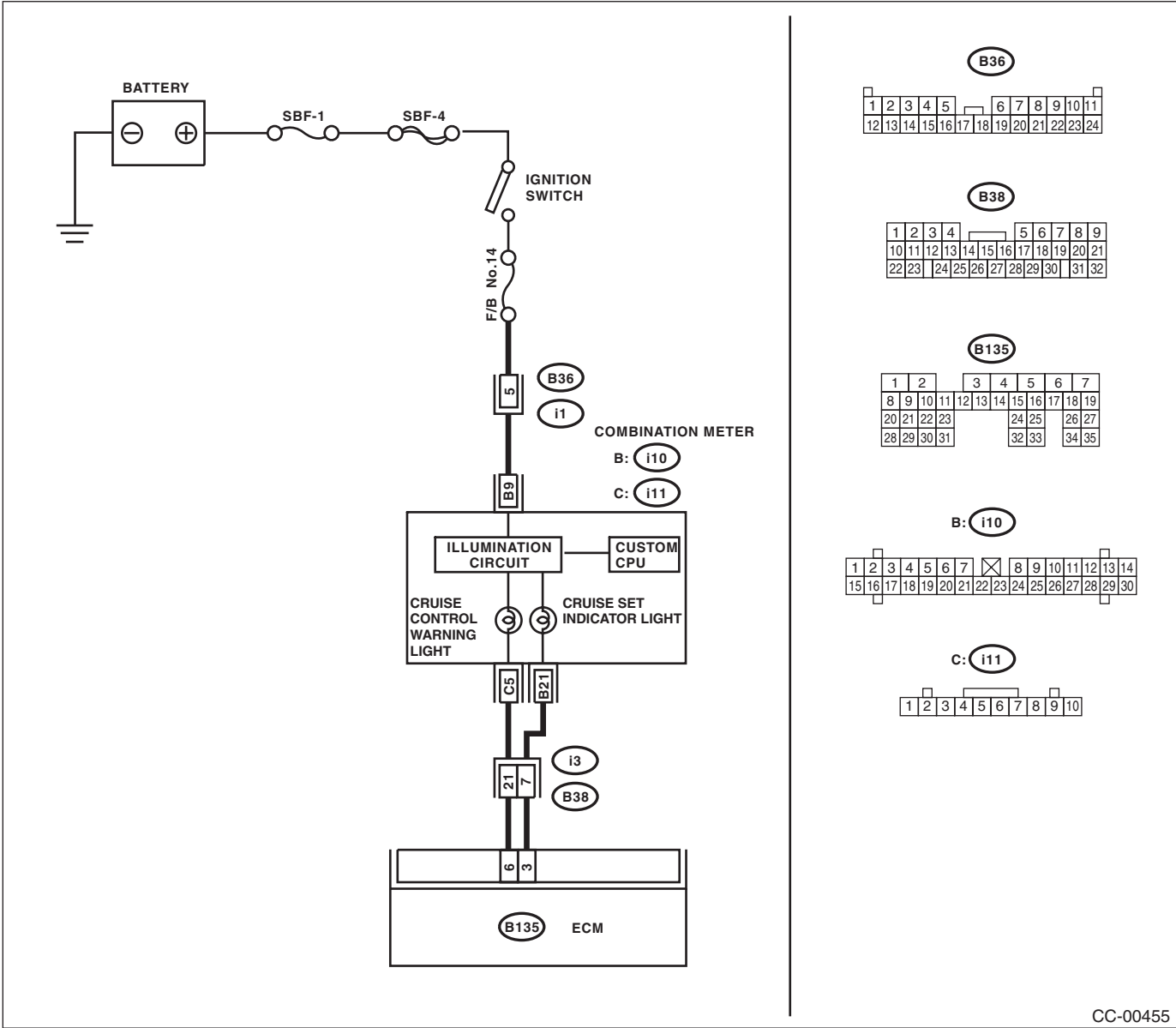
Diagnostics with Phenomenon

B: CHECK CRUISE INDICATOR LIGHT.

TROUBLE SYMPTOM:

Cruise control can be set, but the cruise indicator light does not illuminate.

WIRING DIAGRAM:



CC-00455

Diagnostics with Phenomenon

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CRUISE INDICATOR LIGHT CIRCUIT. 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector of the combination meter. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground. Connector & terminal <i>(i10) No. 9 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Go to step 2.	<ul style="list-style-type: none"> • Check fuse No. 13 (in fuse & relay box). • Check for open or shorted circuits between the combination meter and fuse & relay box.
2 CHECK CRUISE INDICATOR LIGHT CIRCUIT. 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector of ECM. 3) Measure the resistance between the ECM harness connector and the combination meter harness connector. Connector & terminal <i>(B135) No. 6 — (i11) No. 5:</i> <i>(B135) No. 3 — (i10) No. 21:</i>	Is the resistance less than 10 Ω ?	Go to step 3.	Repair the harness.
3 CHECK CRUISE INDICATOR LIGHT CIRCUIT. Connect the ECM harness connector terminal to ground using a suitable lead wire. Connector & terminal <i>(B135) No. 6 — Chassis ground:</i> <i>(B135) No. 3 — Chassis ground:</i>	Does the cruise indicator light illuminate?	Check the poor contact of ECM connector.	Replace the meter main assembly.

List of Diagnostic Trouble Code (DTC)

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

7. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Contents of diagnosis	Reference
11	Main switch	Main switch of cruise control command switch is turned to OFF, and then the cruise control is released.	This DTC is displayed without operating the main switch. <Ref. to CC(ETC)(diag)-15, DTC 11, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
12	Stop light & brake switch	Stop light switch or brake switch is turned to ON, and then the cruise control is released.	This DTC is displayed without depressing the brake pedal. <Ref. to CC(ETC)(diag)-17, DTC 12, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
13	Clutch switch	Clutch switch is turned to ON, and then the cruise control is released.	This DTC is displayed without depressing the clutch pedal. <Ref. to CC(ETC)(diag)-19, DTC 13, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
14	Neutral position switch	Neutral switch is turned to ON, and then the cruise control is released.	This DTC is displayed without shifting to neutral position. <Ref. to CC(ETC)(diag)-21, DTC 14, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
15	Cancel switch	Cancel switch is turned to ON, and then the cruise control is released.	This DTC is displayed without operating the cancel switch. <Ref. to CC(ETC)(diag)-23, DTC 15, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
16	Ignition switch	Ignition switch is turned to OFF, and then the cruise control is released.	This DTC is displayed without operating the ignition switch. <Ref. to CC(ETC)(diag)-24, DTC 16, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
21	Cruise control switch malfunction when ignition switch is turned to ON	When the ignition switch is turned to ON, each switch of cruise control command switch is already turned to ON.	This DTC is displayed because the ignition switch was turned ON without operating the cruise control switch. <Ref. to CC(ETC)(diag)-25, DTC 21, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
22	Vehicle speed variation is abnormal.	Malfunction of vehicle speed signal variation is detected.	<Ref. to CC(ETC)(diag)-25, DTC 22, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

List of Diagnostic Trouble Code (DTC)

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

DTC	Item	Contents of diagnosis	Reference
24	Cruise control-related switch is abnormal.	Open circuit in cruise control switch detected while driving in cruise. (Judged as a system without cruise control)	<Ref. to CC(ETC)(diag)-25, DTC 24, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
25	Brake switch input circuit is abnormal.	Malfunction of brake switch input circuit in ECM is detected.	<Ref. to CC(ETC)(diag)-25, DTC 25, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
31	Engine speed signal	<ul style="list-style-type: none"> • Abnormal increase of engine speed is detected. • Gear is placed in Neutral, 1st or Reverse position. 	<Ref. to CC(ETC)(diag)-25, DTC 31, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
32	Out of vehicle speed range of cruise control operation	<ul style="list-style-type: none"> • The vehicle speed exceeded the controllable speed range while driving in cruise. • Set operation was performed at vehicle speed unavailable for setting. • RESUME operation was performed without memorized vehicle speed. 	This DTC is displayed even though set operation was repeated after increasing vehicle speed to a cruise possible speed. <Ref. to CC(ETC)(diag)-25, DTC 32, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
34	Prohibition when accelerator position is continued to be large.	The vehicle has been driven at higher speed than set vehicle speed for an abnormally long time (approximately 10 minutes) during cruise driving.	<Ref. to CC(ETC)(diag)-25, DTC 34, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
35	Prohibition when vehicle speed feedback is impossible.	Set vehicle speed cannot be kept because of some reasons (steep uphill, parking brake, abnormal decrease of engine output, etc.) during cruise driving.	<Ref. to CC(ETC)(diag)-26, DTC 35, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
43	ABS/VDC malfunction	ABS is operated during cruise driving or cruise setting.	<Ref. to CC(ETC)(diag)-26, DTC 43, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
61	Brake switch malfunction	Stop light switch or brake switch malfunction is detected.	<Ref. to CC(ETC)(diag)-26, DTC 61, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
62	Neutral position switch malfunction	Neutral position switch malfunction is detected.	<Ref. to CC(ETC)(diag)-26, DTC 62, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
63	Vehicle speed variation malfunction 1	Malfunction of vehicle speed signal variation is detected.	<Ref. to CC(ETC)(diag)-26, DTC 63, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
64	Engine sensor related sensor malfunction 1	Malfunction related to the engine is detected.	<Ref. to CC(ETC)(diag)-26, DTC 64, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
65	Cruise control related switch malfunction 1	Cruise control command switch malfunction is detected. (While the switch is pressed ON for a long time (approximately two minutes), an ON stuck open circuit is detected.)	<Ref. to CC(ETC)(diag)-26, DTC 65, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
66	Cruise control computational malfunction	Malfunction of cruise control computer is detected.	<Ref. to CC(ETC)(diag)-26, DTC 66, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

8. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

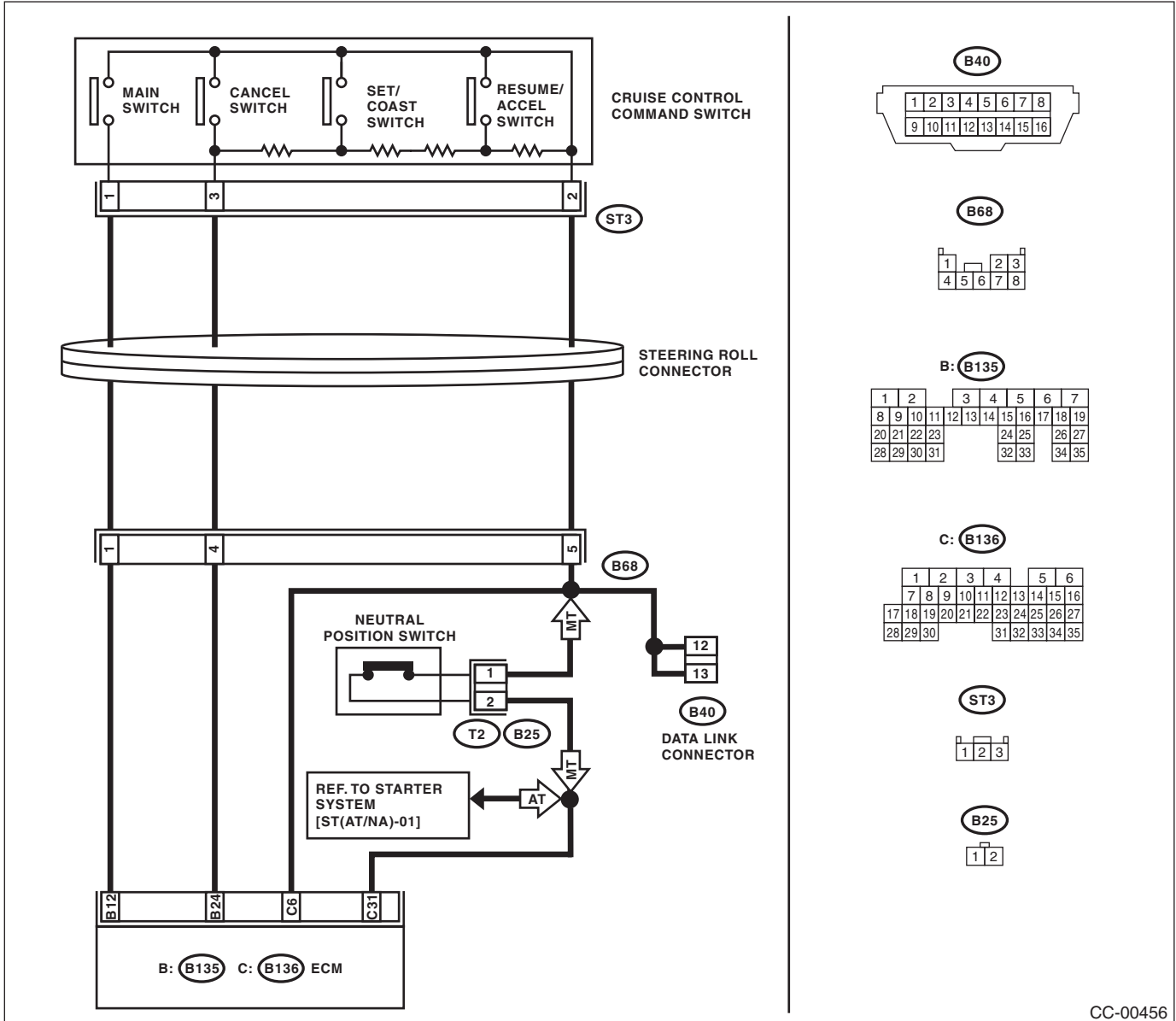
A: DTC 11

DTC for cruise control command switch.

TROUBLE SYMPTOM:

- Cruise control cannot be set. (Cancelled immediately.)
- Cruise control cannot be released.

WIRING DIAGRAM:



Diagnostic Procedure with Diagnostic Trouble Code (DTC)

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CRUISE CONTROL COMMAND SWITCH CIRCUIT. 1) Remove the driver's airbag module. <Ref. to AB-14, REMOVAL, Driver's Airbag Module.> 2) Disconnect the harness connector of cruise control command switch. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground. Connector & terminal (ST3) No. 1 (+) — Chassis ground (-): (ST3) No. 3 (+) — Chassis ground (-):	Is the voltage 5 V or more?	Go to step 2.	Check the harness between cruise control command switch and ECM for open or shorted circuit.
2 CHECK CANCEL SWITCH. 1) Turn the ignition switch to OFF. 2) Remove the cruise control command switch. <Ref. to CC-5, REMOVAL, Cruise Control Command Switch.> 3) Measure the resistance between switch terminals when the CANCEL switch is pressed and not pressed. Terminals No. 2 — No. 3:	Is the resistance approx. less than 1 Ω when the CANCEL switch is pressed? Is the resistance approx. 4 k Ω when the CANCEL switch is not pressed?	Go to step 3.	Replace the cruise control command switch. <Ref. to CC-5, Cruise Control Command Switch.>
3 CHECK SET/COAST SWITCH. Measure the resistance between switch terminals when SET/COAST switch is pressed and not pressed. Terminals No. 2 — No. 3:	Is the resistance approx. 250 Ω when SET/COAST switch is pressed? Is the resistance approx. 4 k Ω when SET/COAST switch is not pressed?	Go to step 4.	Replace the cruise control command switch. <Ref. to CC-5, Cruise Control Command Switch.>
4 CHECK RESUME/ACCEL SWITCH CIRCUIT. Measure the resistance between switch terminals when RESUME/ACCEL switch is pressed and not pressed. Terminals No. 2 — No. 3:	Is the resistance approx. 1,500 Ω when RESUME/ACCEL switch is pressed? Is the resistance approx. 4 k Ω when RESUME/ACCEL switch is not pressed?	Replace the ECM. <Ref. to FU(H4SO)-40, Engine Control Module (ECM).> <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>	Replace the cruise control command switch. <Ref. to CC-5, Cruise Control Command Switch.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

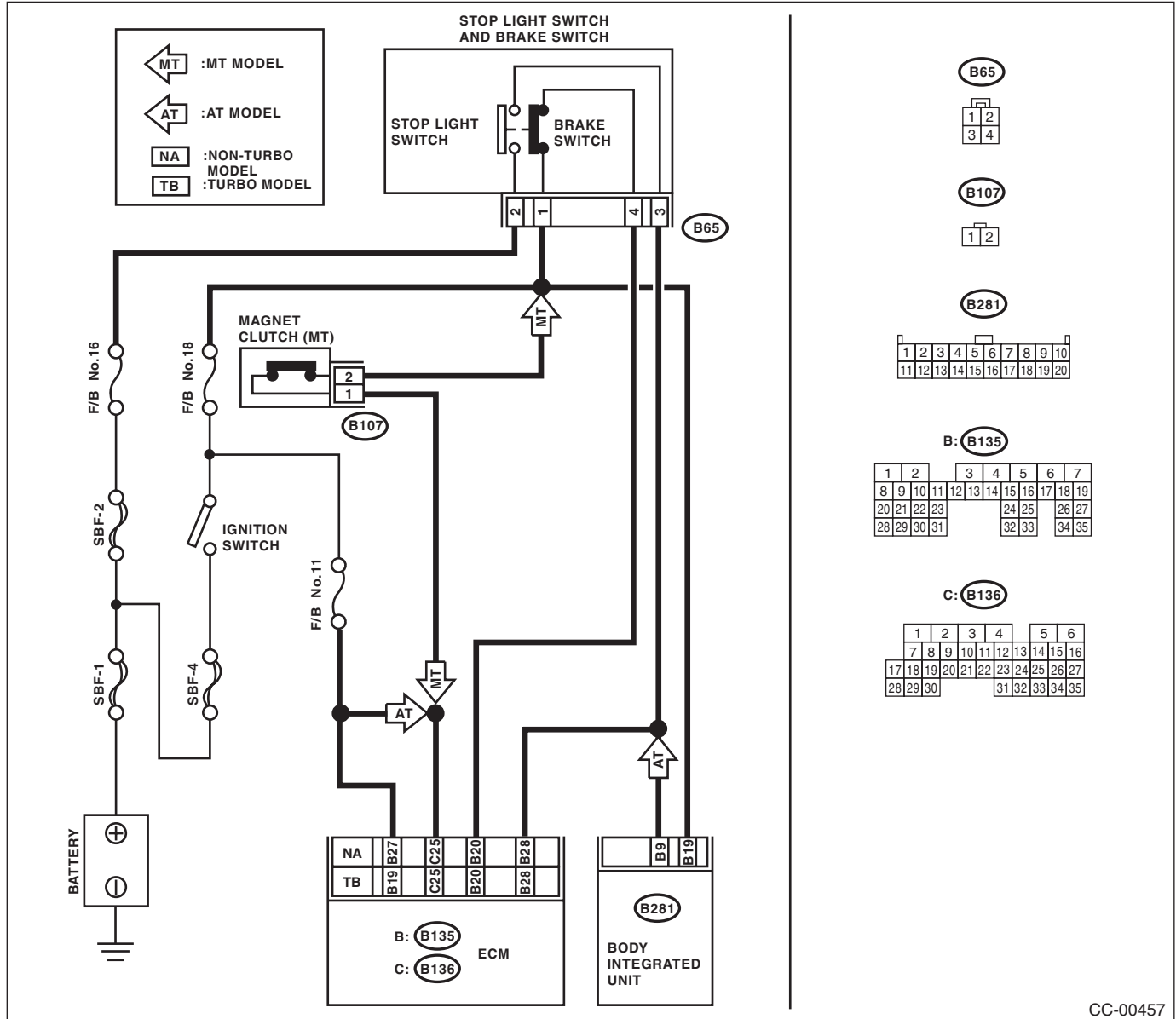
B: DTC 12

DTC for stop light switch and brake light switch.

TROUBLE SYMPTOM:

- Cruise control cannot be set.
- Cruise control cannot be released.

WIRING DIAGRAM:



CC-00457

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT. 1) Turn the ignition switch to OFF. 2) Disconnect the stop light switch and brake switch harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B65) No. 2 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Go to step 2.	<ul style="list-style-type: none"> • Check fuse No. 16 (in fuse & relay box). • Check for open or short in the harness between stop light/brake switch and fuse & relay box.
2 CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT. Measure the voltage between harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B65) No. 1 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Go to step 3.	<ul style="list-style-type: none"> • Check fuse No. 18 (in fuse & relay box). • Check for open or short in the harness between stop light/brake switch and fuse & relay box. • Check the clutch switch and circuit.
3 CHECK STOP LIGHT SWITCH AND BRAKE SWITCH CIRCUIT. 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector of ECM. 3) Disconnect the harness connector of body integrated unit. 4) Measure the resistance between harness connector terminals of ECM and of body integrated unit, and between harness connector terminals of stop light switch and of brake switch. <i>Connector & terminal</i> <i>(B281) No. 9 — (B65) No. 3:</i> <i>(B135) No. 20 — (B65) No. 4:</i>	Is the resistance less than 10 Ω ?	Go to step 4.	Repair the harness.
4 CHECK STOP LIGHT SWITCH AND BRAKE SWITCH. Remove and check the stop light switch and brake switch. <Ref. to CC-6, Stop Light & Brake Switch.>	Are the stop light switch and brake switch OK?	Stop light switch and brake switch circuit are OK.	Replace the stop light switch and brake switch.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

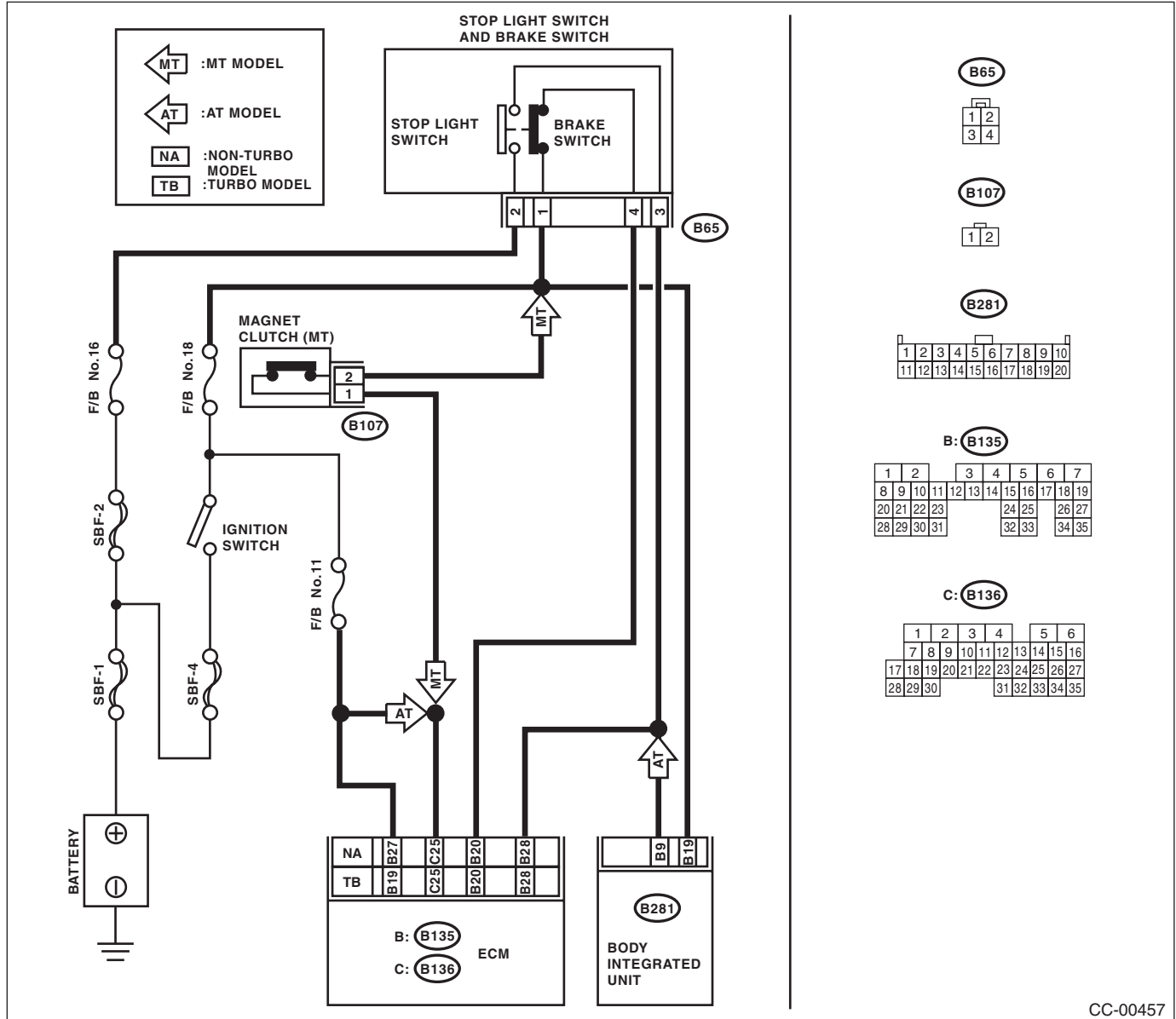
C: DTC 13

DTC for clutch switch.

TROUBLE SYMPTOM:

- Cruise control cannot be set.
- Cruise control cannot be released.

WIRING DIAGRAM:



CC-00457

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK CLUTCH SWITCH CIRCUIT. 1) Turn the ignition switch to OFF. 2) Disconnect the clutch switch harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B107) No. 2 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Go to step 2.	<ul style="list-style-type: none"> • Check fuse No. 18 (in fuse & relay box). • Check open or shorted circuit of harness between clutch switch and fuse & relay box.
2 CHECK CLUTCH SWITCH CIRCUIT. 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector of ECM. 3) Measure the resistance between clutch switch harness connector terminal and ECM harness connector terminal. <i>Connector & terminal</i> <i>(B107) No. 1 — (B136) No. 25:</i>	Is the resistance less than 10 Ω ?	Go to step 3.	Repair the harness.
3 CHECK CLUTCH SWITCH. Remove and check the clutch switch. <Ref. to CC-7, Clutch Switch.>	Is clutch switch OK?	Clutch switch circuit is OK.	Replace the clutch switch.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

D: DTC 14

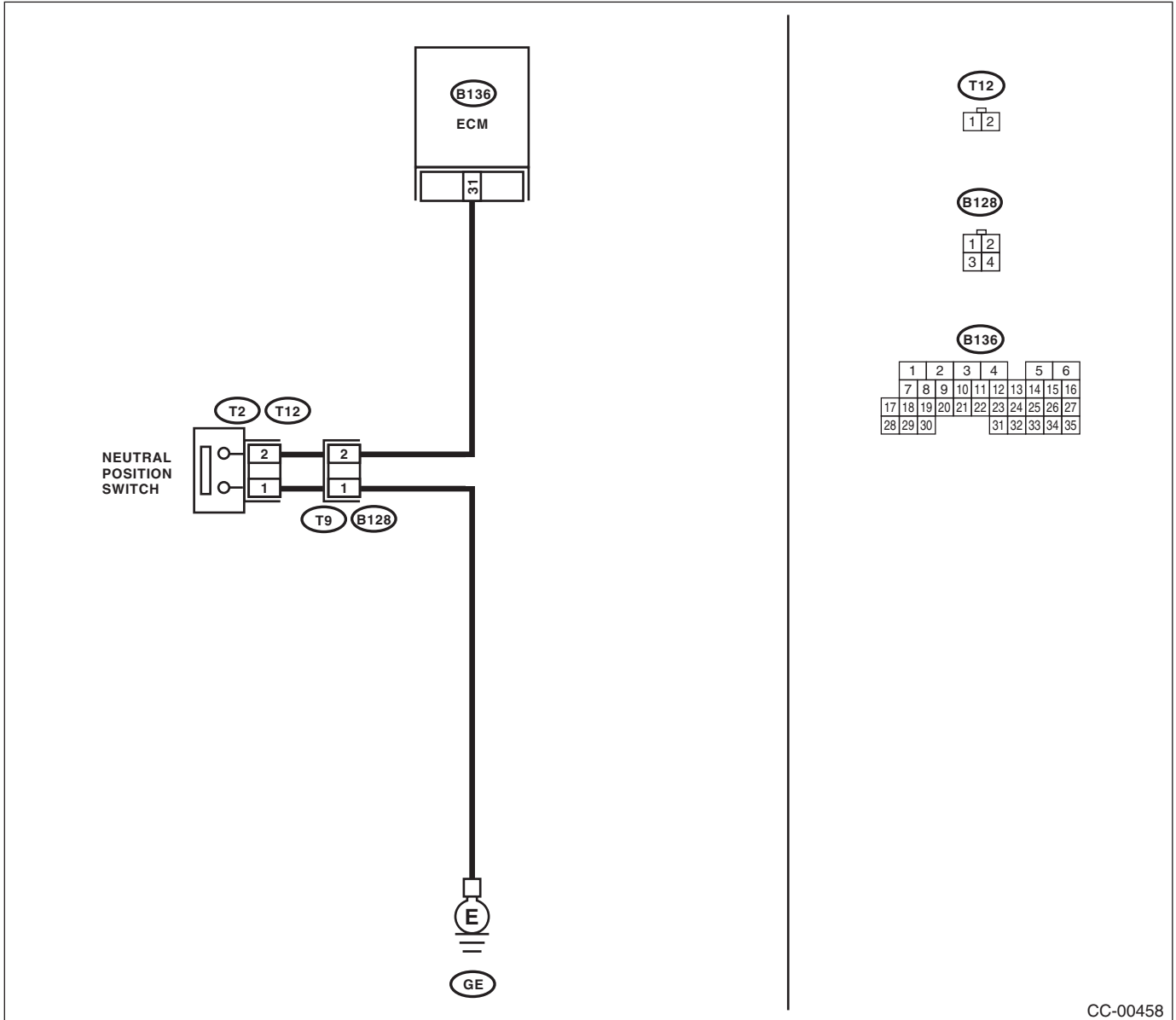
DTC for neutral position switch.

TROUBLE SYMPTOM:

Cruise control cannot be set.

WIRING DIAGRAM:

- Turbo model

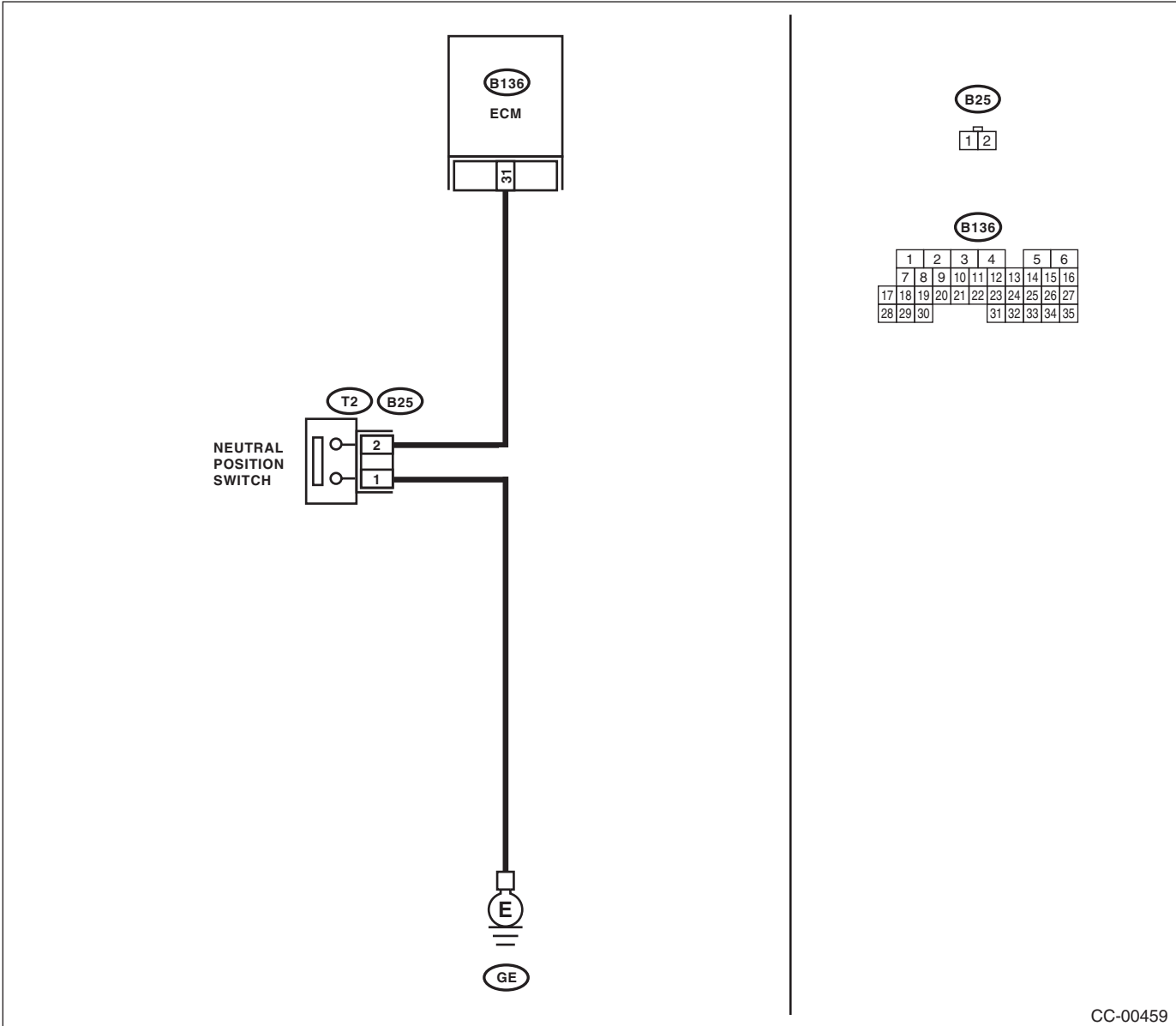


CC-00458

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

- Non-turbo model



CC-00459

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK NEUTRAL POSITION SWITCH CIRCUIT. 1) Turn the ignition switch to OFF. 2) Disconnect the neutral position switch harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground. Connector & terminal Turbo model <i>(B128) No. 1 (+) — Chassis ground (-):</i> Non-turbo model <i>(B25) No. 2 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Go to step 2.	Check for open or short in the harness between neutral position switch and ECM.
2 CHECK NEUTRAL POSITION SWITCH CIRCUIT. 1) Turn the ignition switch to OFF. 2) Measure resistance between harness connector terminal of neutral position switch and chassis ground. Connector & terminal Turbo model <i>(B128) No. 3 — Chassis ground:</i> Non-turbo model <i>(B25) No. 3 — Chassis ground:</i>	Is the resistance less than 10 Ω ?	Go to step 3.	Repair the harness.
3 CHECK NEUTRAL POSITION SWITCH. Remove and check the neutral position switch.	Is the neutral position switch OK?	The neutral position switch circuit is working properly.	Replace the neutral position switch.

E: DTC 15

Malfunction of cancel switch is detected.

Refer to DTC 11 for diagnostic procedure.

<Ref. to CC(ETC)(diag)-15, DTC 11, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

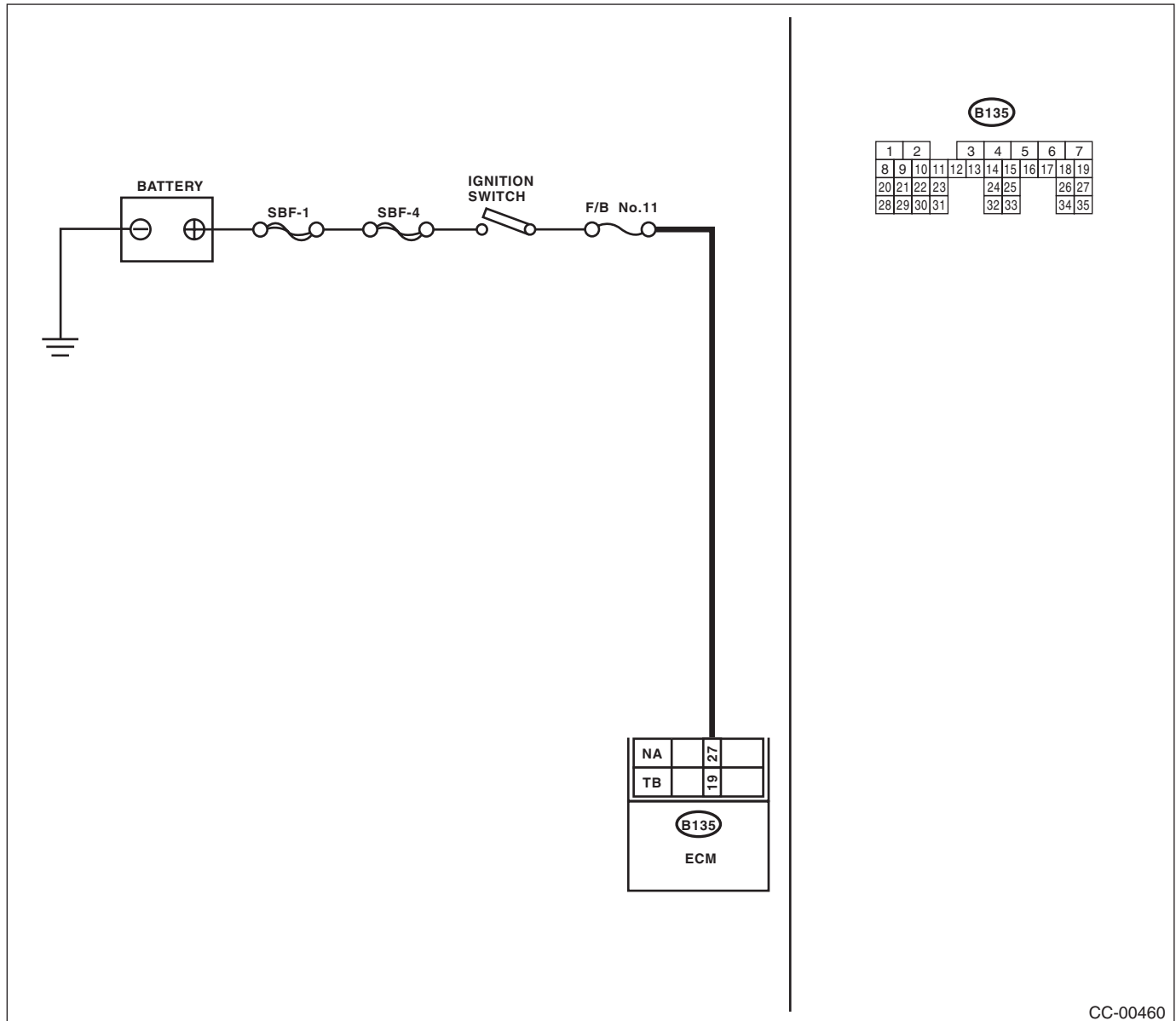
F: DTC 16

DTC for ignition switch.

TROUBLE SYMPTOM:

Cruise control cannot be set.

WIRING DIAGRAM:



CC-00460

Step	Check	Yes	No
<p>1</p> <p>CHECK IGNITION SWITCH CIRCUIT.</p> <ol style="list-style-type: none"> 1) Turn the ignition switch to OFF. 2) Disconnect the ECM harness connector. 3) Turn the ignition switch to ON. 4) Measure the voltage between harness connector terminal and chassis ground. <p>Connector & terminal</p> <p>Turbo model (B135) No. 19 (+) — Chassis ground (-):</p> <p>Non-turbo model (B135) No. 27 (+) — Chassis ground (-):</p>	<p>Is the voltage 10 V or more?</p>	<p>Check the poor contact of ECM connector.</p>	<ul style="list-style-type: none"> • Check fuse No. 11 (in fuse & relay box). • Check the harness for open or short circuit between ignition switch and ECM.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

G: DTC 21

Cruise control command switch malfunction is detected.

Refer to DTC 11 for diagnostic procedure.

<Ref. to CC(ETC)(diag)-15, DTC 11, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

H: DTC 22

DTC DETECTING CONDITION:

Open or shorted circuit in vehicle speed sensor system.

TROUBLE SYMPTOM:

Cruise control cannot be set. (Cancelled immediately.)

WIRING DIAGRAM:

Step	Check	Yes	No
1 CHECK ABS WARNING LIGHT. 1) Turn the ignition switch to ON. 2) After the initial operation of combination meter is completed, check if the ABS warning light continues to illuminate.	Does the ABS warning continues to illuminate?	Check the ABSCM. <Ref. to ABS(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>	Go to step 2.
2 CHECK VEHICLE SPEED SENSOR SIGNAL. 1) Connect the Subaru Select Monitor to the data link connector. 2) Turn the ignition switch and Subaru Select Monitor switch to ON. 3) Select {Engine} from the main menu. 4) Then select {Current Data Display & Save}. 5) Drive the vehicle and check the vehicle speed sensor signal.	Is the vehicle speed displayed on the Subaru Select Monitor?	Replace the ECM. <Ref. to FU(H4DOTC)-44, REMOVAL, Engine Control Module (ECM).>	Replace the vehicle speed sensor.

I: DTC 24

Malfunction of cruise control related switch is detected.

Refer to DTC 11 for diagnostic procedure.

<Ref. to CC(ETC)(diag)-15, DTC 11, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

J: DTC 25

Malfunction of brake switch input circuit is detected.

Refer to engine diagnostic procedure for diagnostic procedure.

<Ref. to EN(H4SO)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>

<Ref. to EN(H4DOTC)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>

K: DTC 31

Malfunction of engine speed signal is detected.

Abnormal increase of engine speed is detected.

Gear is placed in 1st or Reverse position.

Set cruise again while driving in 2nd or higher gear. If a DTC is not detected, it is operating normally.

L: DTC 32

Out of system vehicle speed range detected.

Refer to DTC 22 for diagnostic procedure.

<Ref. to CC(ETC)(diag)-25, DTC 22, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

M: DTC 34

Malfunction of acceleration opening duration is detected.

The vehicle has been driven at higher speed than set vehicle speed for a long time (approximately 10 minutes) during cruise driving.

DTC is detected when driving for a long period of time at higher speed than the cruise set vehicle speed by operating the accelerator pedal.

Cancel the cruise setting. If the DTC is not detected again, it is normal.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

CRUISE CONTROL SYSTEM (DIAGNOSTICS)

N: DTC 35

Malfunction of acceleration opening duration is detected.

The vehicle has been driven at higher speed than set vehicle speed for a long time (approximately 10 minutes) during cruise driving.

DTC is detected when driving for a long period of time at higher speed than the cruise set vehicle speed by operating the accelerator pedal.

Cancel the cruise setting. If the DTC is not detected again, it is normal.

O: DTC 43

ABS/VDC malfunction is detected.

ABS malfunction is detected during cruise or during cruise setting.

Refer to ABS diagnostic procedure for diagnostic procedure.

<Ref. to ABS(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>

P: DTC 61

Brake light switch malfunction is detected.

Refer to DTC 12 for diagnostic procedure.

<Ref. to CC(ETC)(diag)-17, DTC 12, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Q: DTC 62

Neutral position switch malfunction is detected.

Refer to DTC 14 for diagnostic procedure.

<Ref. to CC(ETC)(diag)-21, DTC 14, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

R: DTC 63

Malfunction of vehicle speed signal variation is detected.

Refer to DTC 22 for diagnostic procedure.

<Ref. to CC(ETC)(diag)-25, DTC 22, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

S: DTC 64

Malfunction related to the engine is detected.

Refer to engine diagnostic procedure for diagnostic procedure.

<Ref. to EN(H4SO)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>

<Ref. to EN(H4DOTC)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>

T: DTC 65

Cruise control command switch malfunction is detected.

While the command switch is pressed ON for a long time (approximately two minutes), an ON stuck open circuit is detected.

Refer to DTC 11 for diagnostic procedure.

<Ref. to CC(ETC)(diag)-15, DTC 11, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

U: DTC 66

Cruise control computational malfunction is detected.

Refer to engine diagnostic procedure for diagnostic procedure.

<Ref. to EN(H4SO)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>

<Ref. to EN(H4DOTC)(diag)-2, PROCEDURE, Basic Diagnostic Procedure.>

Basic Diagnostic Procedure

IMMOBILIZER (DIAGNOSTICS)

1. Basic Diagnostic Procedure

A: PROCEDURE

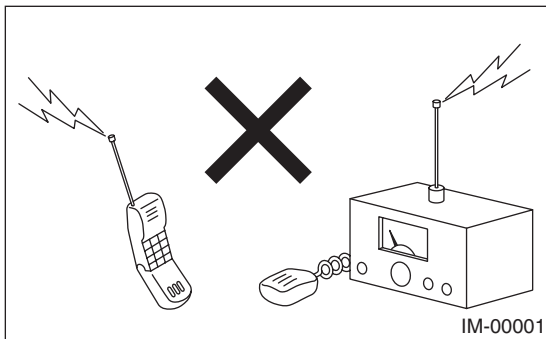
Step	Check	Yes	No
1 CHECK ILLUMINATION OF SECURITY INDICATOR LIGHT. 1) Turn the ignition switch to OFF or ACC position. 2) Wait at least 60 seconds.	Does the security indicator light blink?	Go to step 2.	Check the security indicator light circuit. <Ref. to IM(diag)-10, CHECK SECURITY INDICATOR LIGHT CIRCUIT, INSPECTION, Diagnostics Chart for Security Indicator Light.>
2 CHECK ILLUMINATION OF SECURITY INDICATOR LIGHT. Remove the key from ignition switch.	Does the security indicator light begin to blink within 1 second after the key is removed?	Go to step 3.	Check the ignition switch circuit. <Ref. to SL-42, INSPECTION, Ignition Key Lock.>
3 CHECK ENGINE START. Turn the ignition switch to the START position.	Does the engine start?	Go to step 4.	Go to step 5.
4 CHECK ILLUMINATION OF SECURITY INDICATOR LIGHT. Turn the ignition switch to ON.	Does the security indicator light illuminate?	Check the security indicator light circuit. <Ref. to IM(diag)-10, CHECK SECURITY INDICATOR LIGHT CIRCUIT, INSPECTION, Diagnostics Chart for Security Indicator Light.>	Immobilizer system is normal.
5 CHECK INDICATION OF DTC ON SCREEN. 1) Turn the ignition switch to OFF. 2) Connect the Subaru Select Monitor to the data link connector. <Ref. to IM(diag)-7, Subaru Select Monitor.> 3) Turn the ignition switch and run the Subaru Select Monitor. 4) Read any DTC on the display.	Are DTCs indicated on display?	Go to step 6.	Repair the related parts.
6 PERFORM DIAGNOSIS. 1) Inspect using the "Diagnostic Procedure with Diagnostic Trouble Code (DTC)". <Ref. to IM(diag)-13, Diagnostic Procedure with Diagnostic Trouble Code (DTC).> 2) Repair the trouble cause. 3) Perform the Clear Memory Mode. 4) Read any DTC again.	Are DTCs indicated on display?	Inspect using the "Diagnostic Procedure with Diagnostic Trouble Code (DTC)". <Ref. to IM(diag)-13, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>	Finish the diagnosis.

2. General Description

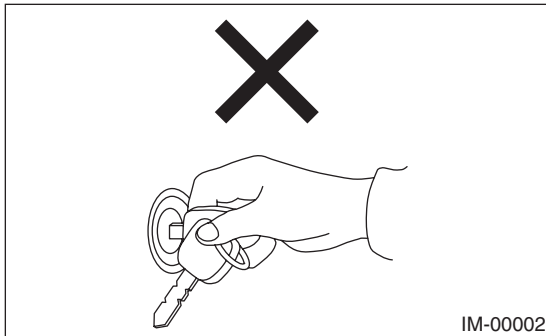
A: CAUTION

CAUTION:

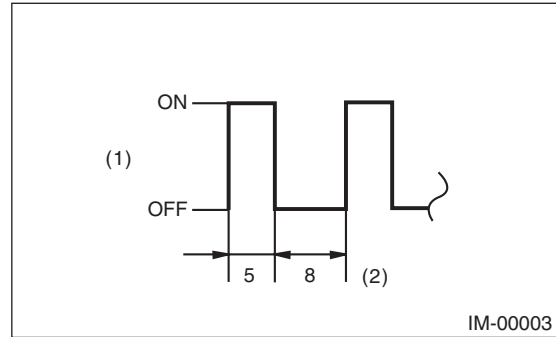
- The airbag system wiring harness is routed near the immobilizer control unit. All airbag system wiring harnesses and connectors are yellow. Do not use the electrical test equipment on these circuits.
- Be careful not to damage the airbag system wiring harness when servicing the immobilizer control module.
- While diagnostic items are being checked, do not operate radios, portable telephones, etc. which emit electromagnetic waves near or inside the vehicle.



- When the ignition switch is being turned ON or OFF while diagnostic items are being checked, do not allow keys with different ID codes be close to the ignition switch. If the ignition key is on a key holder, remove it from the key holder before carrying out diagnoses.



- When repeatedly turning the ignition switch to ON or OFF while diagnostic items are being checked, it should be switched in cycles of "ON" for at least 5 seconds → "OFF" for at least 8 seconds.



- (1) Ignition switch position
 (2) Sec.

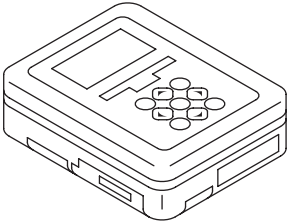
- If the engine fails to start with a registered ignition key, detach the ignition key from ignition switch and wait for approx. 1 second until security indicator light begins to flash. And then start the engine again.
- Before checking the diagnostic items, obtain all keys and security ID for the vehicle to be checked possessed by owner.

General Description

IMMOBILIZER (DIAGNOSTICS)

B: PREPARATION TOOL

1. SPECIAL TOOL

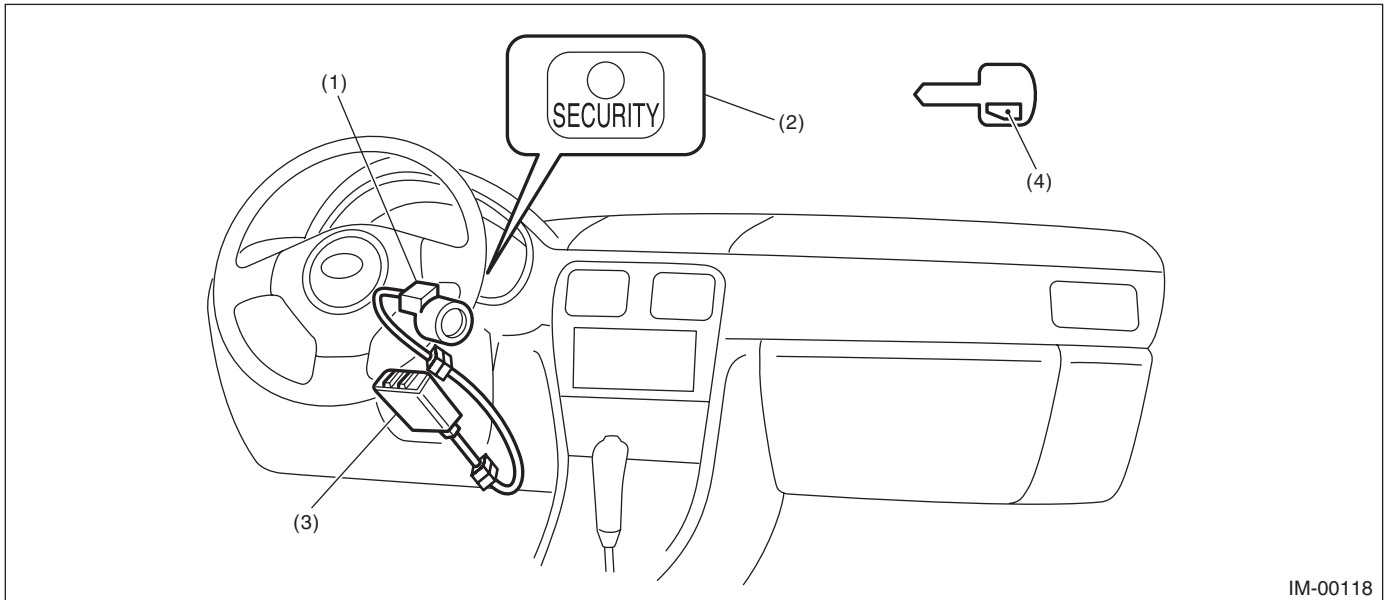
ILLUSTRATION	TOOL NUMBER	Description	REMARKS
 ST1B020XU0	1B020XU0	SUBARU SELECT MONITOR KIT	Used for diagnosing the electrical system.

2. GENERAL TOOL

TOOL NAME	REMARKS
Circuit tester	Used for measuring resistance, voltage and current.

3. Electrical Component Location

A: LOCATION



IM-00118

- | | | |
|---|-------------------------------------|-----------------|
| (1) Antenna | (3) Immobilizer control module (IMM | (4) Transponder |
| (2) Security indicator light (LED bulb) | ECM) | |

Immobilizer Control Module I/O Signal

IMMOBILIZER (DIAGNOSTICS)

4. Immobilizer Control Module I/O Signal

A: WIRING DIAGRAM

1. IMMOBILIZER

<Ref. to WI-89, WIRING DIAGRAM, Immobilizer System.>

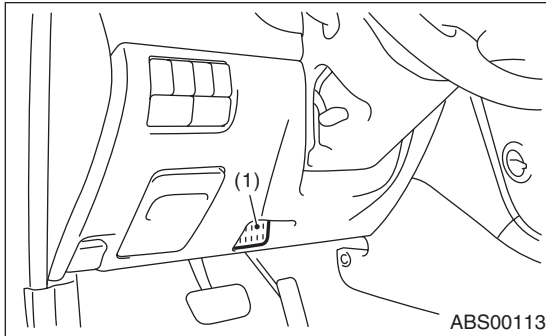
5. Subaru Select Monitor

A: OPERATION

1. HOW TO USE THE SUBARU SELECT MONITOR

- 1) Prepare the Subaru Select Monitor kit.
- 2) Connect the diagnosis cable to Subaru Select Monitor.
- 3) Connect the Subaru Select Monitor to the data link connector.

(1) Data link connector is located in the lower portion of the instrument panel (on the driver's side).



(1) Data link connector

(2) Connect the diagnosis cable to data link connector.

CAUTION:

Do not connect the scan tools other than the Subaru Select Monitor.

- 4) Turn the ignition switch to ON (engine is OFF), and run the Subaru Select Monitor.
- 5) Using the Subaru Select Monitor, call up DTCs and various data, then record them.

2. READ DIAGNOSTIC TROUBLE CODE (DTC) FOR THE ENGINE

Refer to "Read Diagnostic Trouble Code" for information about how to display a DTC. <Ref. to IM(diag)-8, Read Diagnostic Trouble Code (DTC).>

3. COMMUNICATION LINE CHECK

NOTE:

The communication line between ECM and immobilizer control unit can be checked in "System Operation Check Mode". This is referred to as "Communication line check".

- 1) Connect the Subaru Select Monitor.
- 2) On the «Each system check» display, select the {Engine Control System}.
- 3) Start the communication line check.
- 4) Is «OK» displayed on screen?
If displayed, go to step 5).
If not, go to step 6).

5) After diagnostic results, it is determined that the circuit is not shorted. Finish the communication line check.

6) If a problem is detected, repair the trouble cause. <Ref. to IM(diag)-14, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

Read Diagnostic Trouble Code (DTC)

IMMOBILIZER (DIAGNOSTICS)

6. Read Diagnostic Trouble Code (DTC)

A: OPERATION

- 1) On the «Main Menu» display screen, select {Each System Check}.
- 2) On the «System Selection Menu» display screen, select {Engine Control System}.
- 3) Select the [OK] after the information of engine type is displayed.
- 4) On the «Engine Diagnosis» screen, select {DTC Display}.
- 5) On the «Diagnostic Code(s) Display» screen, select {Current Diagnostic Code(s)} or {History Diagnostic Code(s)}.

NOTE:

- For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.
- For detailed concerning DTC, refer to the List of Diagnostic Trouble Codes (DTC). <Ref. to IM(diag)-12, LIST, List of Diagnostic Trouble Code (DTC).>

7. Clear Memory Mode

A: OPERATION

- 1) On the «Main Menu» display screen, select {Each System Check}.
- 2) On the «System Selection Menu» display screen, select {Engine Control System}.
- 3) Select the [OK] after the information of engine type is displayed.
- 4) On the «Engine Diagnosis» display screen, select the {Clear Memory}.
- 5) When the “Done” is shown on the display screen, turn the ignition switch to OFF and then close the Subaru Select Monitor.

NOTE:

- After the memory has been cleared, the idle air control solenoid valve must be initialized. To execute this procedure, turn the ignition switch to ON. Wait for 3 seconds before starting the engine.
- For detailed operation procedure, refer to the “SUBARU SELECT MONITOR OPERATION MANUAL”.

Diagnostics Chart for Security Indicator Light

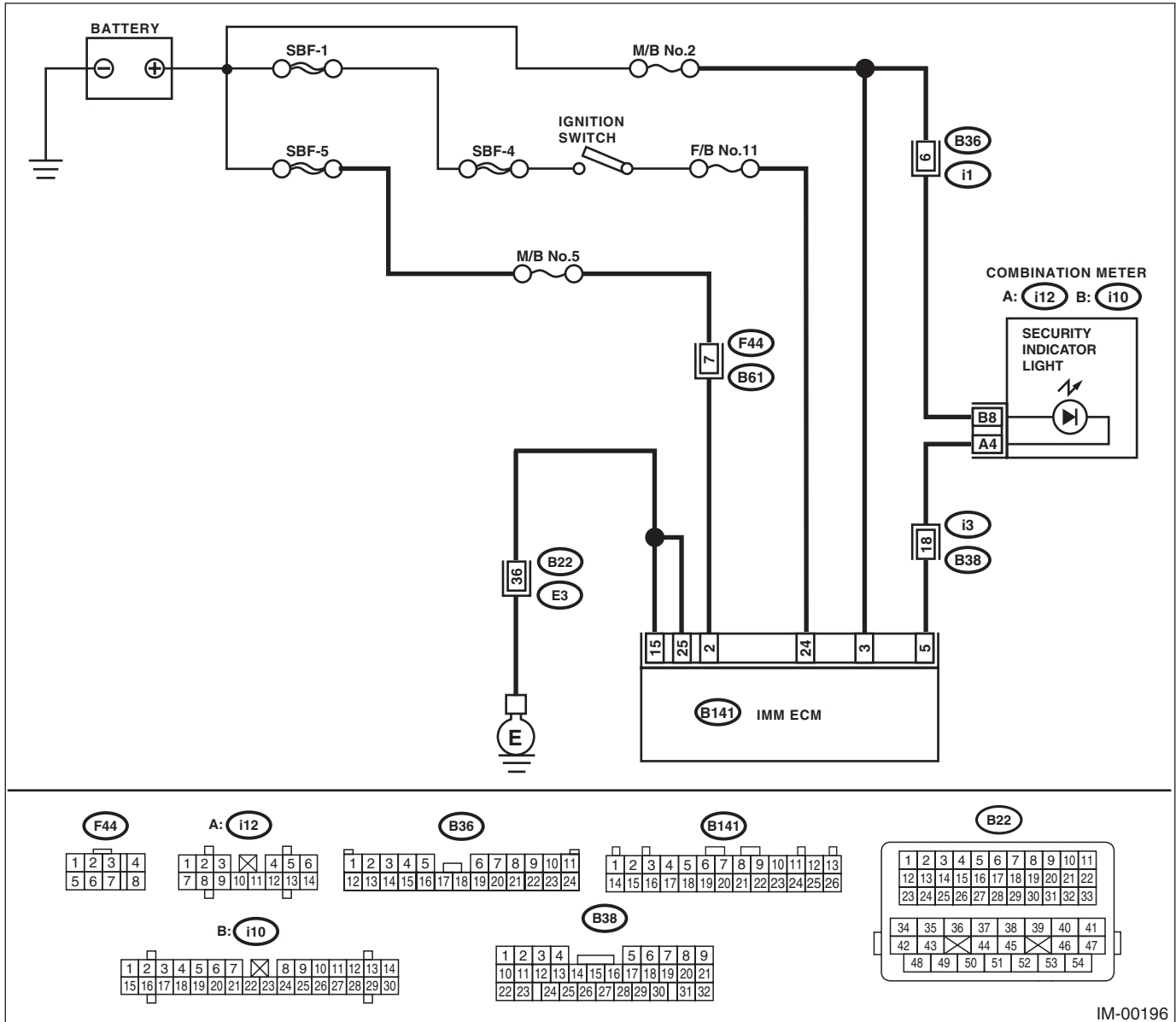
IMMOBILIZER (DIAGNOSTICS)

8. Diagnostics Chart for Security Indicator Light

A: INSPECTION

1. CHECK SECURITY INDICATOR LIGHT CIRCUIT

WIRING DIAGRAM:



IM-00196

Diagnostics Chart for Security Indicator Light

IMMOBILIZER (DIAGNOSTICS)

Step	Check	Yes	No
1 CHECK SECURITY INDICATOR LIGHT. 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from IMM ECM. 3) Connect a resistor (100 Ω) between IMM ECM harness connector terminal No. 5 and chassis ground.	Does the security indicator light illuminate?	Go to step 2.	Go to step 5.
2 CHECK IMM ECM GROUND CIRCUIT. Measure the resistance between IMM ECM harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B141) No. 15 — Chassis ground:</i> <i>(B141) No. 25 — Chassis ground:</i>	Is the resistance less than 10 Ω?	Go to step 3.	Repair the open circuit of IMMCM ground circuit.
3 CHECK IMM ECM IGNITION CIRCUIT. 1) Turn the ignition switch to ON. (Engine OFF) 2) Measure the voltage between IMM ECM harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B141) No. 24 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Go to step 4.	Check the harness for open or short between IMM ECM and ignition switch.
4 CHECK IMM ECM POWER SUPPLY CIRCUIT. 1) Turn the ignition switch to OFF. 2) Measure the voltage between IMM ECM harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(B141) No. 2 (+) — Chassis ground (-):</i> <i>(B141) No. 3 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Replace the IMM ECM <Ref. to SL-53, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the "REGISTRATION MANUAL FOR IMMOBILIZER (Pub. No. S0820GZ)".	Check the harness for open or short between IMM ECM and fuse.
5 CHECK COMBINATION METER CIRCUIT. 1) Remove the combination meter. <Ref. to IDI-10, Combination Meter.> 2) Measure the voltage between combination meter harness connector terminal and chassis ground. <i>Connector & terminal</i> <i>(i10) No. 8 (+) — Chassis ground (-):</i>	Is the voltage 10 V or more?	Go to step 6.	Check the harness for open or short between combination meter and fuse.
6 CHECK COMBINATION METER CIRCUIT. Measure the resistance between IMM ECM harness connector terminal and the combination meter harness connector terminal. <i>Connector & terminal</i> <i>(B141) No. 5 — (i12) No. 4:</i>	Is the resistance less than 10 Ω?	Faulty LED. Replace the combination meter print circuit. <Ref. to IDI-11, DISASSEMBLY, Combination Meter.>	Repair the harness or connector.

List of Diagnostic Trouble Code (DTC)

IMMOBILIZER (DIAGNOSTICS)

9. List of Diagnostic Trouble Code (DTC)

A: LIST

DTC	Item	Contents of diagnosis	Index No.
P1571	Reference Code Incompatibility	Reference code incompatibility between IMM ECM and ECM	<Ref. to IM(diag)-13, DTC P1571 REFERENCE CODE INCOMPATIBILITY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1572	IMM Circuit Failure (Expect Antenna Circuit)	Communication failure between IMM ECM and ECM	<Ref. to IM(diag)-14, DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT), Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1574	Key Communication Failure	Failure of IMM ECM to verify key (transponder) ID code or transponder key failure	<Ref. to IM(diag)-16, DTC P1574 KEY COMMUNICATION FAILURE, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P0513	Incorrect Immobilizer Key	Incorrect immobilizer key (Use of unregistered key in IMM ECM)	<Ref. to IM(diag)-17, DTC P0513 INCORRECT IMMOBILIZER KEY, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1576	EGI Control Module EEPROM	ECM malfunctioning	<Ref. to IM(diag)-17, DTC P1576 EGI CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1577	IMM Control Module EEPROM	IMM ECM malfunctioning	<Ref. to IM(diag)-18, DTC P1577 IMM CONTROL MODULE EEPROM, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>
P1570	Antenna	Faulty antenna	<Ref. to IM(diag)-19, DTC P1570 ANTENNA, Diagnostic Procedure with Diagnostic Trouble Code (DTC).>

NOTE:

Perform the engine DTC when a DTC other than immobilizer DTC is detected. <Ref. to EN(H4DOTC)(diag)-70, List of Diagnostic Trouble Code (DTC).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

IMMOBILIZER (DIAGNOSTICS)

10. Diagnostic Procedure with Diagnostic Trouble Code (DTC)

A: DTC P1571 REFERENCE CODE INCOMPATIBILITY

DTC DETECTING CONDITION:

Reference code incompatibility between IMM ECM and ECM

	Step	Check	Yes	No
1	PERFORM TEACHING OPERATION ON IGNITION KEY. Perform teaching operation on all keys of the vehicle. Refer to the "REGISTRATION MANUAL FOR IMMOBILIZER".	Is teaching operation for all keys completed?	END	Go to step 2.
2	CHECK DTC.	Is there any DTC related to immobilizer except DTC P1571?	Eliminate the cause of DTC other than DTC P1571, and perform the teaching operation again.	Replace the ECM and IMM ECM <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).> <Ref. to SL-53, Immobilizer Control Module.>, and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the "REGISTRATION MANUAL FOR IMMOBILIZER (Pub. No. S0820GZ)".

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

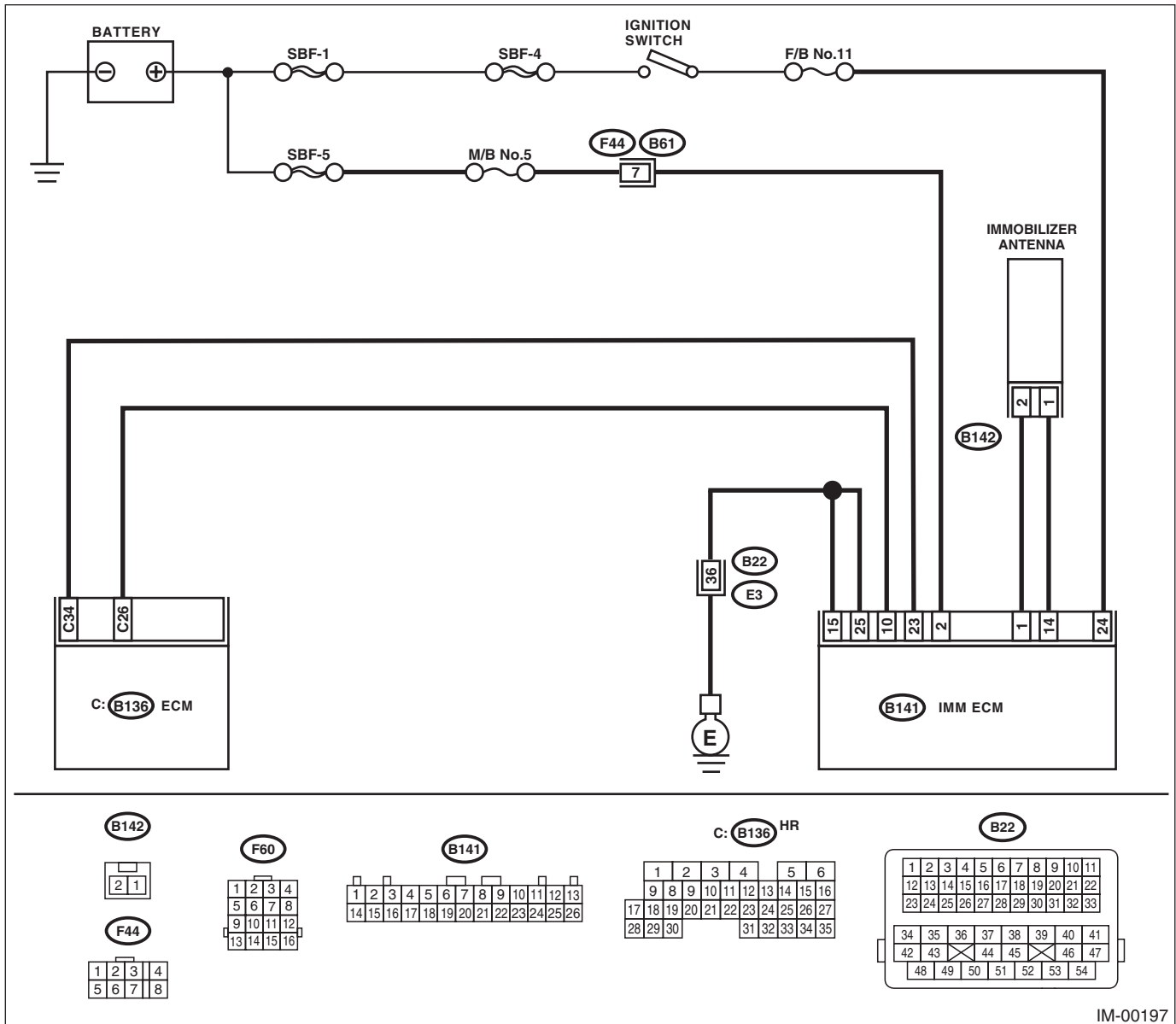
IMMOBILIZER (DIAGNOSTICS)

B: DTC P1572 IMM CIRCUIT FAILURE (EXCEPT ANTENNA CIRCUIT)

DTC DETECTING CONDITION:

Communication failure between IMM ECM and ECM

WIRING DIAGRAM:



IM-00197

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

IMMOBILIZER (DIAGNOSTICS)

Step	Check	Yes	No
<p>1</p> <p>CHECK IMM ECM POWER SUPPLY CIRCUIT. 1) Turn the ignition switch to OFF. 2) Disconnect the harness connector from IMM ECM. 3) Measure the voltage between IMM ECM harness connector terminal and chassis ground. Connector & terminal (B141) No. 2 (+) — Chassis ground (-):</p>	Is the voltage 10 V or more?	Go to step 2.	Check the harness for open or short between IMM ECM and fuse.
<p>2</p> <p>CHECK IGNITION SWITCH CIRCUIT. 1) Turn the ignition switch to ON. (Engine OFF) 2) Measure the voltage between IMM ECM harness connector terminal and chassis ground. Connector & terminal (B141) No. 24 (+) — Chassis ground (-):</p>	Is the voltage 10 V or more?	Go to step 3.	Check the harness for open or short between IMM ECM and ignition switch.
<p>3</p> <p>CHECK IMM ECM GROUND CIRCUIT. 1) Turn the ignition switch to OFF. 2) Measure the resistance between IMM ECM harness connector terminal and chassis ground. Connector & terminal (B141) No. 15 — Chassis ground: (B141) No. 25 — Chassis ground:</p>	Is the resistance less than 10 Ω?	Go to step 4.	Repair the open circuit of IMMCM ground circuit.
<p>4</p> <p>CHECK HARNESS BETWEEN IMM ECM AND ECM. 1) Disconnect the harness connector from the ECM and IMM ECM. 2) Measure the resistance between IMM ECM harness connector terminal and ECM harness connector terminal. Connector & terminal (B141) No. 10 — (B136) No. 26:</p>	Is the resistance less than 10 Ω?	Go to step 5.	Repair the open circuit of harness between IMM ECM and ECM.
<p>5</p> <p>CHECK HARNESS BETWEEN IMM ECM AND ECM. Measure the resistance between IMM ECM harness connector terminal and ECM harness connector terminal. Connector & terminal (B141) No. 23 — (B136) No. 34:</p>	Is the resistance less than 10 Ω?	Go to step 6.	Repair the open circuit of harness between IMM ECM and ECM.
<p>6</p> <p>CHECK HARNESS OF COMMUNICATION LINE. 1) Turn the ignition switch to ON. (Engine OFF) 2) Measure the voltage between IMM ECM harness connector terminal and chassis ground. Connector & terminal (B141) No. 10 (+) — Chassis ground (-): (B141) No. 23 (+) — Chassis ground (-):</p>	Is the voltage 0 V?	Go to step 7.	There is a short circuit in the battery voltage circuit or ignition switch "ON" circuit. Repair the harness between IMM ECM and ECM.
<p>7</p> <p>CHECK HARNESS OF COMMUNICATION LINE. Measure the voltage between ECM harness connector terminal and engine ground. Connector & terminal (B136) No. 26 (+) — Engine ground (-): (B136) No. 34 (+) — Engine ground (-):</p>	Is the voltage 0 V?	Go to step 8.	There is a short circuit in the battery voltage circuit or ignition switch "ON" circuit. Repair the harness between IMM ECM and ECM.

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

IMMOBILIZER (DIAGNOSTICS)

	Step	Check	Yes	No
8	CHECK ECM BY COMMUNICATION LINE CHECK. 1) Connect the harness connector to ECM. 2) Disconnect the harness connector from IMM ECM. 3) Perform communication line check. <Ref. to IM(diag)-7, COMMUNICATION LINE CHECK, OPERATION, Subaru Select Monitor.>	Does "Communication Line not Shorted" appear on the screen?	Replace the IMM ECM <Ref. to SL-53, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the "REGISTRATION MANUAL FOR IMMOBILIZER (Pub. No. S0820GZ)".	Replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).> Then perform teaching operation. Refer to the "REGISTRATION MANUAL FOR IMMOBILIZER (Pub. No. S0820GZ)".

C: DTC P1574 KEY COMMUNICATION FAILURE

DTC DETECTING CONDITION:

Failure of IMM ECM to verify key (transponder) ID code or transponder key failure

	Step	Check	Yes	No
1	CHECK IMM ECM FUNCTION. Insert the key to ignition switch (LOCK position), then measure changes in voltage between antenna connector. Connector & terminal (B142) No. 1 (+) — Chassis ground (-):	Is the voltage -30 — 30 V (Approximately 0.1 seconds after key was inserted)? Is the voltage 0 V (Approximately 1 seconds after key was inserted)?	Go to step 2.	Replace the IMM ECM <Ref. to SL-53, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the "REGISTRATION MANUAL FOR IMMOBILIZER (Pub. No. S0820GZ)".
2	CHECK IGNITION KEY (TRANSPONDER). 1) Remove the key from ignition switch. 2) Start the engine using other keys that have undergone the teaching operation.	Does the engine start?	Replace the ignition key (including the transponder). Then perform teaching operation. Refer to the "REGISTRATION MANUAL FOR IMMOBILIZER (Pub. No. S0820GZ)".	Replace the IMM ECM <Ref. to SL-53, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the "REGISTRATION MANUAL FOR IMMOBILIZER (Pub. No. S0820GZ)".

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

IMMOBILIZER (DIAGNOSTICS)

D: DTC P0513 INCORRECT IMMOBILIZER KEY

DTC DETECTING CONDITION:

Incorrect immobilizer key (Use of unregistered key in IMM ECM)

Step	Check	Yes	No
1 PERFORM TEACHING OPERATION ON IGNITION KEY. Perform teaching operation on all keys of the vehicle. Refer to the "REGISTRATION MANUAL FOR IMMOBILIZER (Pub. No. S0820GZ)".	Is teaching operation for all keys completed?	END	Replace all ignition keys (including the transponder). Go to step 2.
2 PERFORM TEACHING OPERATION ON IGNITION KEY. Perform teaching operation on all keys of the vehicle. Refer to the "REGISTRATION MANUAL FOR IMMOBILIZER (Pub. No. S0820GZ)".	Is teaching operation for all keys completed?	END	Replace the IMM ECM <Ref. to SL-53, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the "REGISTRATION MANUAL FOR IMMOBILIZER (Pub. No. S0820GZ)".

E: DTC P1576 EGI CONTROL MODULE EEPROM

DTC DETECTING CONDITION:

- ECM malfunctioning
- Inaccessible ROM in ECM during key registration

Step	Check	Yes	No
1 PERFORM REGISTRATION ON IGNITION KEY. Perform registration on all keys of the vehicle. Refer to the "REGISTRATION MANUAL FOR IMMOBILIZER".	Is registration for all keys completed?	Verify that the engine starts with all registered keys and finish the diagnosis.	Go to step 2.
2 PERFORM REGISTRATION ON IGNITION KEY. Perform registration on all keys of the vehicle. Refer to the "REGISTRATION MANUAL FOR IMMOBILIZER".	Is registration for all keys completed?	Verify that the engine starts with all registered keys and finish the diagnosis.	Go to step 3.
3 PERFORM REGISTRATION ON IGNITION KEY. Perform registration on all keys of the vehicle. Refer to the "REGISTRATION MANUAL FOR IMMOBILIZER".	Is registration for all keys completed?	Verify that the engine starts with all registered keys and finish the diagnosis.	Replace the ECM. <Ref. to FU(H4DOTC)-44, Engine Control Module (ECM).>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

IMMOBILIZER (DIAGNOSTICS)

F: DTC P1577 IMM CONTROL MODULE EEPROM

DTC DETECTING CONDITION:

- IMM ECM malfunctioning
- Inaccessible ROM in IMM ECM.

Step	Check	Yes	No
1 PERFORM REGISTRATION ON IGNITION KEY. Perform registration on all keys of the vehicle. Refer to the "REGISTRATION MANUAL FOR IMMOBILIZER".	Is registration for all keys completed?	Verify that the engine starts with all registered keys and finish the diagnosis.	Go to step 2.
2 PERFORM REGISTRATION ON IGNITION KEY. Perform registration on all keys of the vehicle. Refer to the "REGISTRATION MANUAL FOR IMMOBILIZER".	Is registration for all keys completed?	Verify that the engine starts with all registered keys and finish the diagnosis.	Go to step 3.
3 PERFORM REGISTRATION ON IGNITION KEY. Perform registration on all keys of the vehicle. Refer to the "REGISTRATION MANUAL FOR IMMOBILIZER".	Is registration for all keys completed?	Verify that the engine starts with all registered keys and finish the diagnosis.	Replace the IMM ECM. <Ref. to SL-53, REMOVAL, Immobilizer Control Module.>Replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the "REGISTRATION MANUAL FOR IMMOBILIZER (Pub. No. S0820GZ)".

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

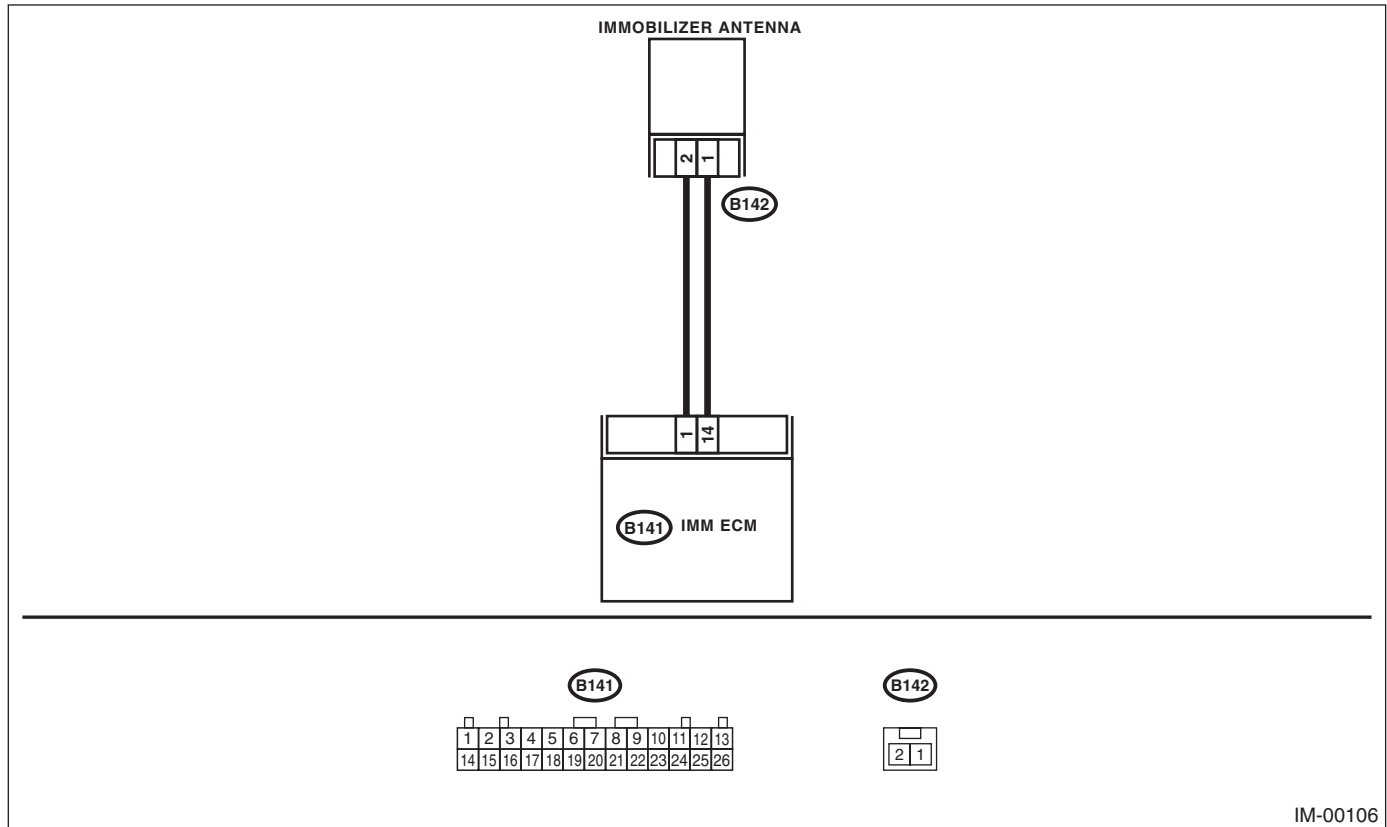
IMMOBILIZER (DIAGNOSTICS)

G: DTC P1570 ANTENNA

DTC DETECTING CONDITION:

Faulty antenna

WIRING DIAGRAM:



Step	Check	Yes	No
1 CHECK ANTENNA CIRCUIT. 1) Turn the ignition switch to OFF. 2) Disconnect the harness antenna connector from the IMM ECM. <Ref. to SL-54, Immobilizer Antenna.> 3) Measure the resistance of the antenna circuit. <i>Connector & terminal</i> <i>(B141) No. 1 — No. 14:</i>	Is the resistance less than 10 Ω?	Go to step 2.	Replace the antenna. <Ref. to SL-54, Immobilizer Antenna.>
2 CHECK ANTENNA CIRCUIT. Measure the resistance between antenna harness connector and chassis ground. <i>Connector & terminal</i> <i>(B141) No. 1 — Chassis ground:</i>	Is the resistance less than 10 Ω?	Replace the antenna. <Ref. to SL-54, Immobilizer Antenna.>	Go to step 3.
3 CHECK ANTENNA CIRCUIT. Measure the resistance between antenna harness connector and chassis ground. <i>Connector & terminal</i> <i>(B141) No. 14 — Chassis ground:</i>	Is the resistance less than 10 Ω?	Replace the antenna. <Ref. to SL-54, Immobilizer Antenna.>	Go to step 4.
4 CHECK ANTENNA CIRCUIT. 1) Turn the ignition switch to ON. (Engine OFF) 2) Measure the voltage between antenna harness connector and chassis ground. <i>Connector & terminal</i> <i>(B141) No. 1 (+) — Chassis ground (-):</i>	Is the voltage 0 V?	Go to step 5.	Replace the antenna. <Ref. to SL-54, Immobilizer Antenna.>

Diagnostic Procedure with Diagnostic Trouble Code (DTC)

IMMOBILIZER (DIAGNOSTICS)

Step	Check	Yes	No
5 CHECK ANTENNA CIRCUIT. Measure the voltage between antenna harness connector and chassis ground. <i>Connector & terminal</i> <i>(B141) No. 14 (+) — Chassis ground (-):</i>	Is the voltage 0 V?	Go to step 6.	Replace the antenna. <Ref. to SL-54, Immobilizer Antenna.>
6 CHECK IMM ECM FUNCTION. 1) Turn the ignition switch to OFF. 2) Connect the antenna harness connector to IMM ECM. 3) Insert the key to ignition switch, then measure changes in voltage between antenna harness connector. <i>Connector & terminal</i> <i>(B141) No. 1 (+) — Chassis ground (-):</i>	Is the voltage -30 — 30 V (Approximately 0.1 seconds after key was inserted)? Is the voltage 0 V (Approximately 1 seconds after key was inserted)?	Go to step 7.	Replace the IMM ECM <Ref. to SL-53, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the "REGISTRATION MANUAL FOR IMMOBILIZER (Pub. No. S0820GZ)".
7 CHECK IGNITION KEY (TRANSPONDER). 1) Remove the key from ignition switch. 2) Start the engine using other keys that have undergone the teaching operation.	Does the engine start?	Replace the ignition key (including the transponder). Then perform teaching operation. Refer to the "REGISTRATION MANUAL FOR IMMOBILIZER (Pub. No. S0820GZ)".	Replace the IMM ECM <Ref. to SL-53, Immobilizer Control Module.> and then replace all ignition keys (including the transponder). Then perform teaching operation. Refer to the "REGISTRATION MANUAL FOR IMMOBILIZER (Pub. No. S0820GZ)".

1. Basic Diagnostic Procedure

A: BASIC PROCEDURES

1. GENERAL DESCRIPTION

The most important purpose of diagnostics is to quickly determine which part is malfunctioning, to save time and labor.

2. IDENTIFICATION OF TROUBLE SYMPTOM

Determine what the problem is based on the symptom.

3. PROBABLE CAUSE OF TROUBLE

Look at the wiring diagram and check the system's circuit. Then check the switch, relay, fuse, ground, etc.

4. LOCATION AND REPAIR OF TROUBLE

- 1) Using the diagnostics, narrow down the causes.
- 2) If necessary, use a voltmeter, ohmmeter, etc.
- 3) Before replacing certain component parts (switch, relay, etc.), check the power supply, ground, for open wiring harness, poor connectors, etc. If no problem is encountered, check the component parts.

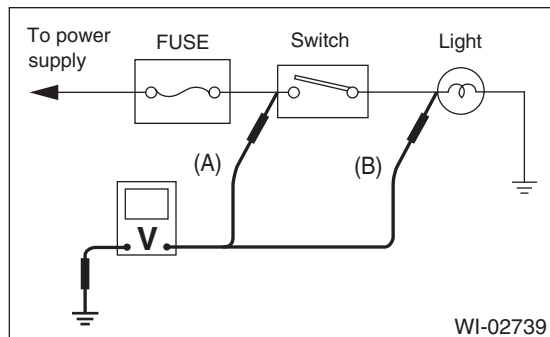
5. SYSTEM OPERATION CHECK

After repairing, ensure that the system operates properly.

B: BASIC INSPECTION

1. VOLTAGE MEASUREMENT

- 1) Using a voltmeter, connect the negative lead to a good ground point or negative battery terminal and the positive lead to the connector or component terminal.
- 2) Contact the positive lead of the voltmeter on connector (A). The voltmeter will indicate a voltage.
- 3) Shift the positive lead to connector (B). The voltmeter will indicate no voltage.



- 4) With the test set-up held as it is, turn the switch ON. The voltmeter will indicate a voltage and, at the same time, the light will come on.

- 5) The circuit is in good order. If a problem such as a light failing to illuminate occurs, use the procedures outlined above to track down the malfunction.

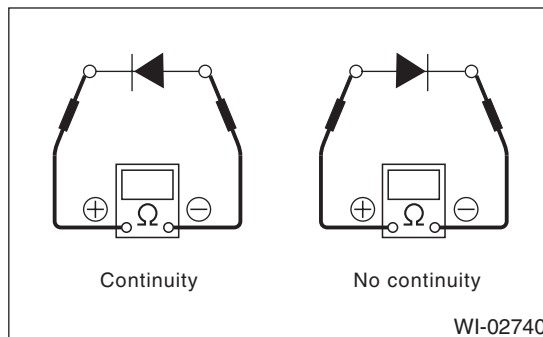
2. CIRCUIT CONTINUITY CHECKS

- 1) Disconnect the battery terminal or connector so there is no voltage between the check points. Contact the two leads of an ohmmeter to each of the check points.

If the circuit has diodes, reverse the two leads and check again.

- 2) Use an ohmmeter to check for diode continuity. When contacting the negative lead to the diode positive side and the positive lead to the negative side, there should be continuity.

When contacting the two leads in reverse, there should be no continuity.



- 3) The symbol "○ — ○" indicates that continuity exists between two points or terminals. For example, when a switch position is at "3", continuity exists among terminals 1, 3 and 6, as shown in the table below.

Terminal	Switch Position					
Switch Position	1	2	3	4	5	6
OFF						
1	○ — ○				○ — ○	
2	○ — ○			○ — ○		
3	○ — ○		○ — ○			○ — ○
4	○ — ○	○ — ○				○ — ○

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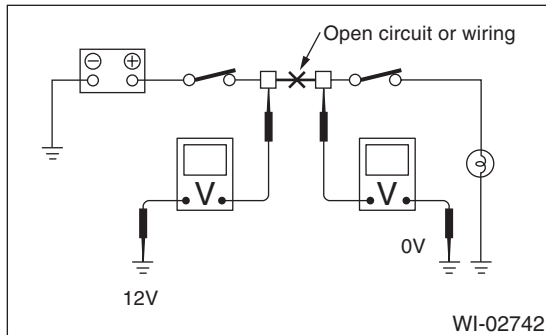
Basic Diagnostic Procedure

WIRING SYSTEM

3. HOW TO DETERMINE AN OPEN CIRCUIT

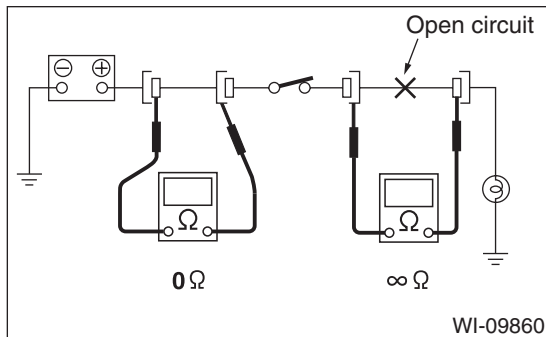
1) With voltmeter:

An open circuit is determined by measuring the voltage between respective connectors and ground using a voltmeter, starting with the connector closest to the power supply. The power supply must be turned ON so that current flows in the circuit. If voltage is not present between a particular connector and ground, the circuit between that connector and the previous connector is open.



2) With ohmmeter:

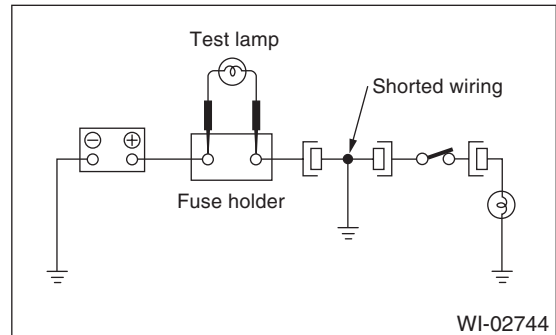
Disconnect all connectors affected, and check continuity in the wiring between adjacent connectors. When the ohmmeter indicates "infinite", the wiring is open.



4. HOW TO DETERMINE A SHORT CIRCUIT

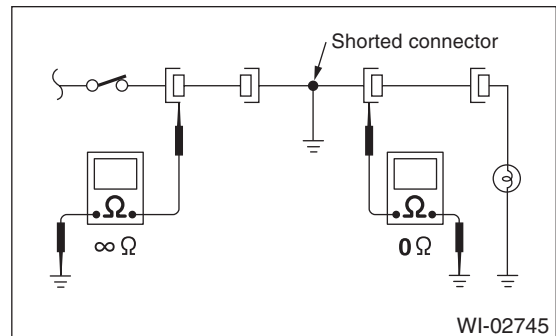
1) With test light:

Connect a test light (rated at approx. 3 watts) in place of the blown fuse and allow current to flow through the circuit. Disconnect one connector at a time from the circuit. Starting with the one located farthest from the power supply. If the test light goes out when a connector is disconnected, the wiring between that connector and the next connector (farther from the power supply) is shorted.



2) With ohmmeter:

Disconnect all affected connectors, and check continuity between each connector and ground. When the ohmmeter indicates continuity between a particular connector and a ground, that connector is shorted.



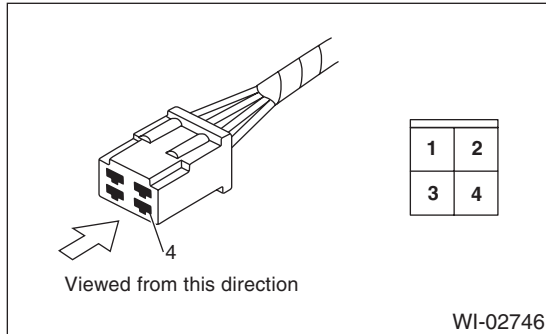
C: HOW TO READ WIRING DIAGRAMS

1. WIRING DIAGRAM

The wiring diagram of each system is illustrated so that you can understand the path through which the electric current flows from the battery.

Sketches and codes are used in the diagrams. They should read as follows:

- Each connector and its terminal position are indicated by a sketch of the connector in a disconnected state which is viewed from the front.



- The number of poles or pins, presence of a lock are indicated in the sketch of each connector. In the sketch, the highest pole number refers to the number of poles which the connector has. For example, the sketch of the connector shown in figure indicates the connector has 9 poles.

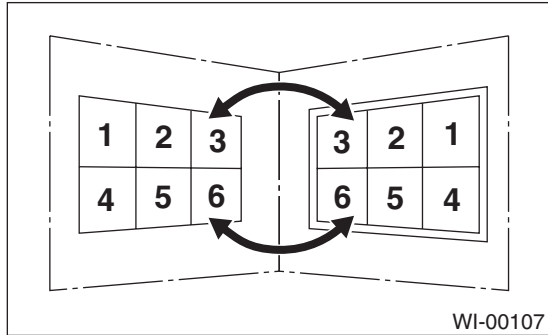
Connector used in vehicle	Connector shown in wiring diagram		
	Sketch	Symbol	Number of poles
	<p>Double frames</p> <p>Indicates a lock is included.</p> <p>Indicates the number of poles.</p>		<p>Numbered in order from upper right to lower left.</p>
	<p>Indicates a lock is included.</p> <p>Single frame</p>		<p>Numbered in order from upper left to lower right</p>

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Basic Diagnostic Procedure

WIRING SYSTEM

- When one set of connectors is viewed from the front side, the pole numbers of one connector are symmetrical to those of the other. When these two connectors are connected as a unit, the poles which have the same number are joined.



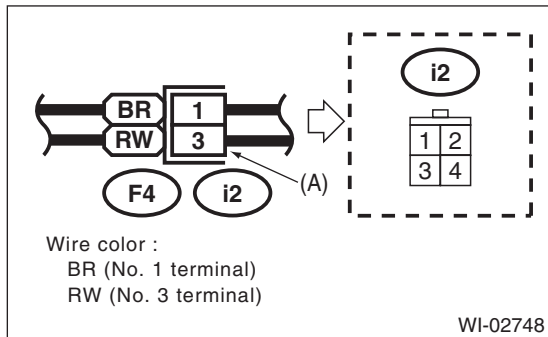
WIRING DIAGRAM:

The connectors are numbered along with the number of poles, external colors, and mating connections in the accompanying list.

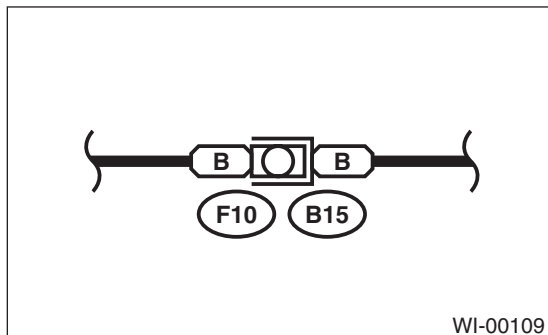
- The sketch of each connector in the wiring diagram usually shows the (A) side of the connector. The relationship between the wire color, terminal number and connector is described in the figure.

NOTE:

A wire which runs in one direction from a connector terminal sometimes may have a different color from that which runs in the other direction from that terminal.

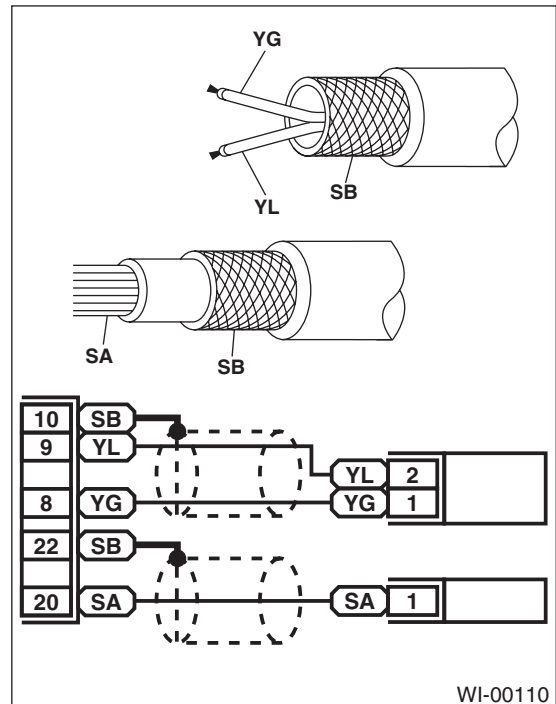


- In the wiring diagram, connectors which have no terminal number refer to one-pole types. Sketches of these connectors are omitted intentionally.

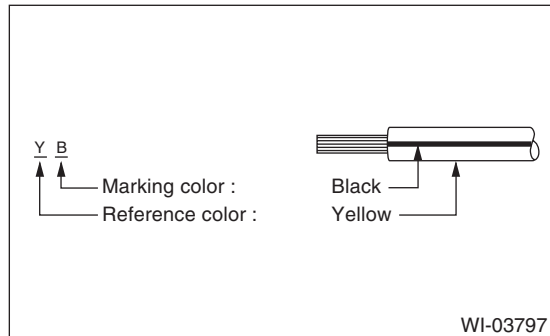


- The following color codes are used to indicate the colors of the wires.

Color code	Color
L	Blue
B	Black
Y	Yellow
G	Green
R	Red
W	White
Br	Brown
Lg	Light green
Gr	Gray
P	Pink
Or	Orange
Sb	Sky blue
V	Purple
SA	Sealed (Inner)
SB	Sealed (Outer)



- The wire color code, which consists of two letters (or three letters including Br or Lg), indicates the standard color (base color of the wire covering) by its first letter and the stripe marking by its second letter.



- The table lists the nominal sectional areas and allowable currents of the wires.

CAUTION:

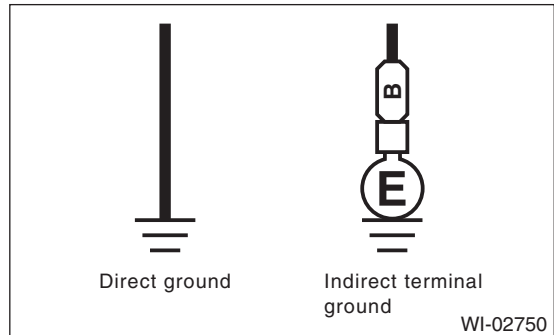
When replacing or repairing a wire, be sure to use the same size and type of the wire which was originally used.

NOTE:

- The allowable current in the table indicates the tolerable amperage of each wire at an ambient temperature of 40°C (104°F).
- The allowable current changes with ambient temperature. Also, it changes if a bundle of more than two wires is used.

Nominal sectional area mm ²	No. of strands/ strand diameter	Outside diameter of wiring mm	Allowable current Amps/ 40°C (104°F)
0.3	7/0.26	1.8	7
0.5	7/0.32	2.2 (or 2.0)	12
0.75	30/0.18	2.6 (or 2.4)	16
0.85	11/0.32	2.4 (or 2.2)	16
1.25	16/0.32	2.7 (or 2.5)	21
2	26/0.32	3.1 (or 2.9)	28
3	41/0.32	3.8 (or 3.6)	38
5	65/0.32	4.6 (or 4.4)	51
8	50/0.45	5.5	67

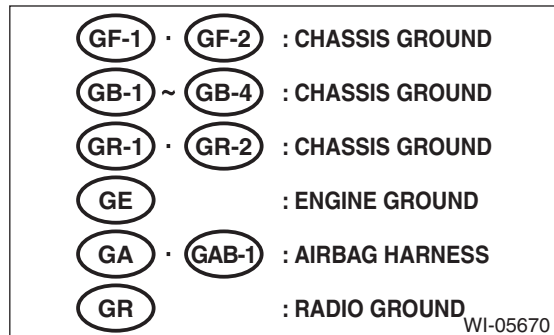
- Each unit is either directly grounded to the body or indirectly grounds through a harness ground terminal. Different symbols are used in the wiring diagram to identify the two grounding systems.



- The ground points shown in the wiring diagram refer to the following:

NOTE:

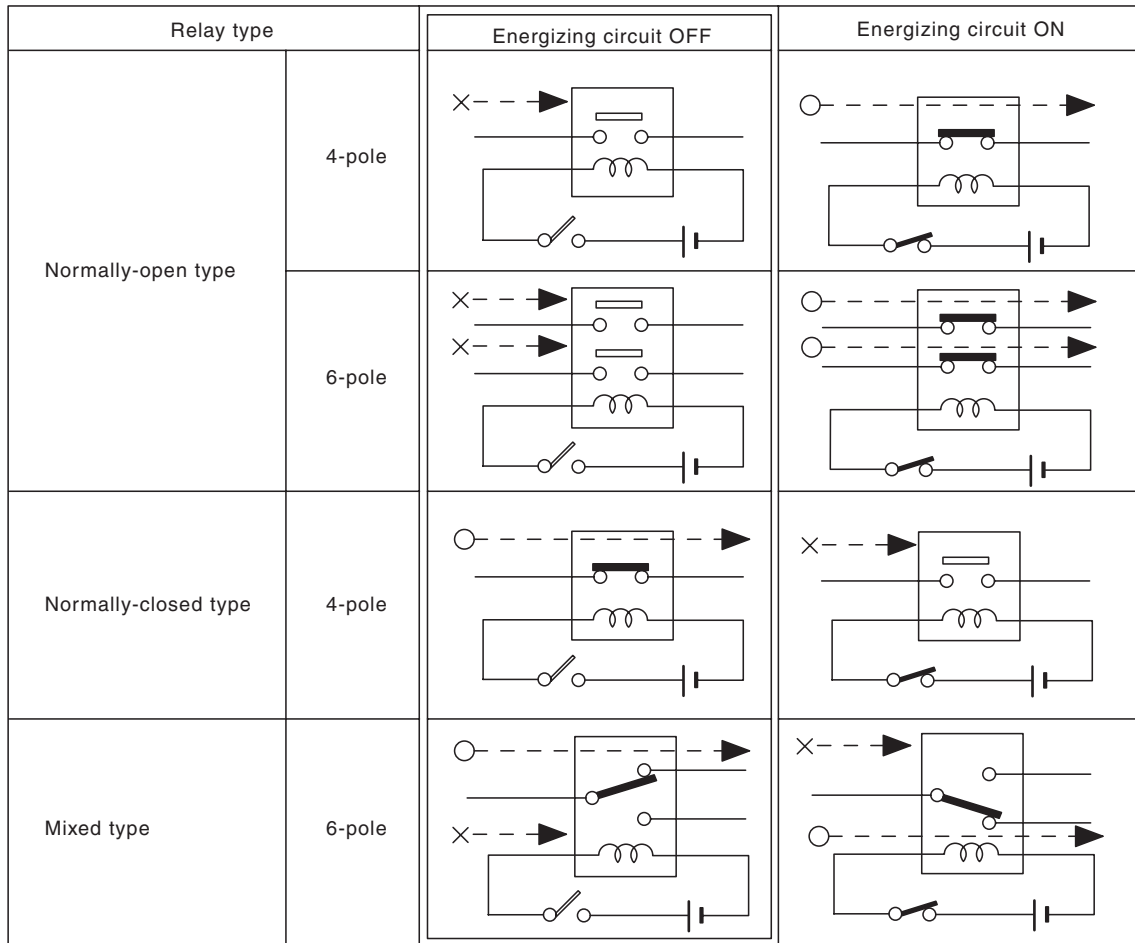
All wiring harnesses are provided with a ground point which should be securely connected.



Basic Diagnostic Procedure

WIRING SYSTEM

- Relays are classified as normally-open or normally-closed.
- The normally-closed relay has one or more contacts. The wiring diagram shows the relay mode when the energizing circuit is OFF.



Key to symbols:

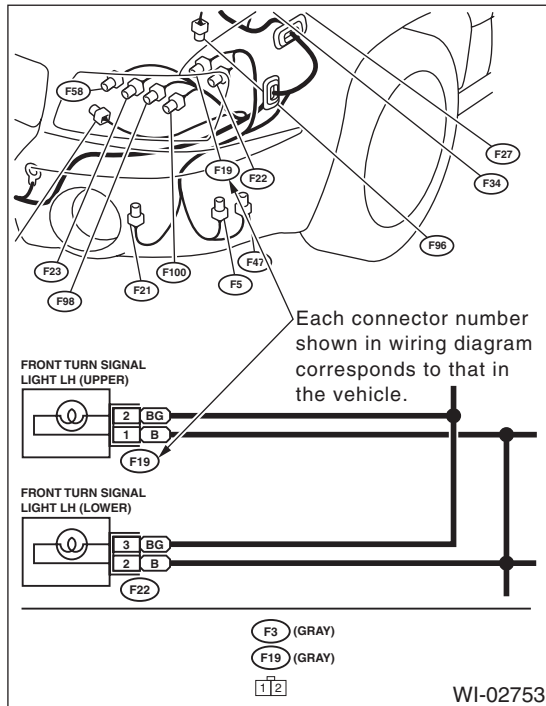
○ —▶ : Current flows.

× —▶ : Current does not flow.

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- Each connector number shown in the wiring diagram corresponds to that in the wiring harness. The location of each connector in the actual vehicle is determined by reading the first character of the connector (for example, a "F" for F8, "i" for i16, etc.) and the type of wiring harness. The first character of each connector number corresponds to the area or system of the vehicle.

Symbol	Wiring harness and cord
F	Front wiring harness
B	Bulkhead wiring harness
E	Engine wiring harness
T	Transmission cord, Rear oxygen sensor cord
D	Door cord LH & RH, Rear gate cord Rear door cord LH & RH
i	Instrument panel wiring harness
R	Rear wiring harness, Fuel tank cord, Roof cord
AB	Airbag wiring harness

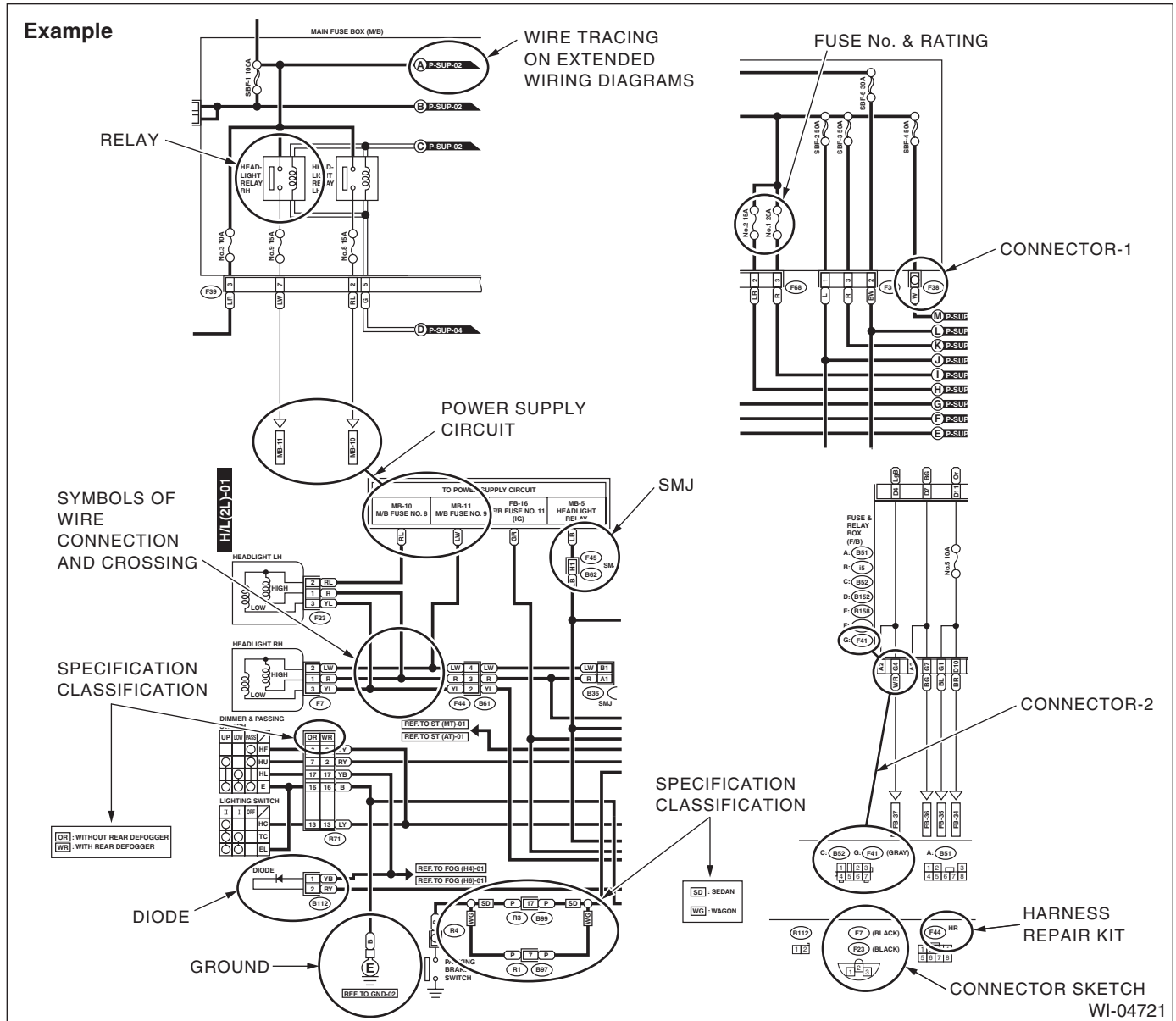


Basic Diagnostic Procedure

WIRING SYSTEM

D: SYMBOLS IN WIRING DIAGRAMS

A number of symbols are used in each wiring diagram to easily identify parts or circuits.



1. RELAY

A symbol used to indicate a relay.

2. CONNECTOR 1

The sketch of the connector indicates the one-pole types.

3. WIRING CONNECTION

Some wiring diagrams are indicated in foldouts for convenience. Wiring destinations are indicated where necessary by corresponding symbols. (When two pages are needed for clear indication)

4. FUSE NO. & RATING

The "FUSE No. & RATING" corresponds with that used in the fuse box (main fuse box, fuse and joint box).

5. CONNECTOR 2

- Each connector is indicated by a symbol.
- Each terminal number is indicated in the corresponding wiring diagram in an abbreviated form.
- For example, terminal number "G4" refers to No. 4 terminal of connector (G: F41) shown in the connector sketch.

6. CONNECTOR SKETCH

- Each connector sketch clearly identifies the shape and color of a connector as well as terminal locations. Non-colored connectors are indicated in natural color.
- When more than two types of connector number are indicated in a connector sketch, it means that the same type connectors are used.

7. GROUND

Each grounding point can be located easily by referring to the corresponding wiring harness.

8. DIODE

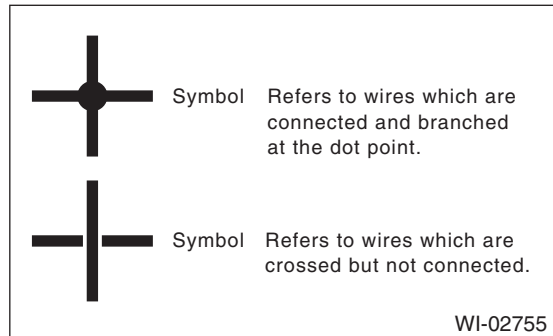
A symbol is used to indicate a diode.

9. WIRE TRACING ON EXTENDED WIRING DIAGRAMS

For a wiring diagram extending over at least two pages, a symbol (consisting of the same characters with arrows), facilitates wire tracing from one page to the other.

A ↔ A, B ↔ B

10. SYMBOLS OF WIRE CONNECTION AND CROSSING



11. POWER SUPPLY ROUTING

A symbol is used to indicate the power supply in each wiring diagram.

"MB-5", "MB-6", etc., which are used as power-supply symbols throughout the text, correspond with those shown in "POWER SUPPLY ROUTING" in the wiring diagram.

Accordingly, using "POWER SUPPLY ROUTING" and wiring diagrams permits service personnel to understand the entire electrical arrangement of a system.

12. CLASSIFICATION BY SPECIFICATION

- When the wiring diagram differ according to vehicle specifications, the specification difference is described by using abbreviations.
- For V.I.N., refer to the ID section. <Ref. to ID-2, IDENTIFICATION NUMBER AND LABEL LOCATIONS, IDENTIFICATION, Identification.>

13. HARNESS REPAIR KIT













The connector adapting to Harness repair kit is shown as "HR" in the right-upper of connector number. Refer to "Harness Repair Kit" for harness repair kit. <Ref. to WI-184, SPECIFICATION, Harness Repair Kit.>

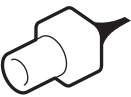











Basic Diagnostic Procedure

WIRING SYSTEM

E: CONNECTOR SYMBOL IN WIRING HARNESS

A number of connector symbols are used in each wiring diagram to easily identify the wiring harness connectors.

Standard type: Female		
Pole: From 1 to 8	Pole: From 9 to 20	Pole: More than 21
		
		
Standard type: Male		
		
		

Water proof type: Female		
Pole: From 1 to 8	Pole: From 9 to 20	Pole: More than 21
		
		
Water proof type: Male		
		
		

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F: ABBREVIATION IN WIRING DIAGRAMS

Abbr.	Full name
A/B	Airbag
A/C	Air Conditioner
A/F	Air/Fuel (Air fuel ratio sensor)
ABS	Antilock Brake System
ABSCM	Antilock Brake System Control Module
ACC	Accessory
AT	Automatic Transmission
ATF	Automatic Transmission Fluid
AUX	Auxiliary Audio Input Terminal
AVCS	Active Valve Control System
AWD	All Wheel Drive
B	Battery
CAN	Controller Area Network
COM	Computer
CPC	Canister Purge Control
CPU	Central Integrated Circuit
D	Drive Range or Down
E	Ground
EBD	Electric Brake Distribution
ECM	Engine Control Module
EEPROM	Electronically Erasable and Programmable Read Only Memory
EGI	Electric Gasoline Injection
EGR	Exhaust Gas Recirculation
ELR	Emergency Locking Retractor
F/B	Fuse & Relay Box
FL	Front Left Hand
FLD	Front Left Down
FLU	Front Left Up
FR	Front Right Hand
FRD	Front Right Down
FRU	Front Right Up
FWD	Front Wheel Drive
GND	Ground
H/L	Headlight
HI	High
HID	High Intensity Discharge
I/F	Interface
IG	Ignition
INT	Intermittent
LCD	Liquid Crystal Display
LH	Left Hand
LO	Low
M	Motor
M/B	Main Fuse Box
MT	Manual Transmission
N	Neutral Range
NA	Natural Aspiration

Abbr.	Full name
OP	Optional Parts or Open
P	Parking Range
PASS	Passing
PCV	Purge Control Valve
P-VIGN	P-V Ignition Relay
R	Reverse Range
RH	Right Hand
RL	Rear Left
RLD	Rear Left Down
RLU	Rear Left Up
RR	Rear Right
RRD	Rear Right Down
RRU	Rear Right Up
SBF	Slow Blow Fuse
ST	Starter
TCM	AT Control Module
TGV	Tumble Generator Valve
U	Up
WASH	Washer

Working Precautions

WIRING SYSTEM

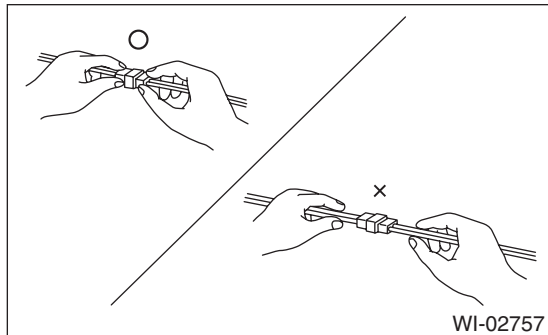
2. Working Precautions

A: PRECAUTIONS WHEN WORKING WITH THE PARTS MOUNTED ON THE VEHICLE

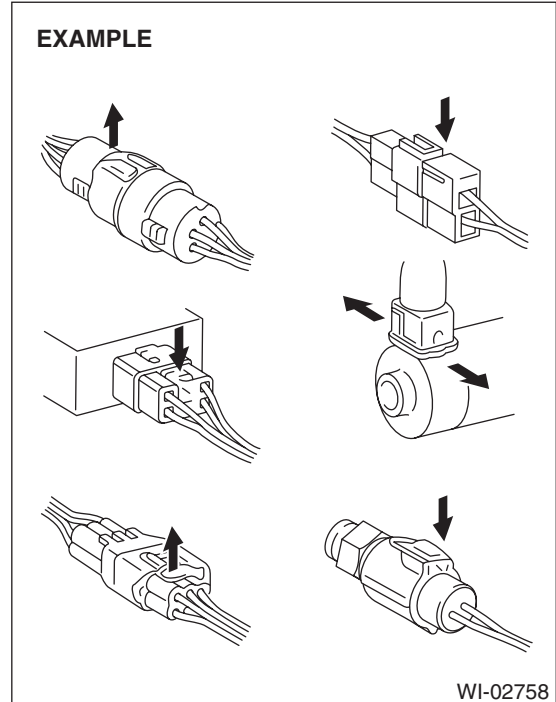
- 1) When working under a vehicle which is jacked-up, always be sure to use rigid rack.
- 2) The parking brake must always be applied during working. Also, in automatic transmission vehicles, keep the select lever set to the P (Parking) range.
- 3) Be sure the workshop is properly ventilated when running the engine. Further, be careful not to touch the belt or fan while the engine is operating.
- 4) Be careful not to touch hot metal parts, especially radiator and the exhaust system immediately after the engine has been turned off.

B: PRECAUTIONS IN TROUBLE DIAGNOSIS AND REPAIR OF ELECTRIC PARTS

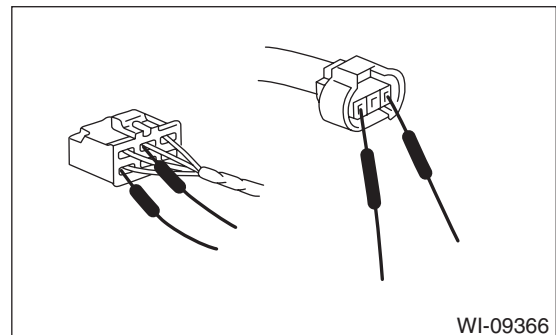
- 1) The battery cable must be disconnected from the battery's (-) terminal, and the ignition switch must be set to the OFF position, unless otherwise required by the diagnostics.
- 2) Securely fasten the wiring harness with clamps and clips so that the harness does not interfere with the body end parts or edges and bolts or screws.
- 3) When installing parts, be careful not to catch them on the wiring harness.
- 4) When disconnecting a connector, do not pull the wires, but pull while holding the connector body.



- 5) Some connectors are provided with a lock. One type of such a connector is disconnected by pushing the lock, and the other, by moving the lock up. In either type the lock shape must be identified before attempting to disconnect the connector. To connect, insert the connector until it snaps and confirm that it is connected securely.



- 6) When checking continuity between connector terminals, or measuring voltage across the terminal and ground, always contact tester probe(s) on terminals from the wiring connection side. If the probe is too thick to gain access to the terminal, use "mini" test leads. To check water-proof connectors (which are not accessible from the wiring side), contact test probes on the terminal side being careful not to bend or damage terminals.



- 7) Sensors, relays, electrical unit, etc., are sensitive to strong impacts. Handle them with care so that they are not dropped or mishandled.

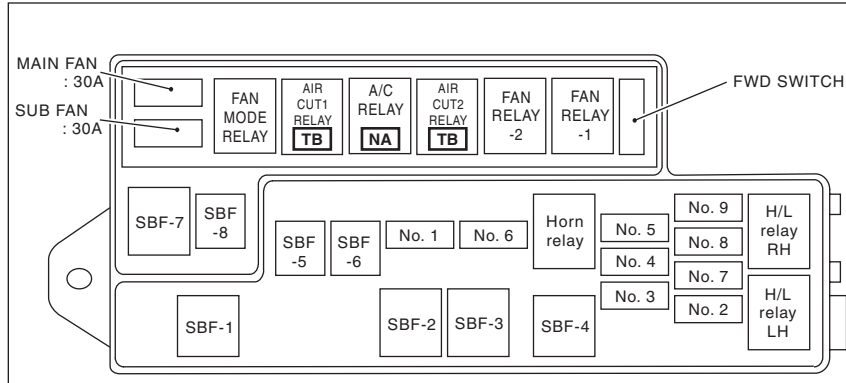
3. Power Supply Circuit

A: WIRING DIAGRAM

P-SUP-01

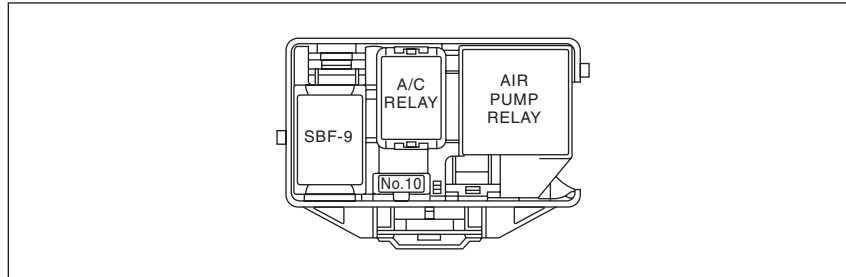
P-SUP-01

MAIN FUSE BOX (M/B)

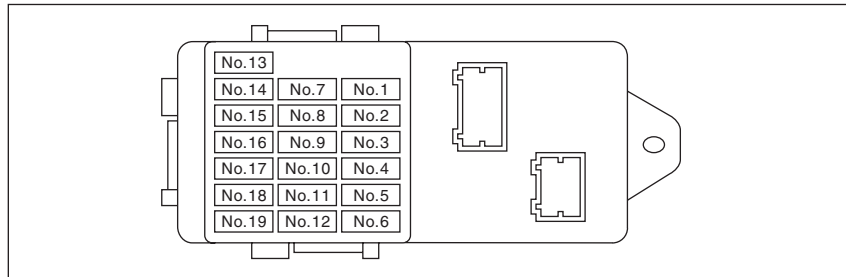


NA : NON-TURBO MODEL
TB : TURBO MODEL

SECONDARY AIR FUSE BOX (TURBO MODEL)

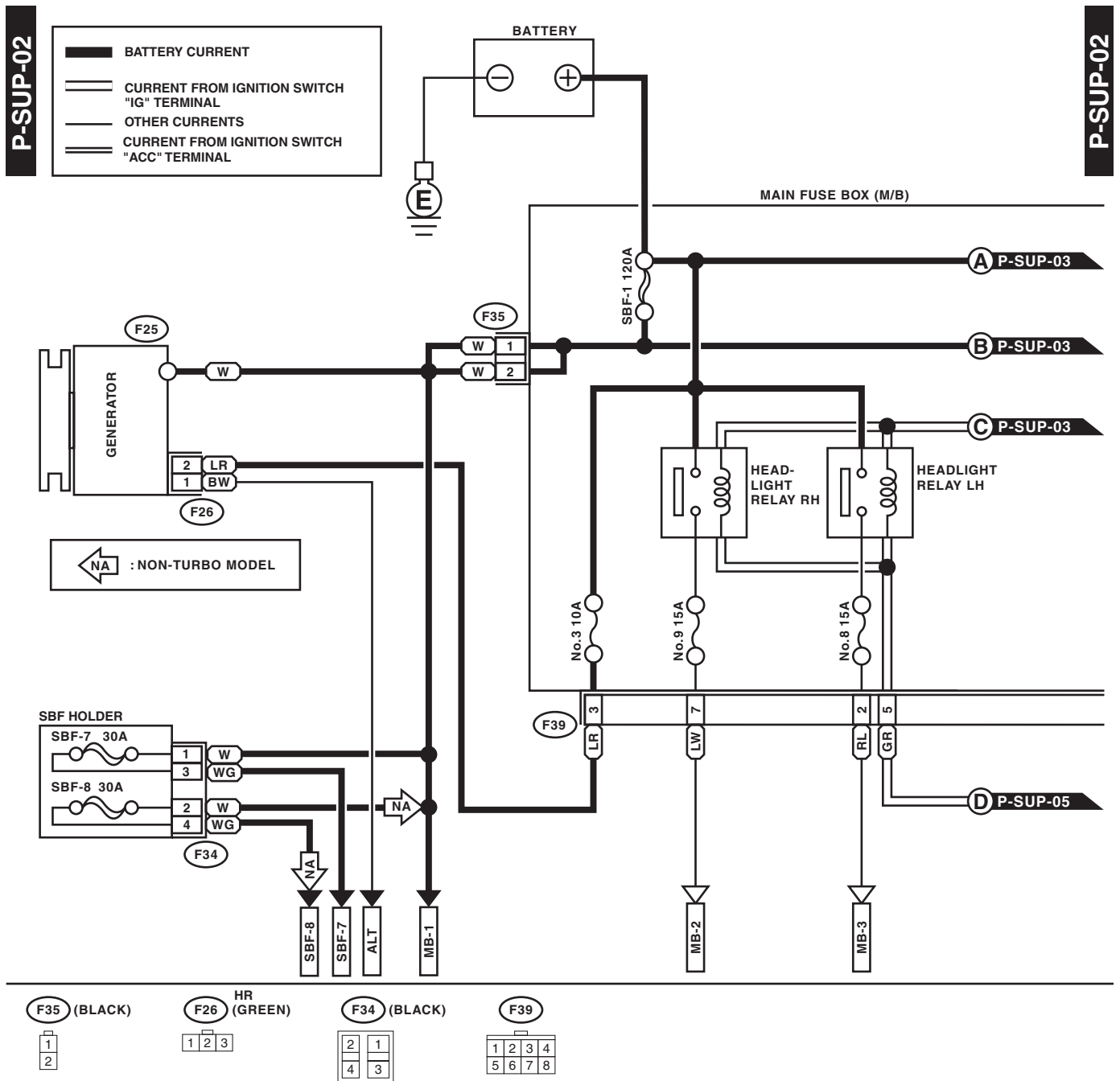


FUSE & BOX (F/B)



Power Supply Circuit

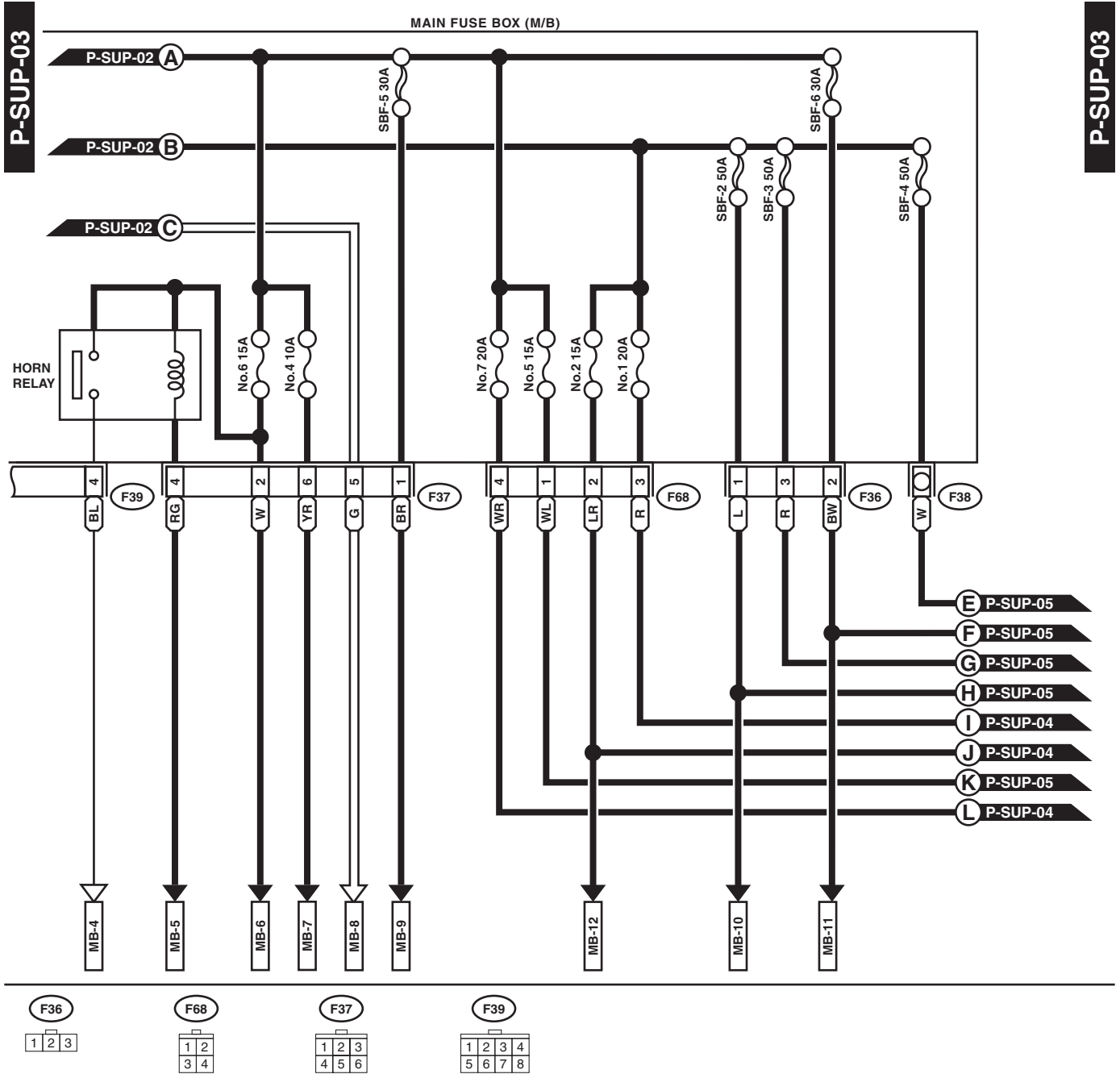
WIRING SYSTEM



WI-14971

Power Supply Circuit

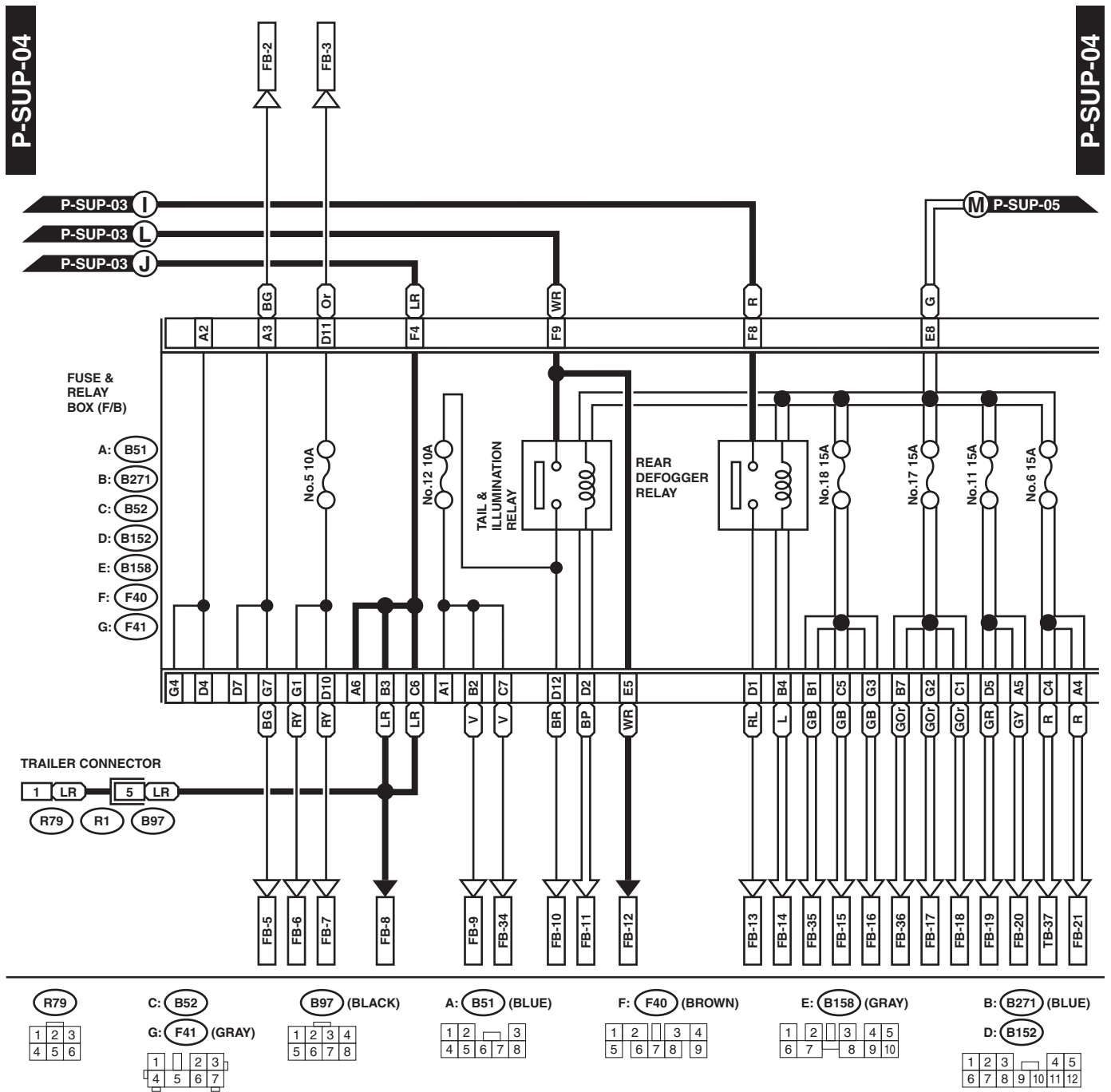
WIRING SYSTEM



WI-12323

Power Supply Circuit

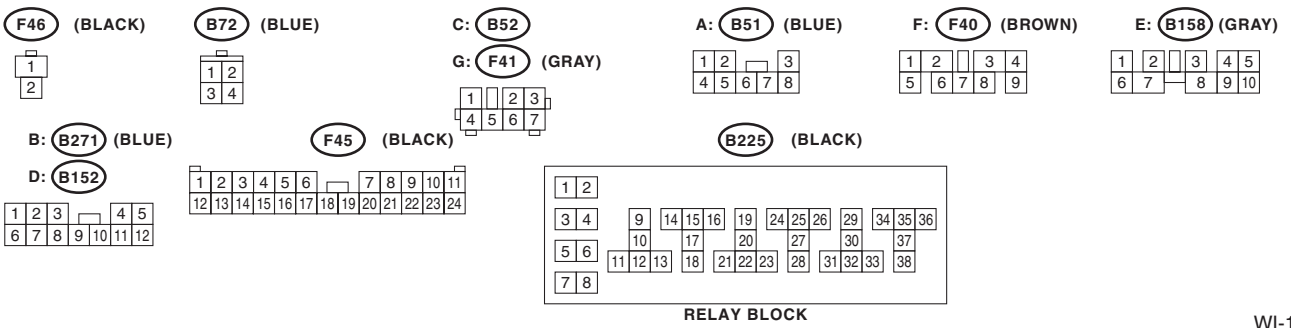
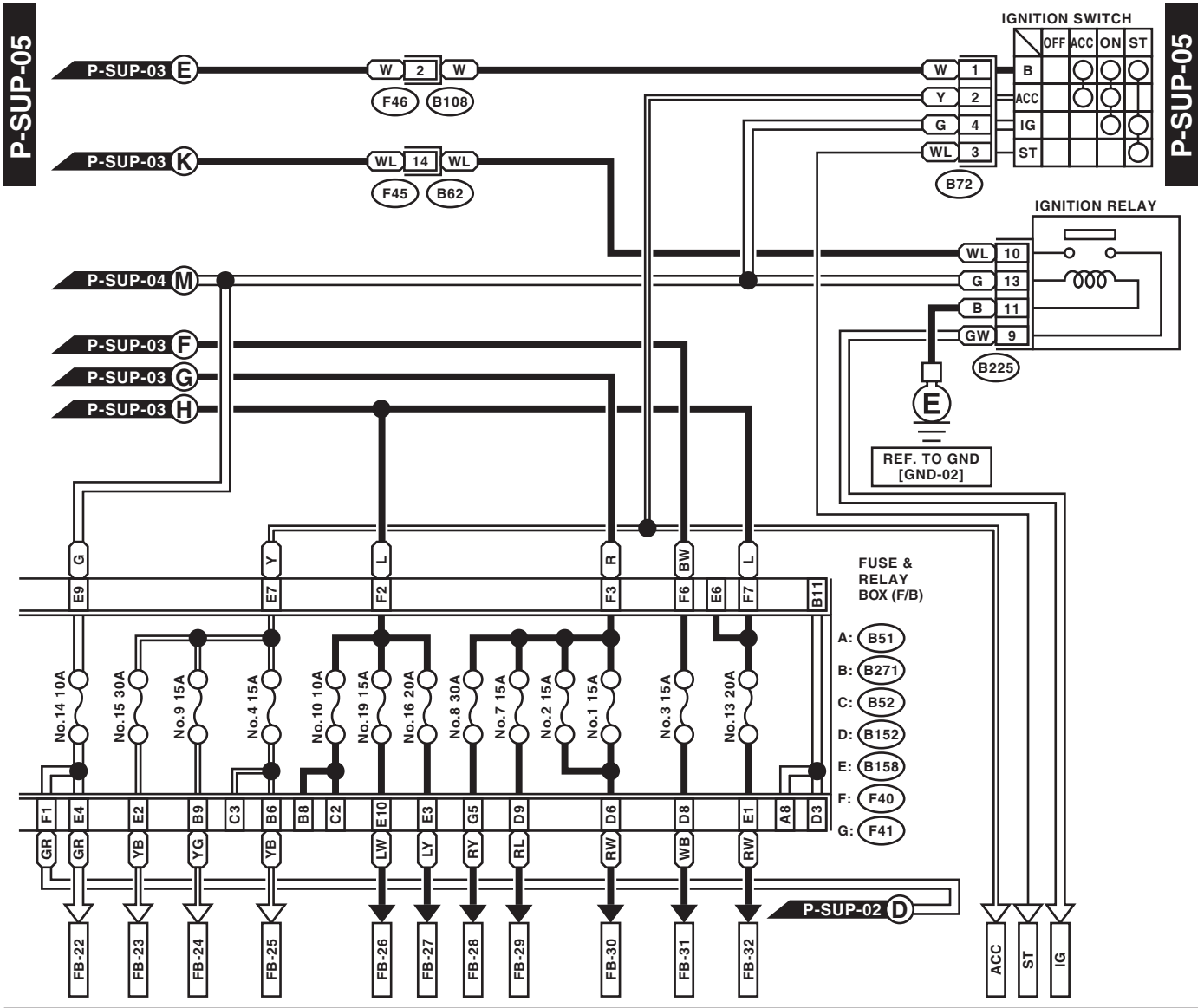
WIRING SYSTEM



WI-15217

Power Supply Circuit

WIRING SYSTEM



RELAY BLOCK

WI-12205

Power Supply Circuit

WIRING SYSTEM

No.	Load
MB-1	Secondary air relay holder (Fuse)
	A/C relay holder (Fuse)
MB-2	Combination meter
	Headlight RH
MB-3	Headlight LH
MB-4	Horn
MB-5	Keyless entry control module
	Horn switch
MB-6	Key warning switch
	Keyless entry control module
	Hazard switch
MB-7	TCM
MB-8	Diode
	Body integrated unit
	HID diode
MB-9	Immobilizer control module
	ECM
	Data link connector
	Fuel pump relay
	Main relay
	Electronic throttle control relay
	A/F & oxygen sensor relay
MB-10	Fuse (Seat heater)
MB-11	Power window circuit breaker
MB-12	Keyless buzzer
	Combination meter
	Immobilizer control module
SBF-7	ABS control module
	VDC control module
SBF-8	A/F & oxygen sensor relay
ALT	Combination meter
ACC	Fuse (Rear wiper)
IG	Hazard switch
	Power window relay
	Data link connector
	Vehicle speed sensor (MT model)
ST	Interrupt relay
FB-2	Keyless entry control module
	Turn signal switch
	Trailer connector
	Hazard switch
	Turn signal light
	Rear turn signal light LH
FB-3	Parking switch
	Daytime running light relay
	HID relay
FB-5	Front turn signal light LH

No.	Load
FB-6	Side marker light LH
	Front clearance light LH
	Front clearance light RH
	Headlight beam leveler LH
	Headlight beam leveler RH
FB-7	Side marker light RH
	Trailer connector
	Headlight beam leveler switch
	License plate light
	Rear combination light LH
Rear combination light RH	
FB-8	Audio
	Auto A/C control module
	Combination meter
	Spot map light
	Room light
	Clock
	Key illumination
Luggage room light	
FB-9	Illumination light
	Combination meter
FB-10	Parking switch
FB-11	ECM
	Lighting switch
FB-12	Parking switch
	Daytime running light relay
FB-13	Rear defogger
	Auto A/C control module
	Manual A/C control module
FB-14	ECM
	Body integrated unit
FB-15	Inhibitor switch (AT model)
	Keyless entry control module
	Clutch switch (MT model)
	Stop light & brake switch
	Back-up light switch (MT model)
	Body integrated unit
	ABS control module
VDC control module	
Impact sensor	
FB-16	Fan relay - 1
FB-17	A/C relay
	Fan mode relay
	Fan relay - 2
FB-18	Wiper deicer switch

Power Supply Circuit

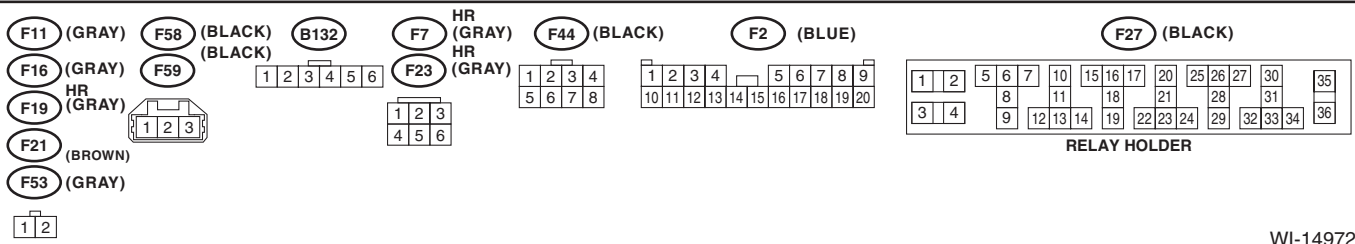
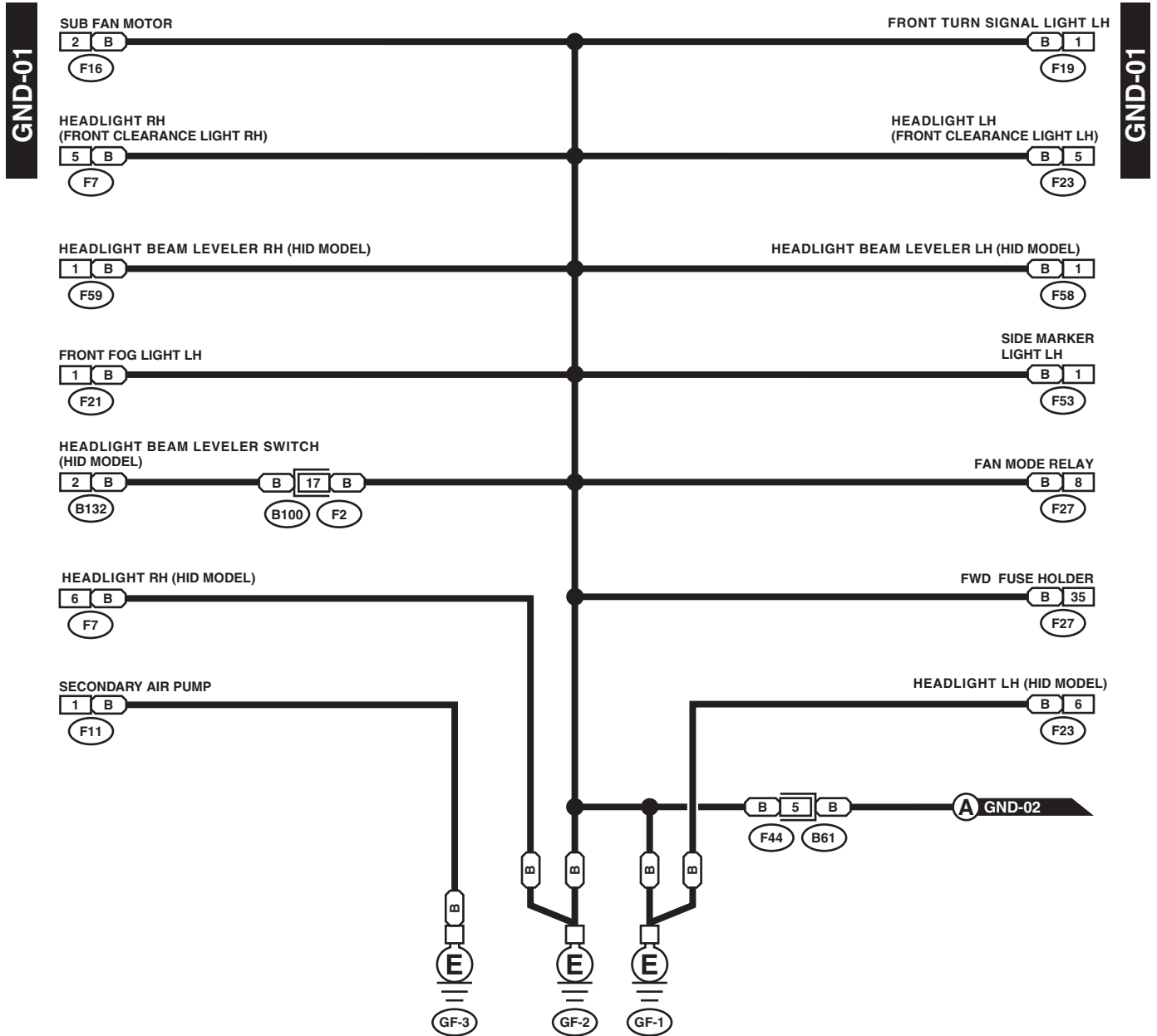
No.	Load
FB-19	Immobilizer control module
	Ignition coil No. 1 (Turbo model)
	ECM
	Transmission control module
	Rear wheel speed sensor (AWD)
	Fuel pump relay
	Ignition coil No. 2 (Turbo model)
	Ignition coil No. 3 (Turbo model)
Ignition coil No. 4 (Turbo model)	
FB-20	Airbag control module
FB-21	Airbag control module
FB-22	Combination meter
	High beam relay
	Daytime running light relay
	Clock
FB-23	Combination switch (Wiper)
	Front washer motor
	Front wiper motor
FB-24	Audio
	Compass mirror
	Clock
FB-25	Seat heater relay
	TCM
	Front accessory power supply socket
	Body integrated unit
	Remote control mirror switch
	Rear accessory relay
FB-26	Rear accessory relay
FB-27	Stop light switch
FB-28	ABS control module
	VDC control module
FB-29	Front fog light relay
FB-30	Blower fan relay
FB-31	Keyless entry control module
	Impact sensor
	Body integrated unit
FB-32	Wiper deicer and mirror heater relay
FB-34	Illumination light
	Body integrated unit
	Clock
FB-35	Wiper deicer and mirror heater relay
FB-36	A/C pressure switch
	Blower fan relay
	Auto A/C control module
	Intake actuator
	Manual A/C control module
FB-37	Occupant detection control module

Ground Circuit

WIRING SYSTEM

4. Ground Circuit

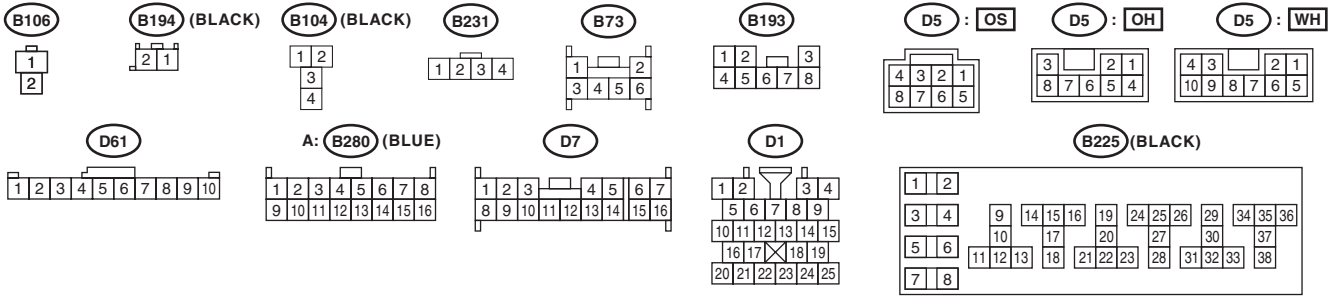
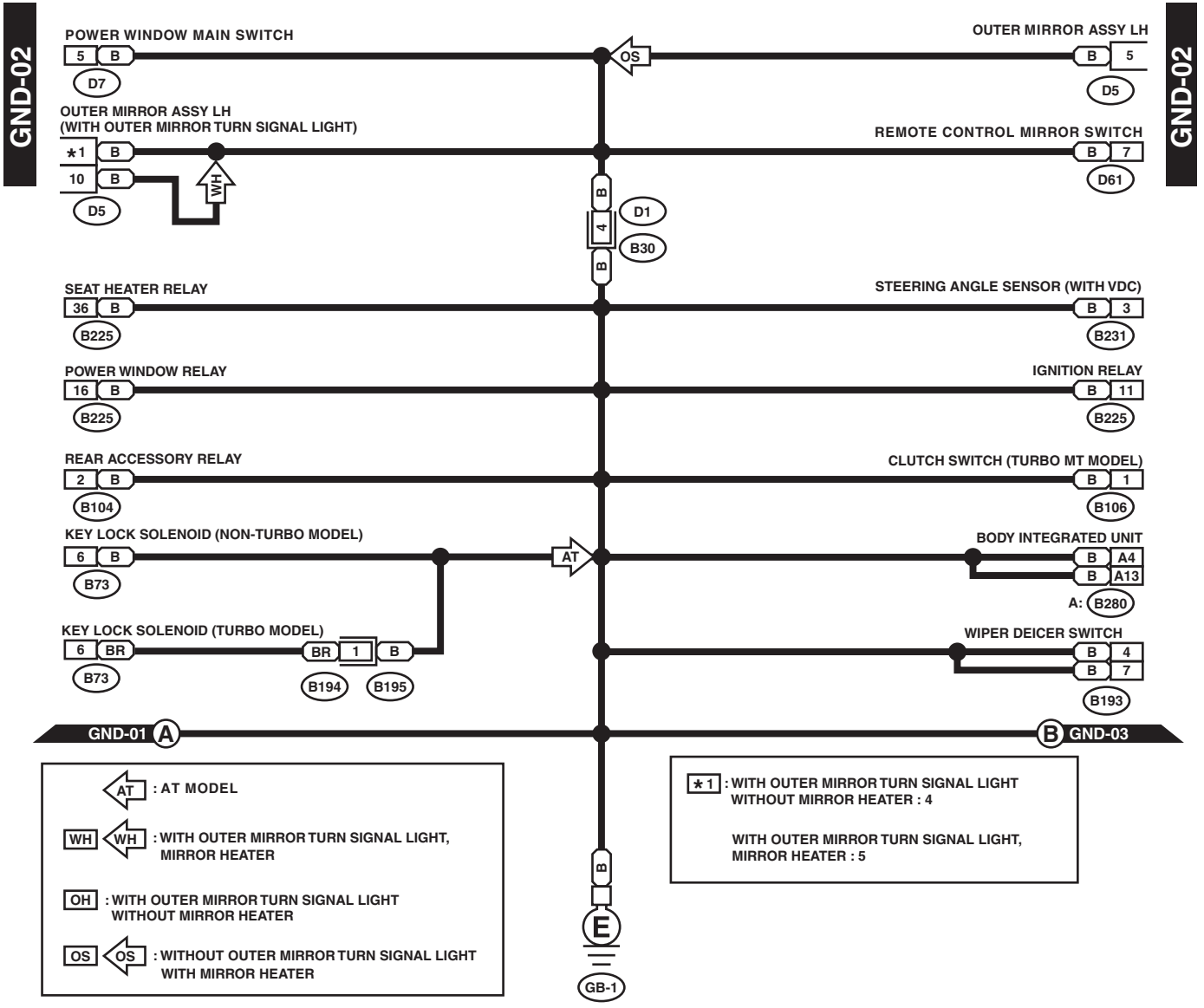
A: WIRING DIAGRAM



WI-14972

Ground Circuit

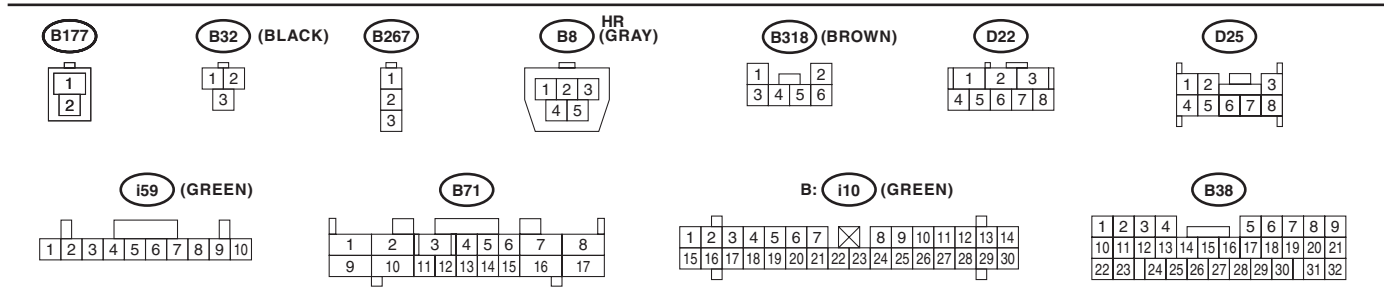
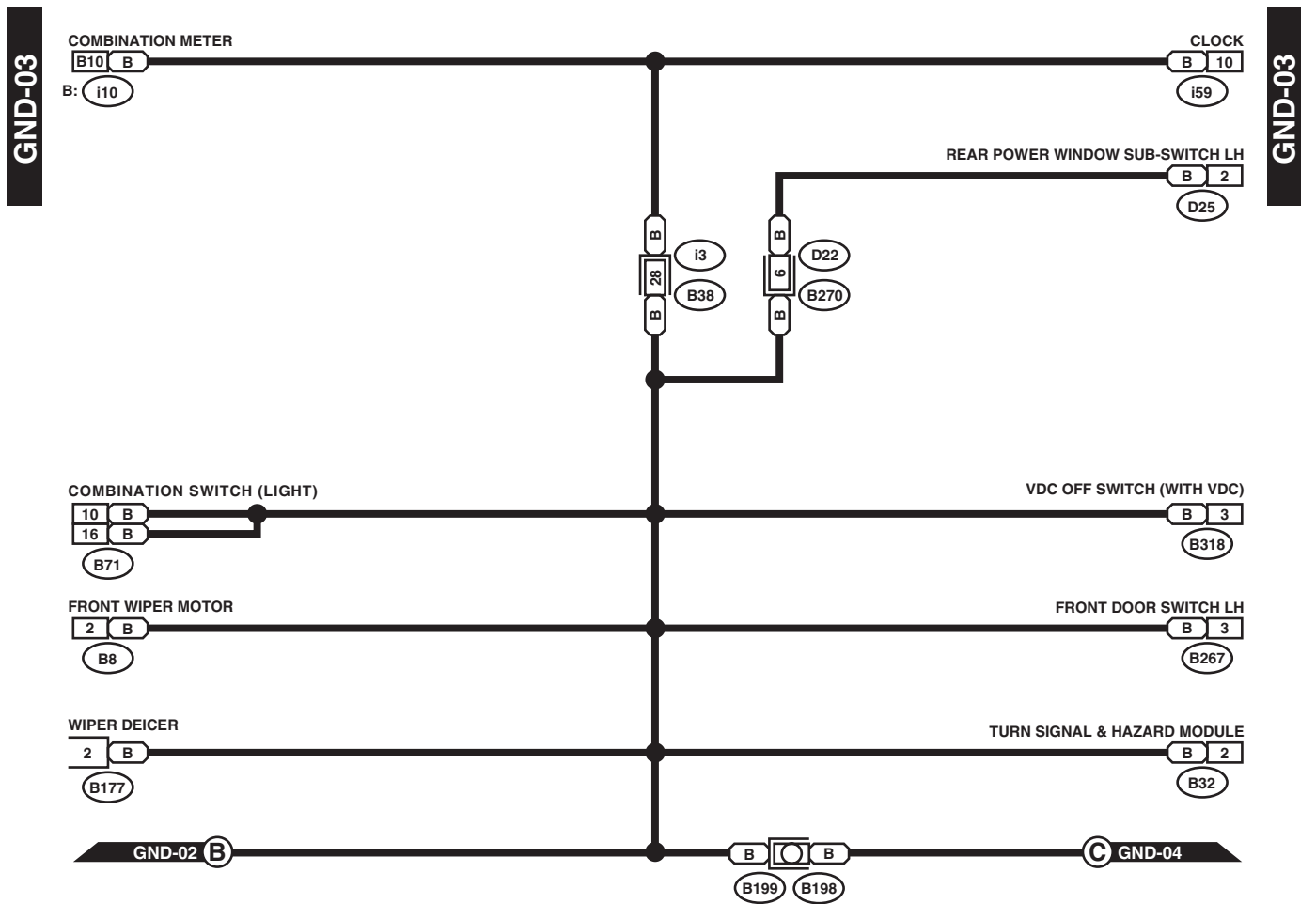
WIRING SYSTEM



RELAY BLOCK WI-15230

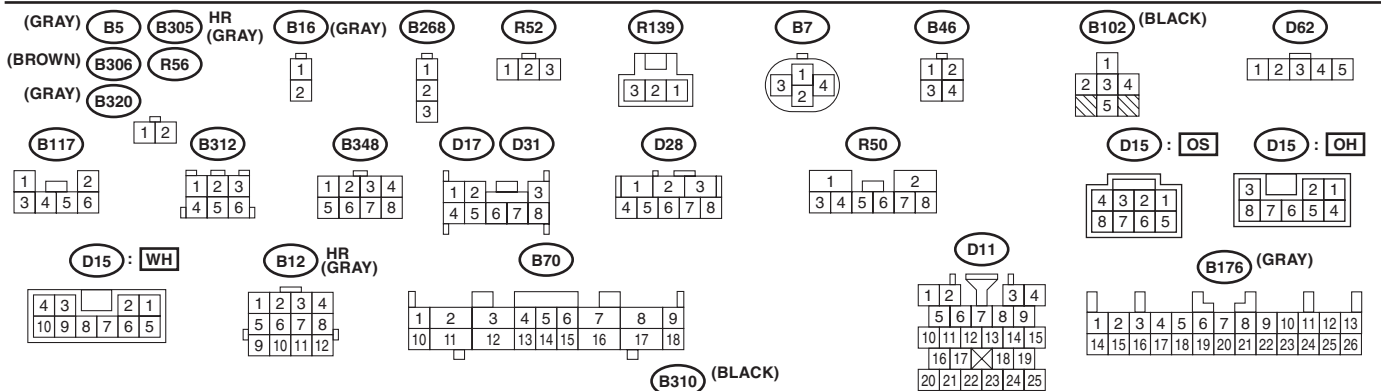
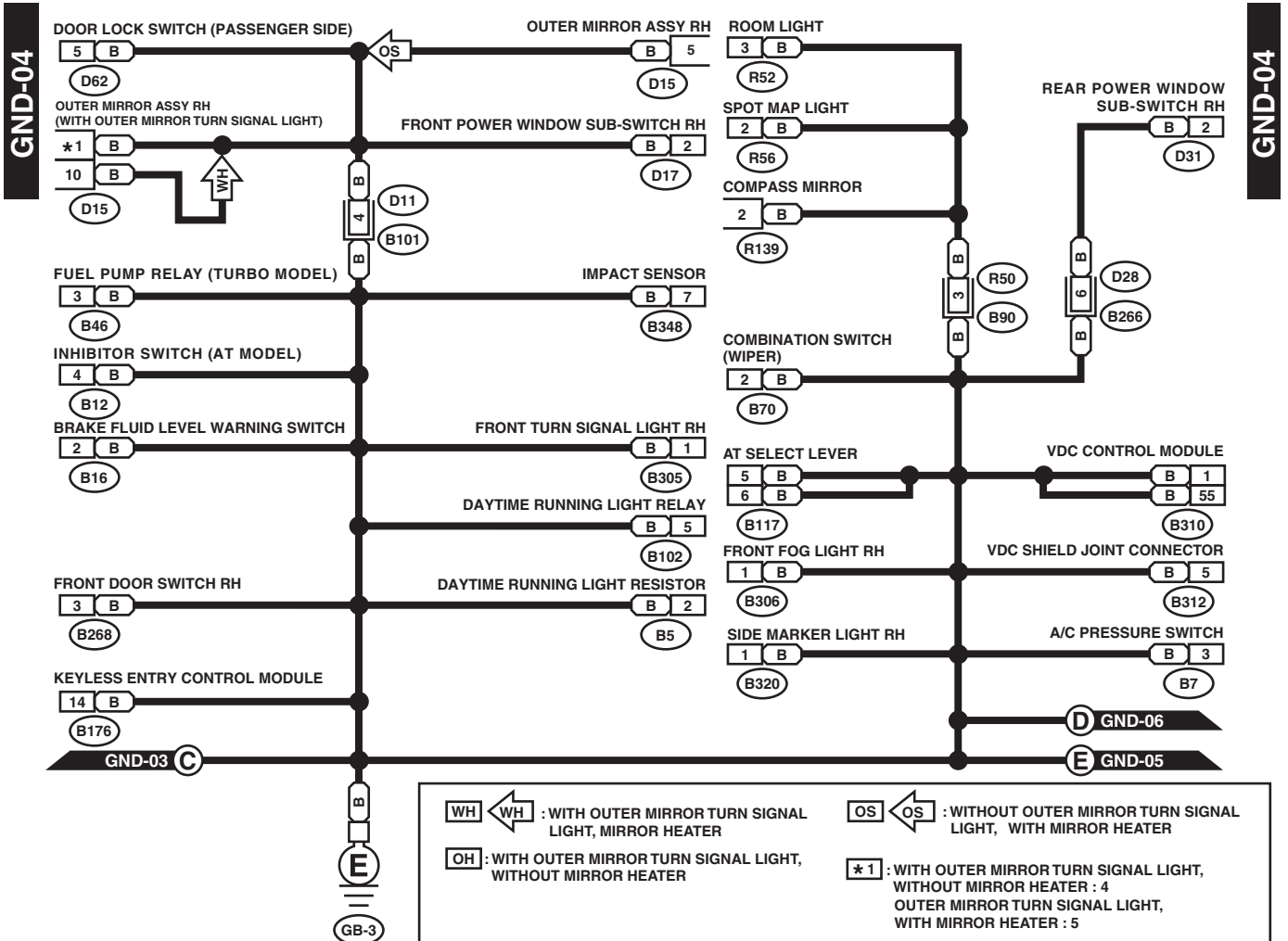
Ground Circuit

WIRING SYSTEM



WI-15231

Ground Circuit

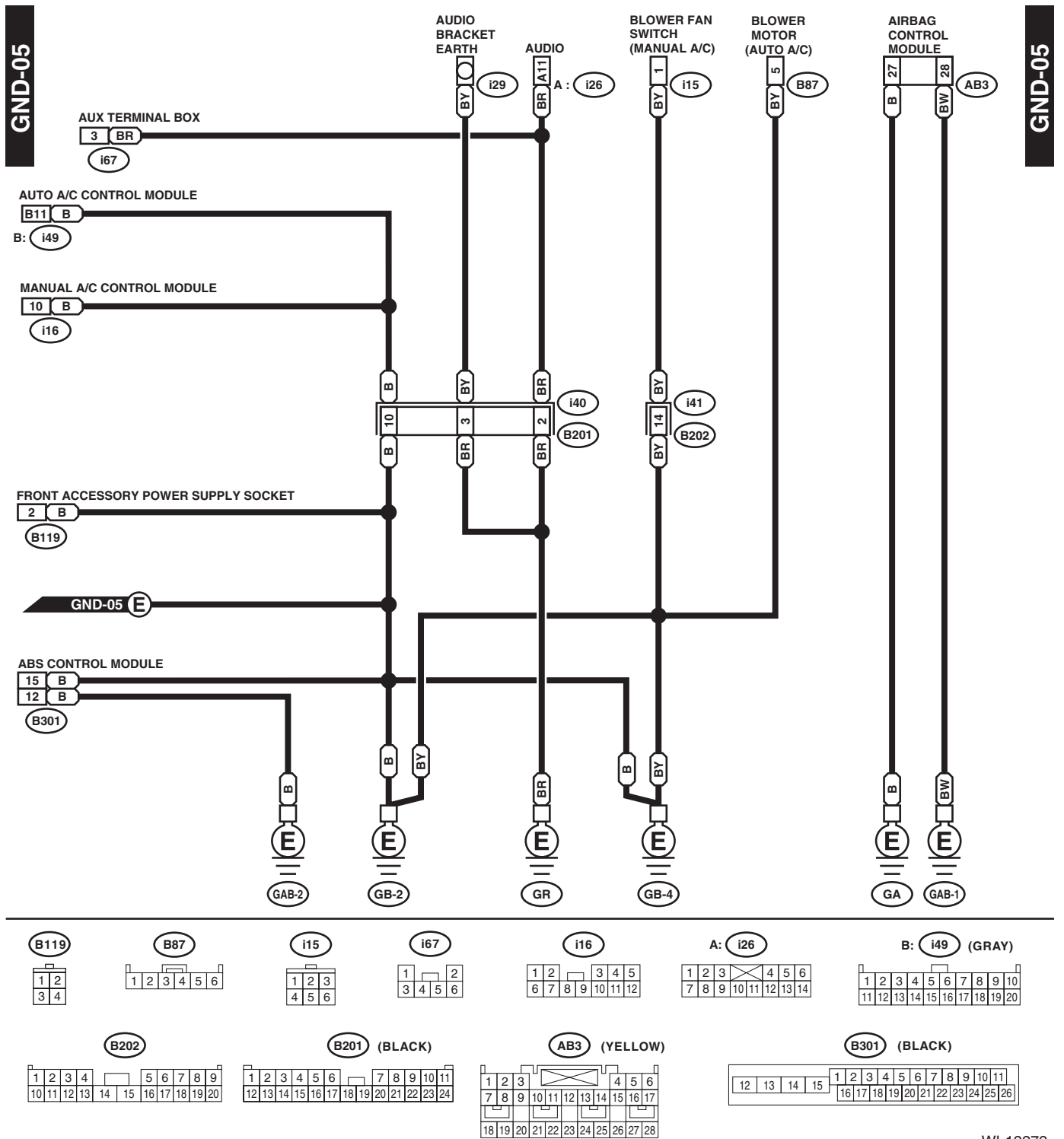


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WI-15232

Ground Circuit

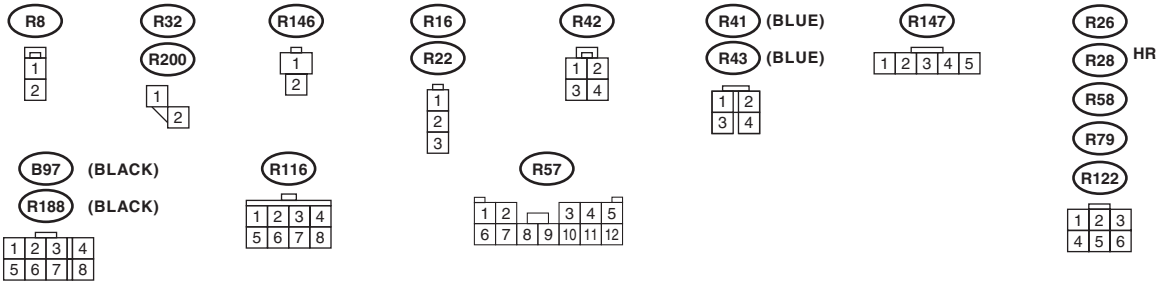
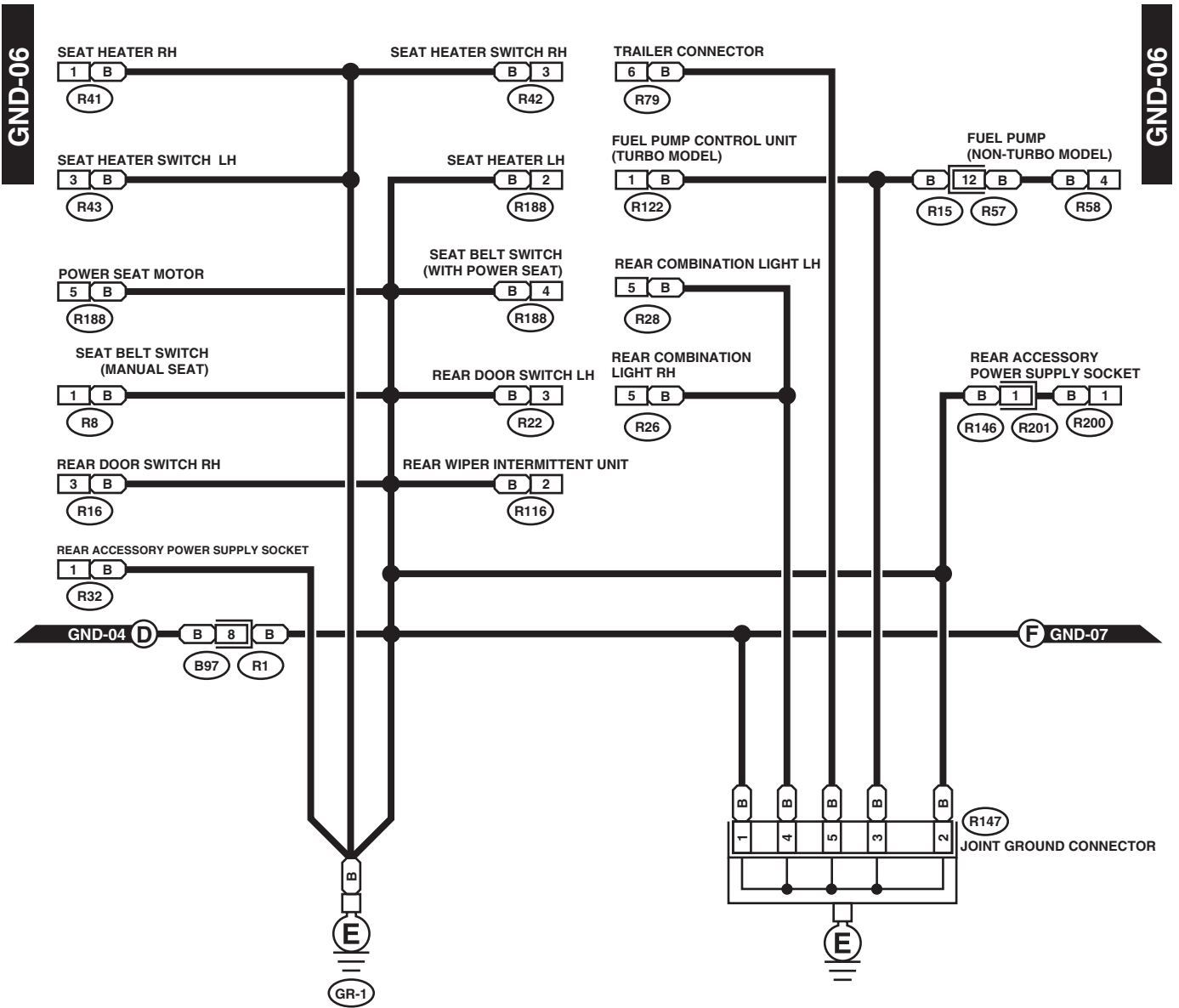
WIRING SYSTEM



WI-12272

Ground Circuit

WIRING SYSTEM



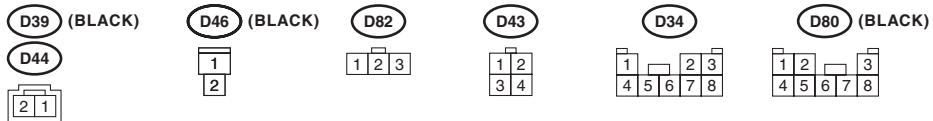
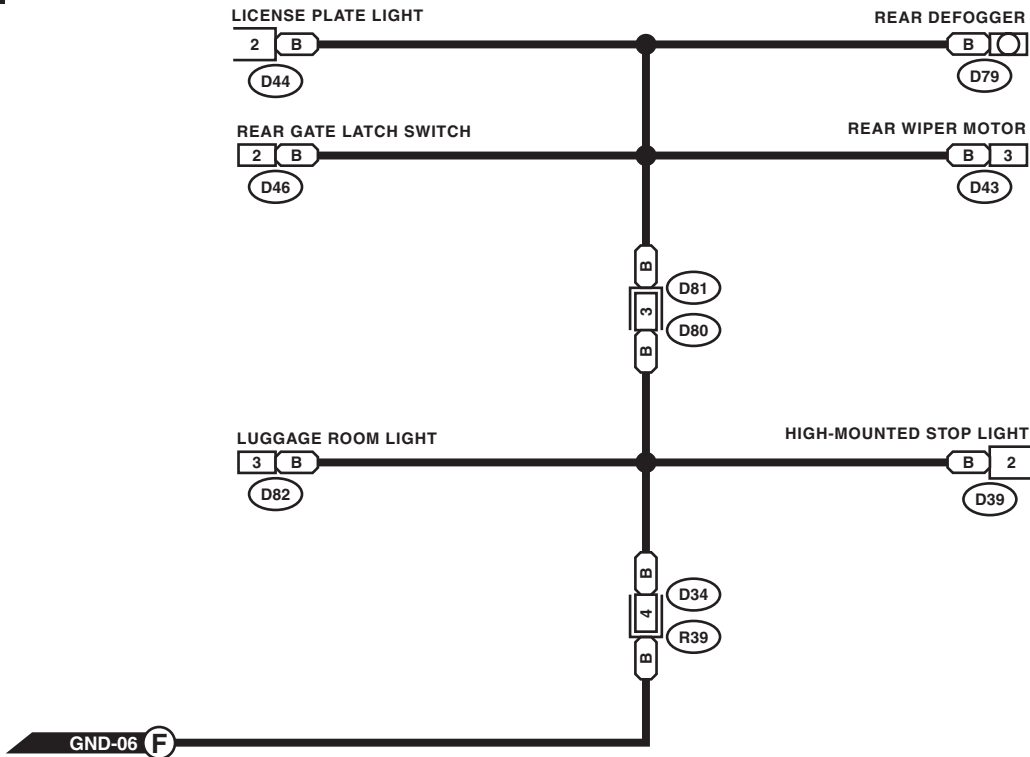
WI-14975

Ground Circuit

WIRING SYSTEM

GND-07

GND-07

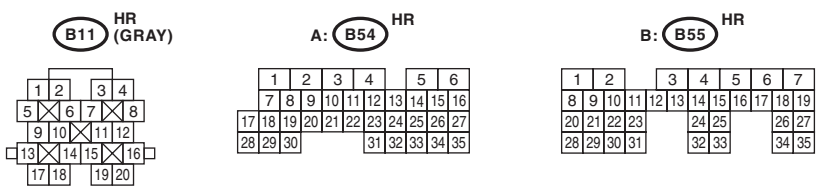
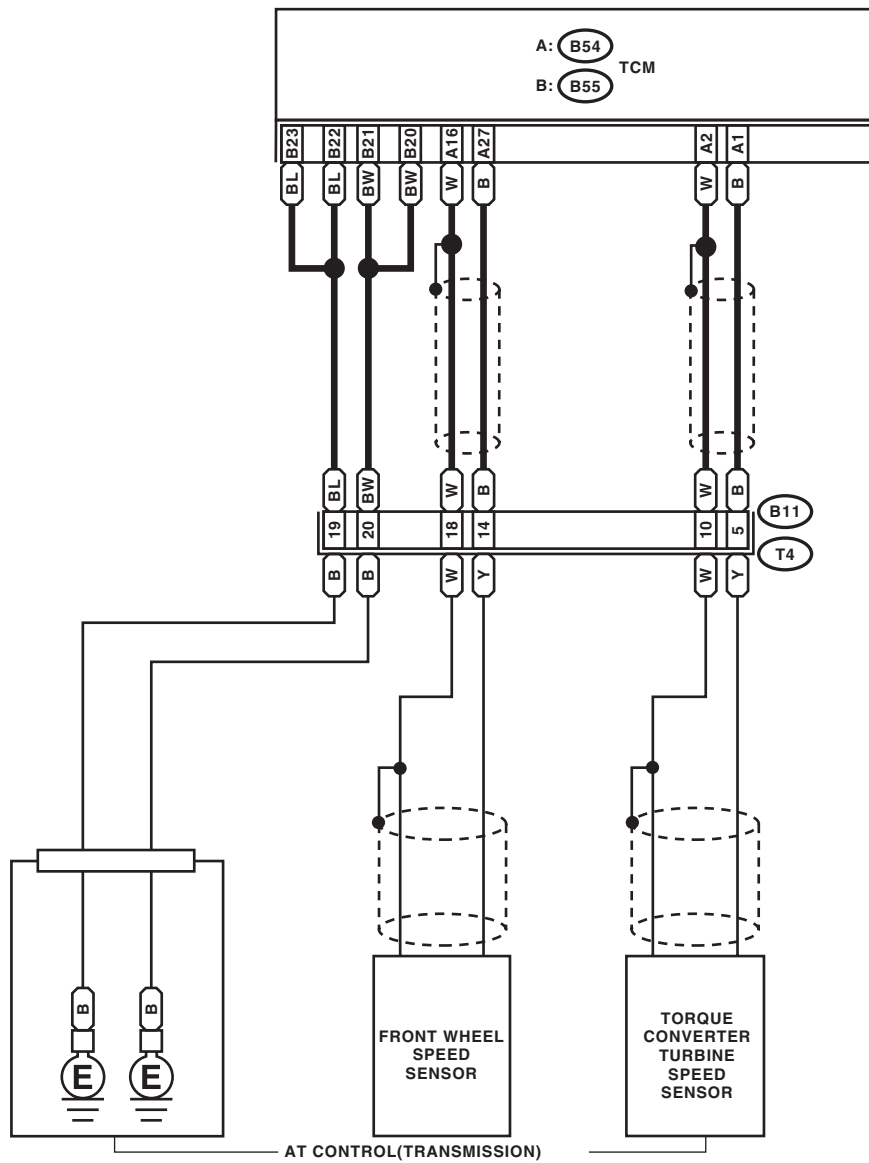


WI-13100

Ground Circuit

GND-08

GND-08

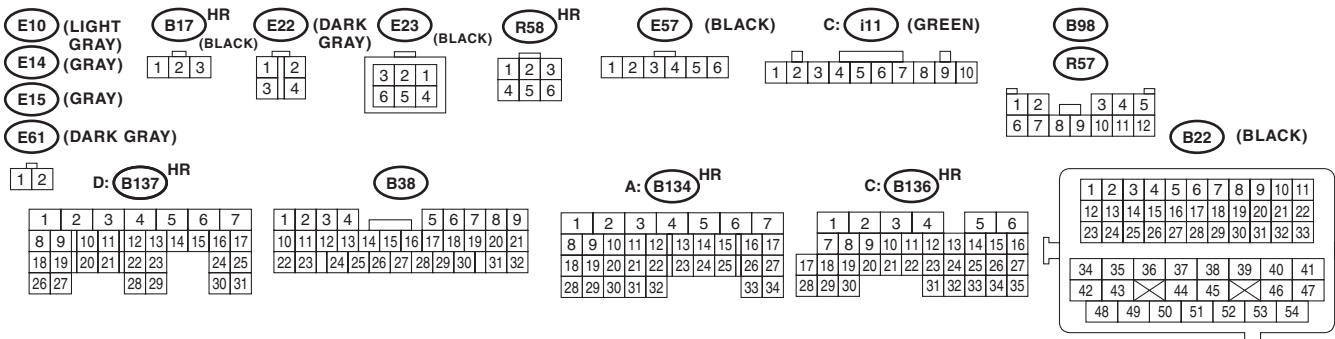
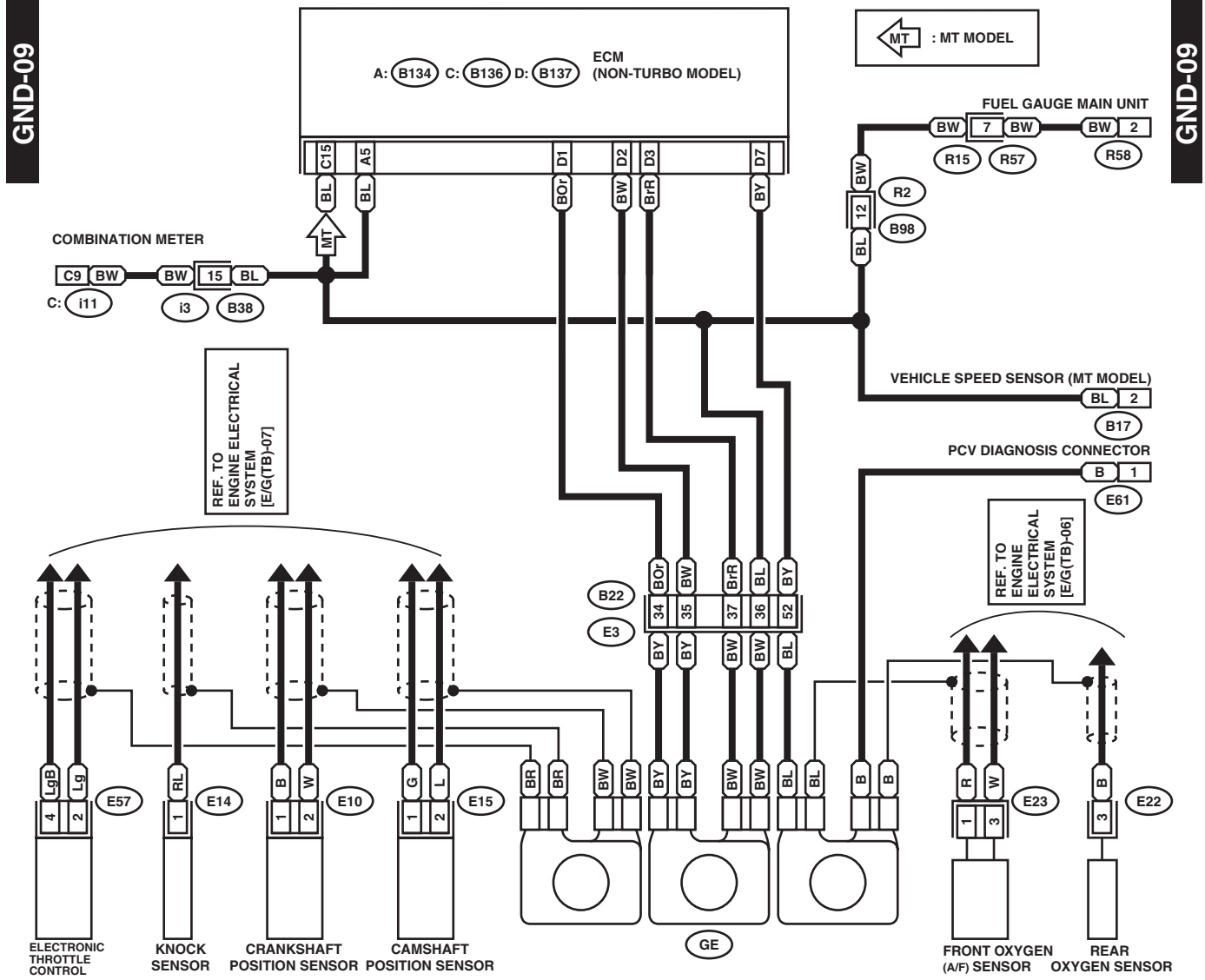


Ground Circuit

WIRING SYSTEM

GND-09

GND-09



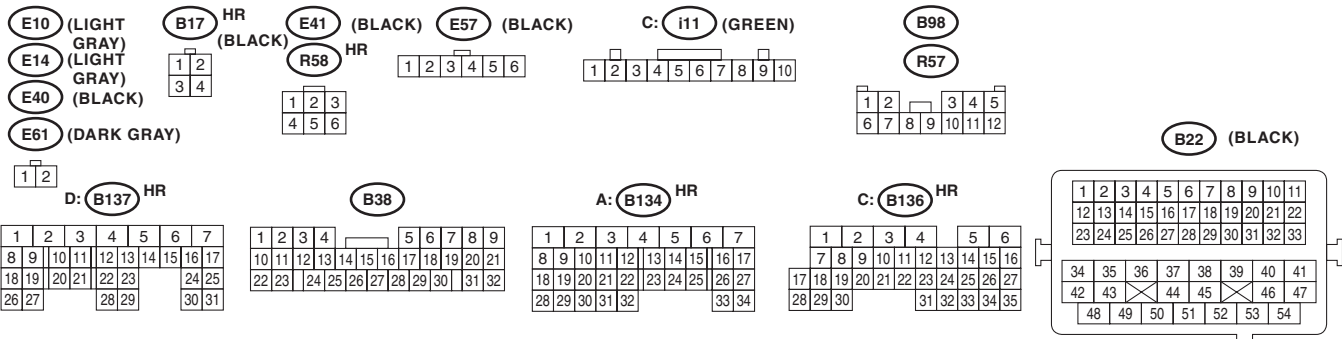
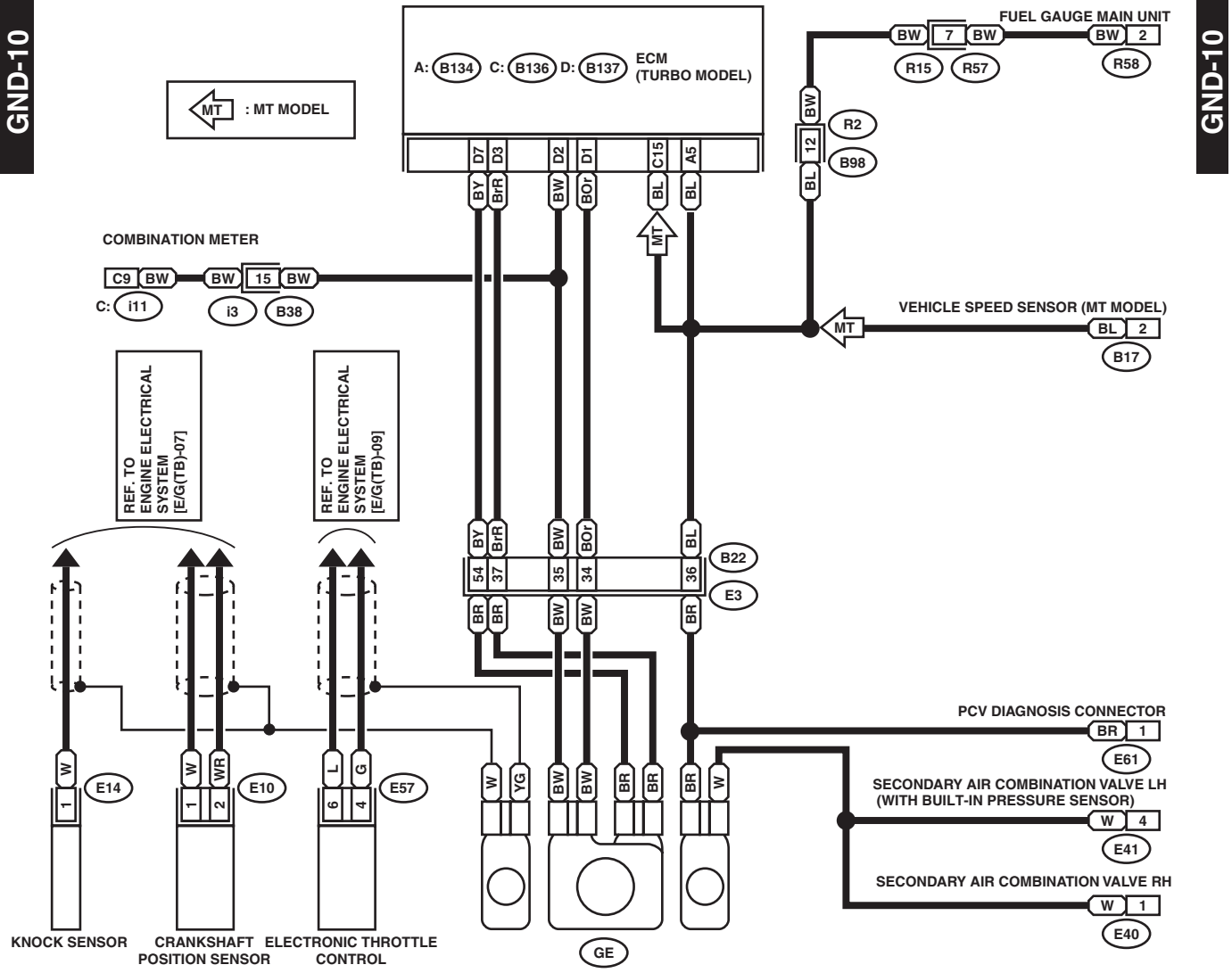
WI-14977

Ground Circuit

WIRING SYSTEM

GND-10

GND-10



WI-14978

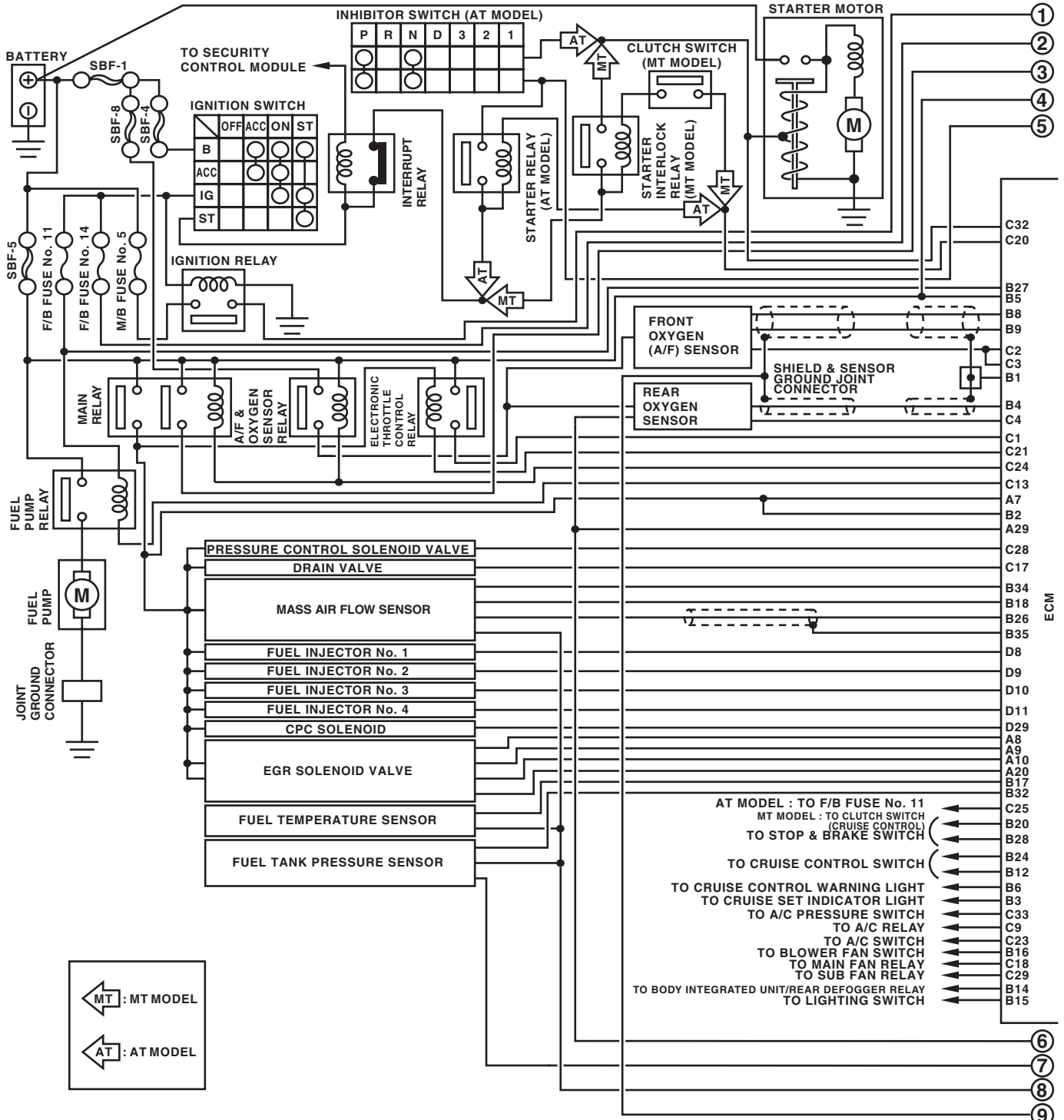
Engine Electrical System

WIRING SYSTEM

5. Engine Electrical System

A: WIRING DIAGRAM

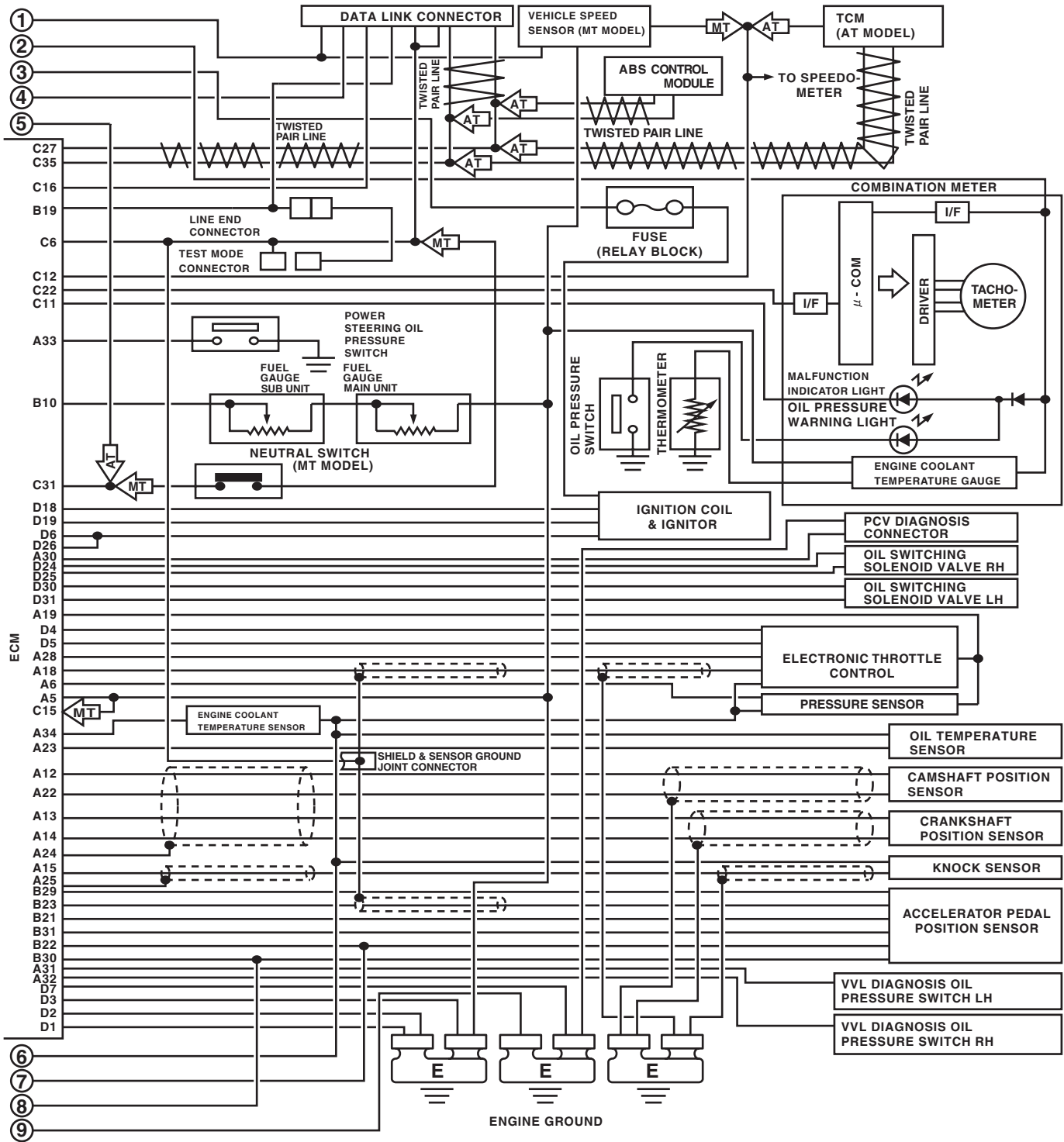
1. NON-TURBO MODEL



WI-12206

Engine Electrical System

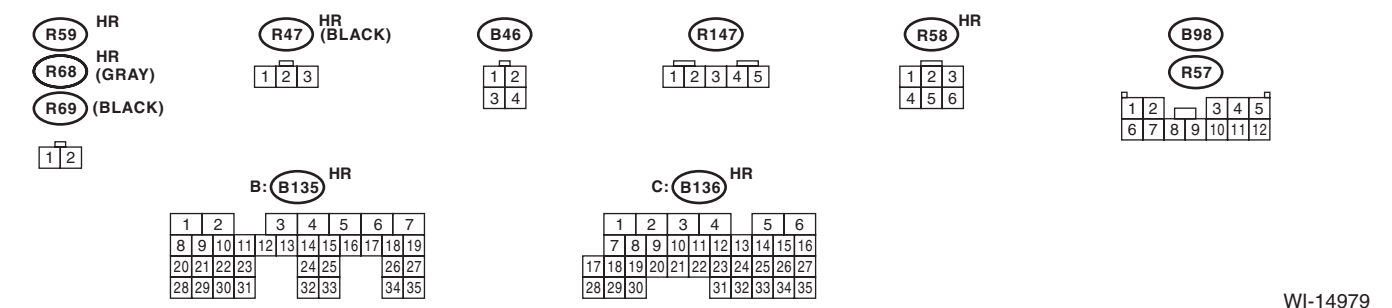
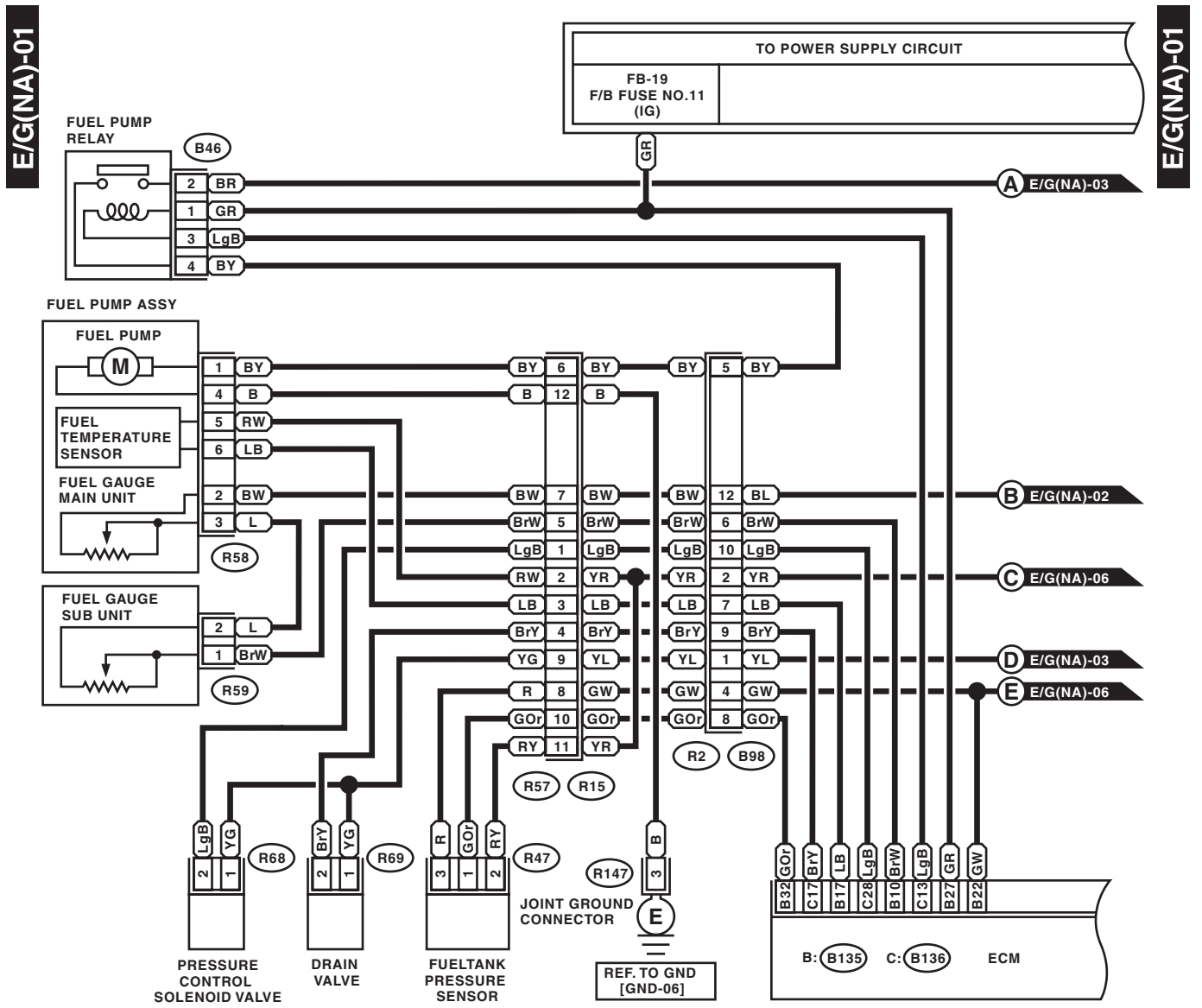
WIRING SYSTEM



WI-12207

Engine Electrical System

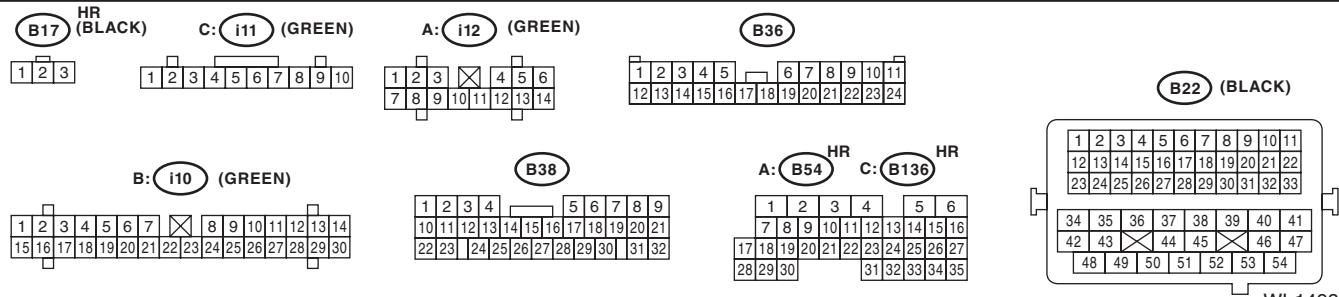
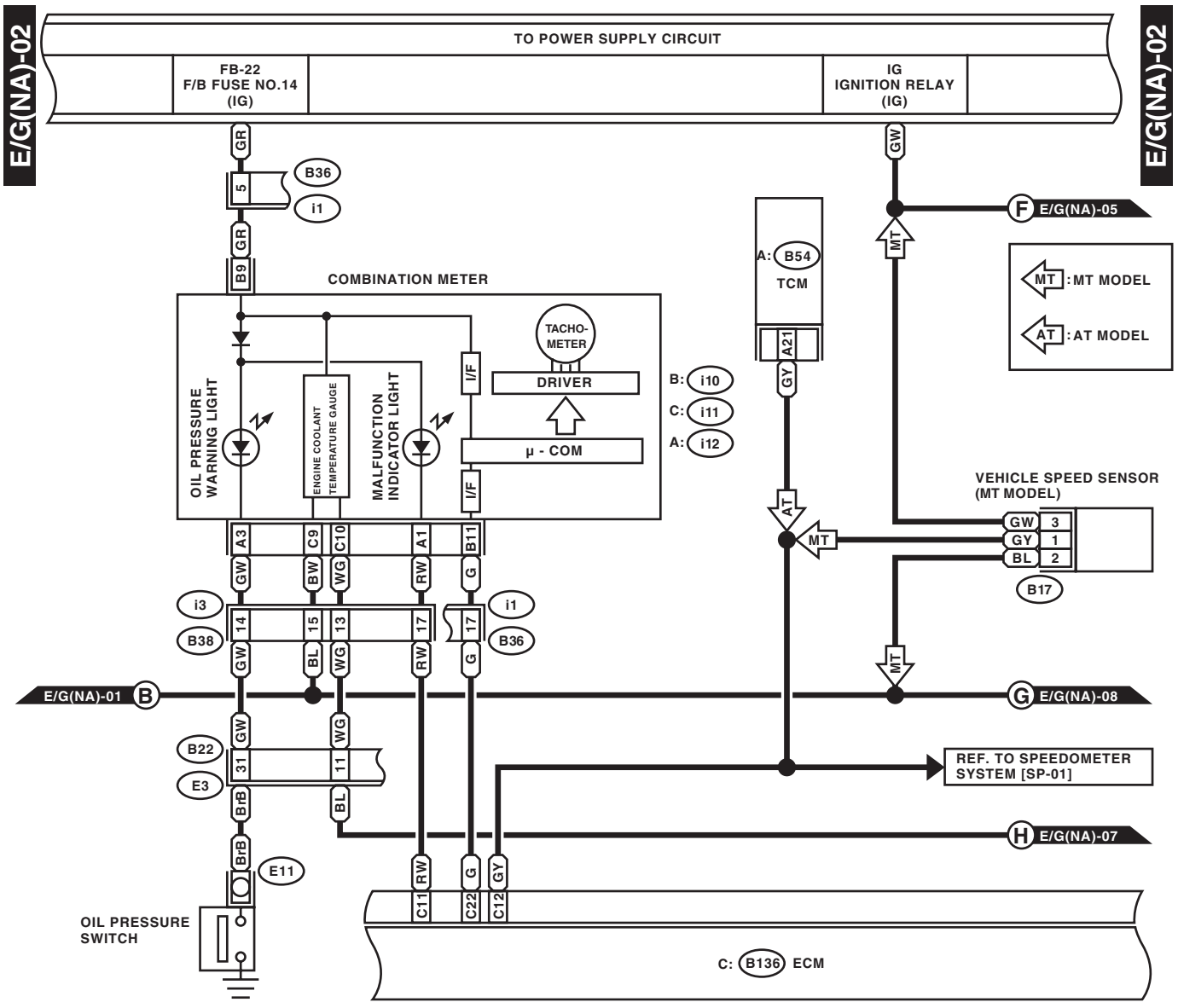
WIRING SYSTEM



WI-14979

Engine Electrical System

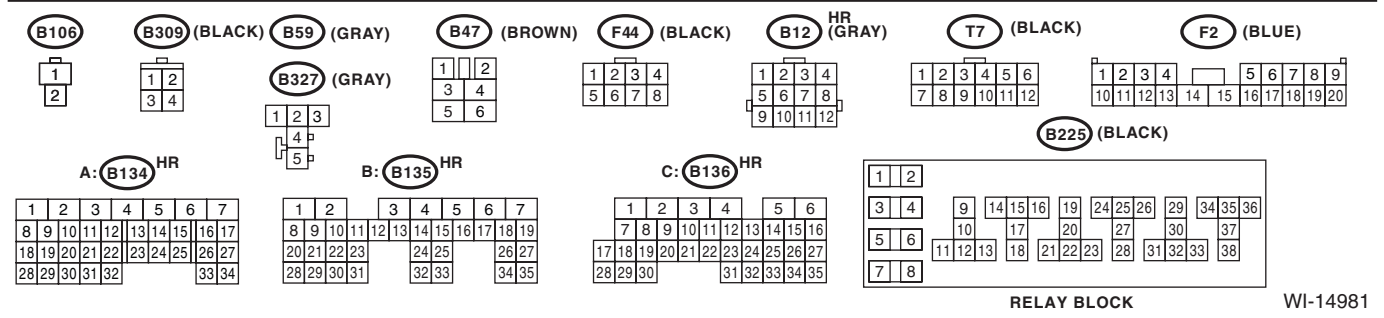
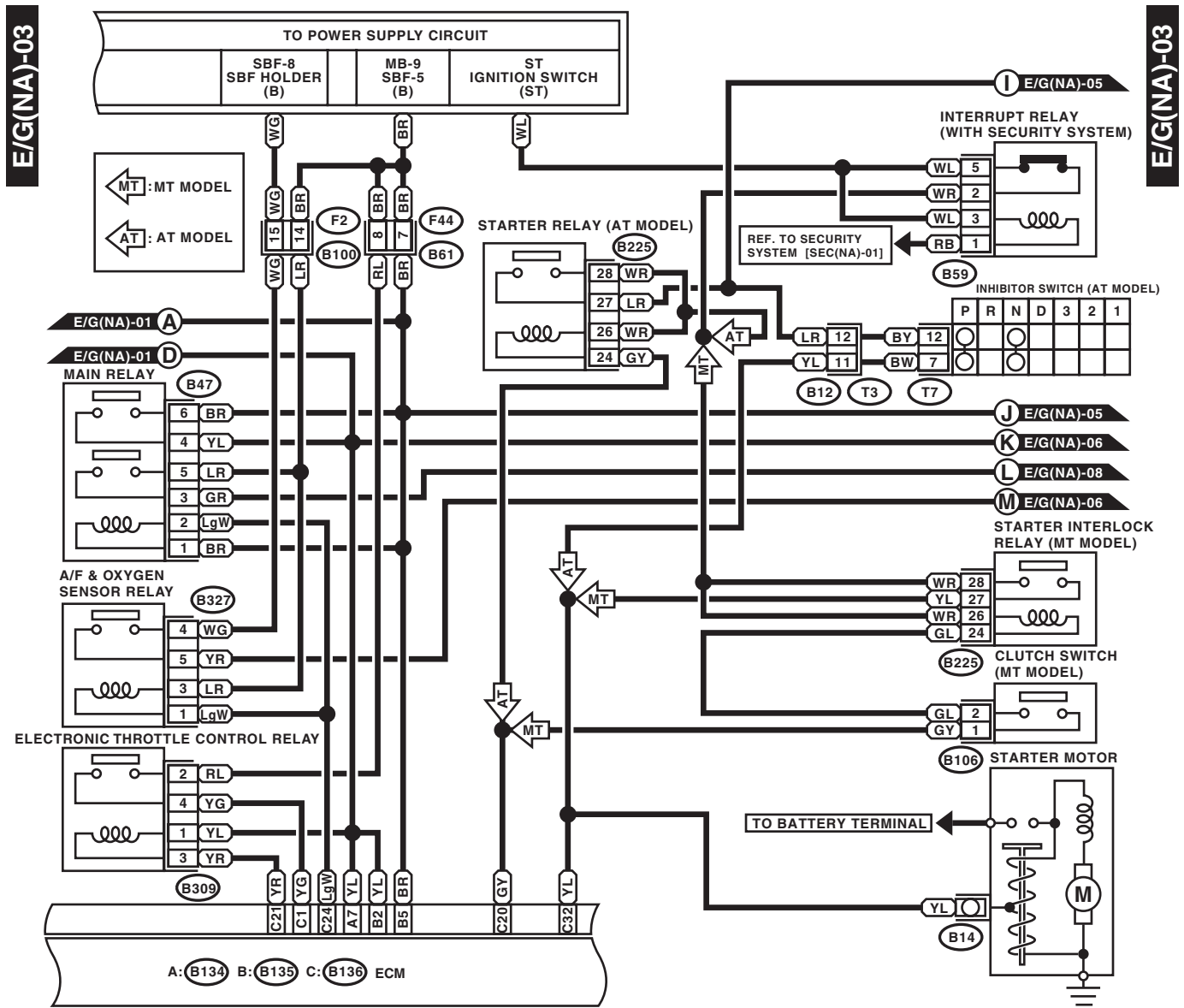
WIRING SYSTEM



WI-14980

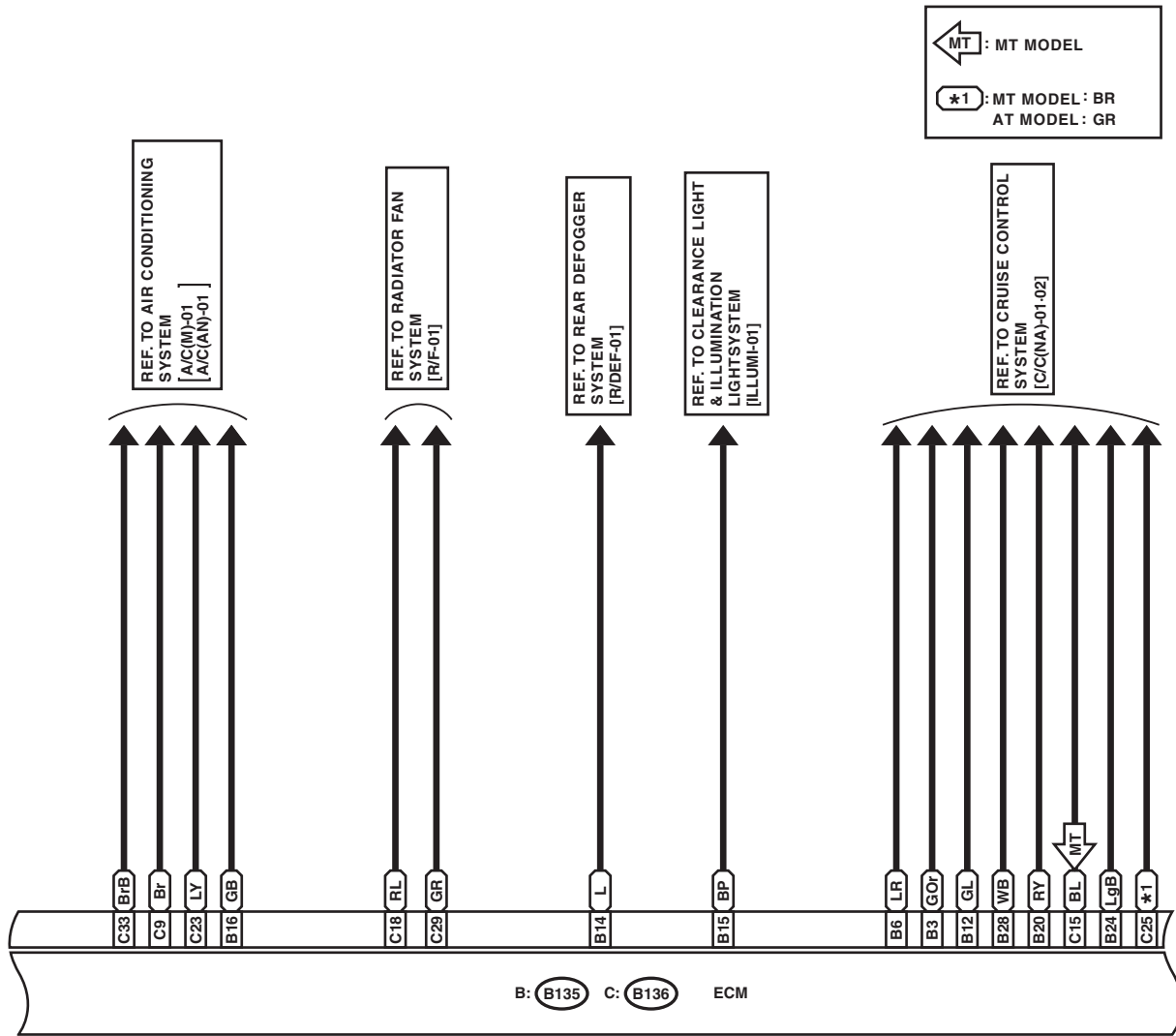
Engine Electrical System

WIRING SYSTEM



E/G(NA)-04

E/G(NA)-04



B: B135 HR

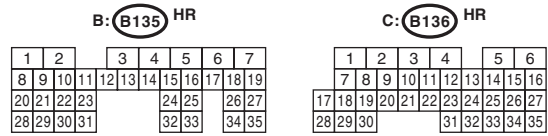
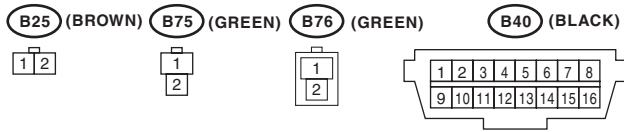
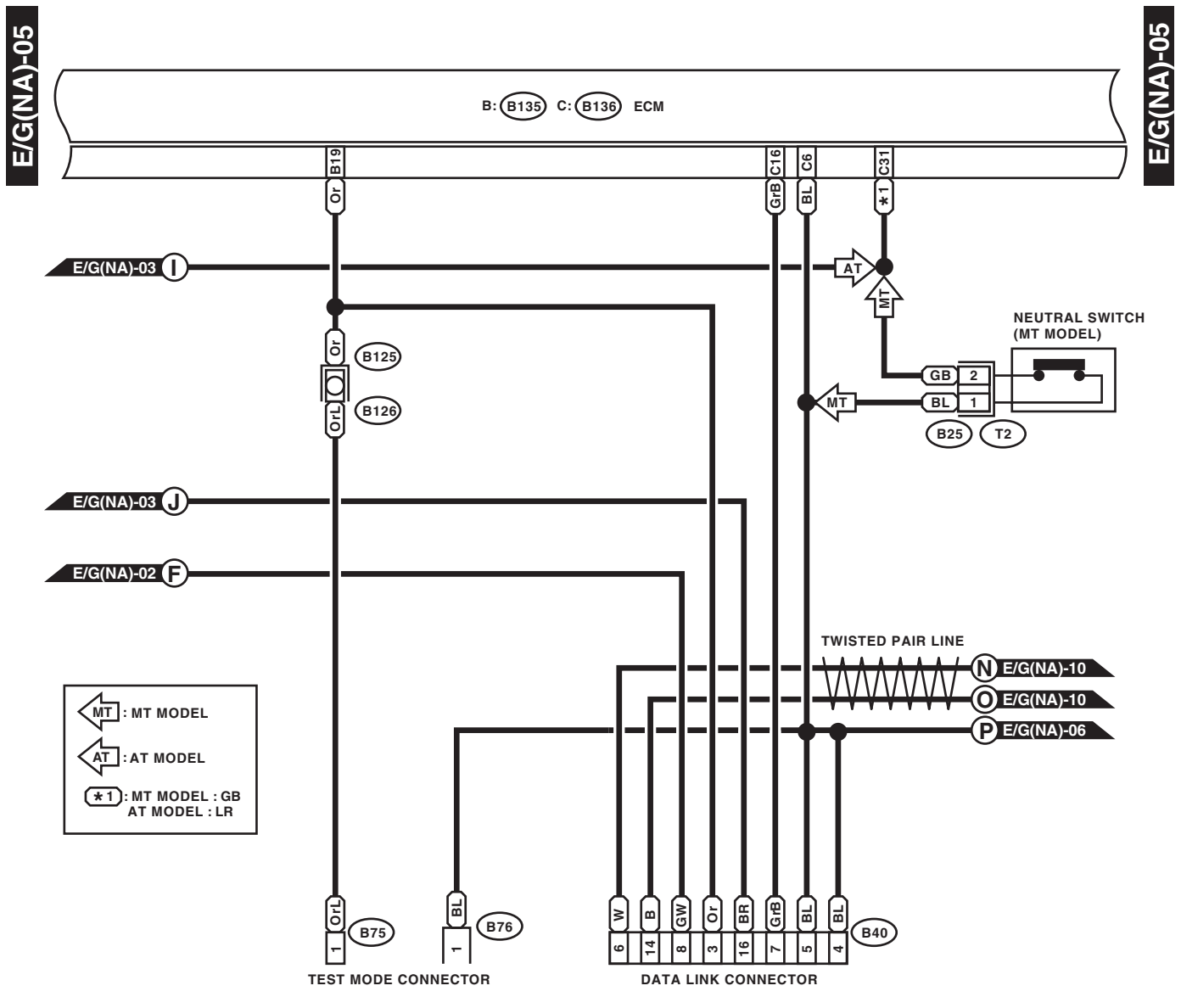
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C: B136 HR

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Engine Electrical System

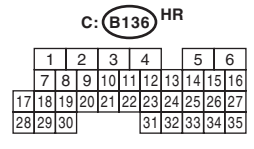
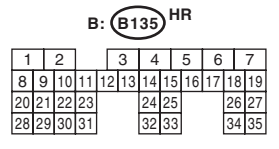
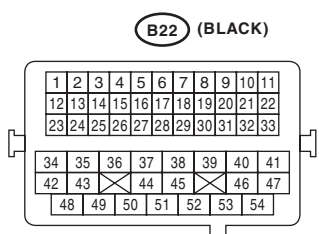
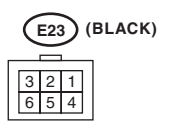
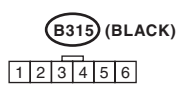
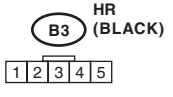
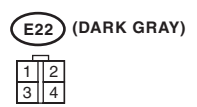
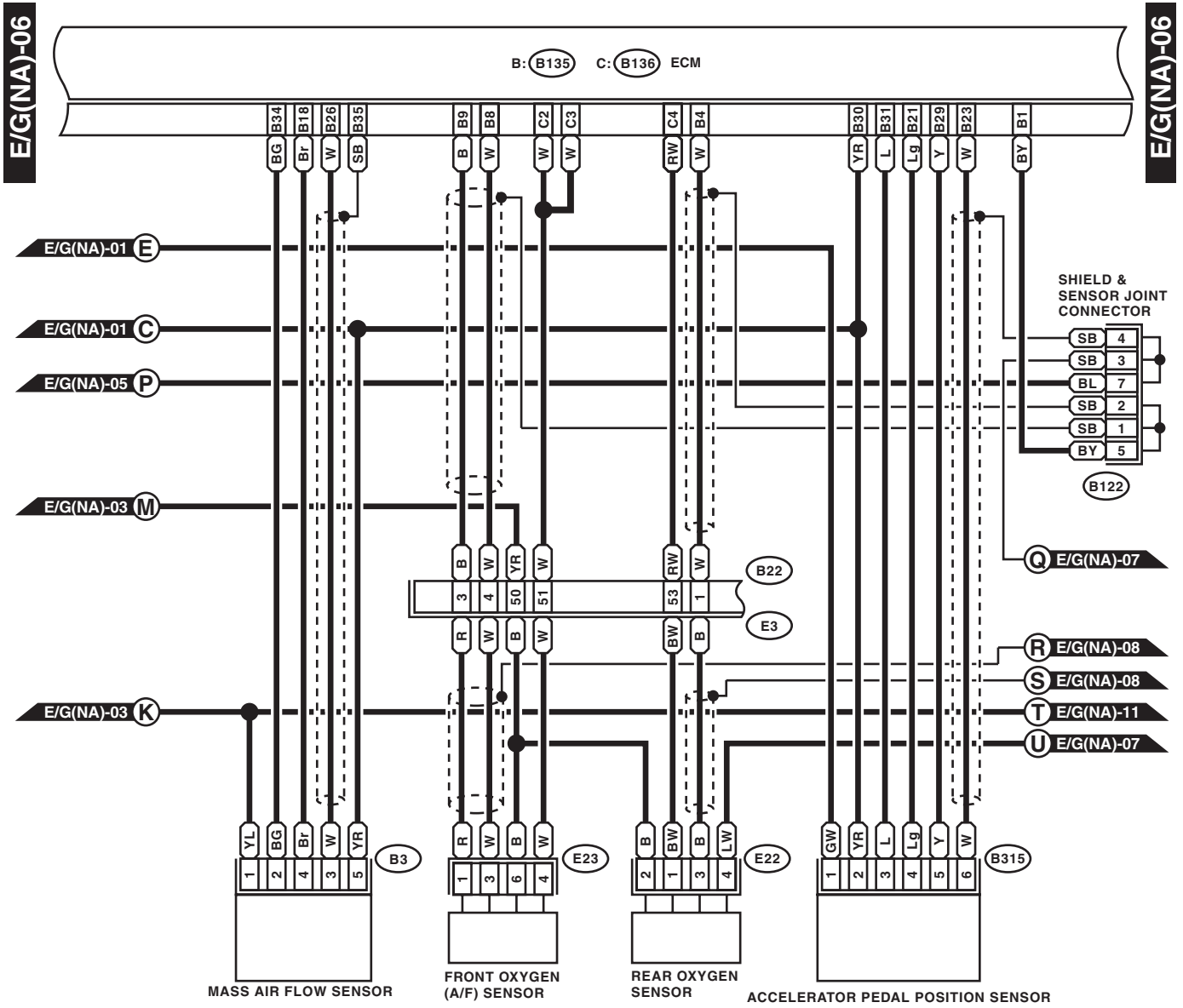
WIRING SYSTEM



WI-14983

Engine Electrical System

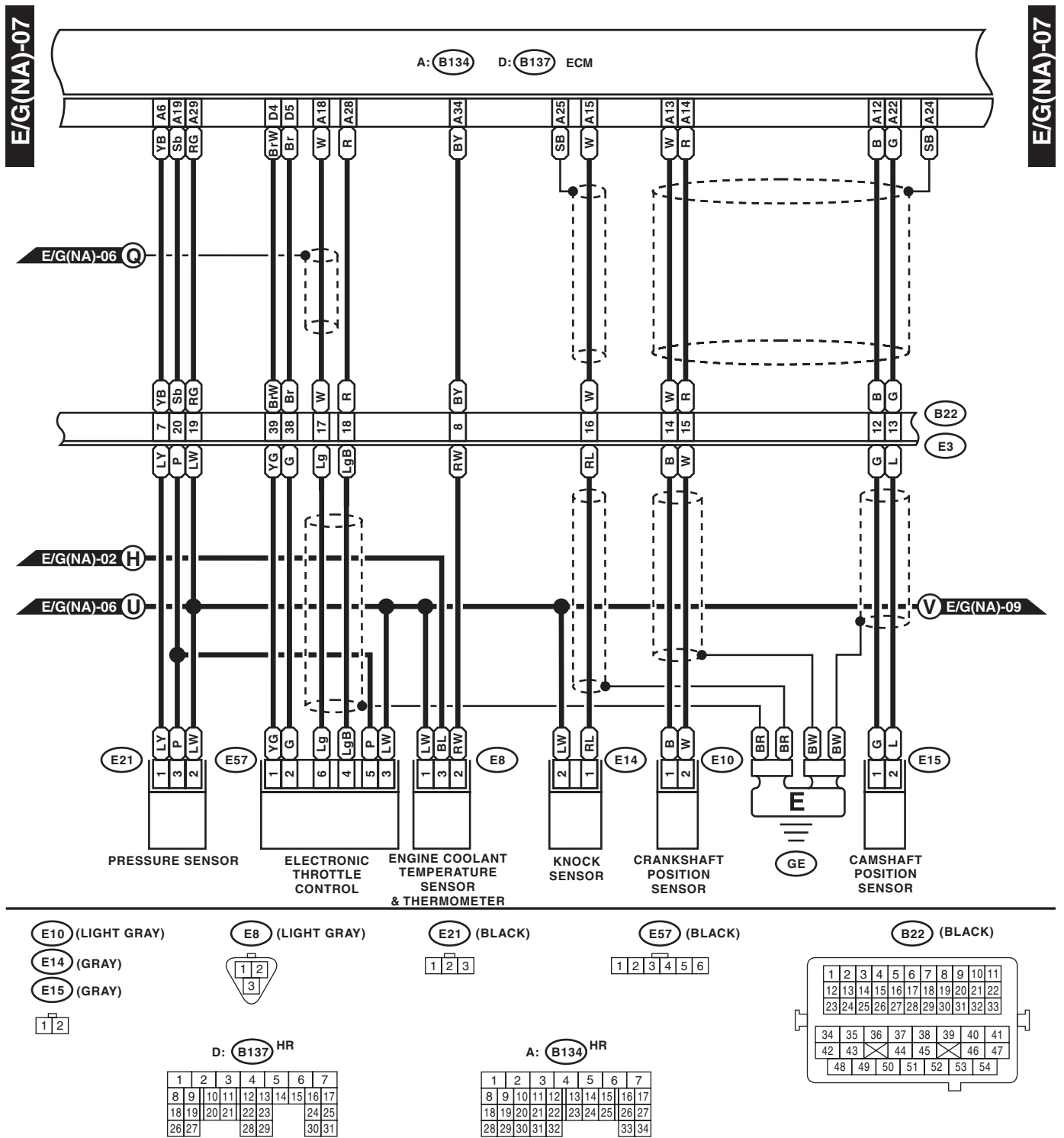
WIRING SYSTEM



WI-14984

Engine Electrical System

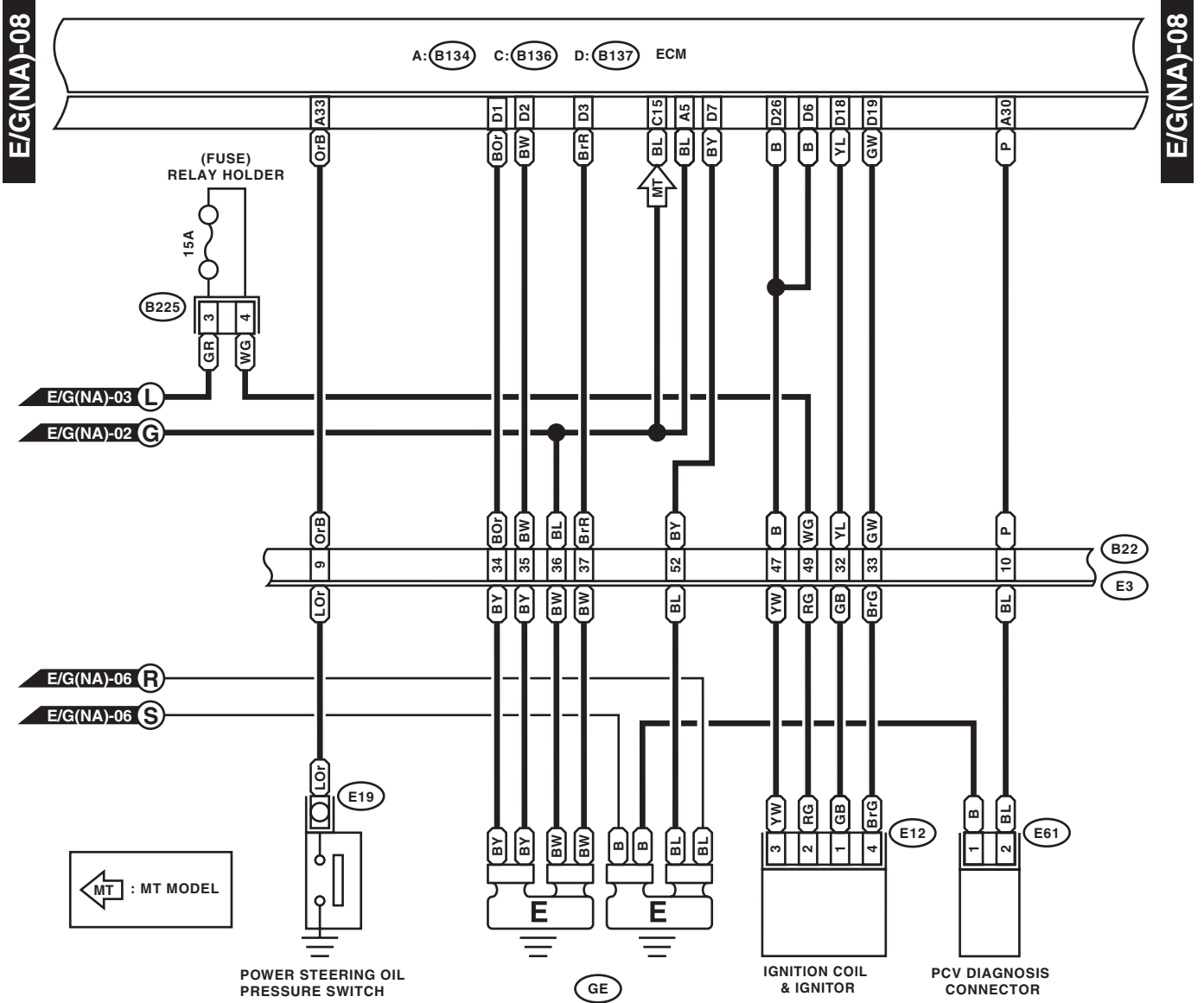
WIRING SYSTEM



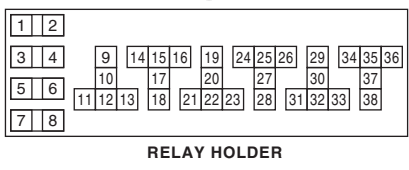
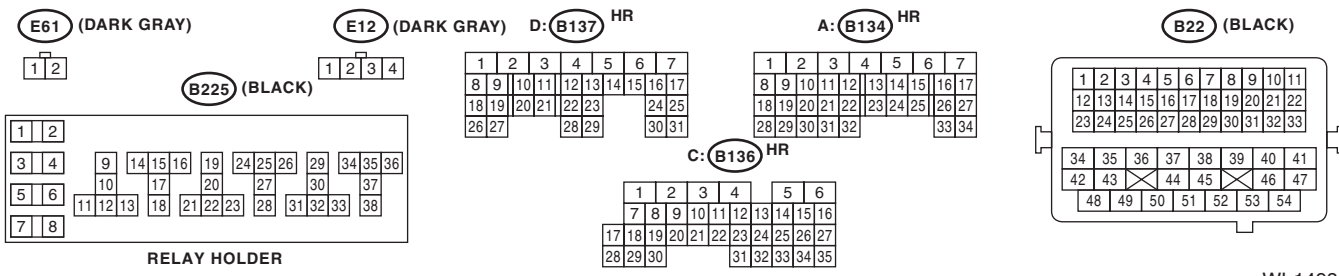
WI-14985

Engine Electrical System

WIRING SYSTEM



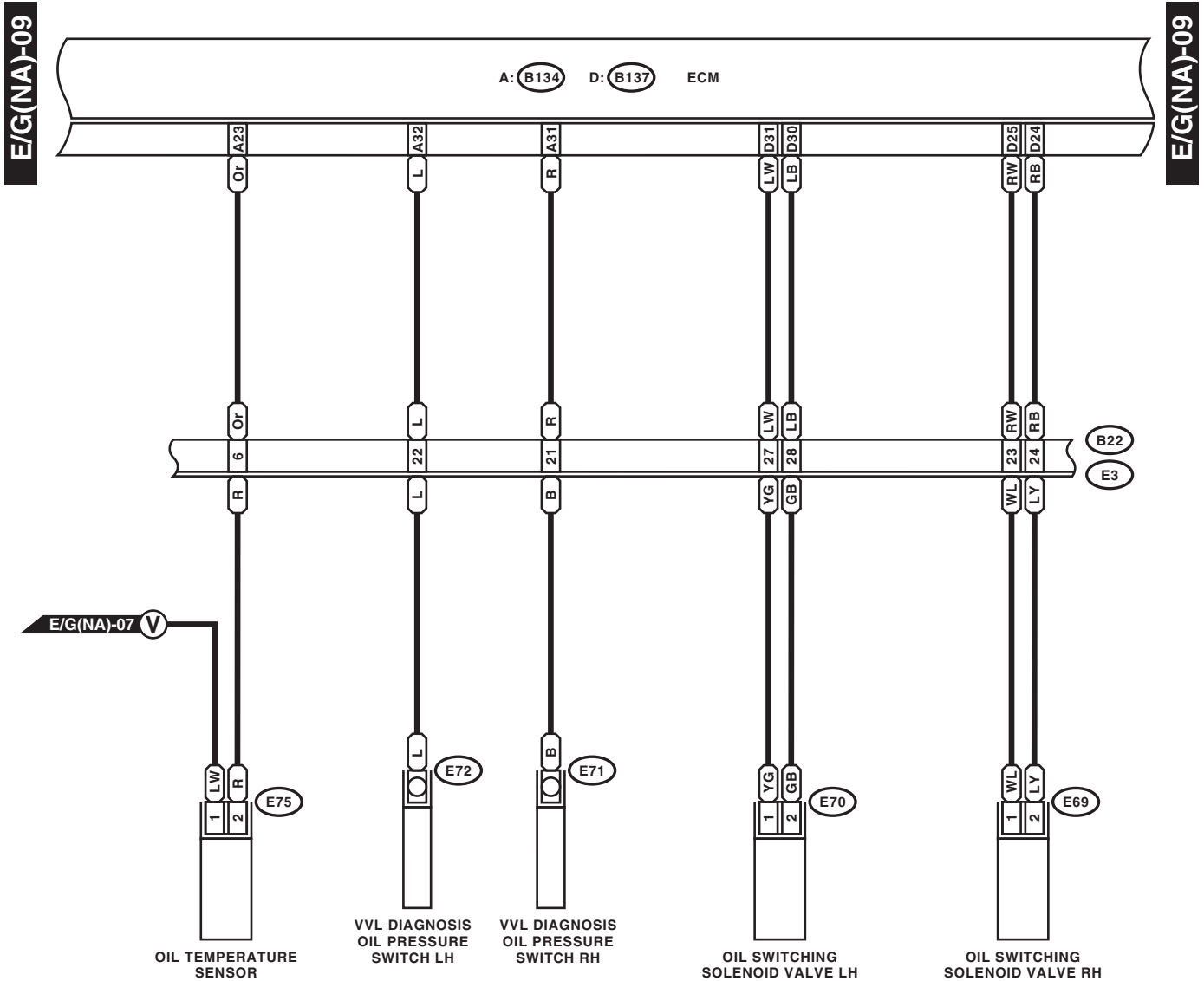
← MT : MT MODEL



WI-14986

Engine Electrical System

WIRING SYSTEM



- (E69) (BLUE)
 - (E70) (BLUE)
 - (E75) (BLACK)
- | | |
|---|---|
| 1 | 2 |
|---|---|

D: (B137) HR

1	2	3	4	5	6	7
8	9	10	11	12	13	14
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29	30	31				

A: (B134) HR

1	2	3	4	5	6	7
8	9	10	11	12	13	14
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22	23	24	25	26	27	28
29	30	31	32	33	34	

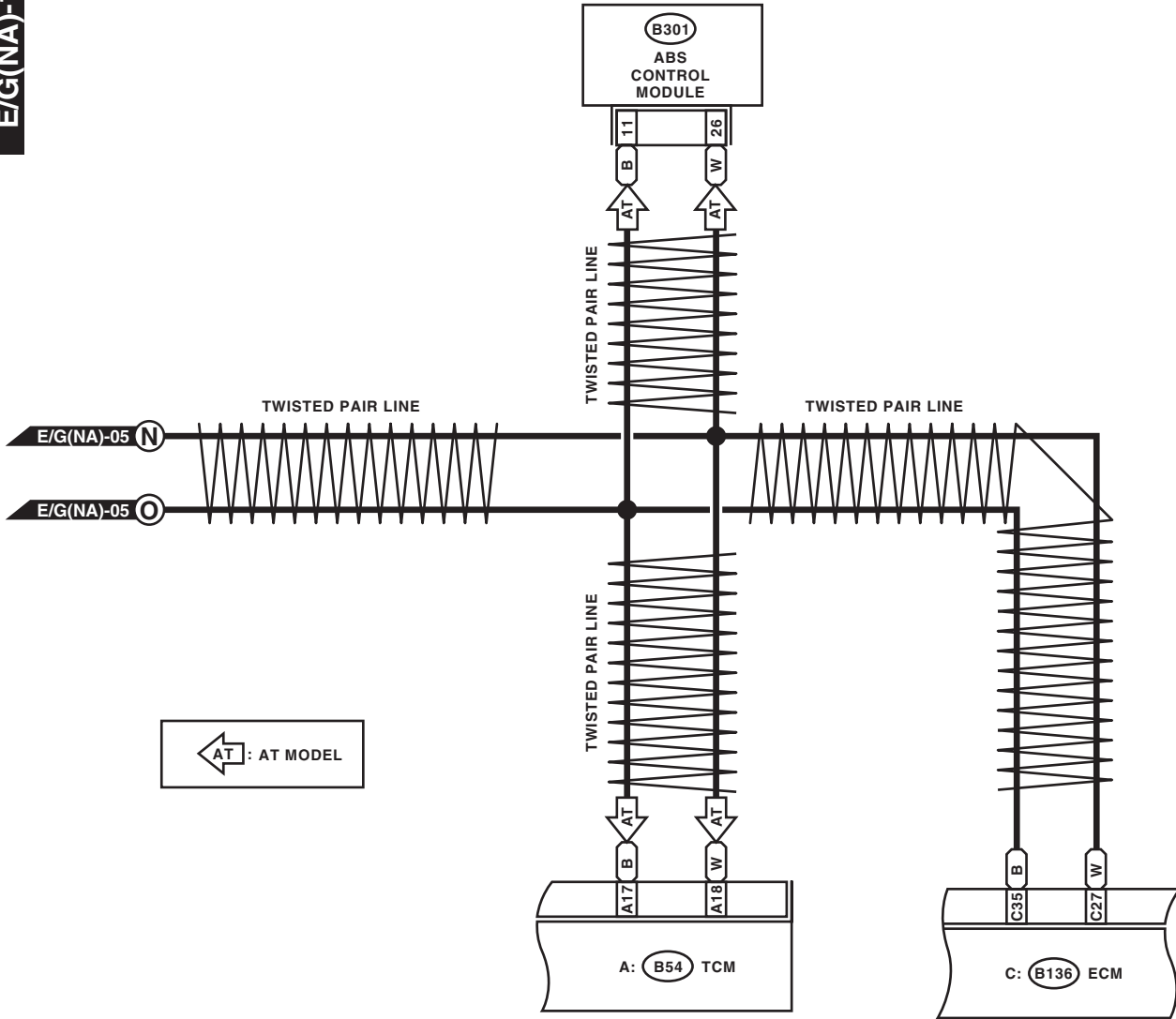
(B22) (BLACK)

1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33
34	35	36	37	38	39	40	41			
42	43	44	45	46	47					
48	49	50	51	52	53	54				

WI-14987

E/G(NA)-10

E/G(NA)-10



B301 (BLACK)

12	13	14	15	1	2	3	4	5	6	7	8	9	10	11
16	17	18	19	20	21	22	23	24	25	26				

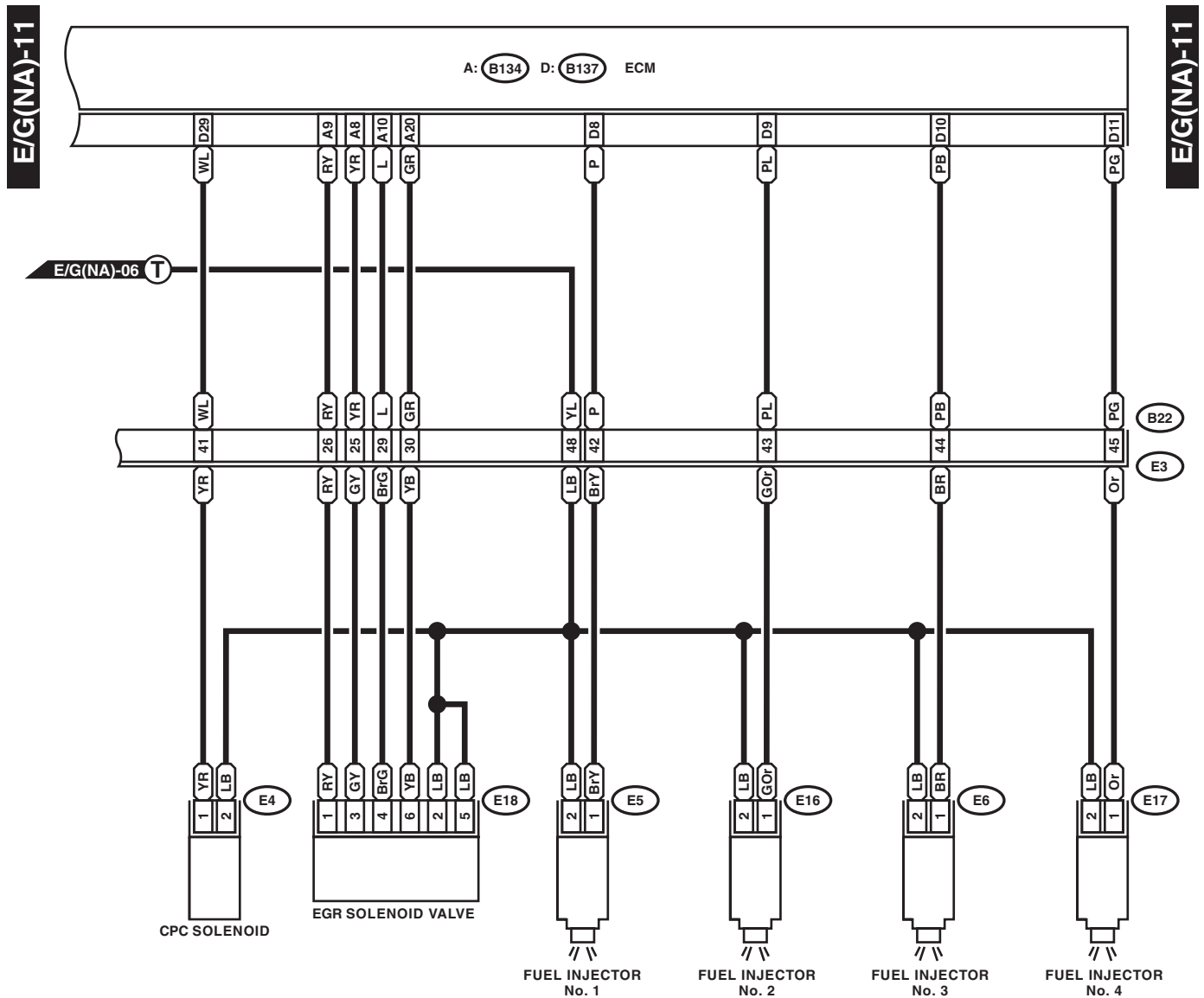
A: **B54** HR

C: **B136** HR

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	

Engine Electrical System

WIRING SYSTEM



E4 (BLACK)

E18 (DARK GRAY)

D: B137 HR

A: B134 HR

B22 (BLACK)

E5 (DARK GRAY)

1	2	3
4	5	6

1	2	3	4	5	6	7			
8	9	10	11	12	13	14	15	16	17
18	19	20	21	22	23	24	25		
26	27		28	29	30	31			

1	2	3	4	5	6	7			
8	9	10	11	12	13	14	15	16	17
18	19	20	21	22	23	24	25	26	27
28	29	30	31	32		33	34		

E6 (DARK GRAY)

E16 (DARK GRAY)

E17 (DARK GRAY)



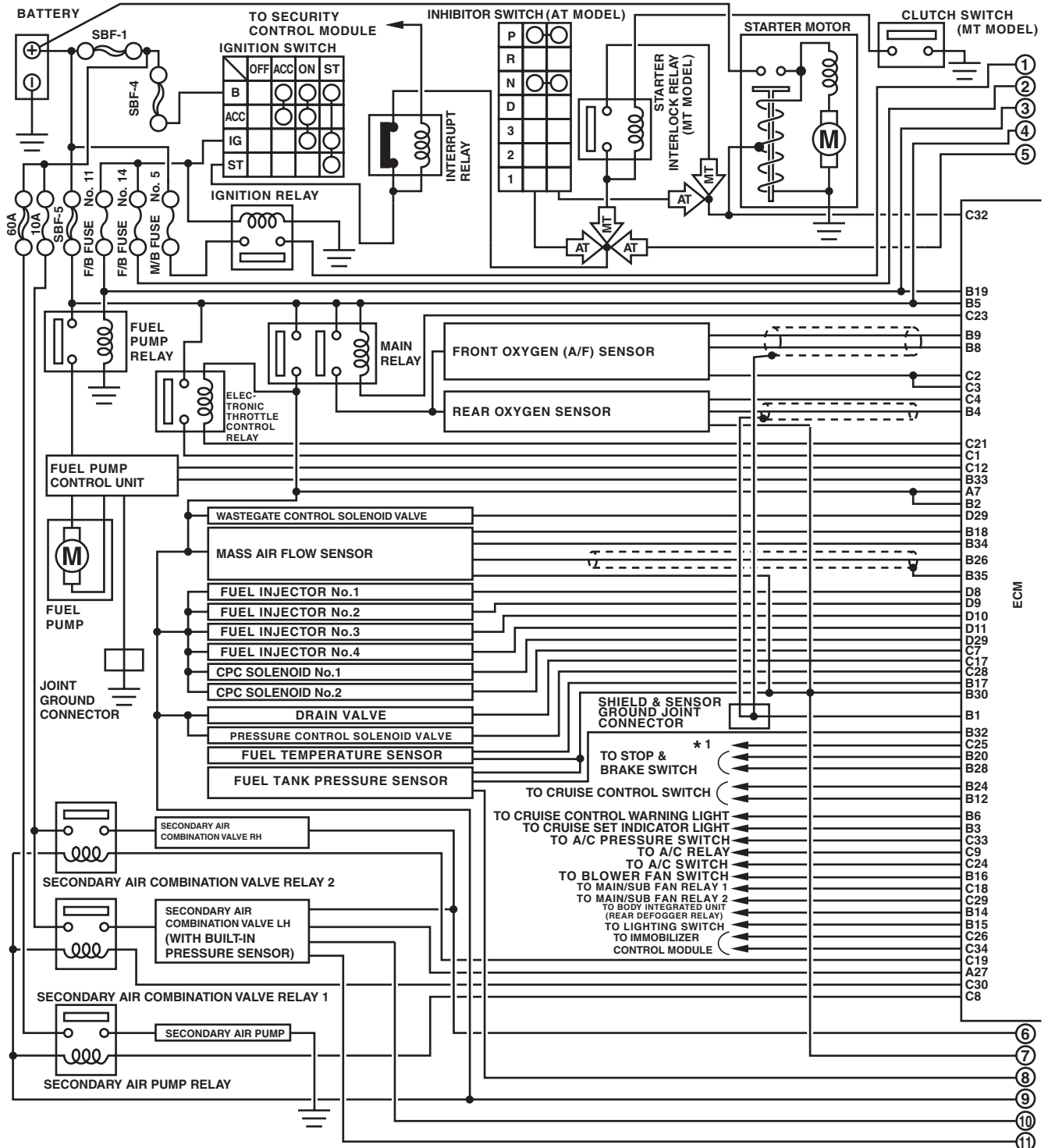
1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33
34	35	36	37	38	39	40	41			
42	43	44	45	46	47					
48	49	50	51	52	53	54				

WI-14989

Engine Electrical System

WIRING SYSTEM

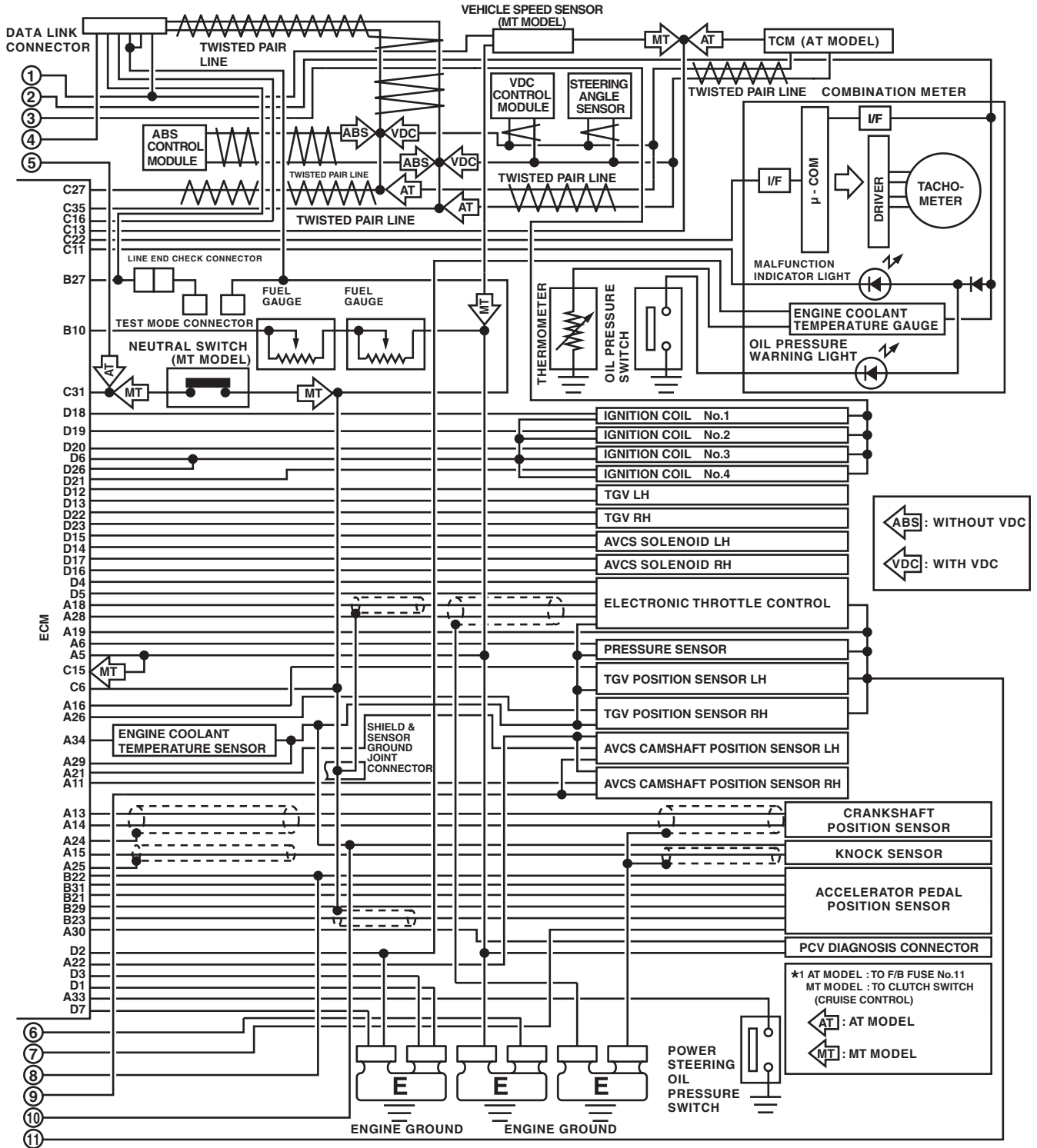
2. TURBO MODEL



WI-12217

Engine Electrical System

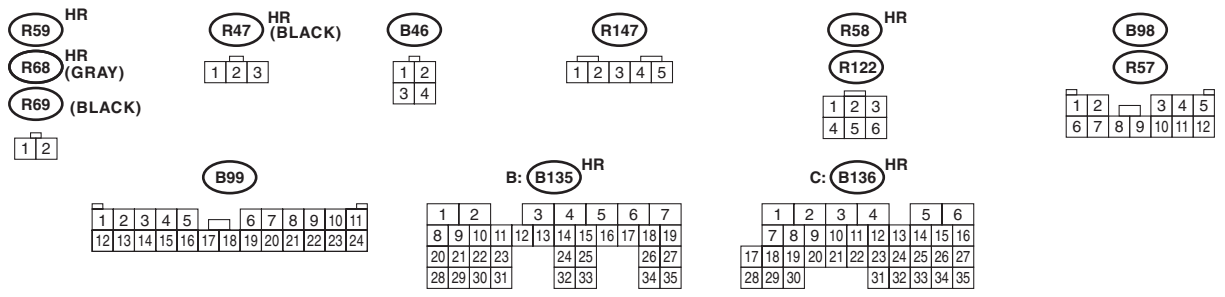
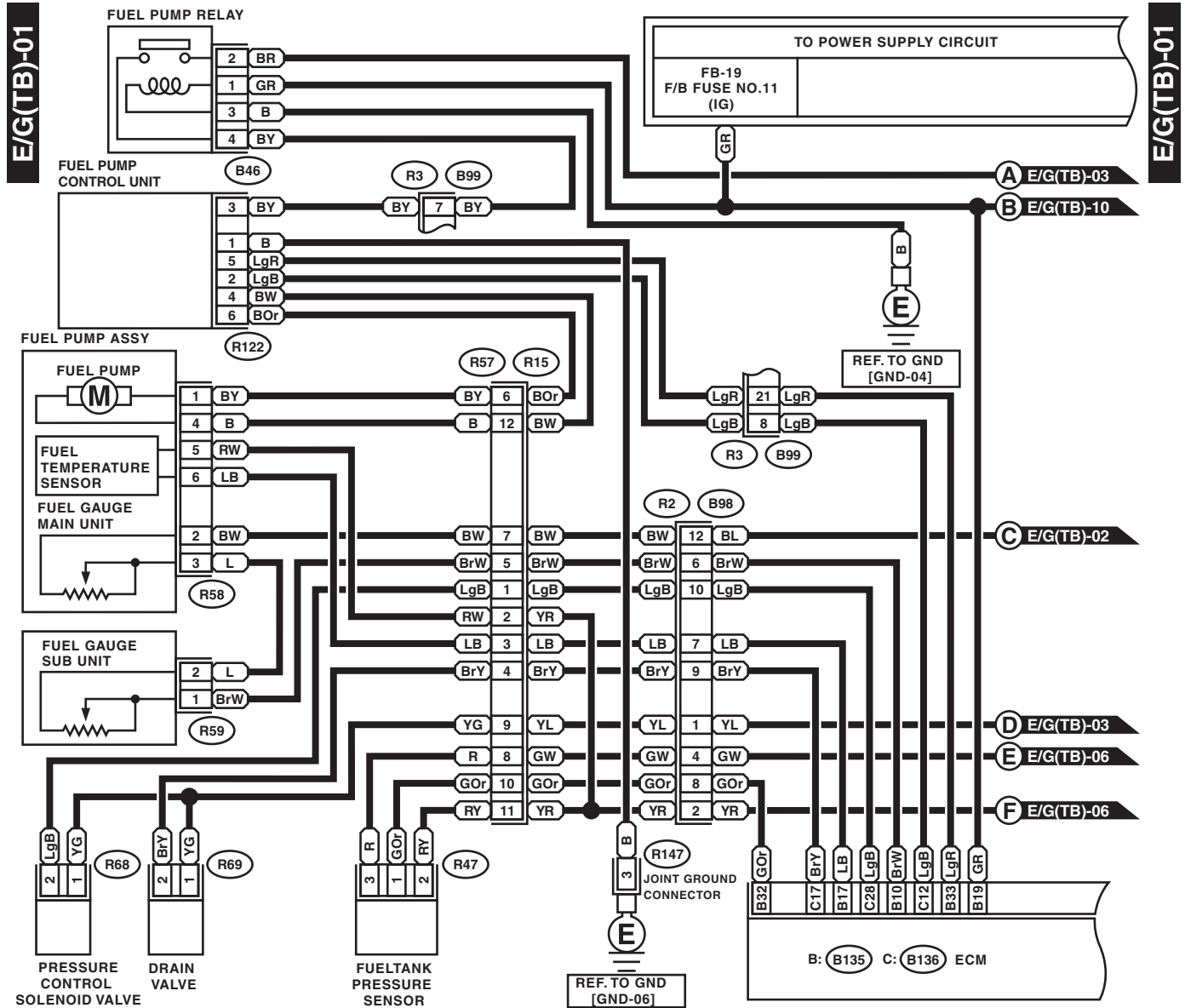
WIRING SYSTEM



WI-15233

Engine Electrical System

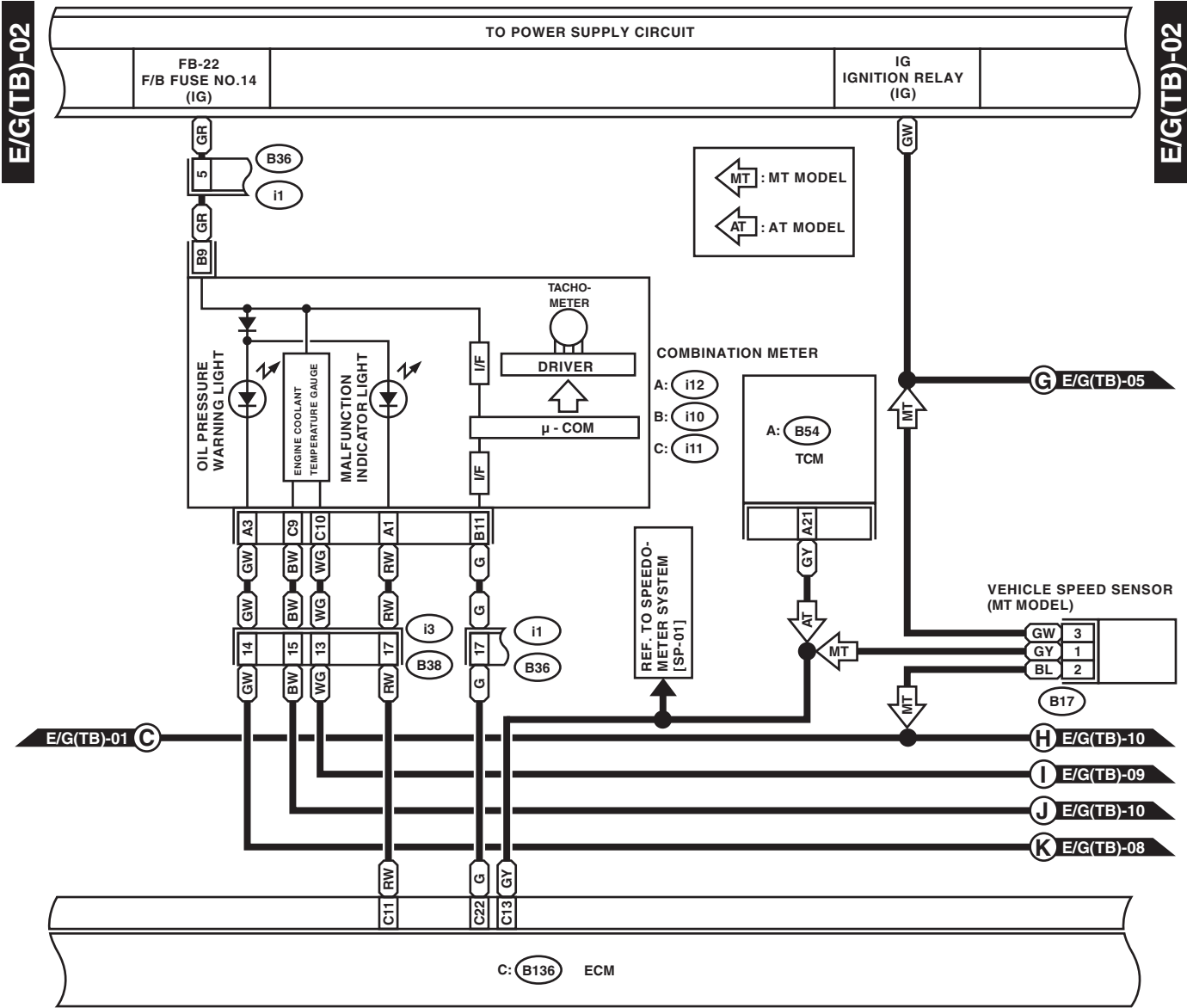
WIRING SYSTEM



WI-14990

Engine Electrical System

WIRING SYSTEM



B17 HR (BLACK)

1	2
3	4

C: i11 (GREEN)

1	2	3	4	5	6	7	8	9	10
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A: i12 (GREEN)

1	2	3	4	5	6		
7	8	9	10	11	12	13	14

B36

1	2	3	4	5	6	7	8	9	10	11		
12	13	14	15	16	17	18	19	20	21	22	23	24

B: i10 (GREEN)

1	2	3	4	5	6	7	8	9	10	11	12	13	14		
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

B38

1	2	3	4	5	6	7	8	9			
10	11	12	13	14	15	16	17	18	19	20	21
22	23	24	25	26	27	28	29	30	31	32	

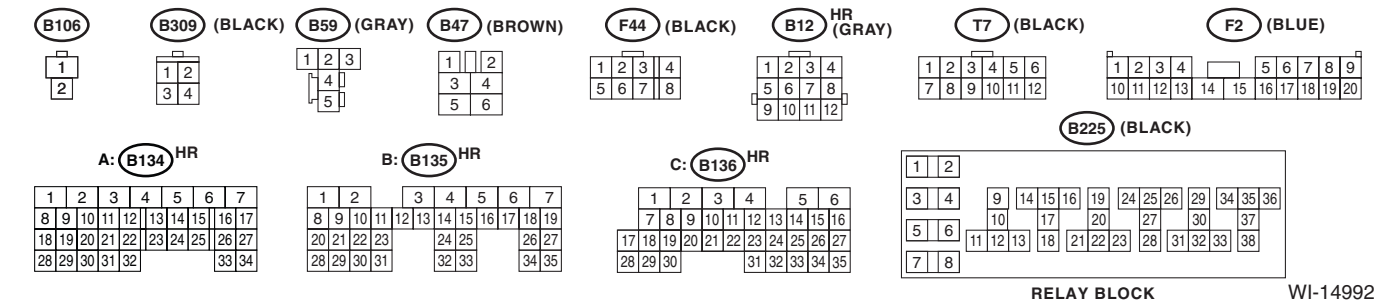
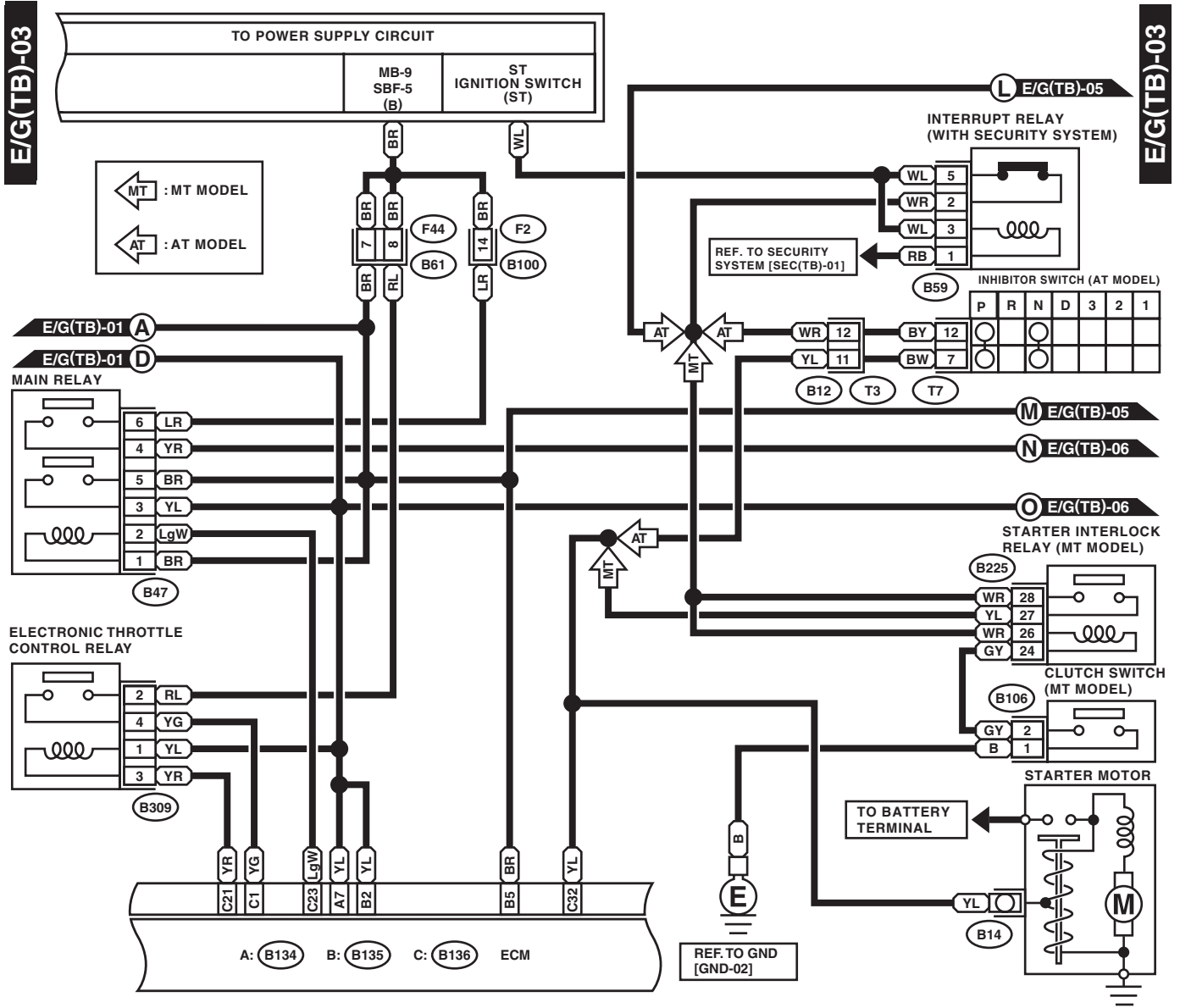
A: B54 HR C: B136 HR

1	2	3	4	5	6					
7	8	9	10	11	12	13	14	15	16	
17	18	19	20	21	22	23	24	25	26	27
28	29	30	31	32	33	34	35			

WI-14991

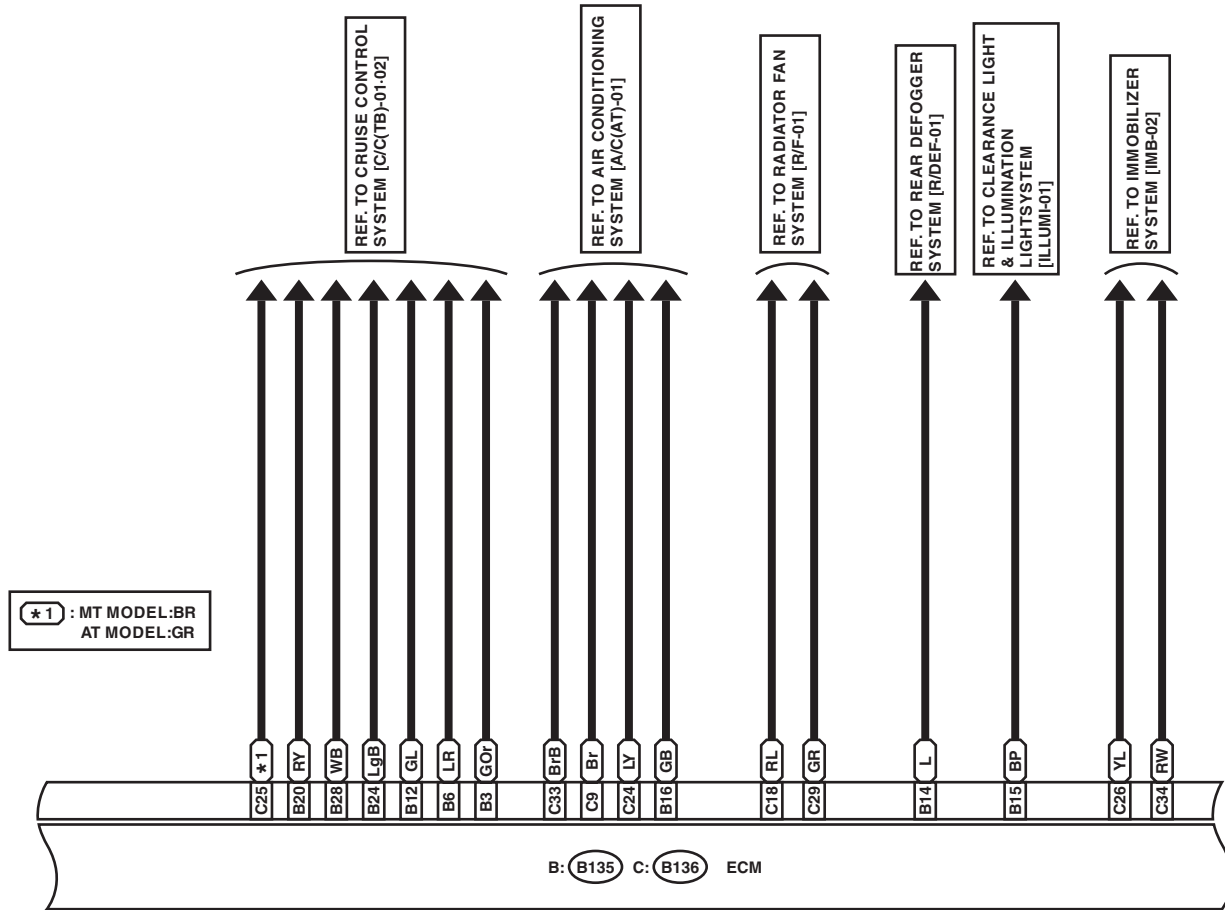
Engine Electrical System

WIRING SYSTEM



E/G(TB)-04

E/G(TB)-04



B: B135 HR

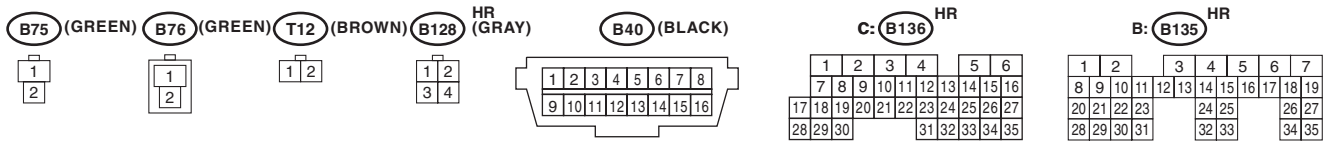
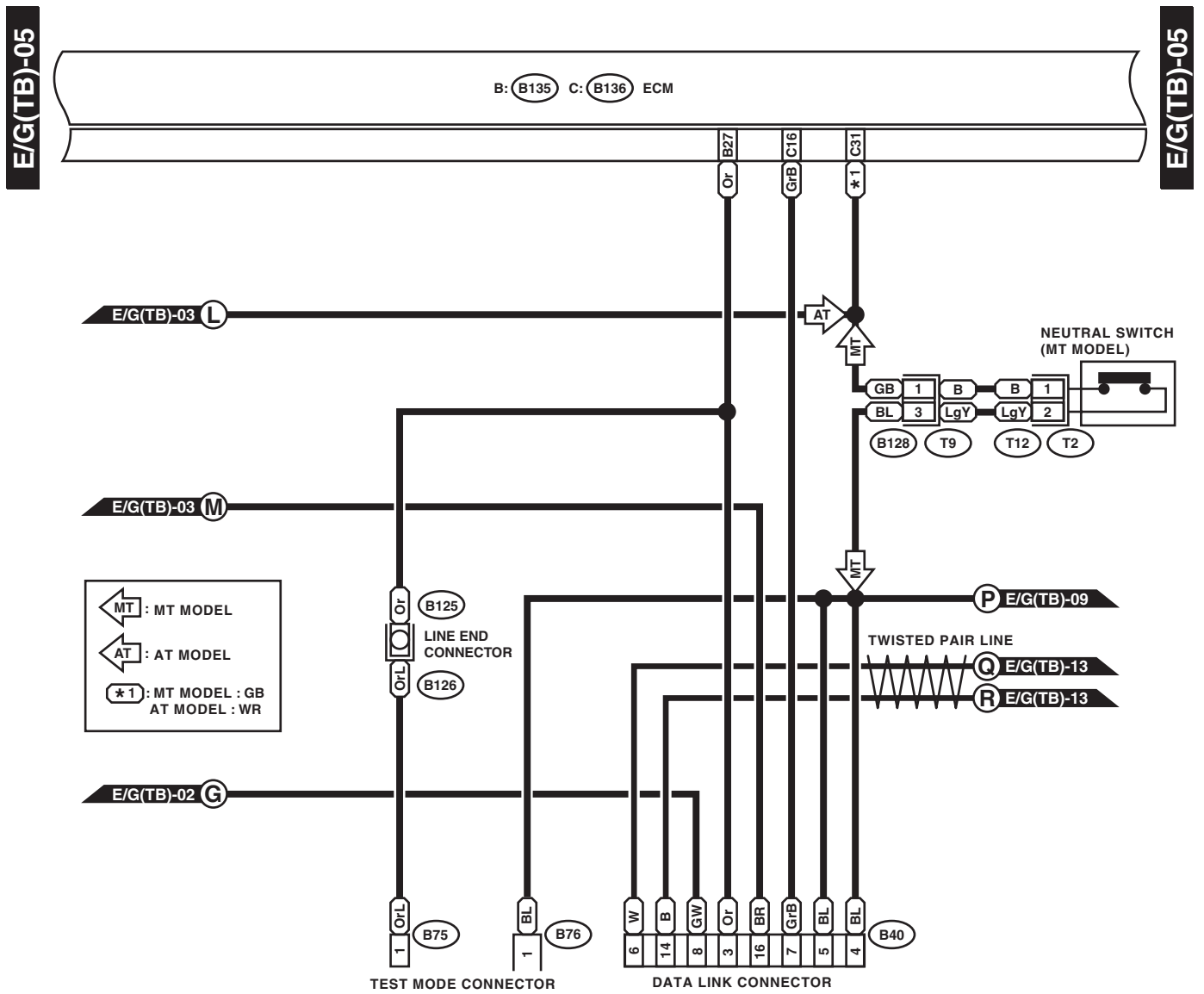
1	2	3	4	5	6	7					
8	9	10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27				
28	29	30	31	32	33	34	35				

C: B136 HR

1	2	3	4	5	6					
7	8	9	10	11	12	13	14	15	16	
17	18	19	20	21	22	23	24	25	26	27
28	29	30	31	32	33	34	35			

Engine Electrical System

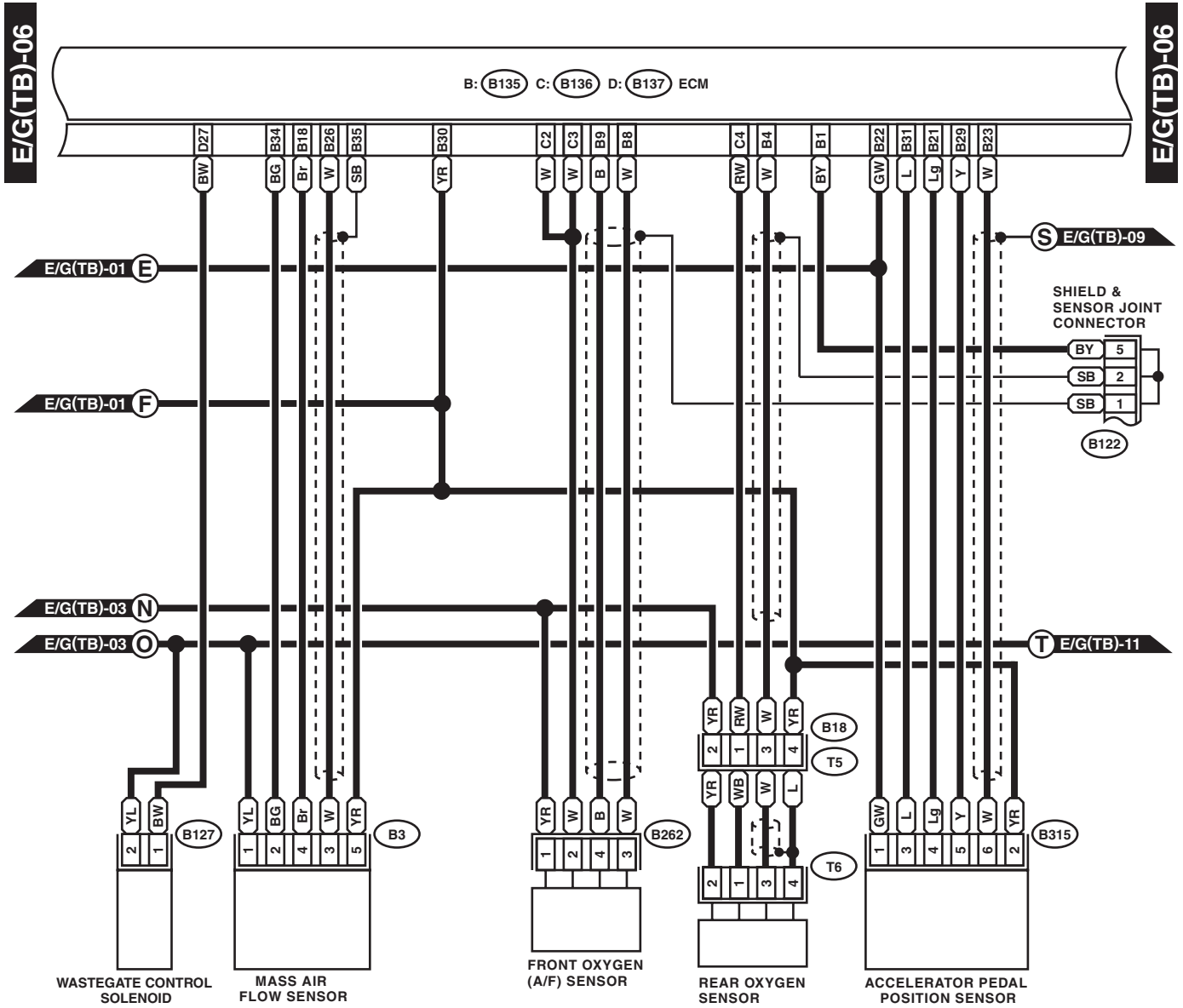
WIRING SYSTEM



WI-14994

Engine Electrical System

WIRING SYSTEM



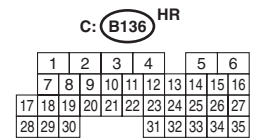
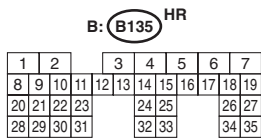
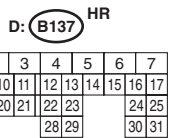
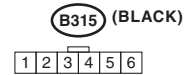
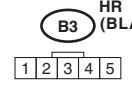
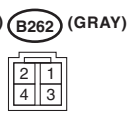
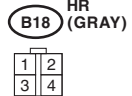
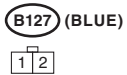
WASTEGATE CONTROL SOLENOID

MASS AIR FLOW SENSOR

FRONT OXYGEN (A/F) SENSOR

REAR OXYGEN SENSOR

ACCELERATOR PEDAL POSITION SENSOR



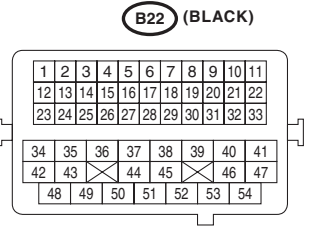
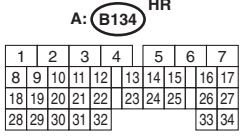
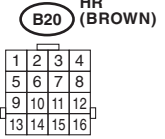
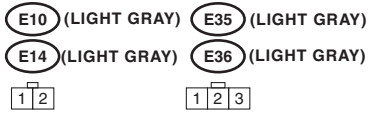
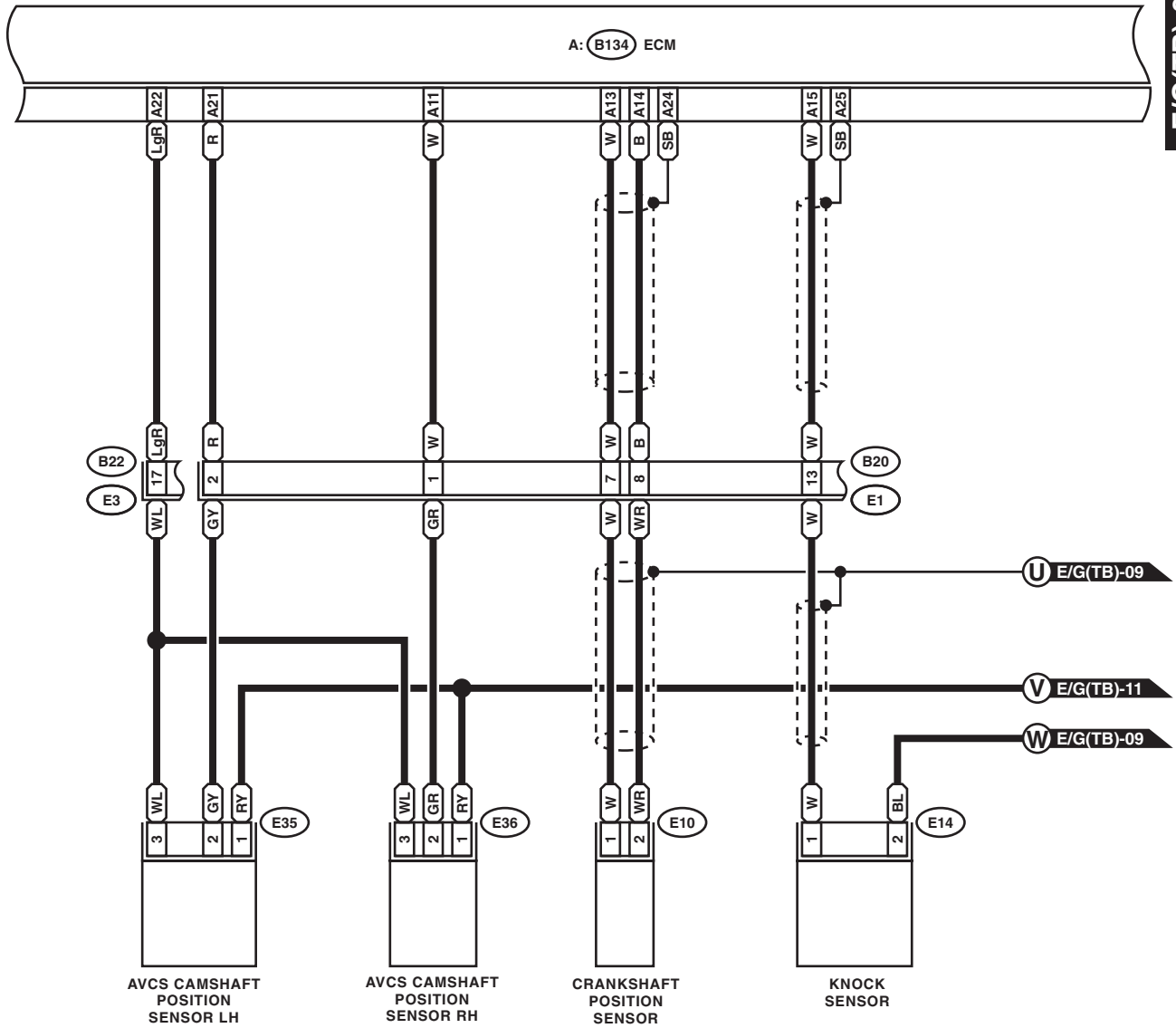
WI-14995

Engine Electrical System

WIRING SYSTEM

E/G(TB)-07

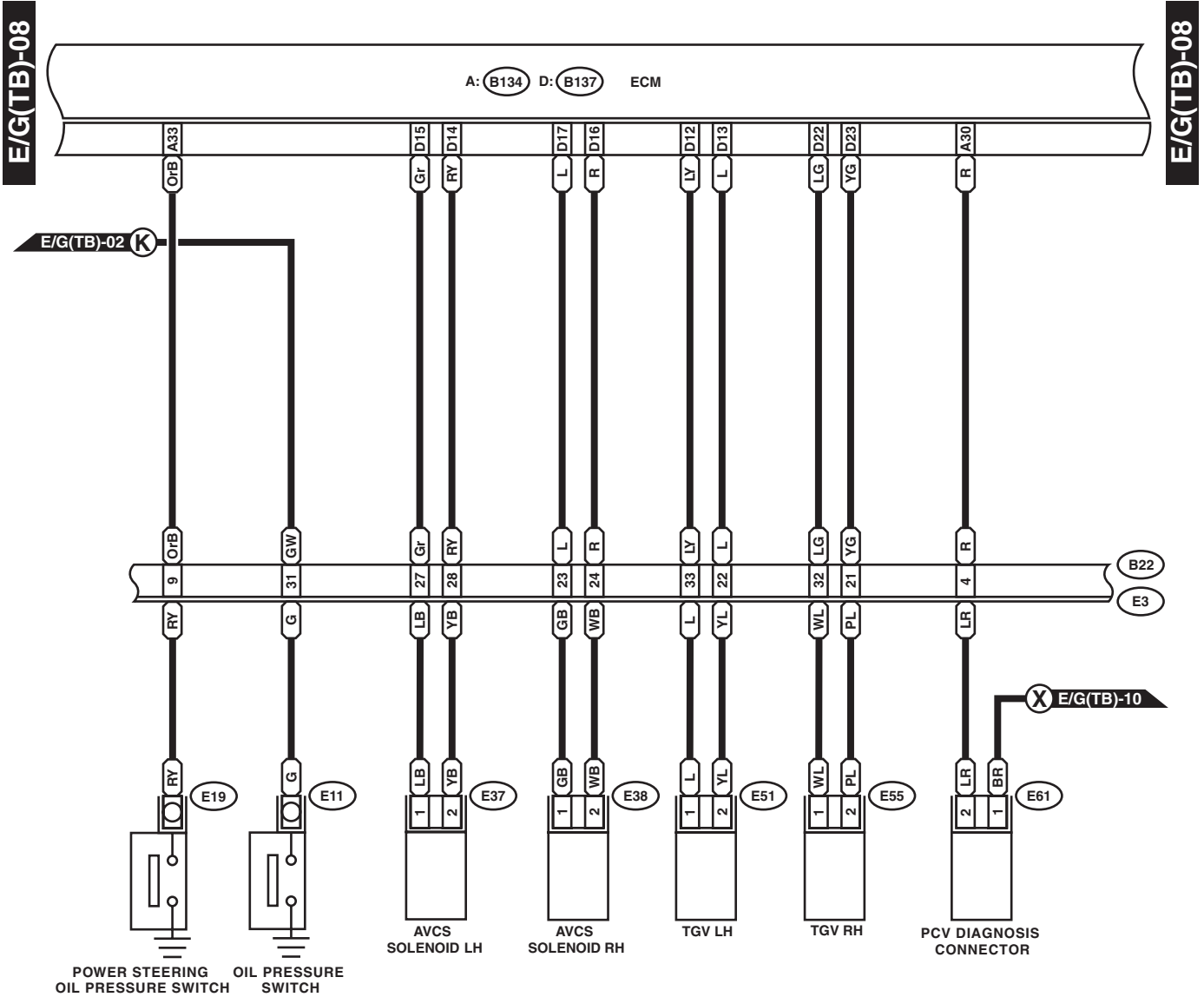
E/G(TB)-07



WI-14996

Engine Electrical System

WIRING SYSTEM



- E37** (BLUE)
- E38** (BLUE)
- E51** (BLACK)
- E55** (BLACK)
- E61** (DARK GRAY)

D: B137 HR

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32			

A: B134 HR

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32	33	34	

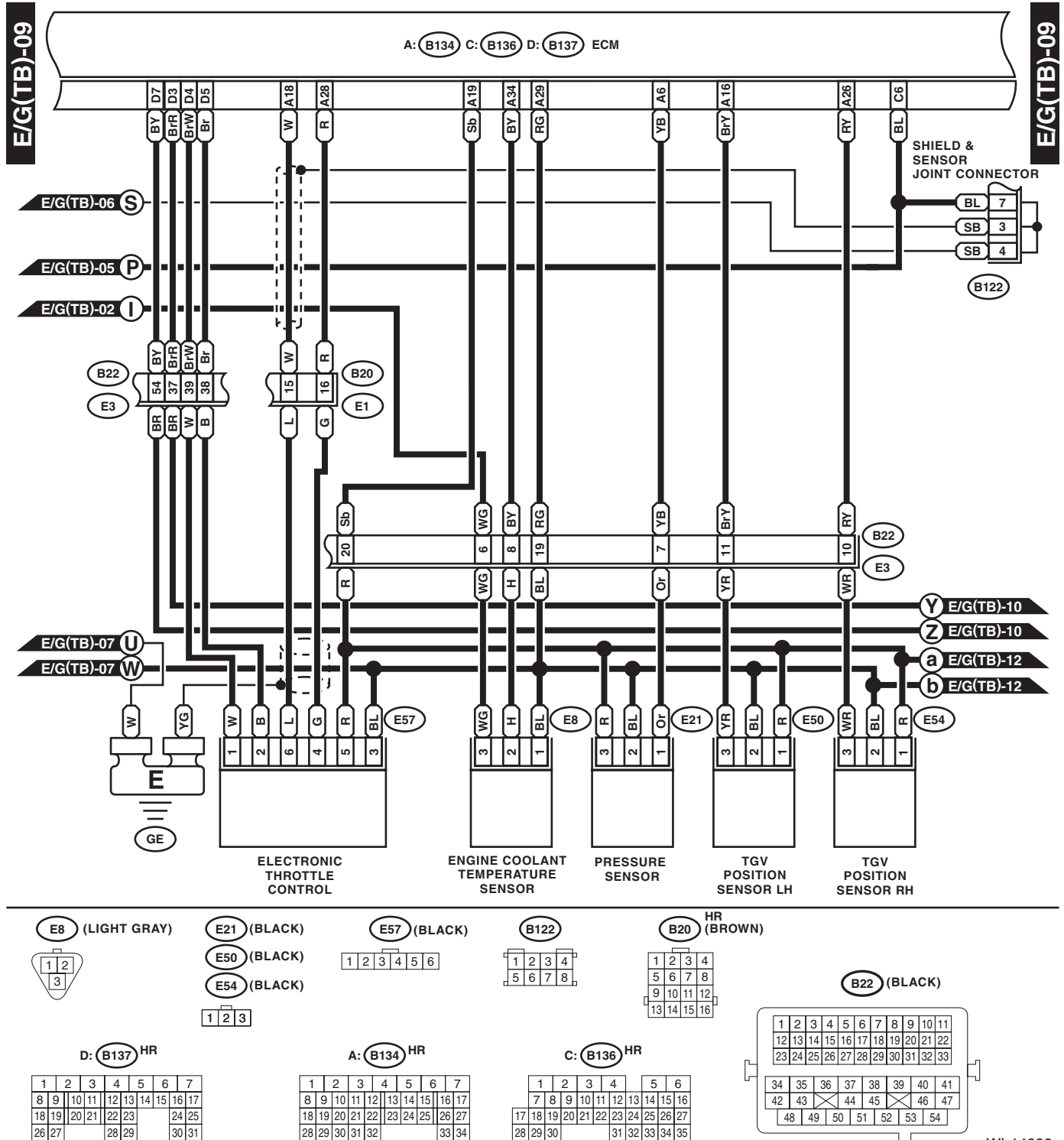
B22 (BLACK)

1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33
34	35	36	37	38	39	40	41			
42	43	44	45	46	47					
48	49	50	51	52	53	54				

WI-14997

Engine Electrical System

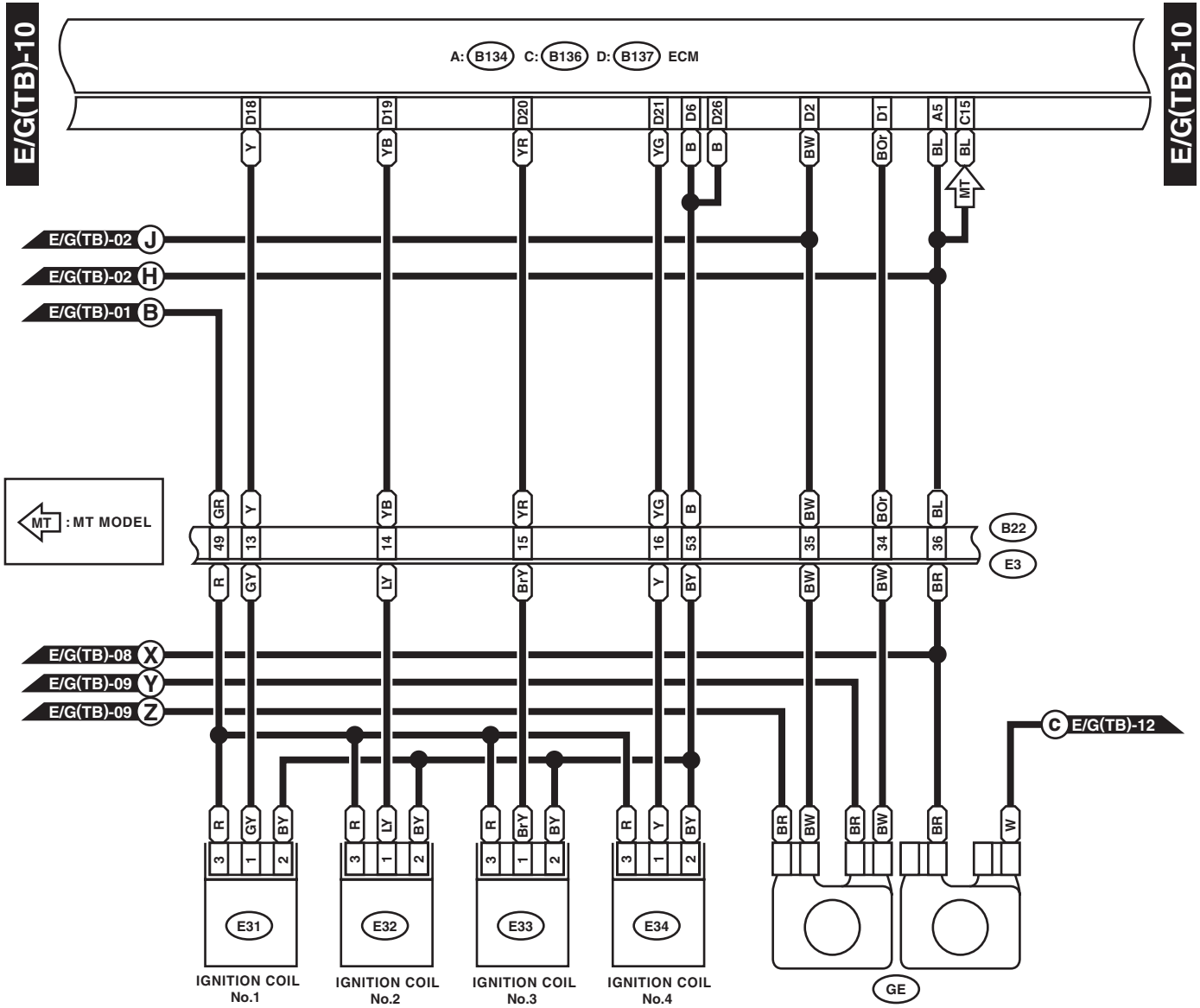
WIRING SYSTEM



WI-14998

Engine Electrical System

WIRING SYSTEM



D: (B137) HR

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32	33	34	35

A: (B134) HR

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32	33	34	35

C: (B136) HR

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

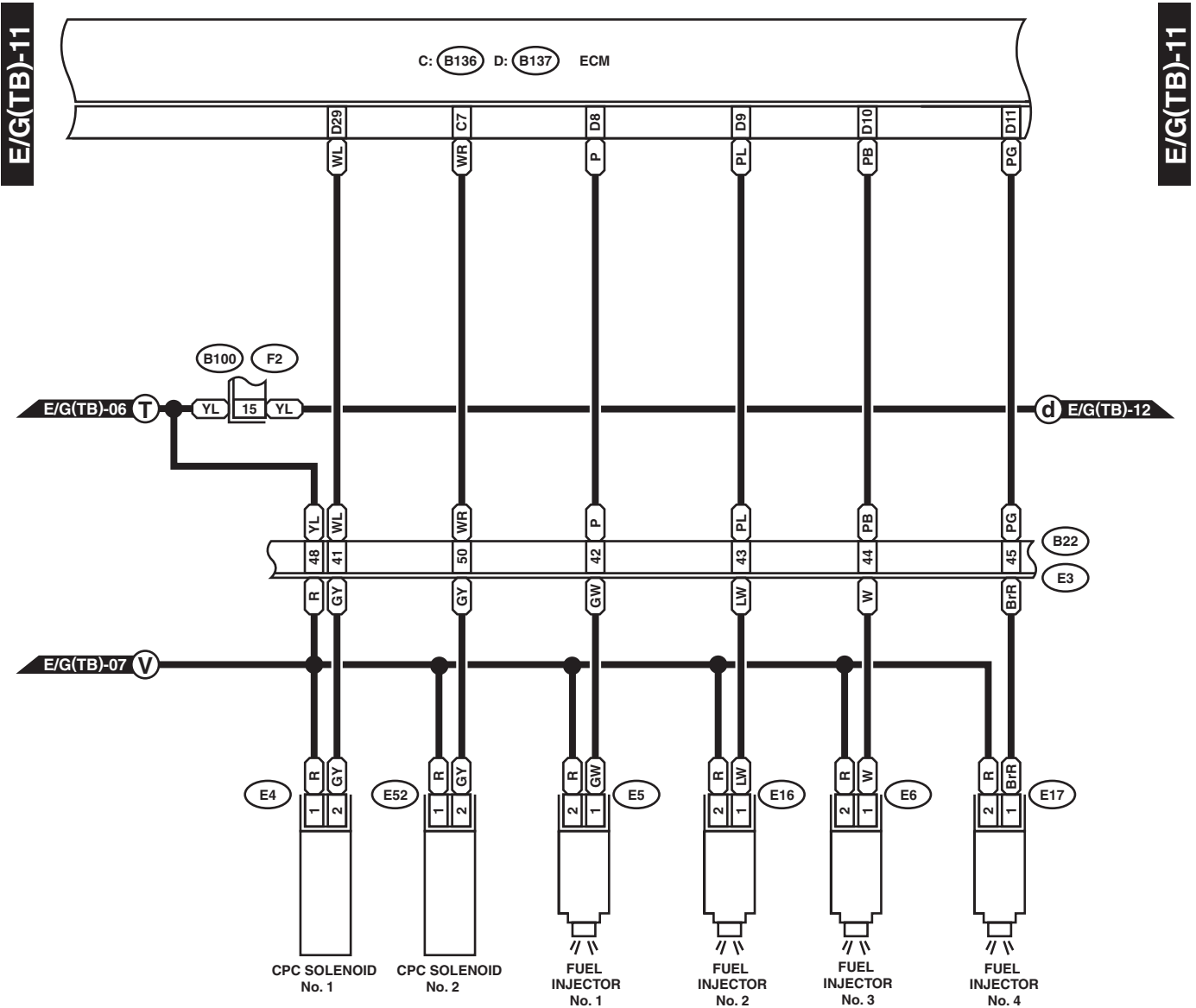
(B22) (BLACK)

1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33
34	35	36	37	38	39	40	41	42	43	44
45	46	47	48	49	50	51	52	53	54	55

WI-14999

Engine Electrical System

WIRING SYSTEM



E5 (DARK GRAY)

E4 (BLACK)

F2 (BLUE)

E6 (DARK GRAY)

E52

1	2	3	4	5	6	7	8	9		
10	11	12	13	14	15	16	17	18	19	20

B22 (BLACK)

E16 (DARK GRAY)

1 2

1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33
34	35	36	37	38	39	40	41			
42	43	44	45	46	47					
48	49	50	51	52	53	54				

E17 (DARK GRAY)

D: B137 HR

C: B136 HR

1	2
---	---

1	2	3	4	5	6	7			
8	9	10	11	12	13	14	15	16	17
18	19	20	21	22	23	24	25		
26	27	28	29	30	31				

1	2	3	4	5	6					
7	8	9	10	11	12	13	14	15	16	
17	18	19	20	21	22	23	24	25	26	27
28	29	30	31	32	33	34	35			

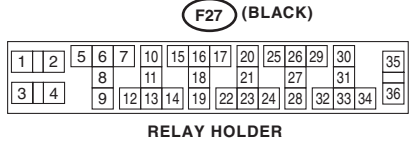
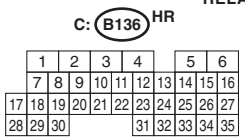
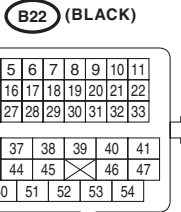
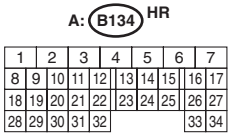
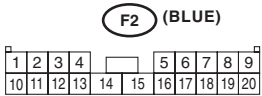
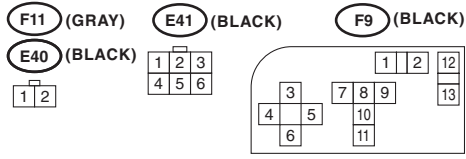
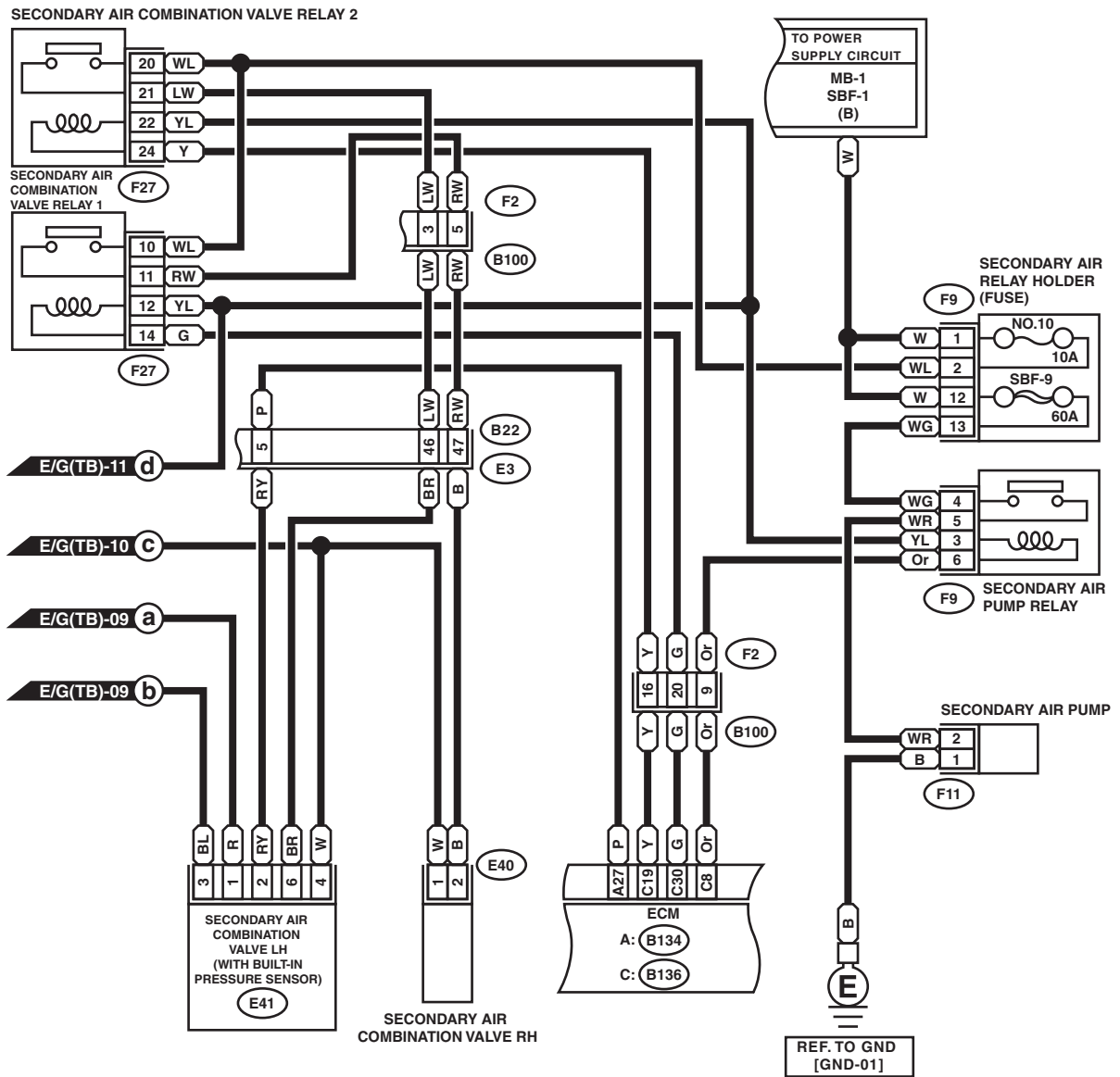
WI-15000

Engine Electrical System

WIRING SYSTEM

E/G(TB)-12

E/G(TB)-12



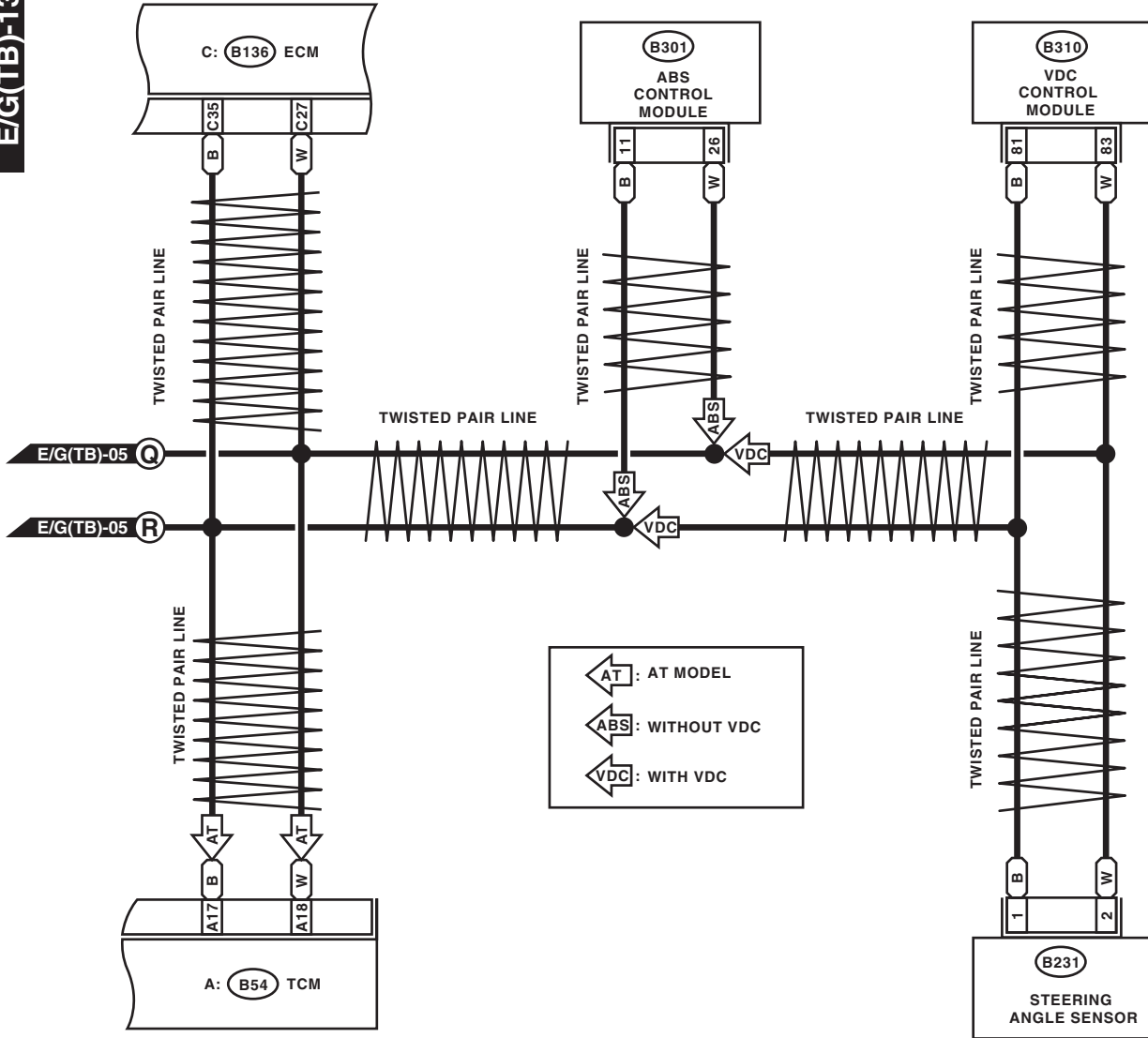
WI-15001

Engine Electrical System

WIRING SYSTEM

E/G(TB)-13

E/G(TB)-13



B231

1	2	3	4
---	---	---	---

B301 (BLACK)

12	13	14	15	1	2	3	4	5	6	7	8	10	11	
				16	17	18	19	20	21	22	23	24	25	26

A: B54 HR

C: B136 HR

1	2	3	4	5	6					
7	8	9	10	11	12	13	14	15	16	
17	18	19	20	21	22	23	24	25	26	27
28	29	30		31	32	33	34	35		

B310 (BLACK)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28		
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55			
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83		

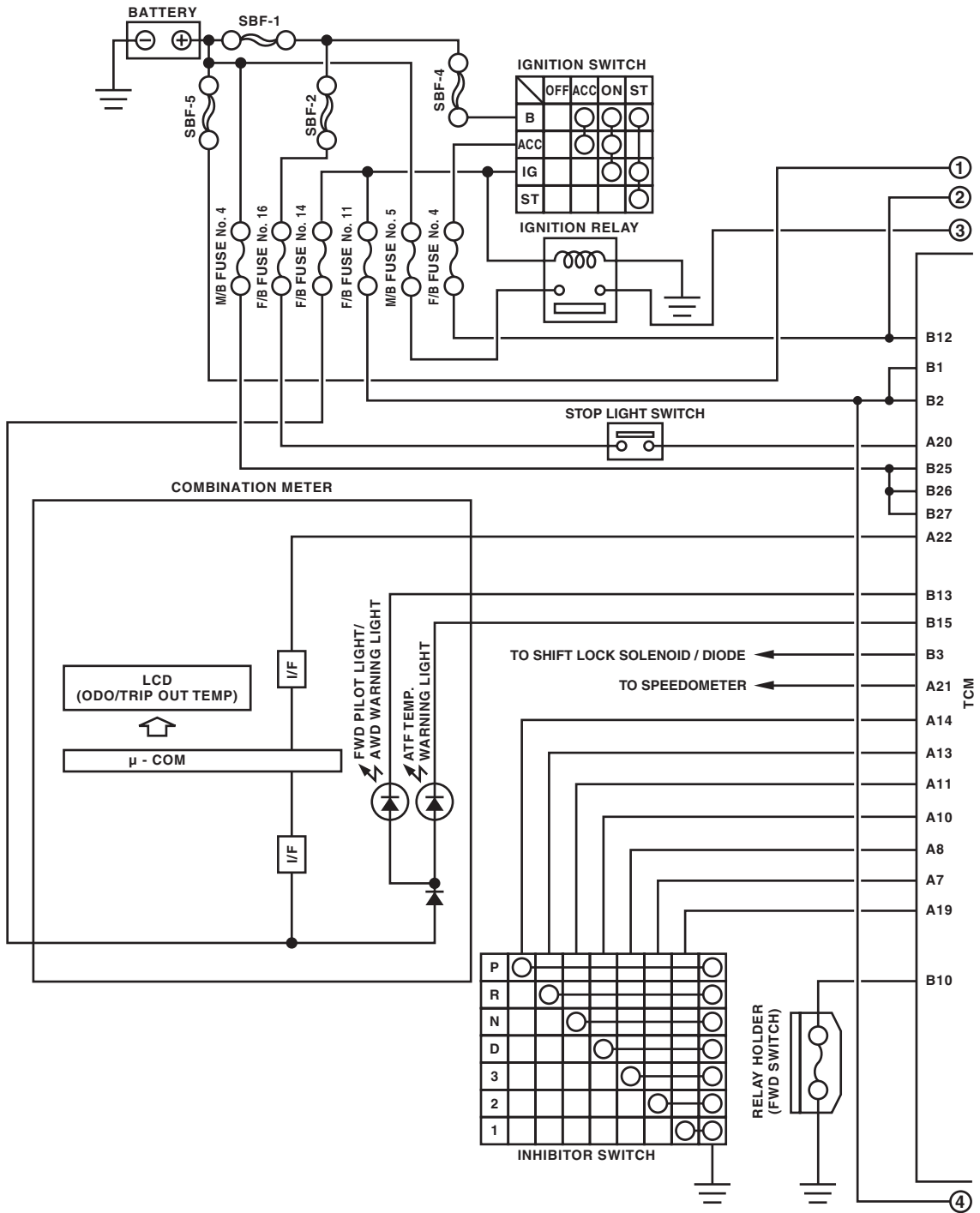
WI-15234

AT Control System

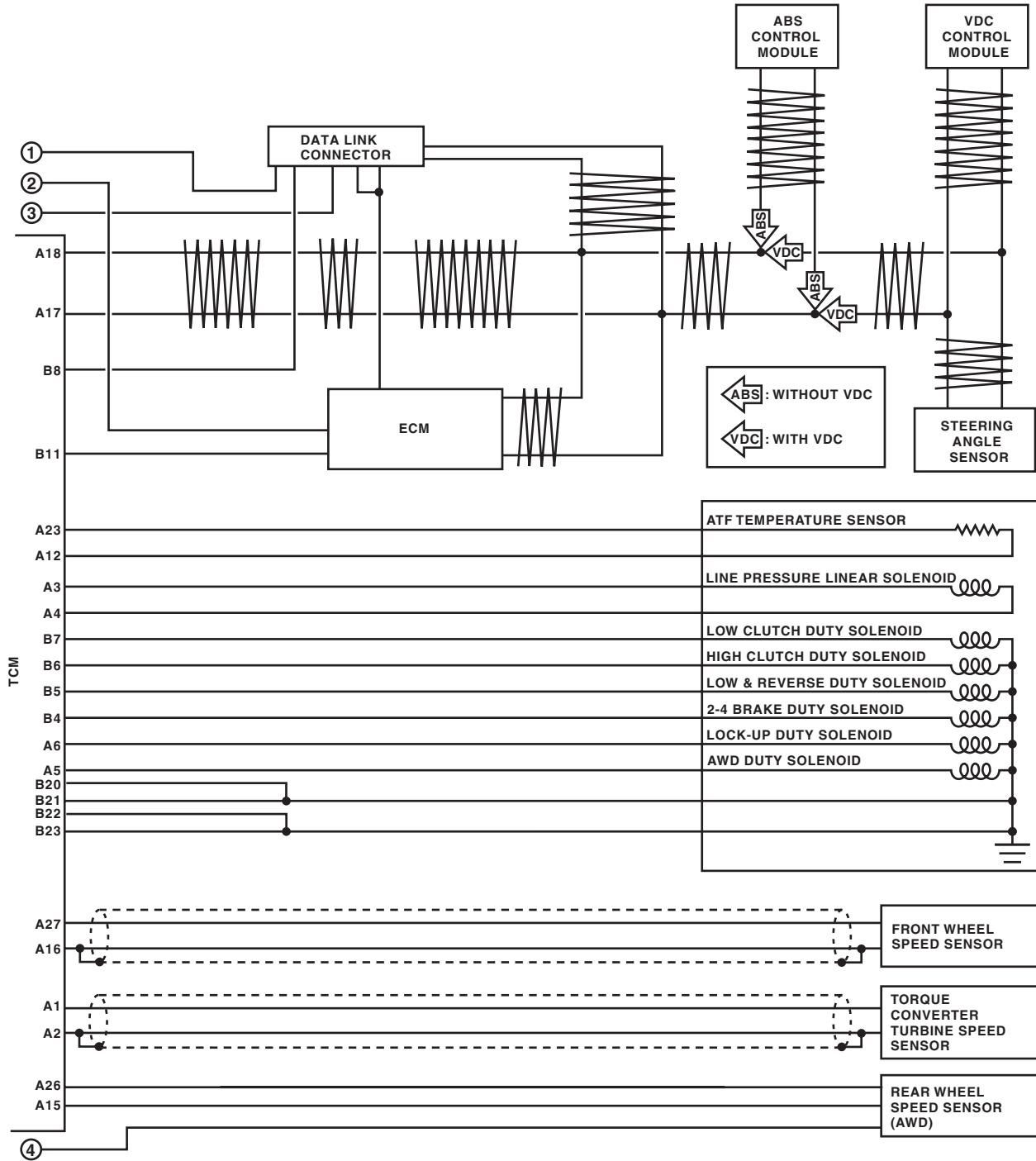
WIRING SYSTEM

6. AT Control System

A: WIRING DIAGRAM



WI-12232



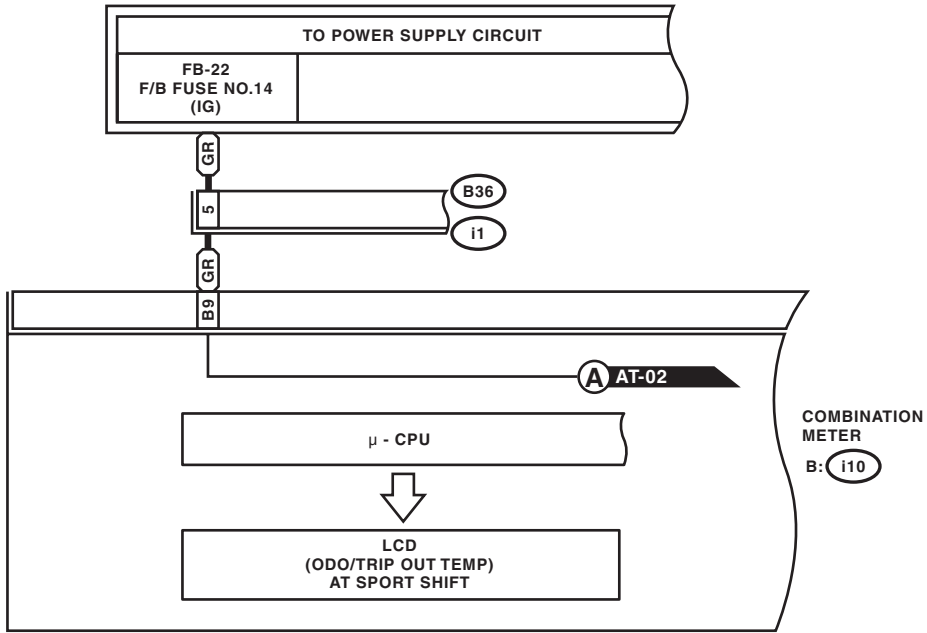
WI-15235

AT Control System

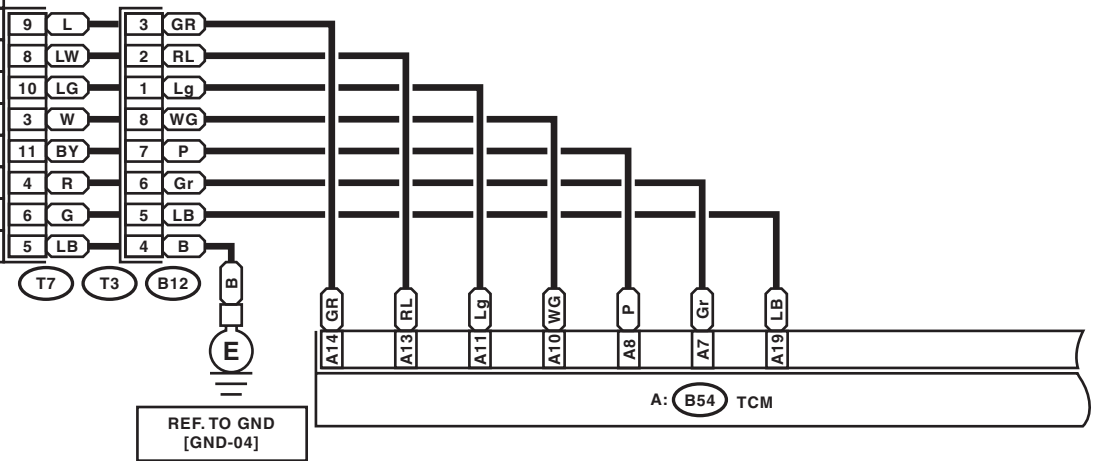
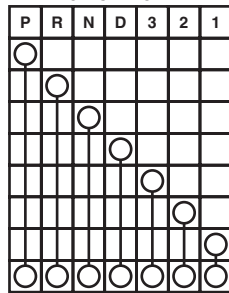
WIRING SYSTEM

AT-01

AT-01



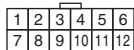
INHIBITOR SWITCH



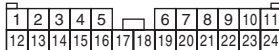
B12 (GRAY) HR



T7 (BLACK)



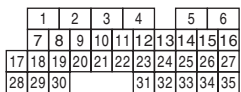
B36



B: i10 (GREEN)



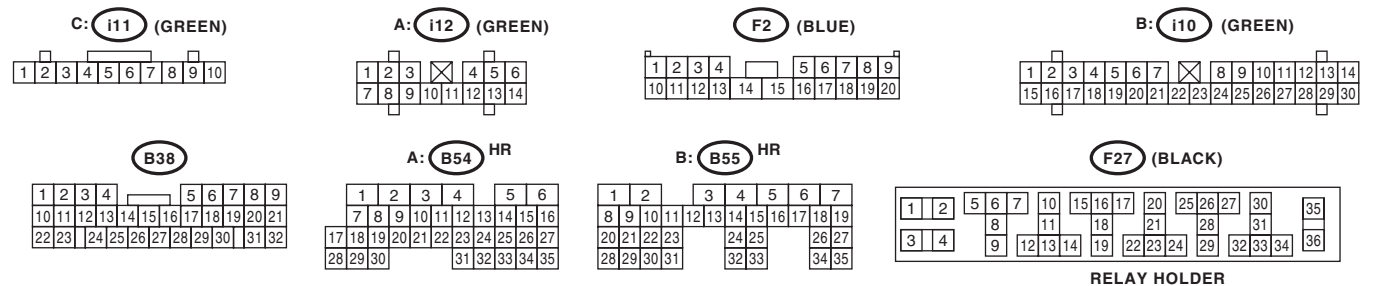
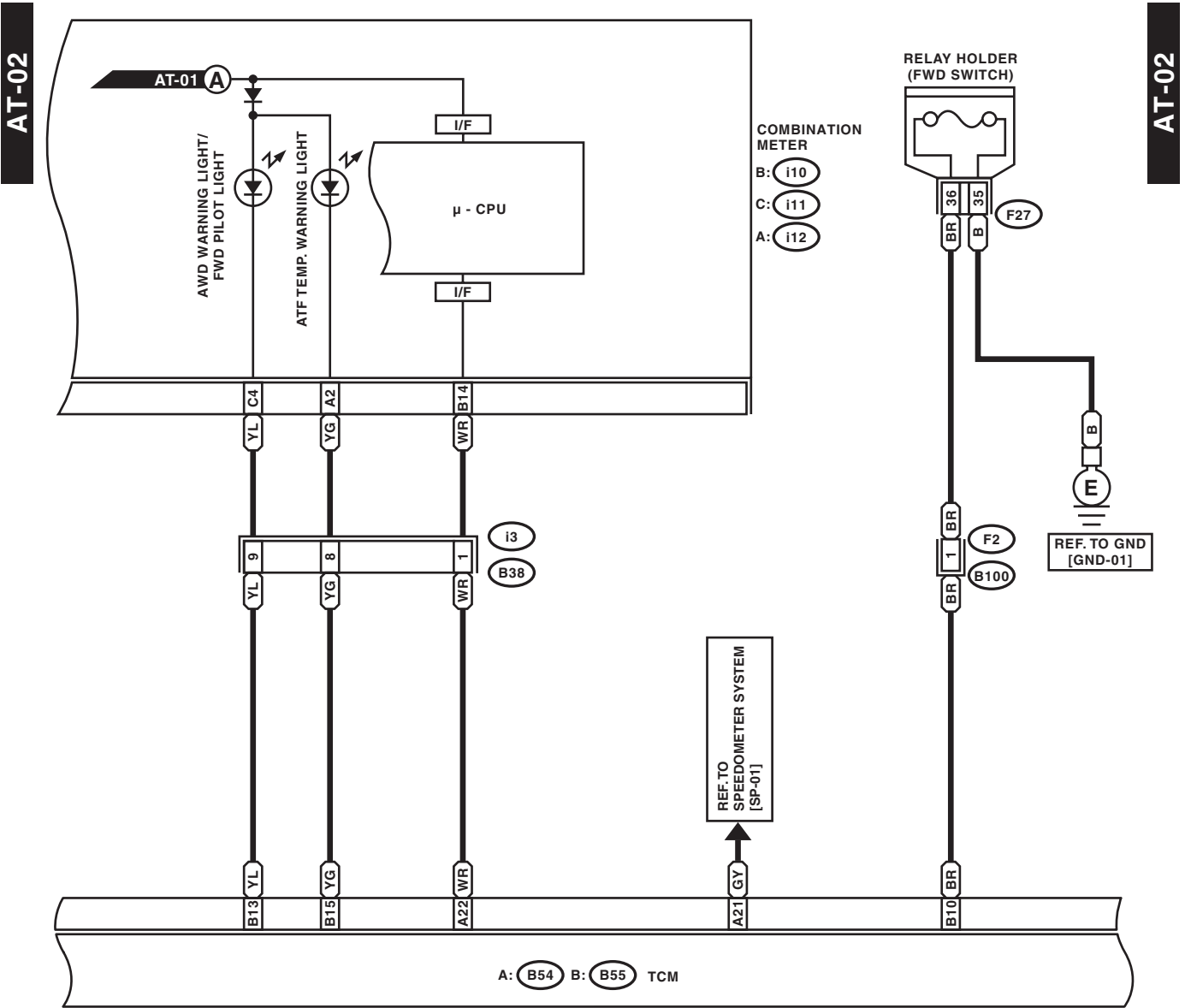
A: B54 HR



WI-15003

AT Control System

WIRING SYSTEM

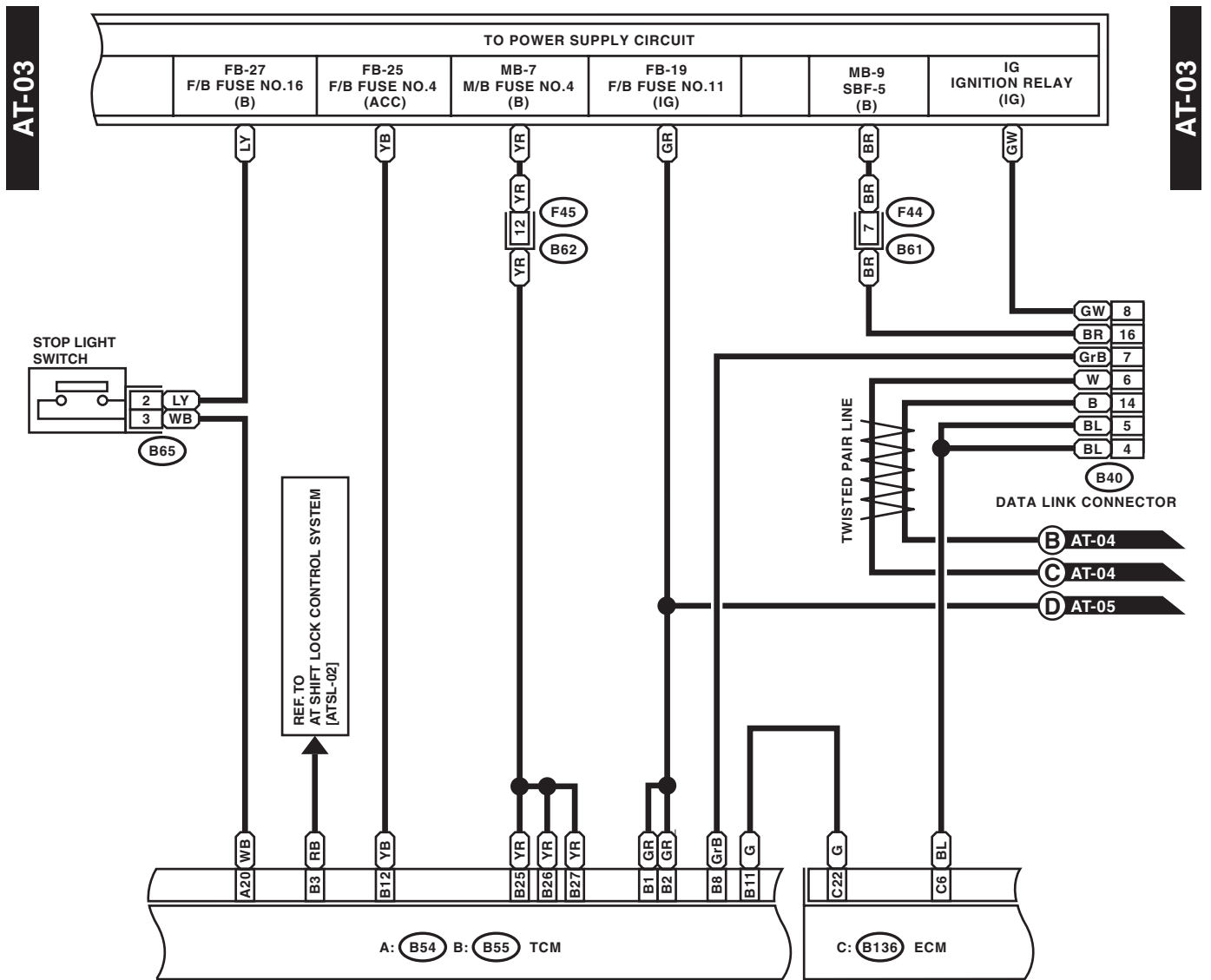


RELAY HOLDER

WI-15004

AT Control System

WIRING SYSTEM



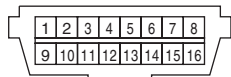
B65 (BLACK)



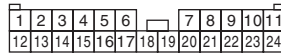
F44 (BLACK)



B40 (BLACK)



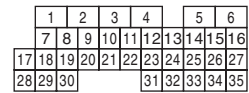
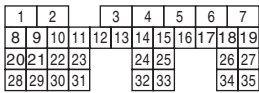
F45 (BLACK)



A: B54 HR

C: B136 HR

B: B55 HR



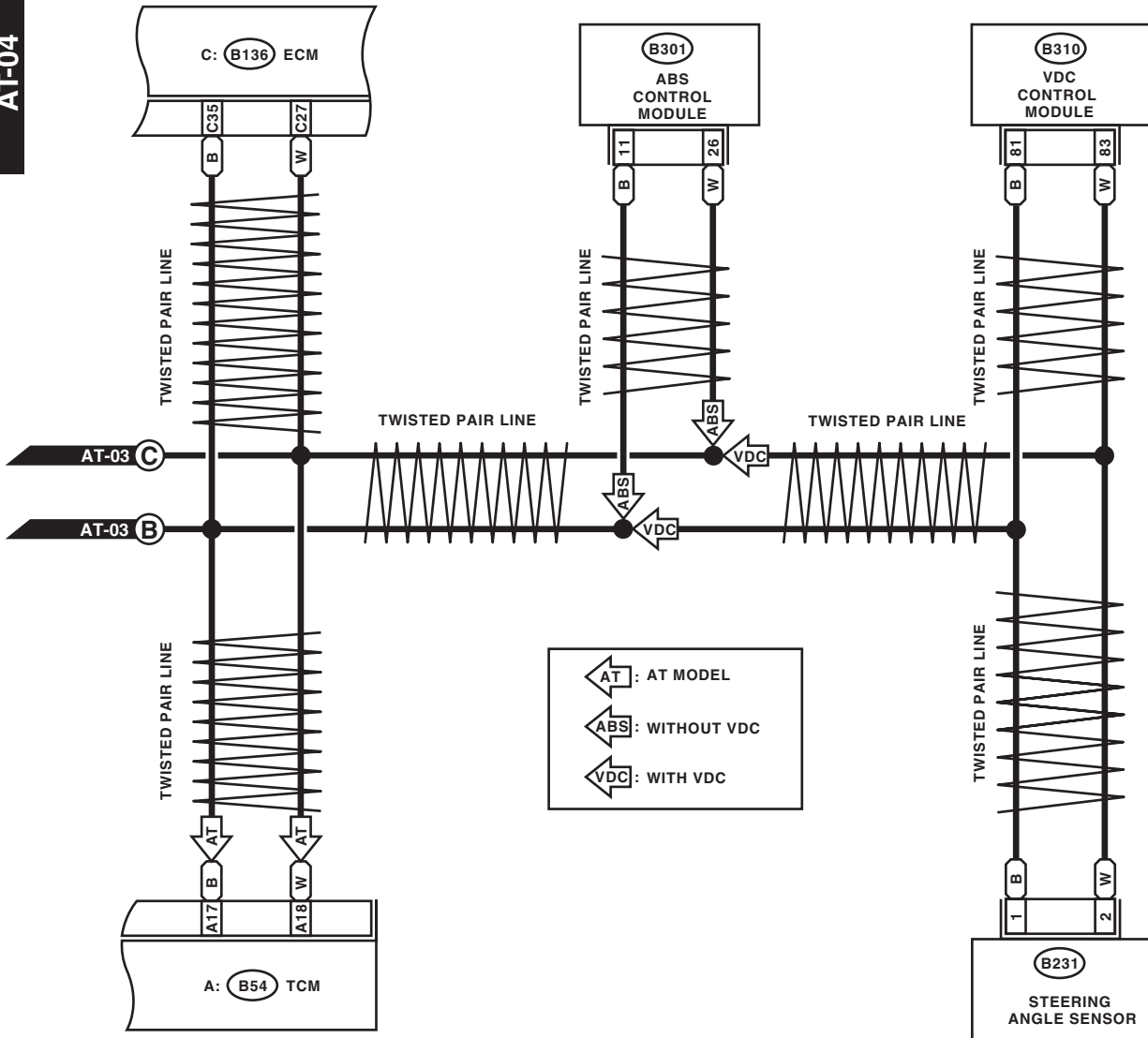
WI-15005

AT Control System

WIRING SYSTEM

AT-04

AT-04

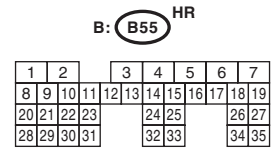
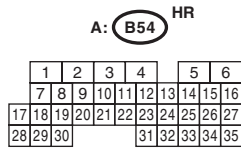
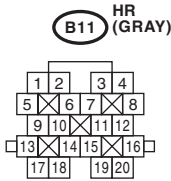
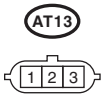
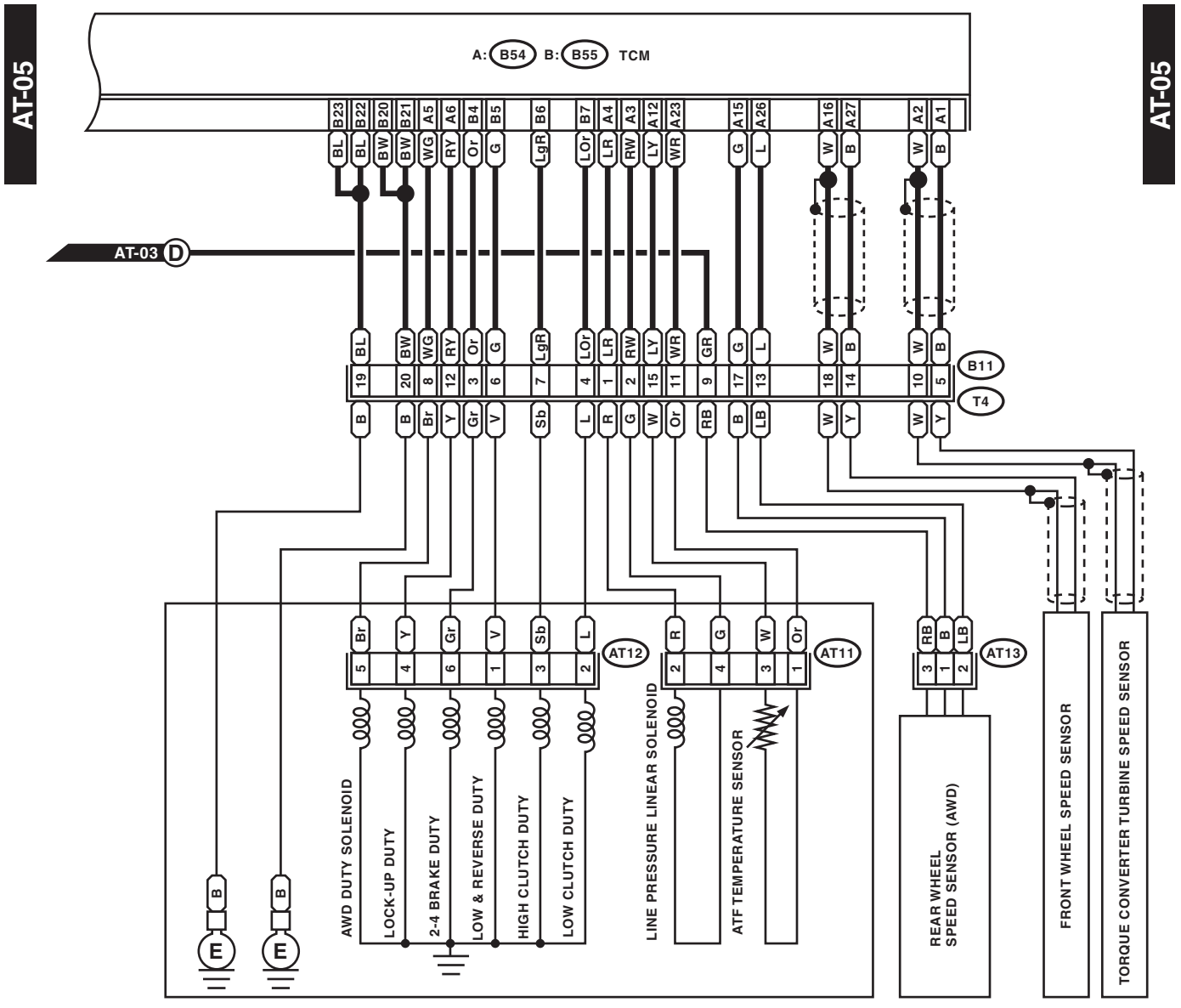


B231				B301 (BLACK)											A: B54 HR						C: B136 HR																		
1	2	3	4	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5	6	1	2	3	4	5	6													
				12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
																		28	29	30		31	32	33	34	35													
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28												
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55													
56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83												

WI-15236

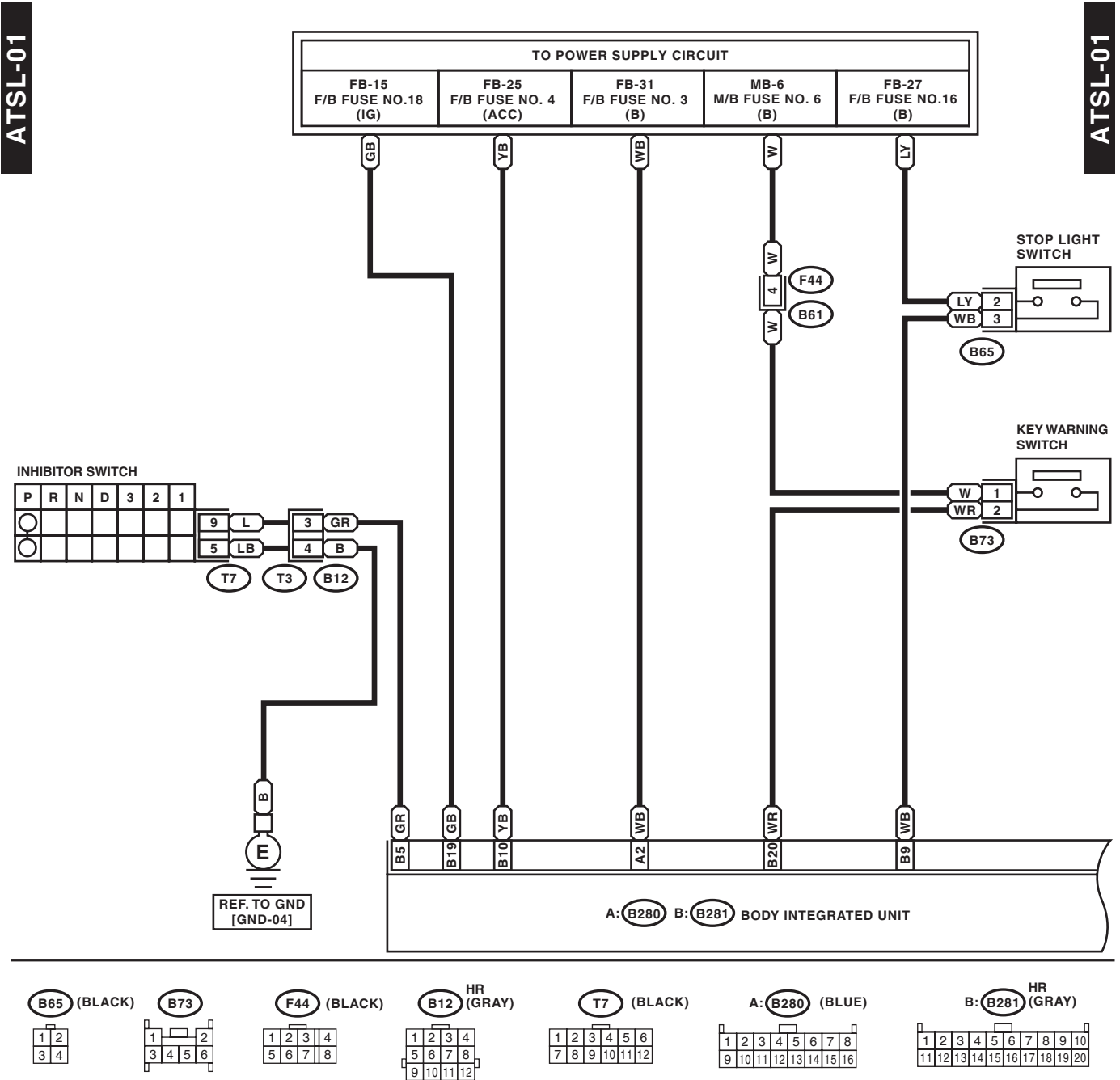
AT Control System

WIRING SYSTEM



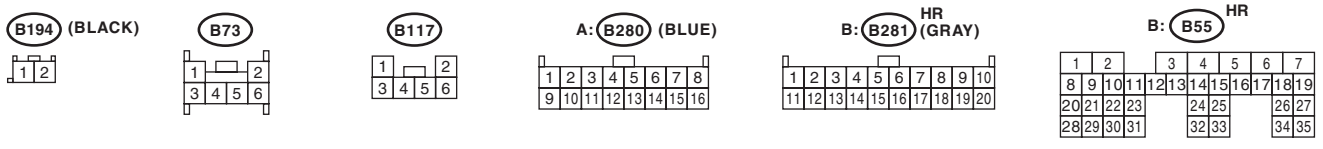
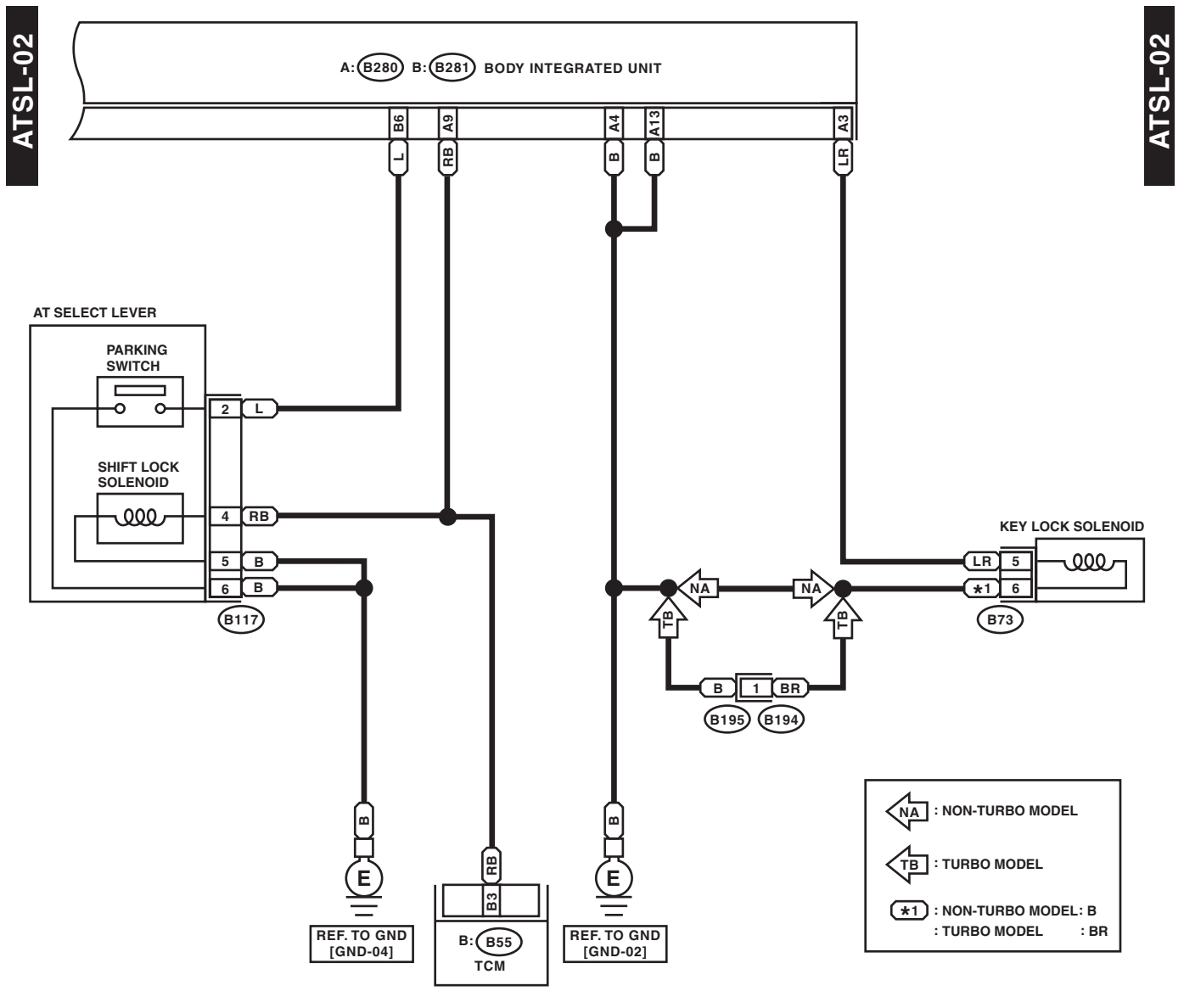
7. AT Shift Lock Control System

A: WIRING DIAGRAM



AT Shift Lock Control System

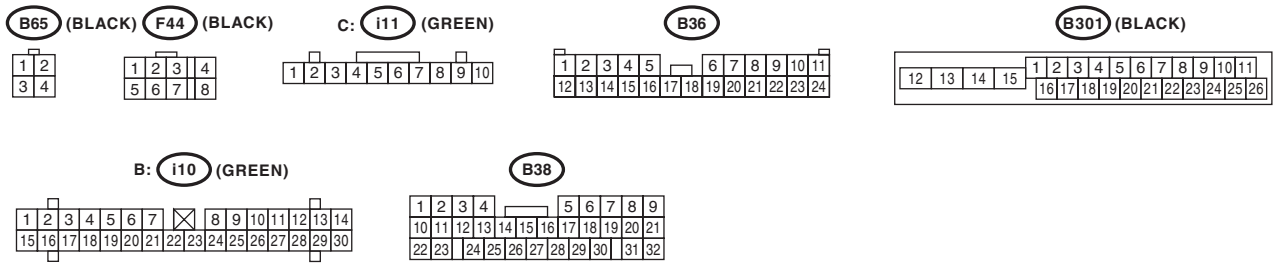
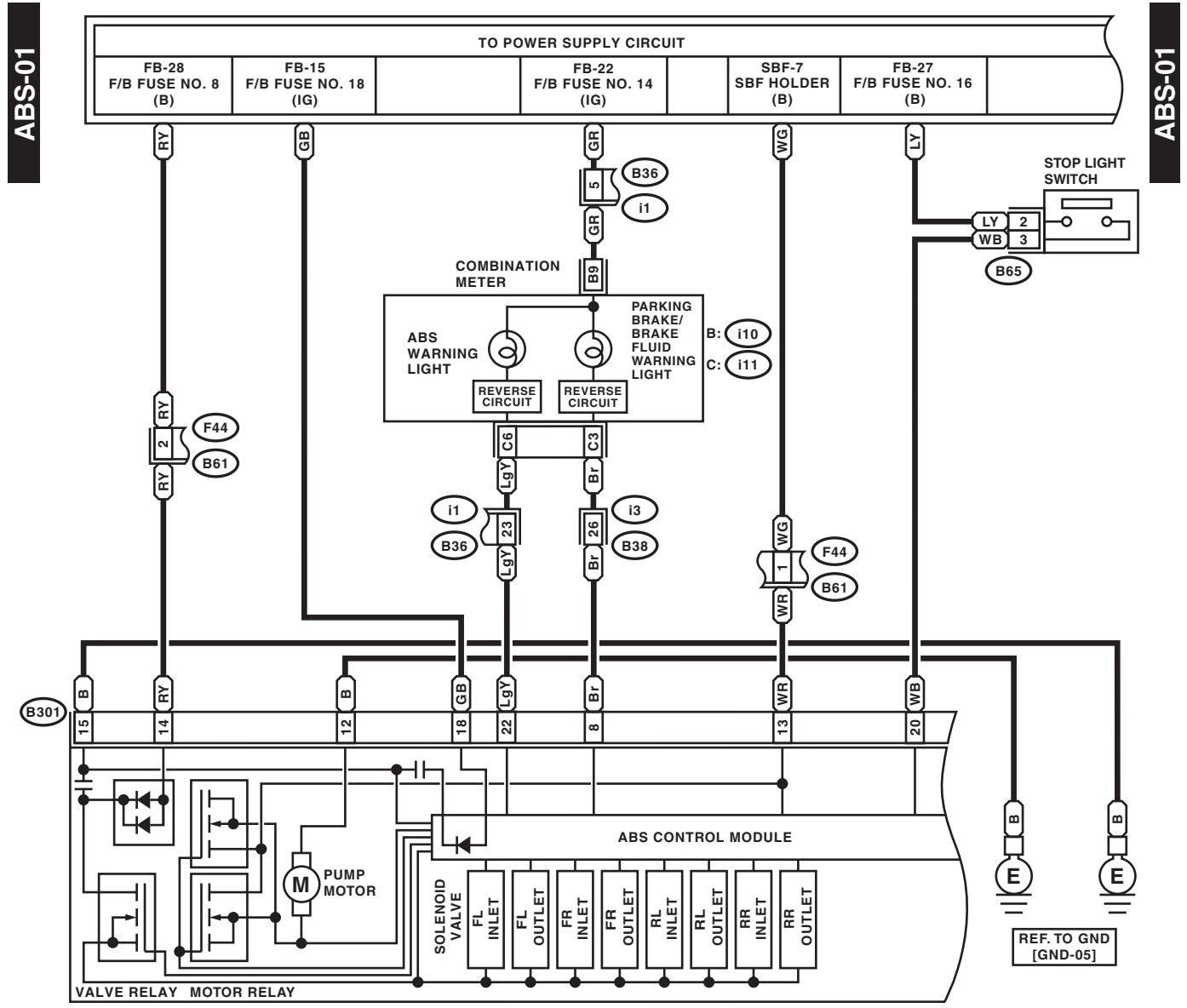
WIRING SYSTEM



WI-15009

8. Anti-Lock Brake System

A: WIRING DIAGRAM



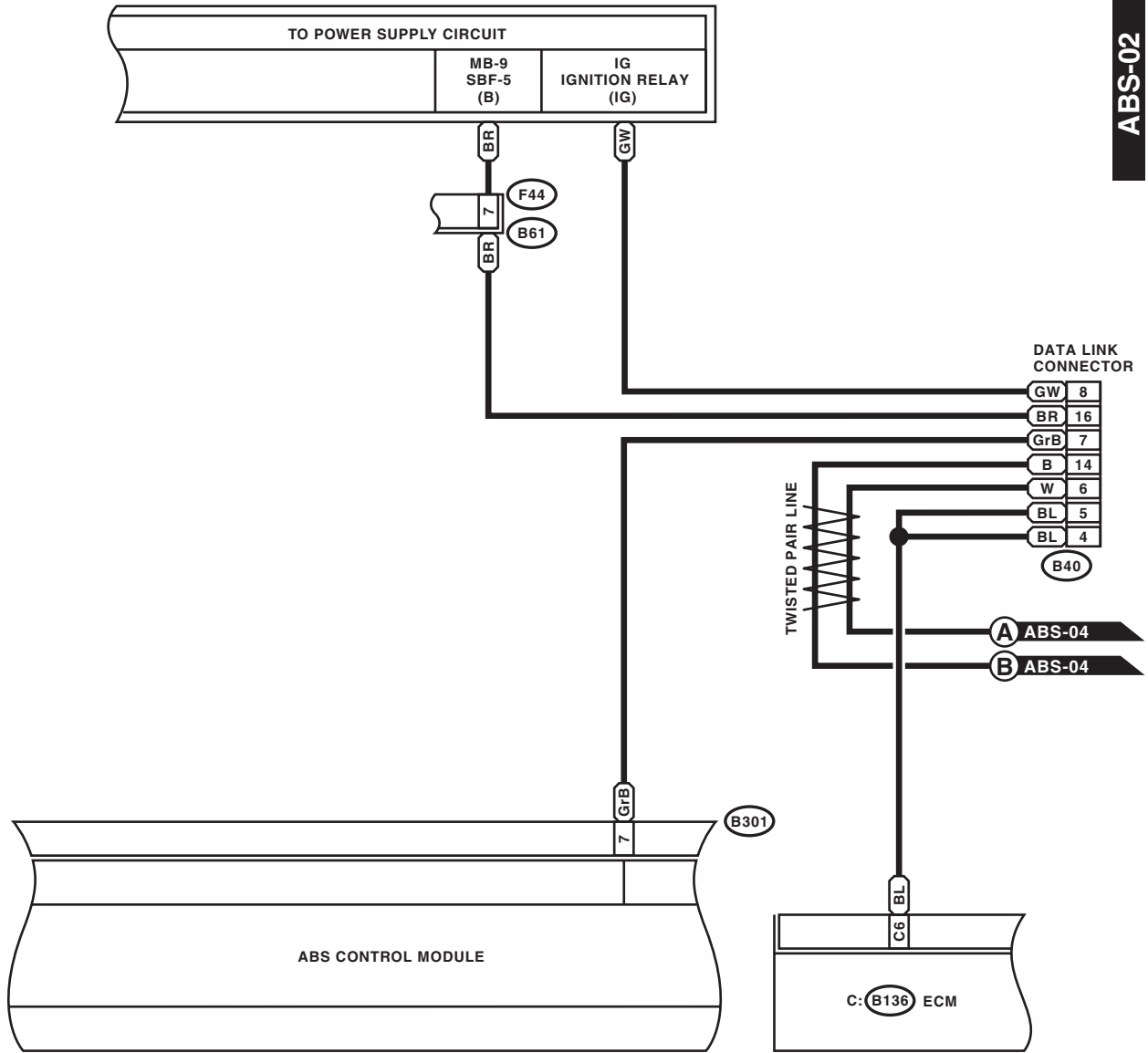
WI-15250

Anti-Lock Brake System

WIRING SYSTEM

ABS-02

ABS-02



F44 (BLACK)

1	2	3	4
5	6	7	8

B40 (BLACK)

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16

B301 (BLACK)

12	13	14	15	1	2	3	4	5	6	7	8	9	10	11
16	17	18	19	20	21	22	23	24	25	26				

C: B136 HR

1	2	3	4	5	6										
7	8	9	10	11	12	13	14	15	16						
17	18	19	20	21	22	23	24	25	26	27					
28	29	30									31	32	33	34	35

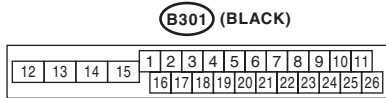
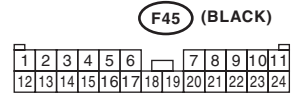
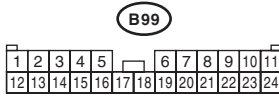
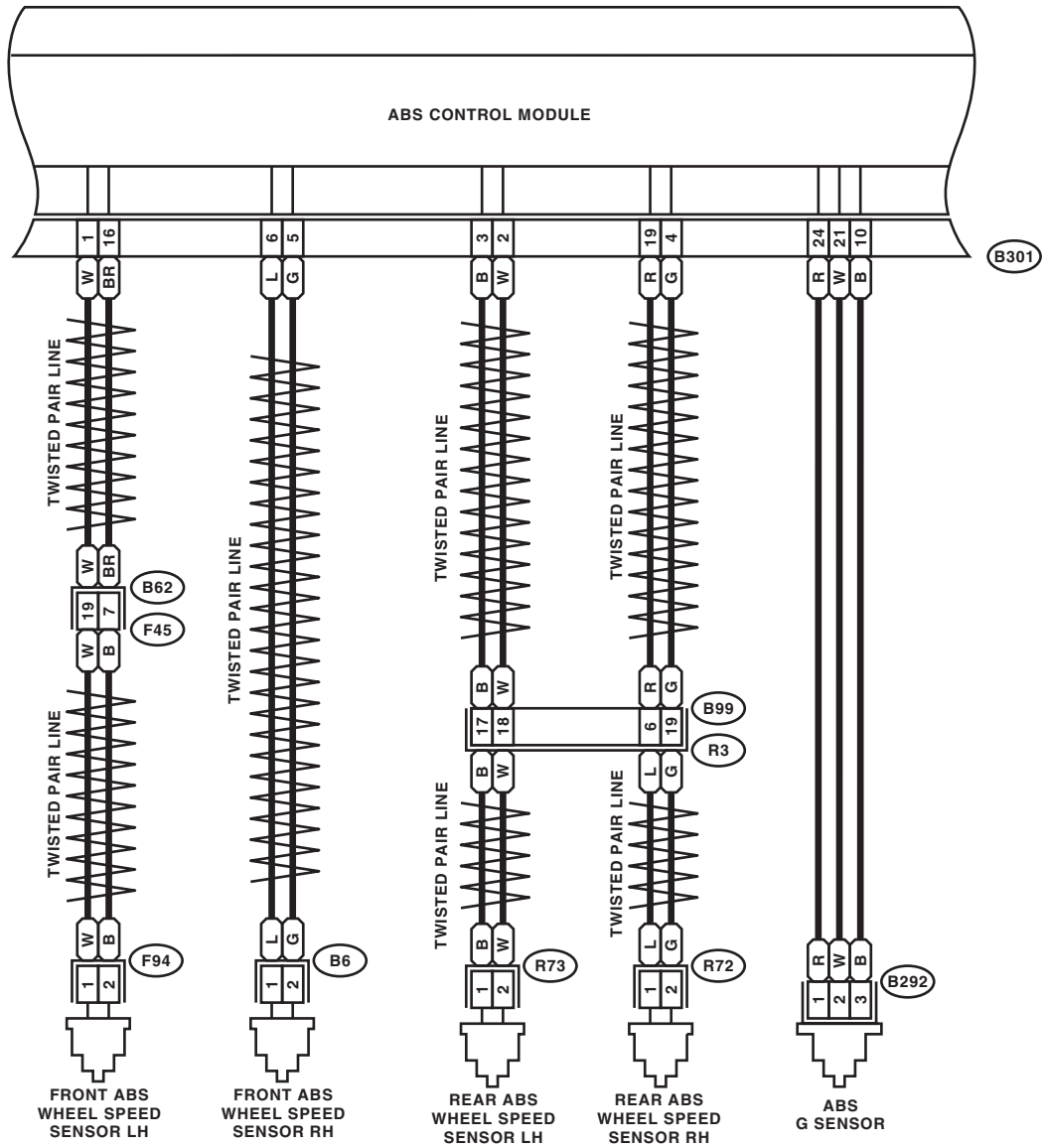
WI-15010

Anti-Lock Brake System

WIRING SYSTEM

ABS-03

ABS-03



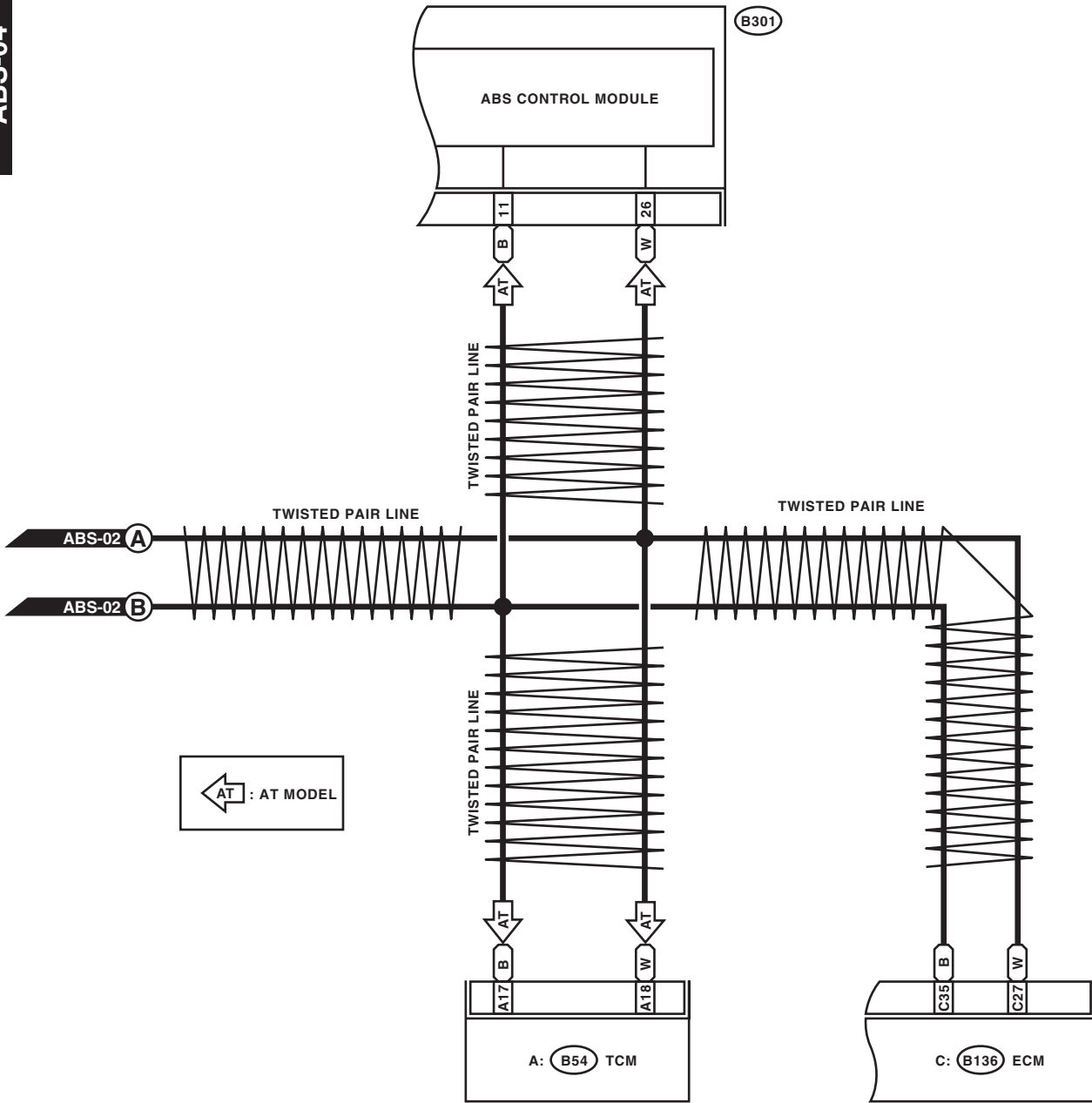
WI-15011

Anti-Lock Brake System

WIRING SYSTEM

ABS-04

ABS-04



B301 (BLACK)

12	13	14	15	1	2	3	4	5	6	7	8	10	11	
				16	17	18	19	20	21	22	23	24	25	26

A: B54 HR

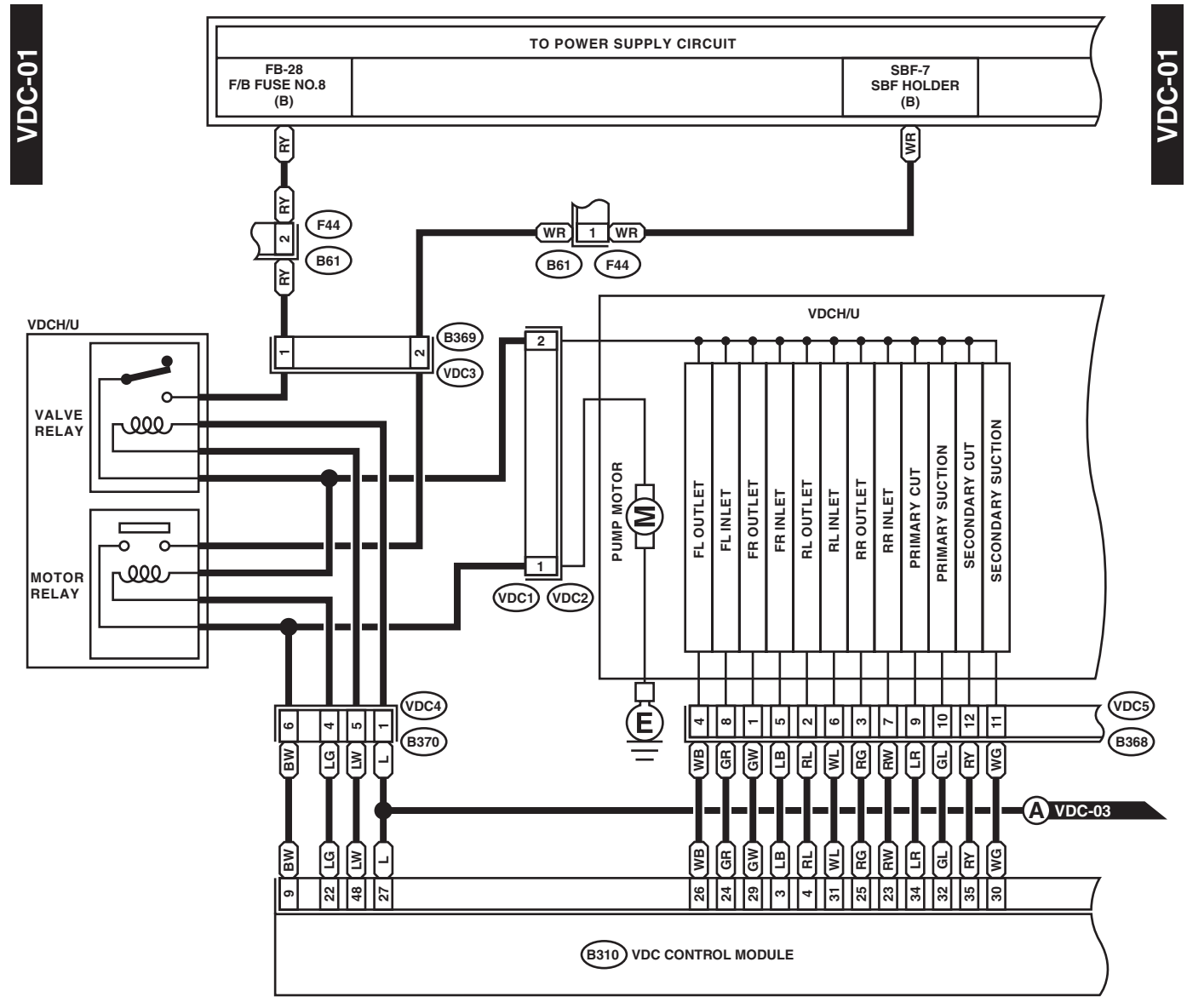
C: B136 HR

1	2	3	4	5	6					
7	8	9	10	11	12	13	14	15	16	
17	18	19	20	21	22	23	24	25	26	27
28	29	30				31	32	33	34	35

WI-15012

9. Vehicle Dynamics Control System

A: WIRING DIAGRAM

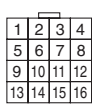


B369 (GRAY)

B370 (BLACK)

F44 (BLACK)

VDC5 (BLACK)

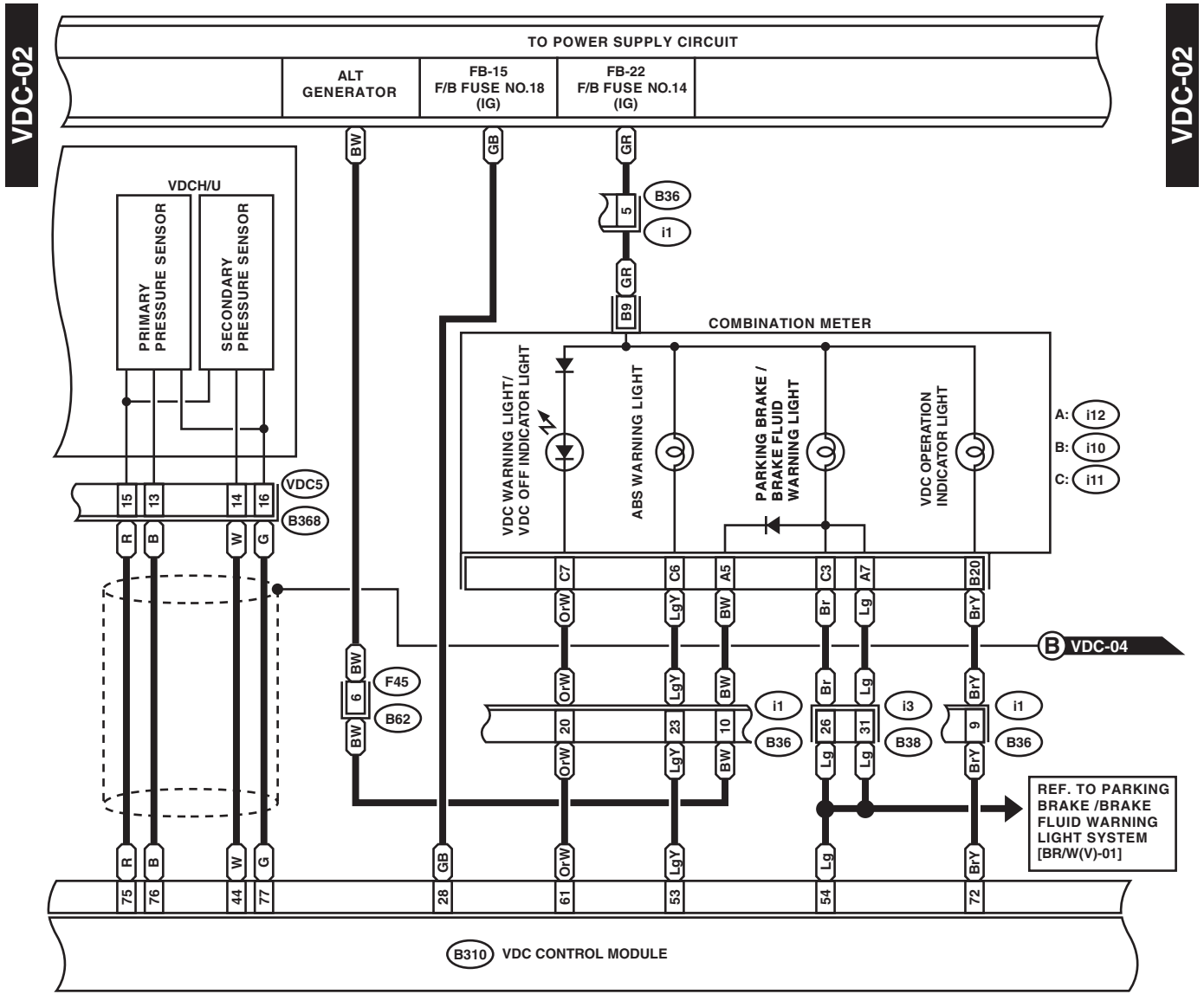


B310 (BLACK)

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29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84

Vehicle Dynamics Control System

WIRING SYSTEM

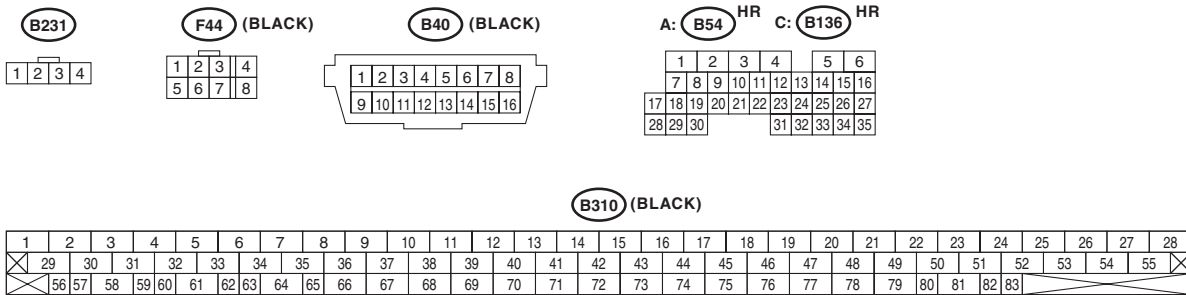
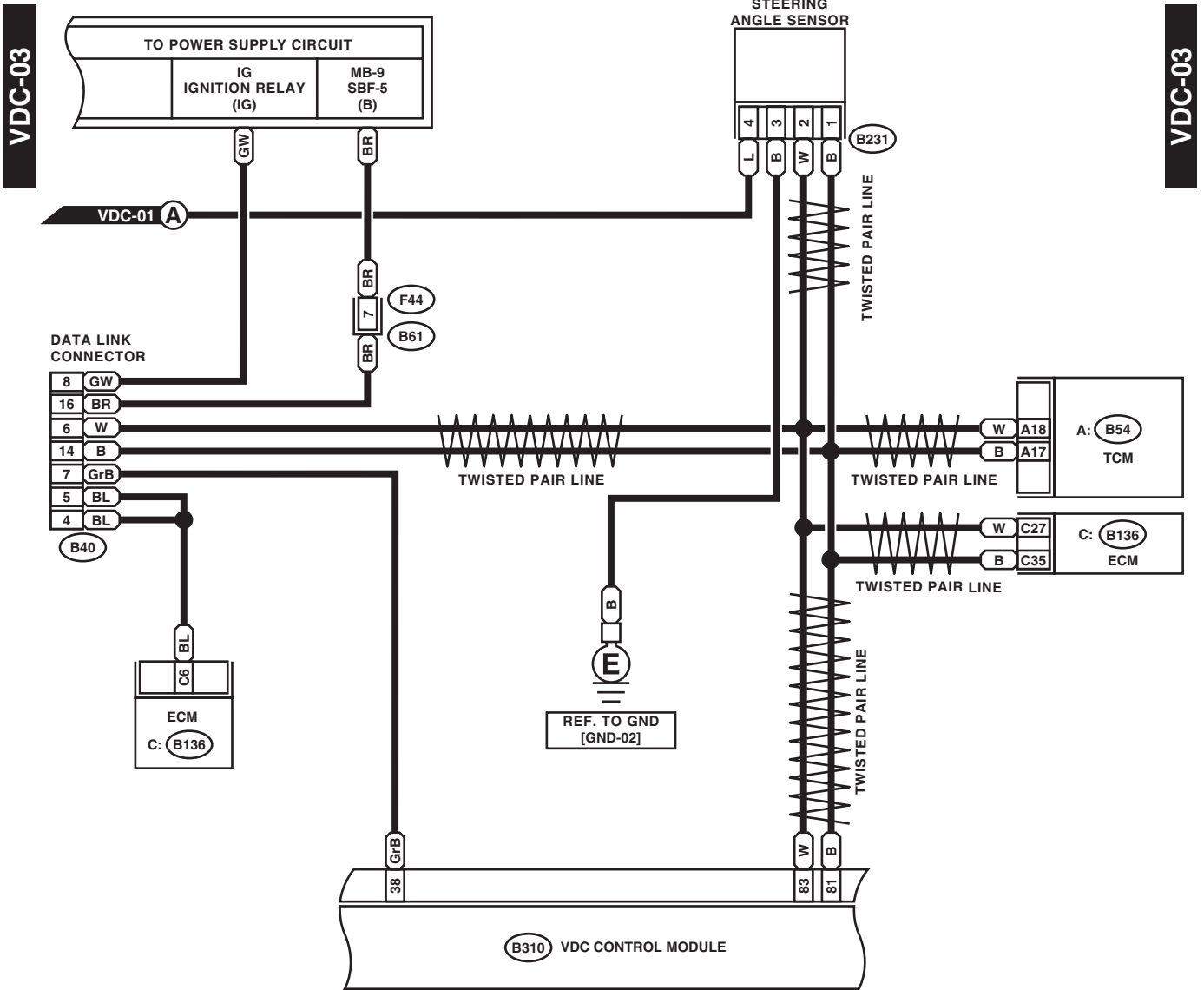


C: i11 (GREEN)	A: i12 (GREEN)	VDC5 (BLACK)	B36	F45 (BLACK)																																																																																				
1 2 3 4 5 6 7 8 9 10	1 2 3 4 5 6 7 8 9 10 11 12 13 14	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	1 2 3 4 5 12 13 14 15 16 17 18 19 20 21 22 23 24	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24																																																																																				
B: i10 (GREEN)	B38	B310 (BLACK)																																																																																						
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28																																																																																						
<table border="1"> <tr> <td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td> </tr> <tr> <td>29</td><td>30</td><td>31</td><td>32</td><td>33</td><td>34</td><td>35</td><td>36</td><td>37</td><td>38</td><td>39</td><td>40</td><td>41</td><td>42</td><td>43</td><td>44</td><td>45</td><td>46</td><td>47</td><td>48</td><td>49</td><td>50</td><td>51</td><td>52</td><td>53</td><td>54</td><td>55</td><td>56</td> </tr> <tr> <td>57</td><td>58</td><td>59</td><td>60</td><td>61</td><td>62</td><td>63</td><td>64</td><td>65</td><td>66</td><td>67</td><td>68</td><td>69</td><td>70</td><td>71</td><td>72</td><td>73</td><td>74</td><td>75</td><td>76</td><td>77</td><td>78</td><td>79</td><td>80</td><td>81</td><td>82</td><td>83</td><td>84</td> </tr> </table>					1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28																																																													
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56																																																													
57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84																																																													

WI-15238

Vehicle Dynamics Control System

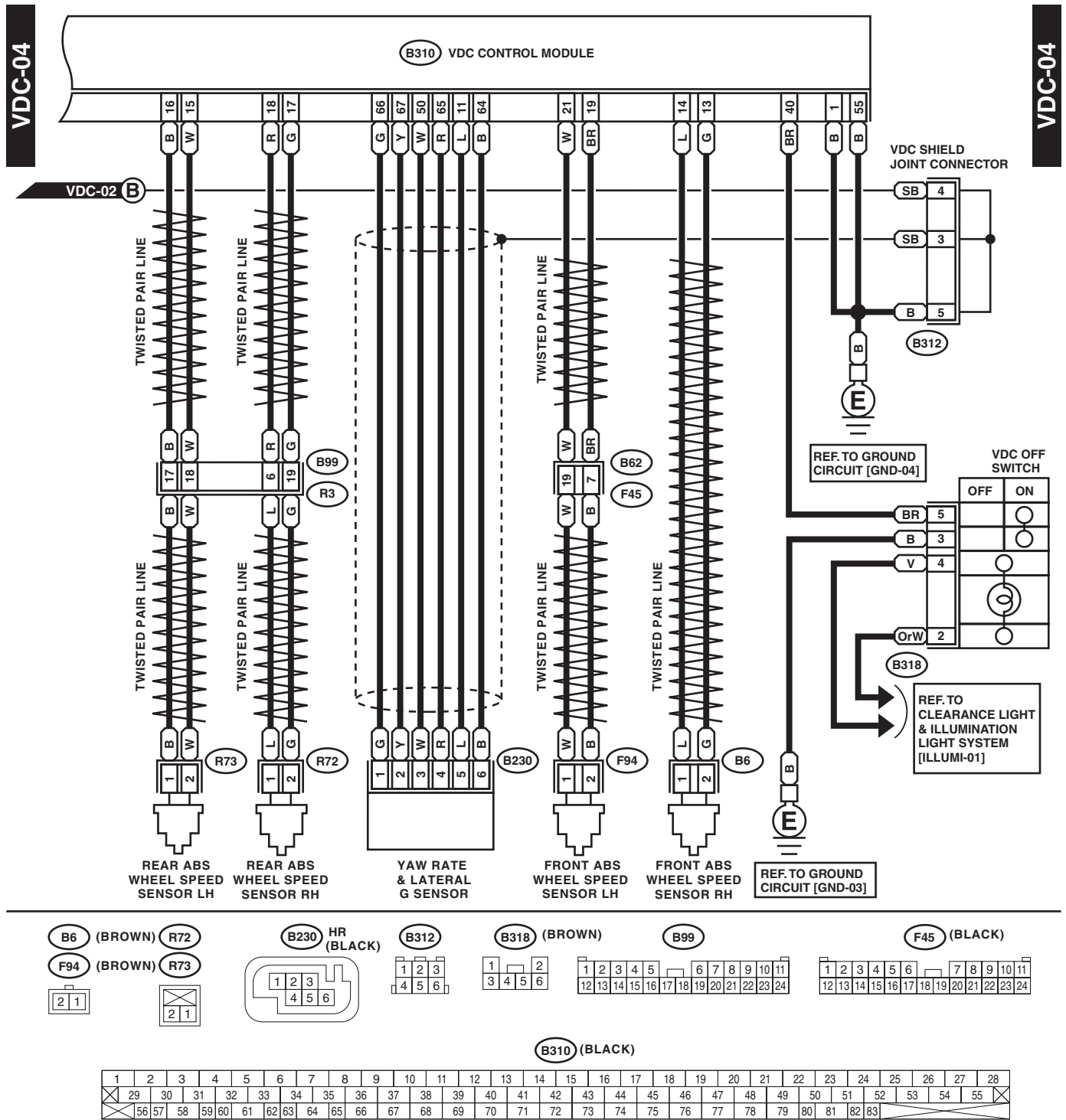
WIRING SYSTEM



WI-15239

Vehicle Dynamics Control System

WIRING SYSTEM

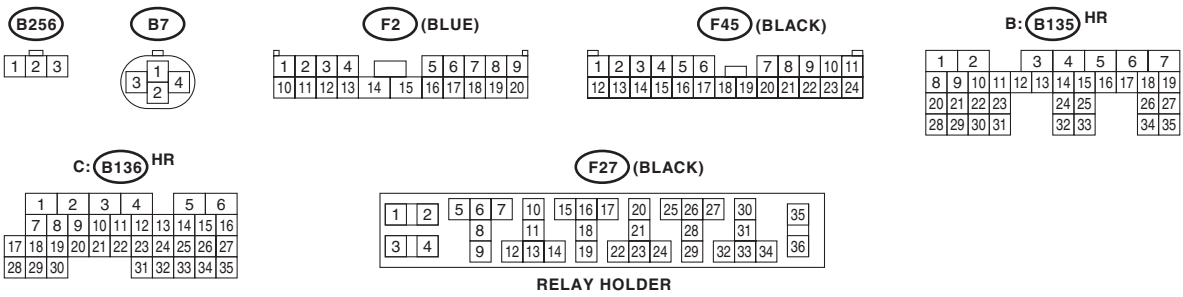
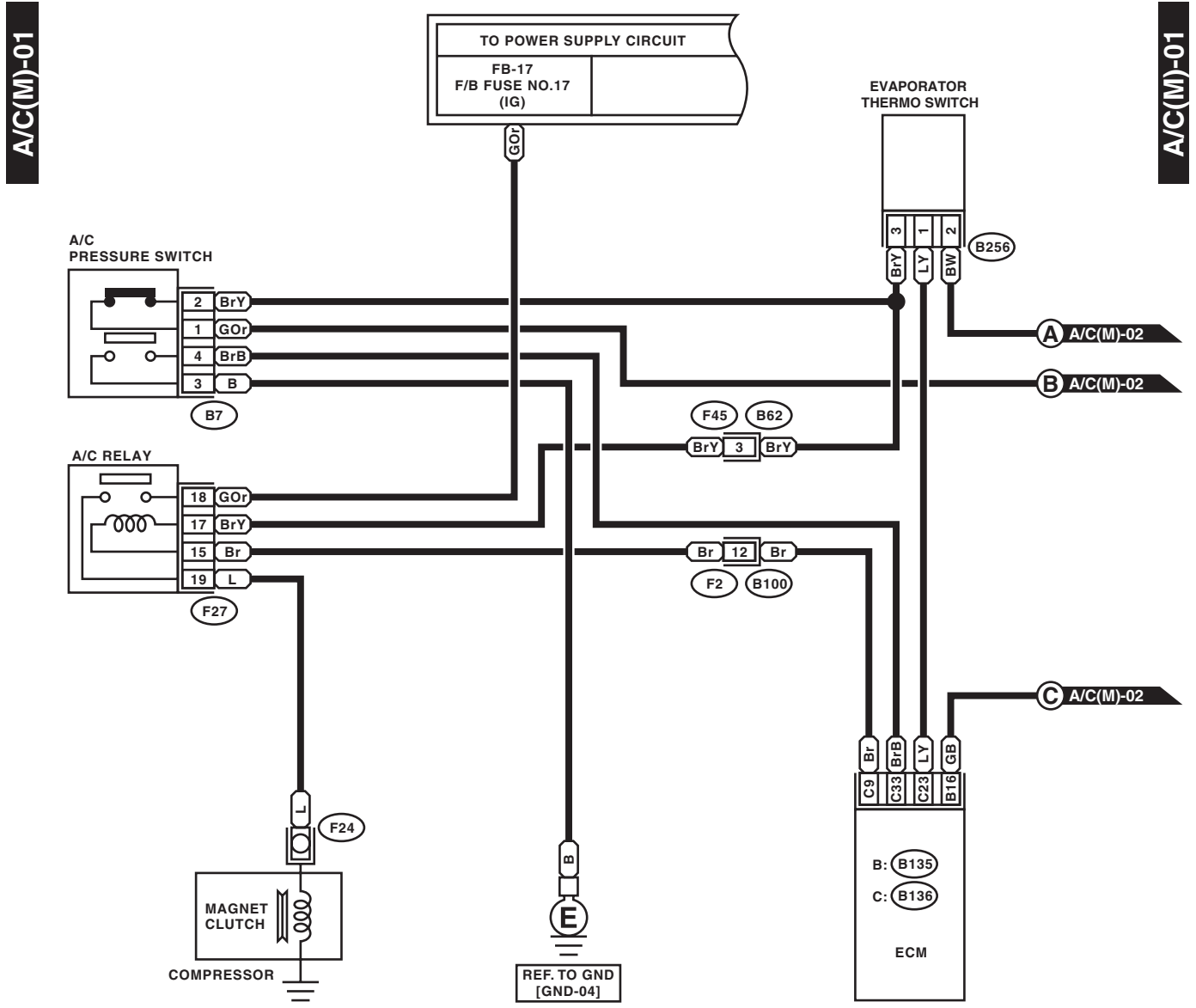


WI-15240

10. Air Conditioning System

A: WIRING DIAGRAM

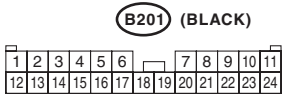
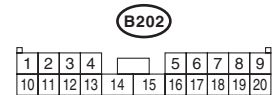
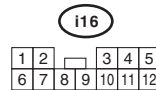
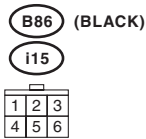
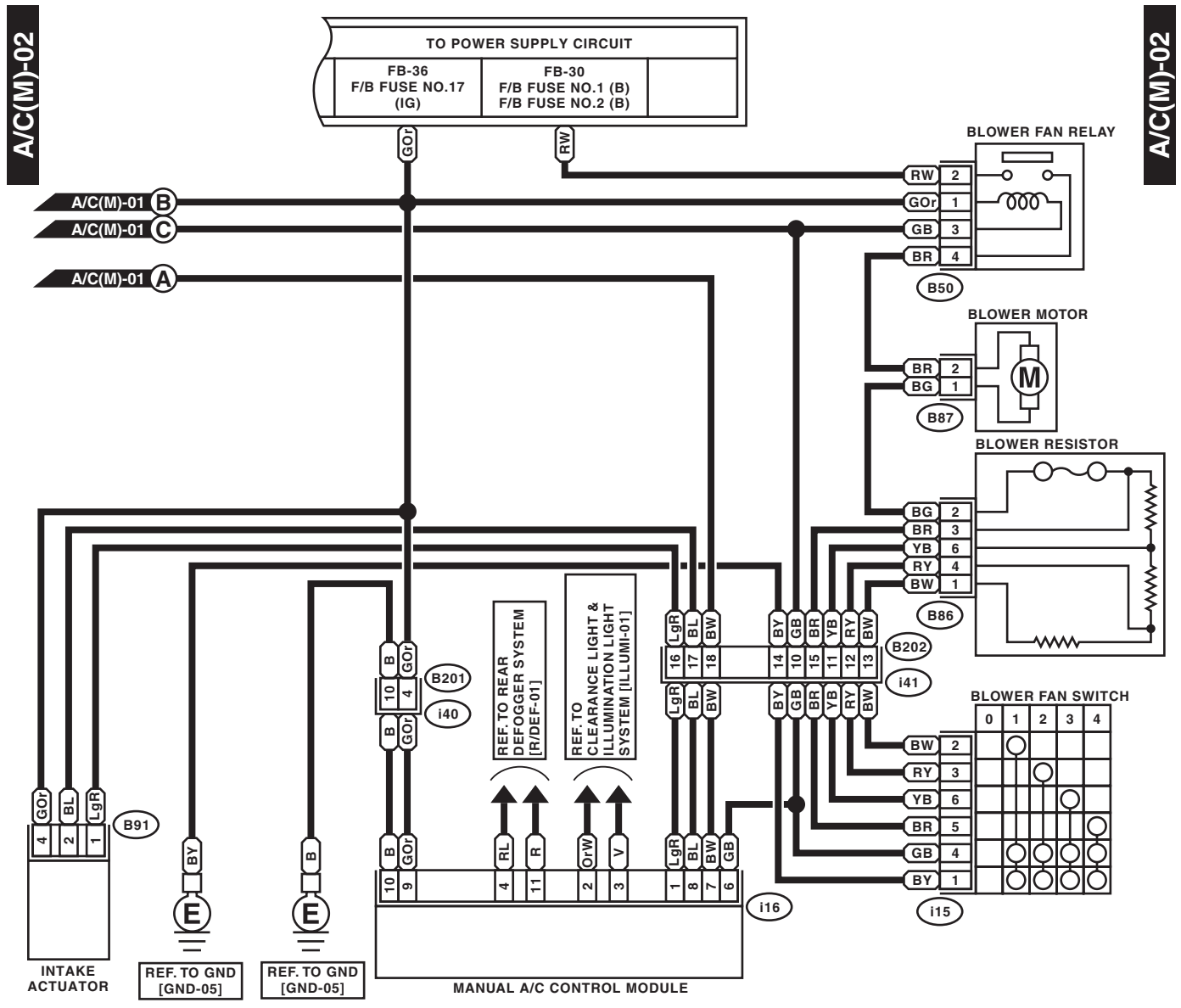
1. MANUAL A/C MODEL



WI-15013

Air Conditioning System

WIRING SYSTEM

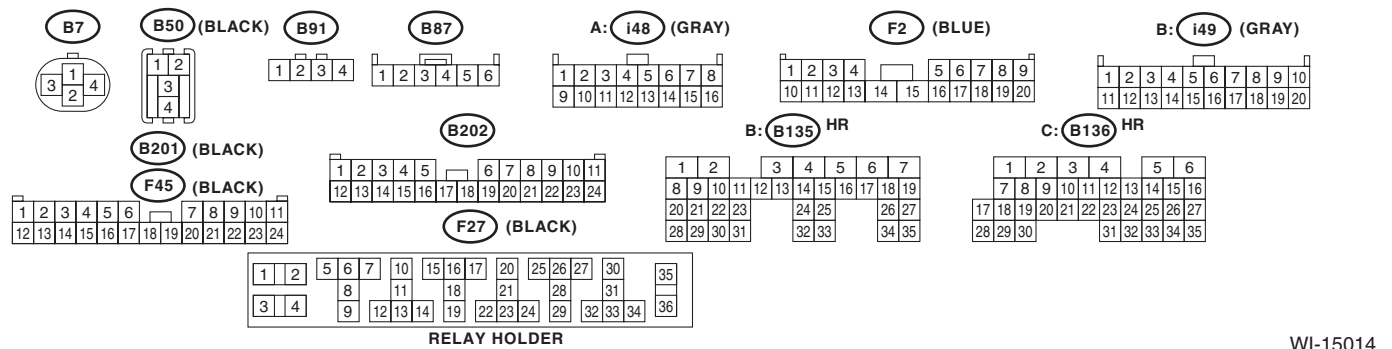
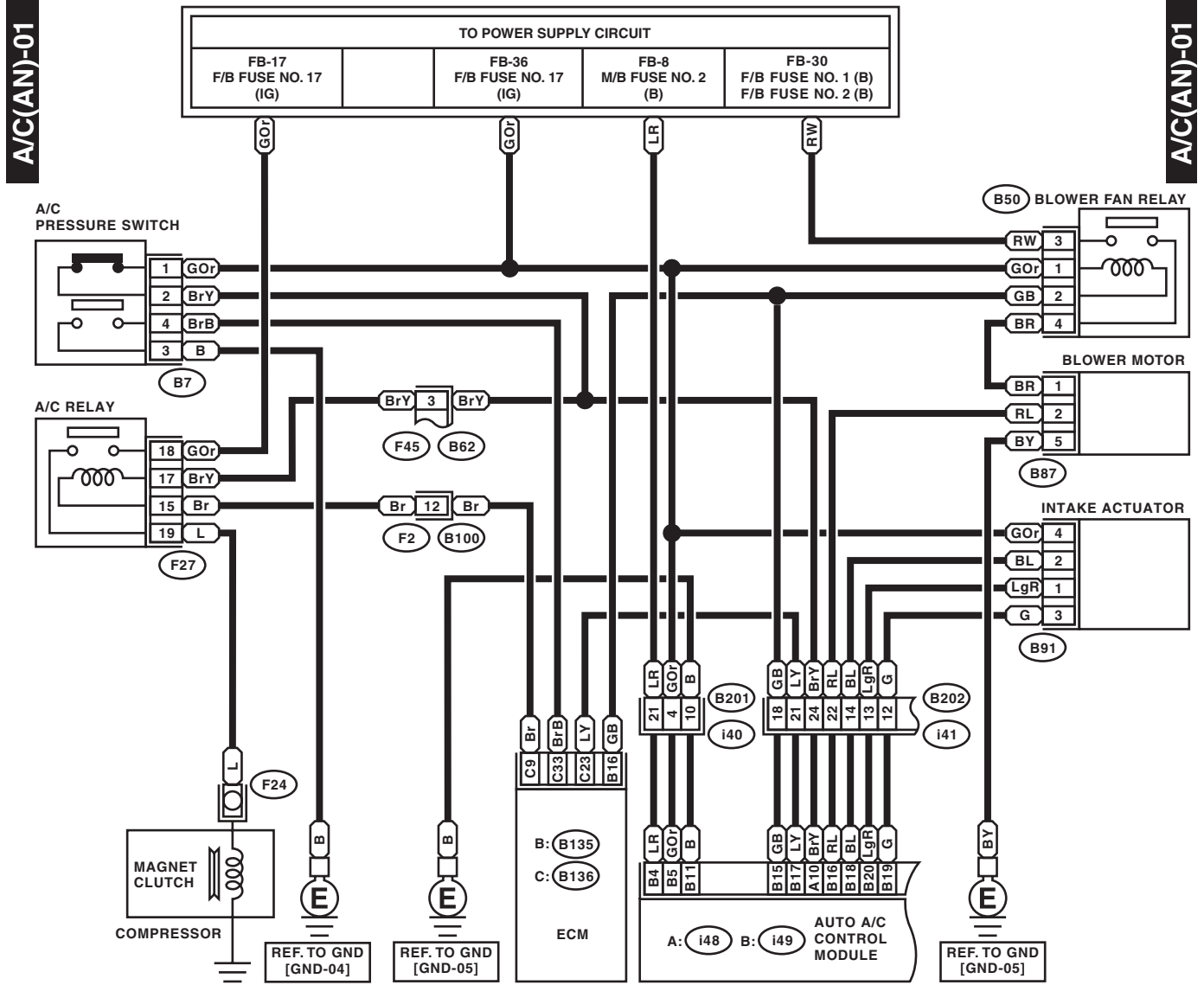


WI-12245

Air Conditioning System

WIRING SYSTEM

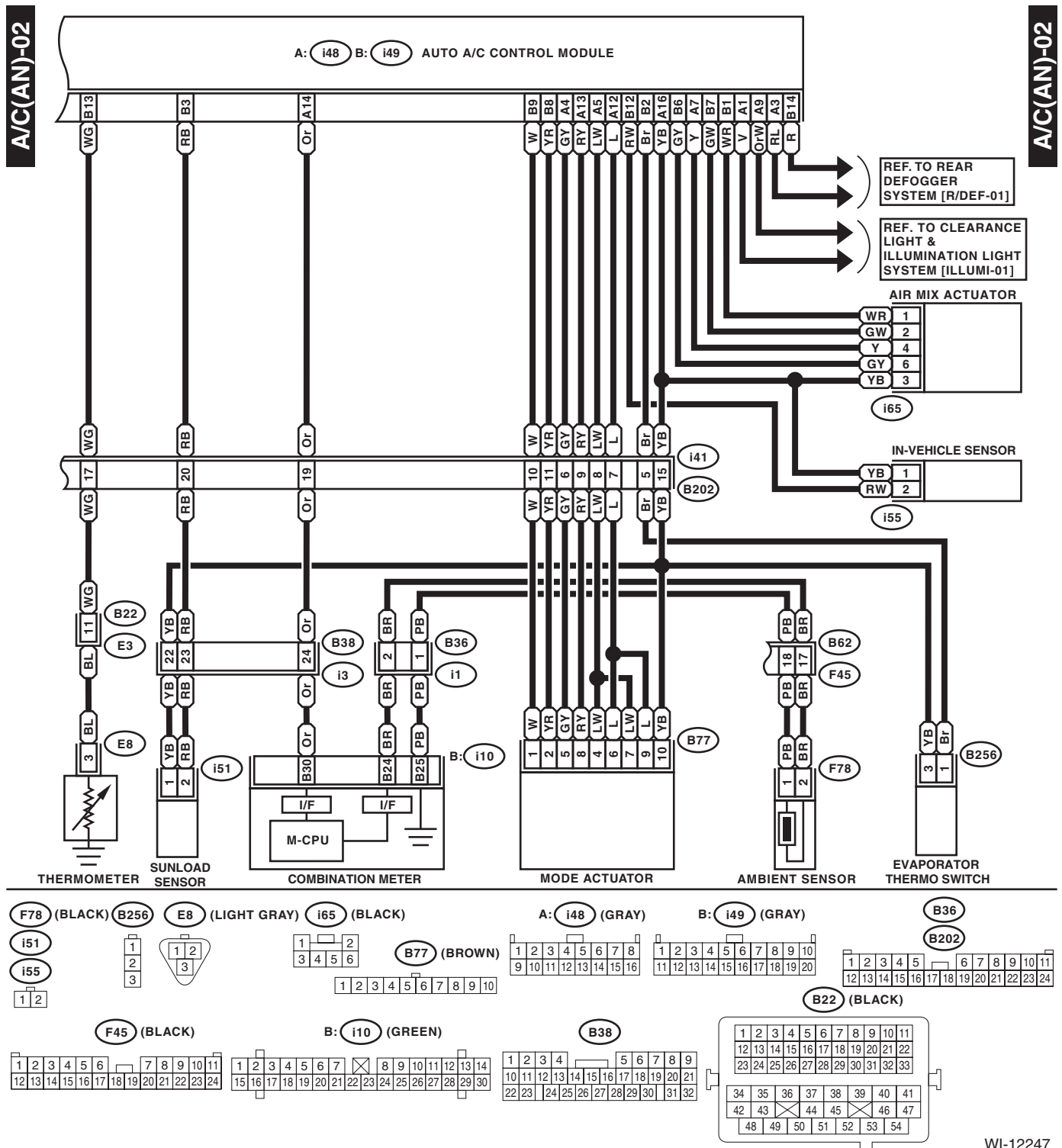
2. AUTO A/C NON-TURBO MODEL



WI-15014

Air Conditioning System

WIRING SYSTEM

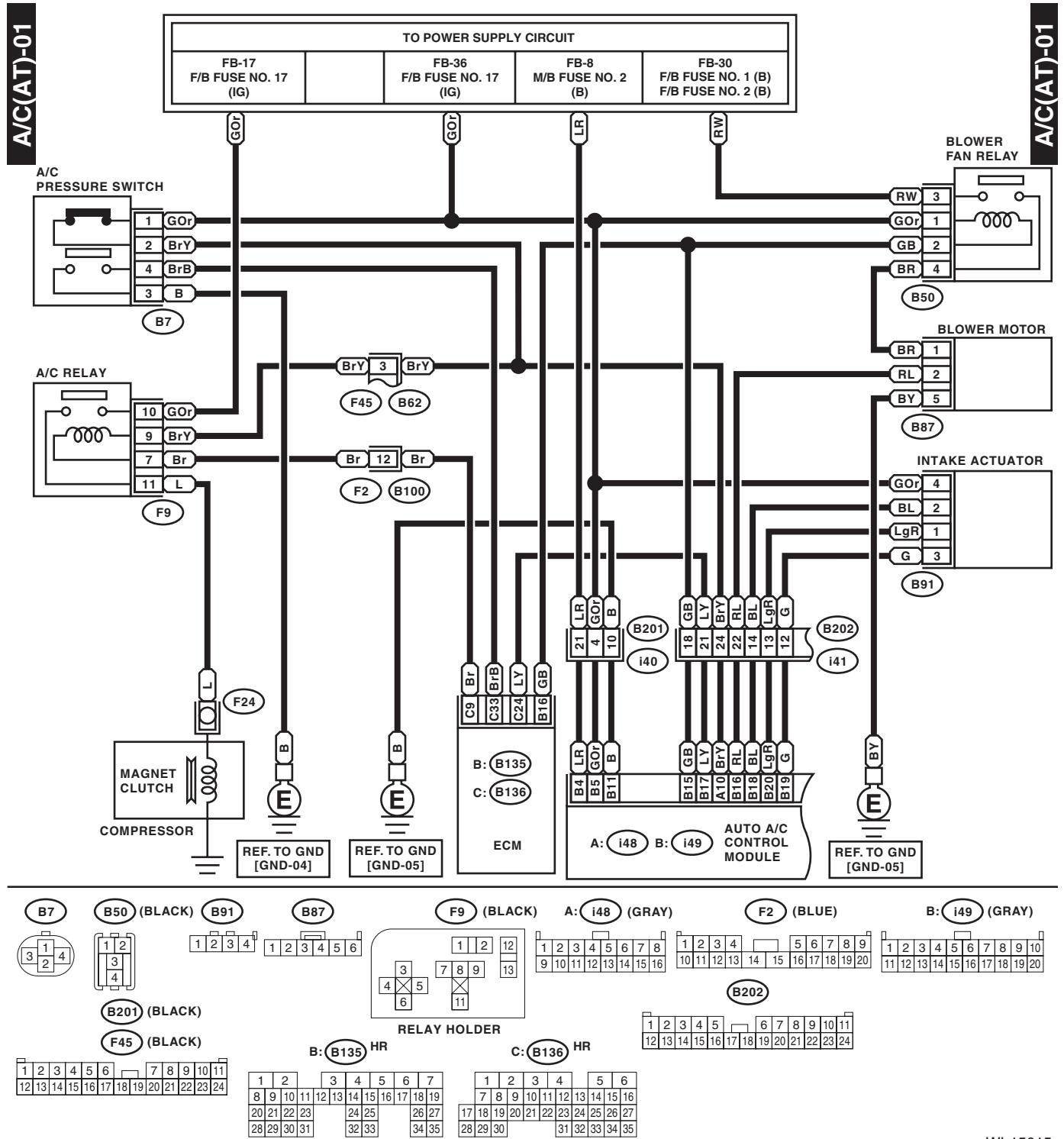


WI-12247

Air Conditioning System

WIRING SYSTEM

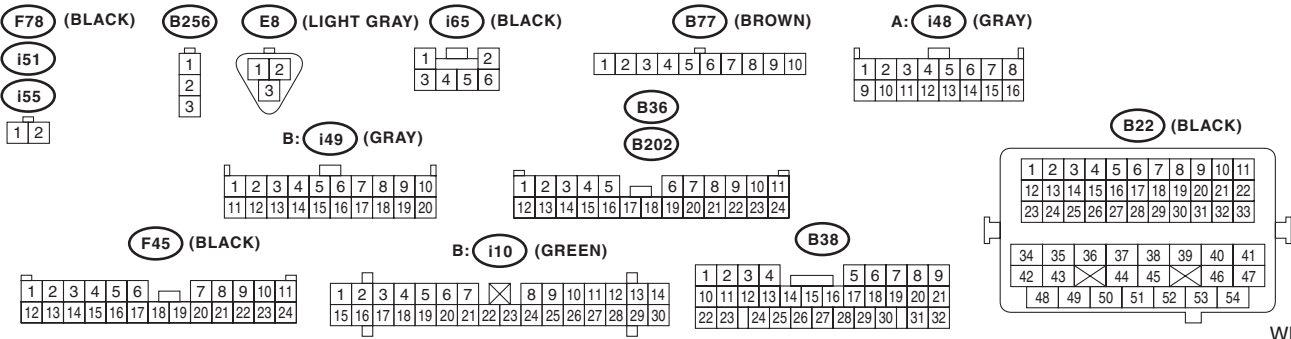
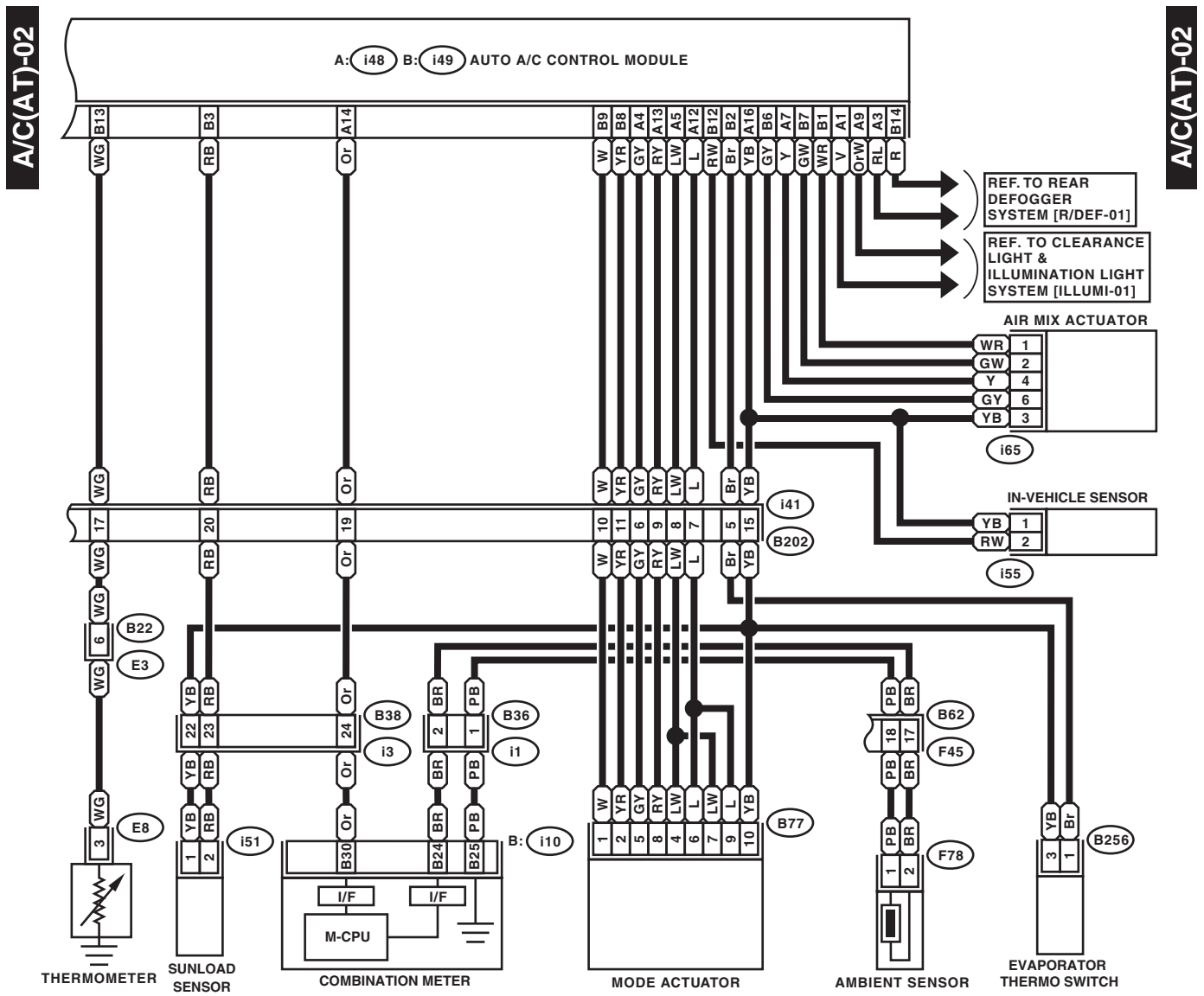
3. AUTO A/C TURBO MODEL



WI-15015

Air Conditioning System

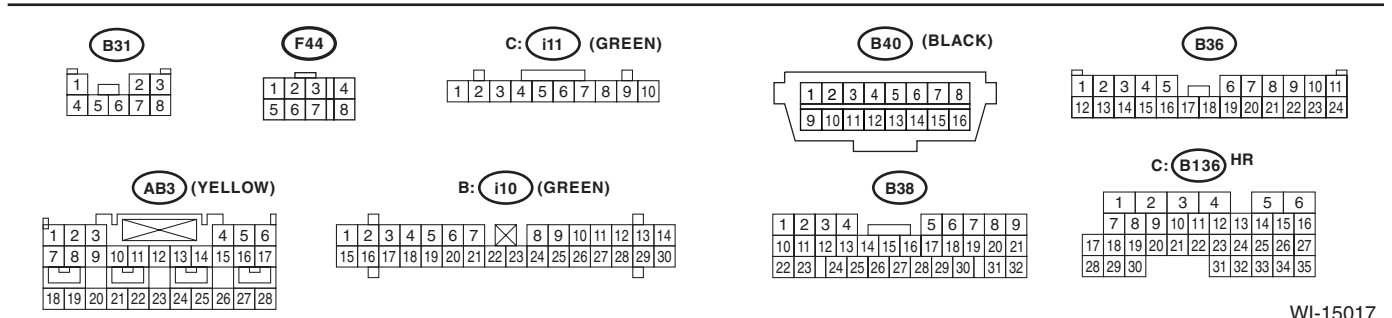
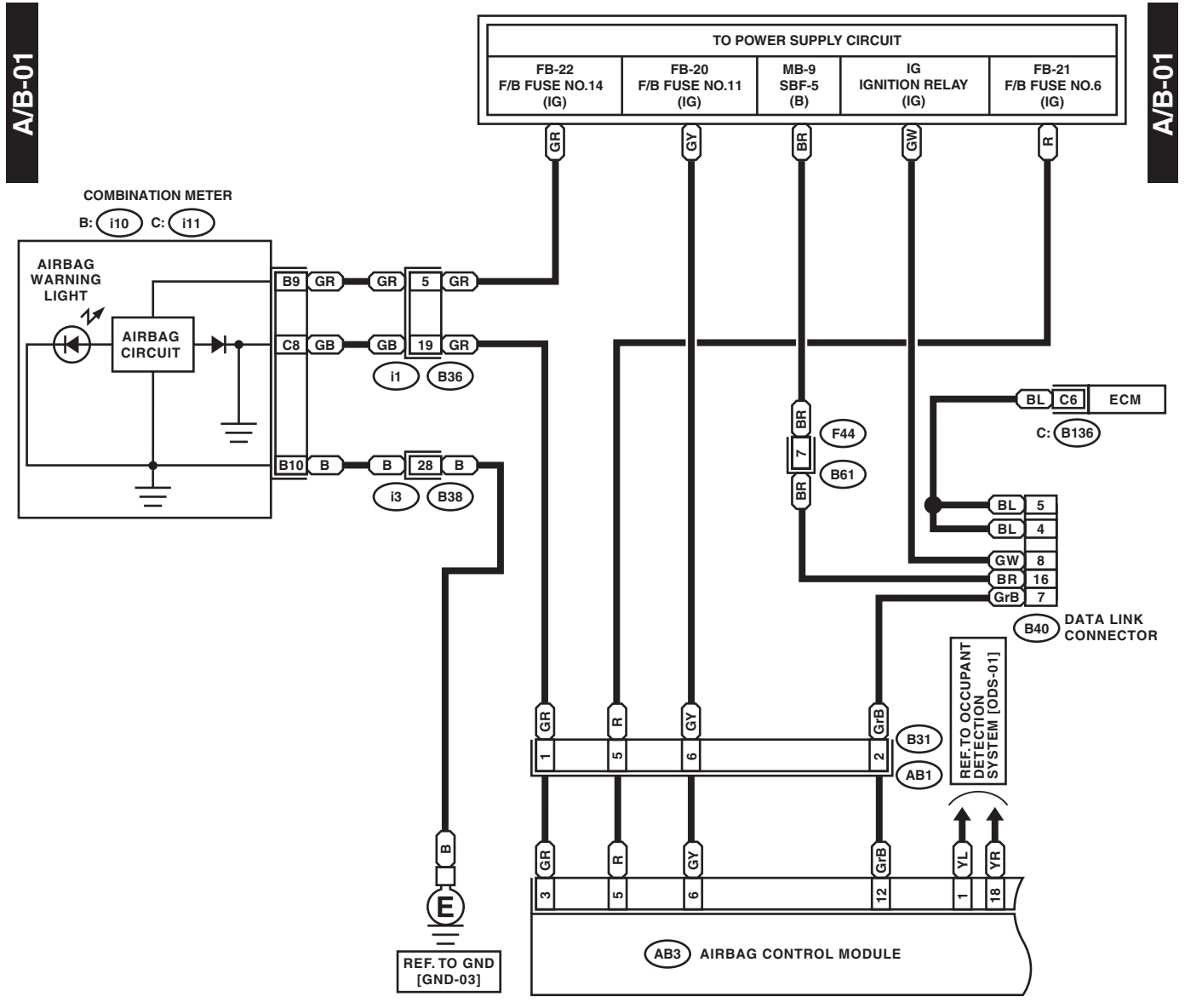
WIRING SYSTEM



WI-15016

11. Airbag System

A: WIRING DIAGRAM

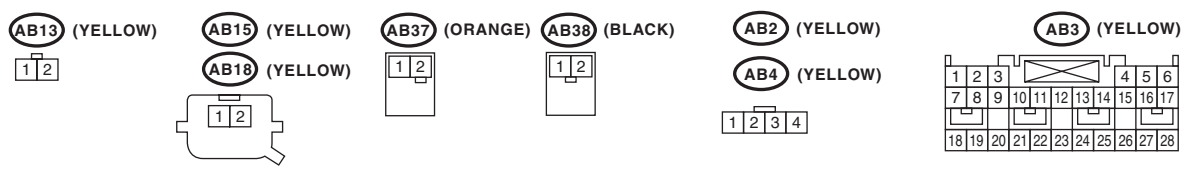
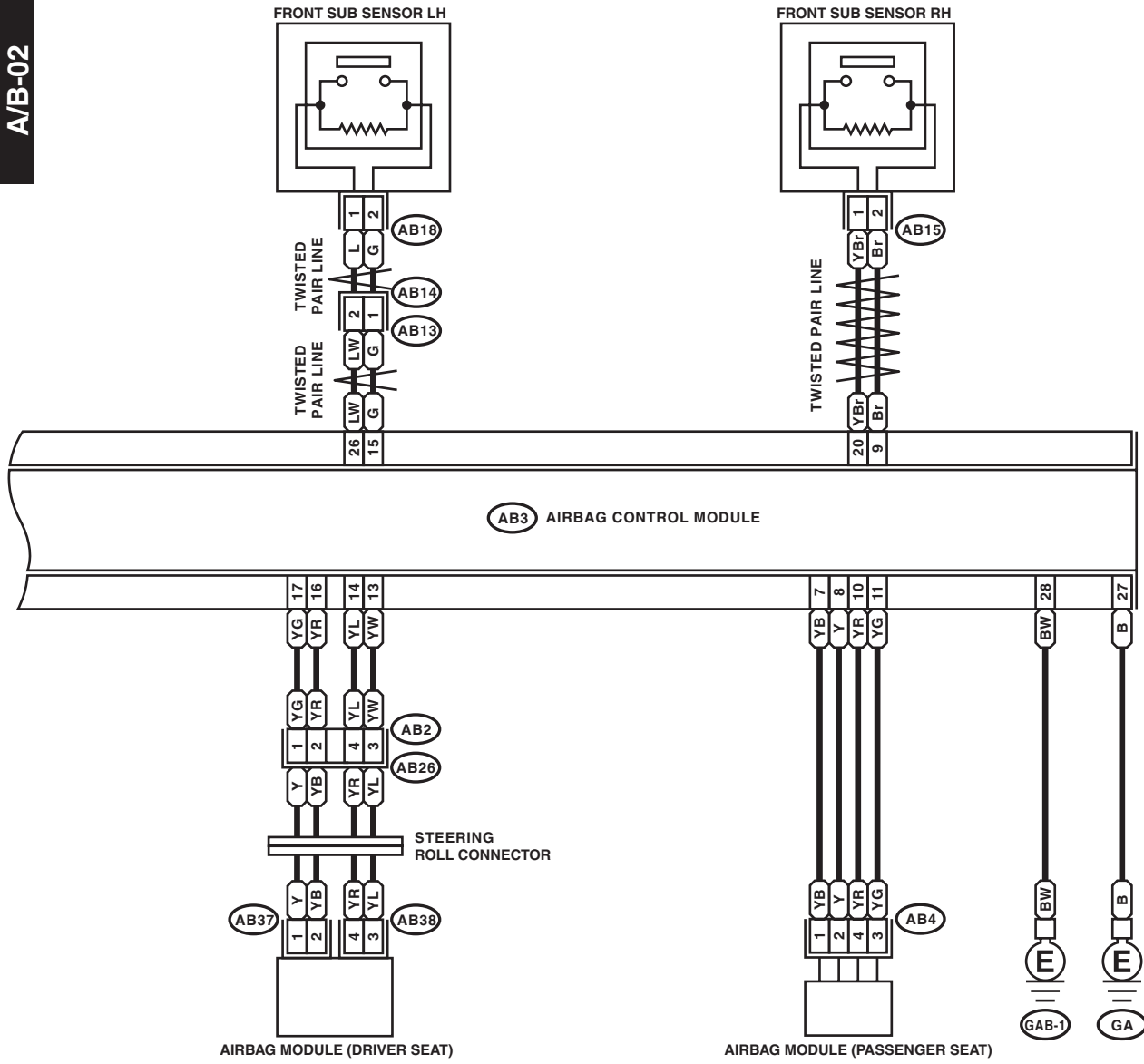


Airbag System

WIRING SYSTEM

A/B-02

A/B-02



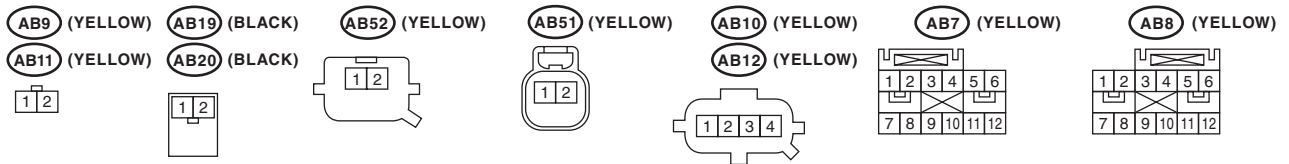
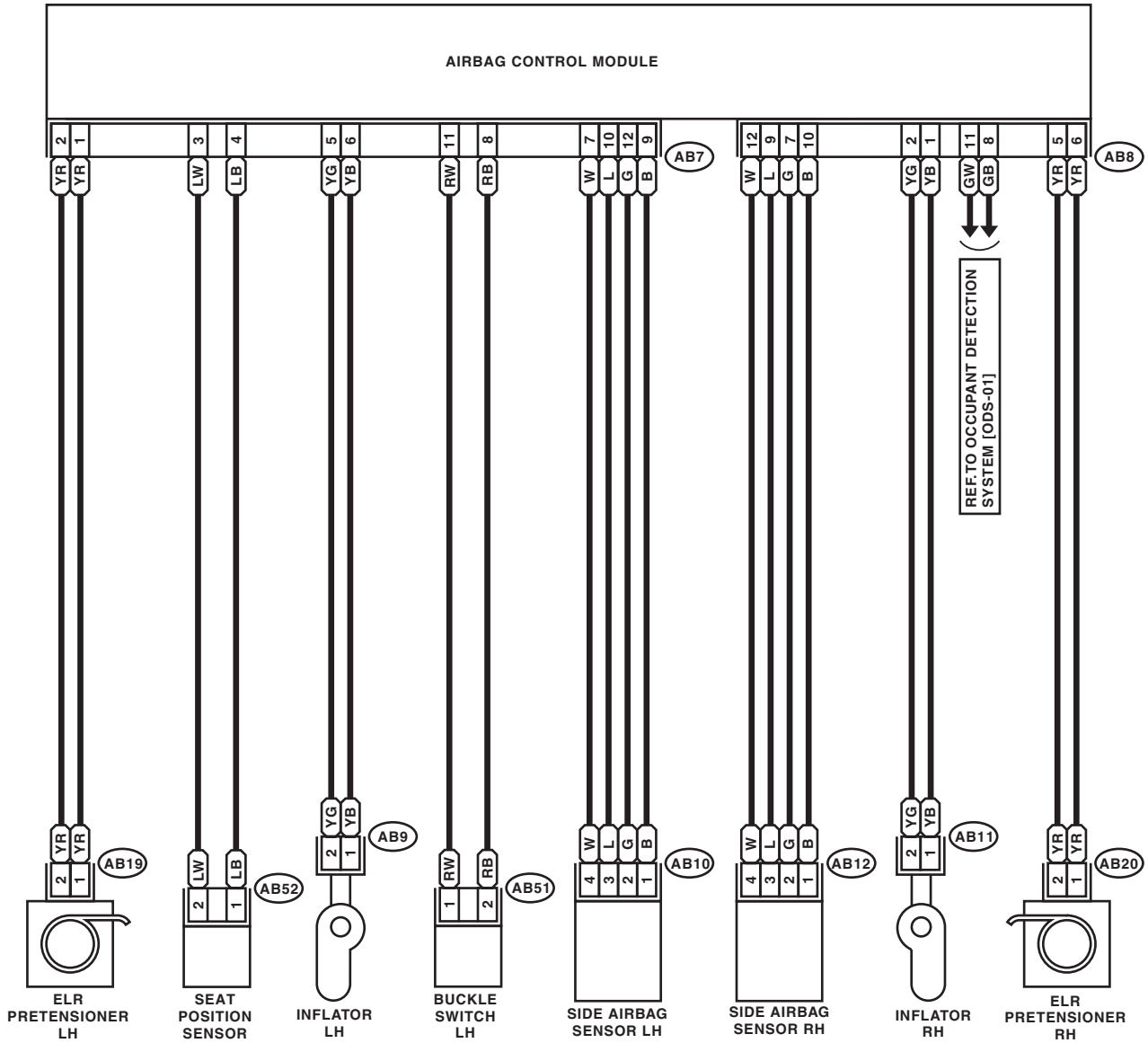
WI-13103

Airbag System

WIRING SYSTEM

A/B-03

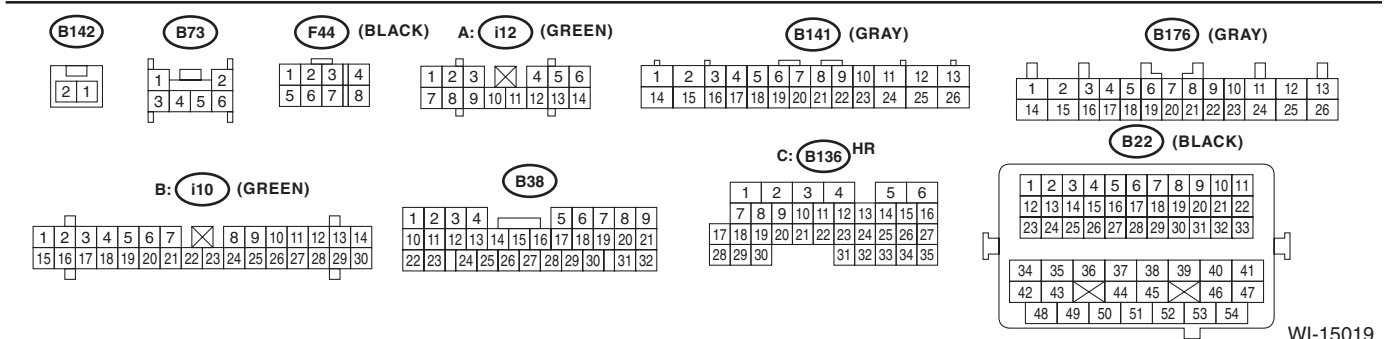
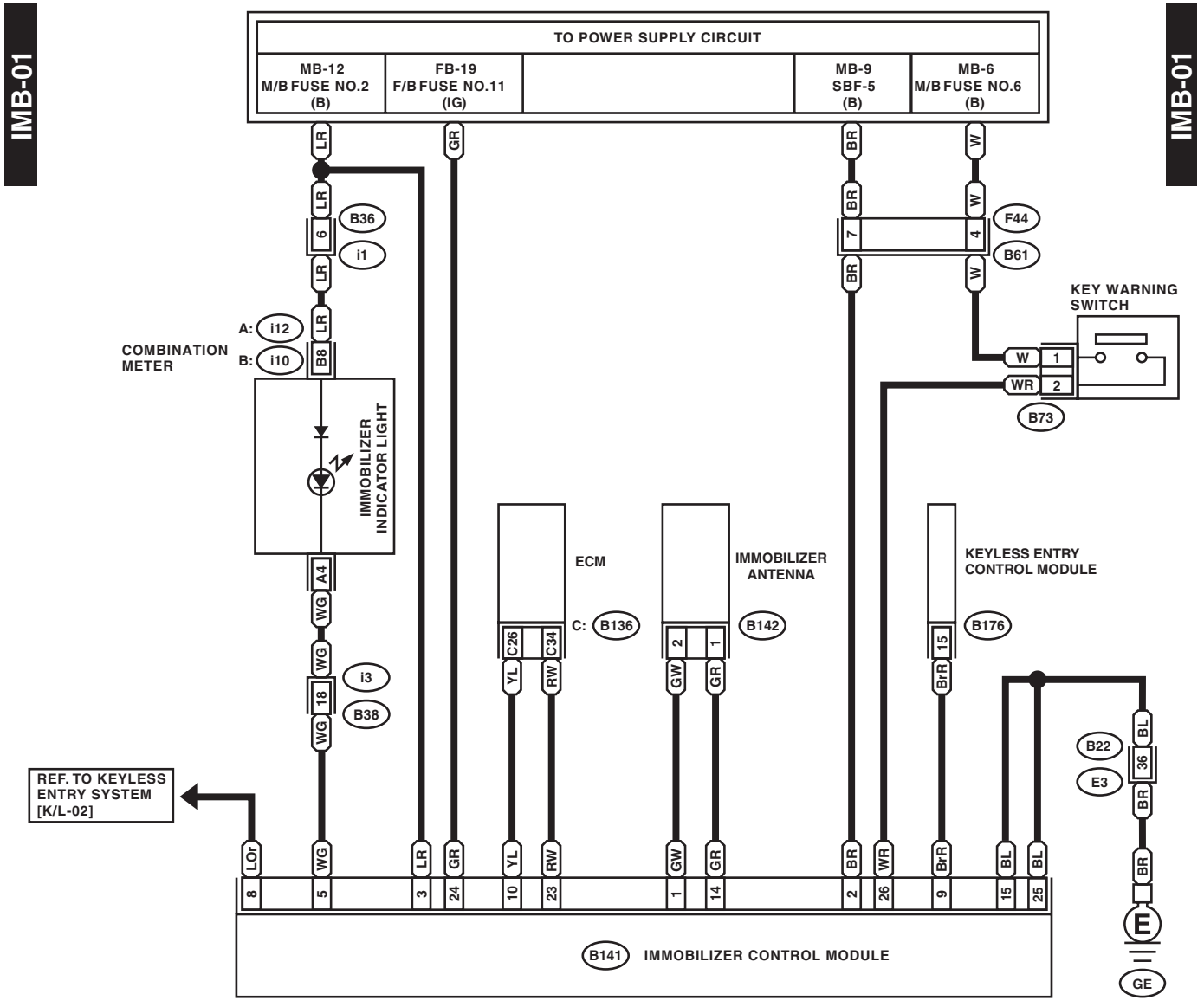
A/B-03



WI-12324

13. Immobilizer System

A: WIRING DIAGRAM



WI-15019

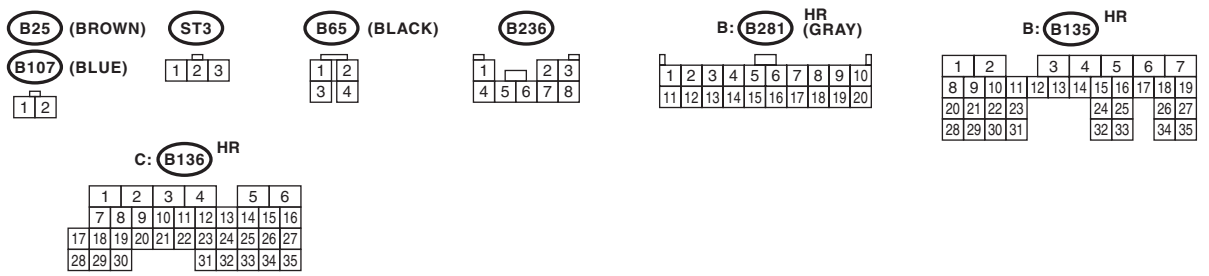
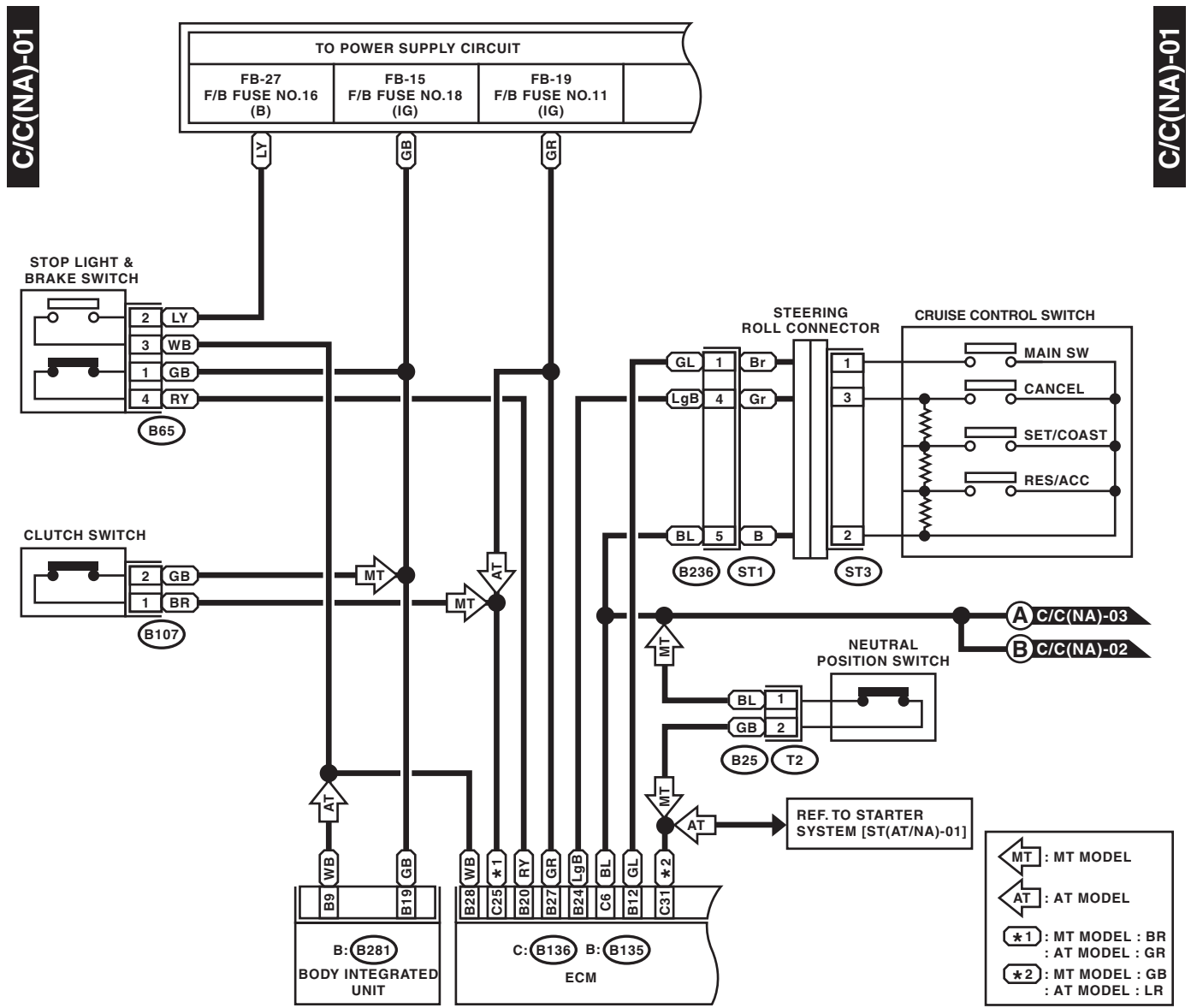
Cruise Control System

WIRING SYSTEM

14. Cruise Control System

A: WIRING DIAGRAM

1. NON-TURBO MODEL



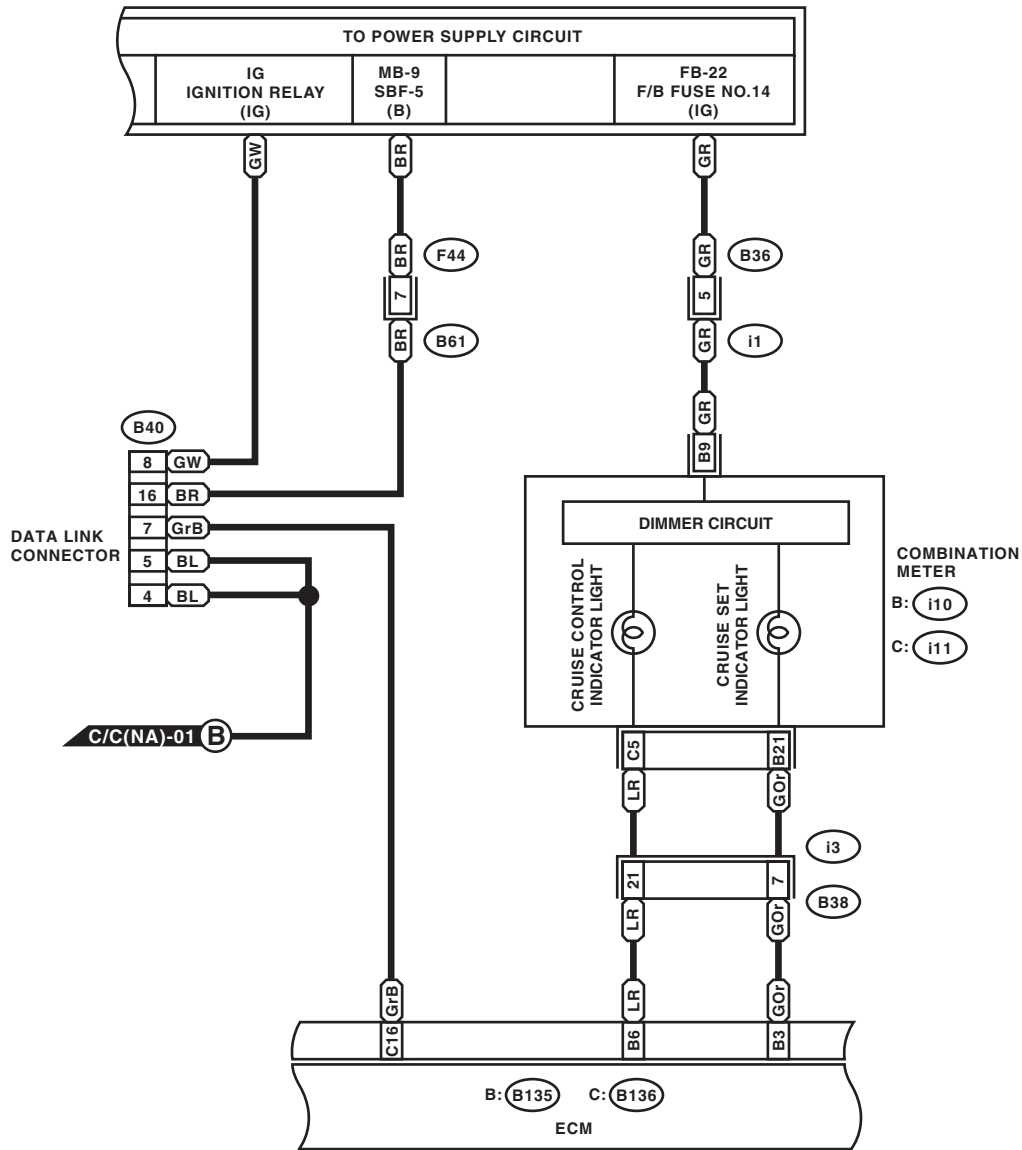
WI-15020

Cruise Control System

WIRING SYSTEM

C/C(NA)-02

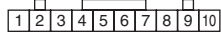
C/C(NA)-02



F44 (BLACK)



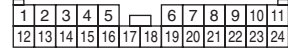
C: i11 (GREEN)



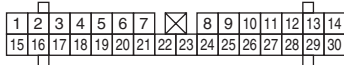
B40 (BLACK)



B36



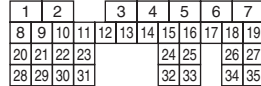
B: i10 (GREEN)



B38



B: B135 HR



C: B136 HR



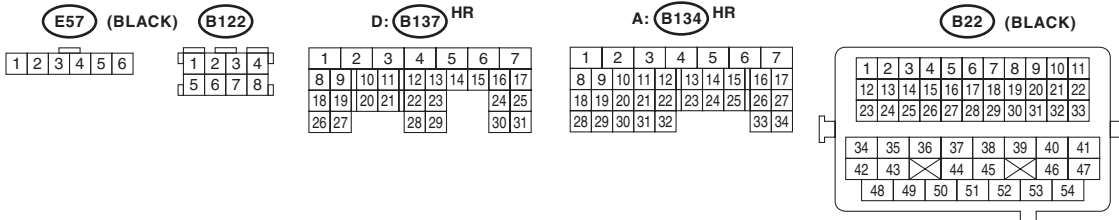
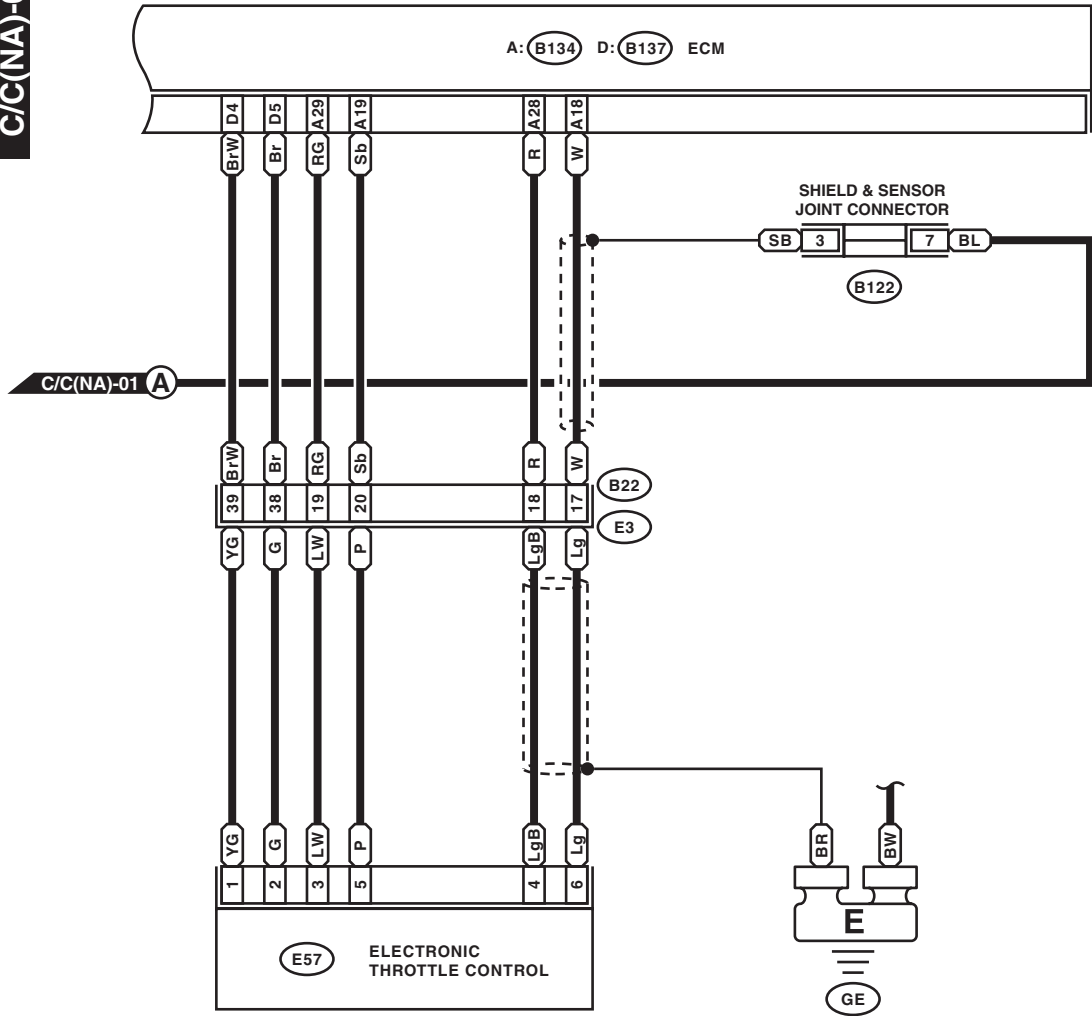
WI-15021

Cruise Control System

WIRING SYSTEM

C/C(NA)-03

C/C(NA)-03

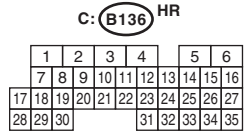
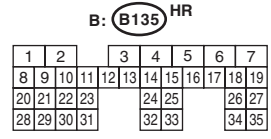
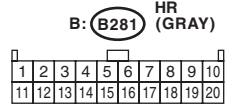
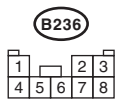
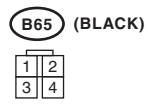
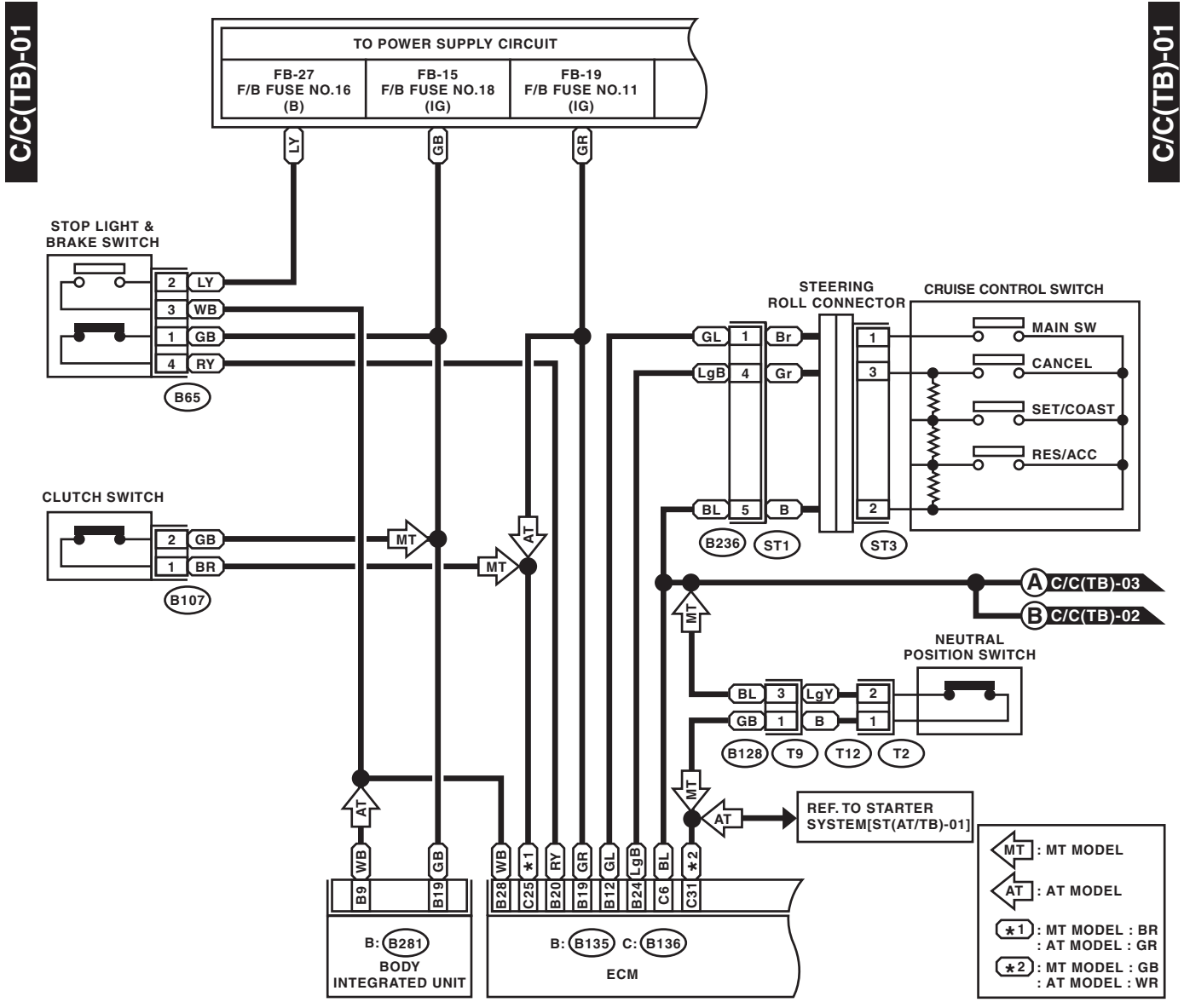


WI-15022

Cruise Control System

WIRING SYSTEM

2. TURBO MODEL



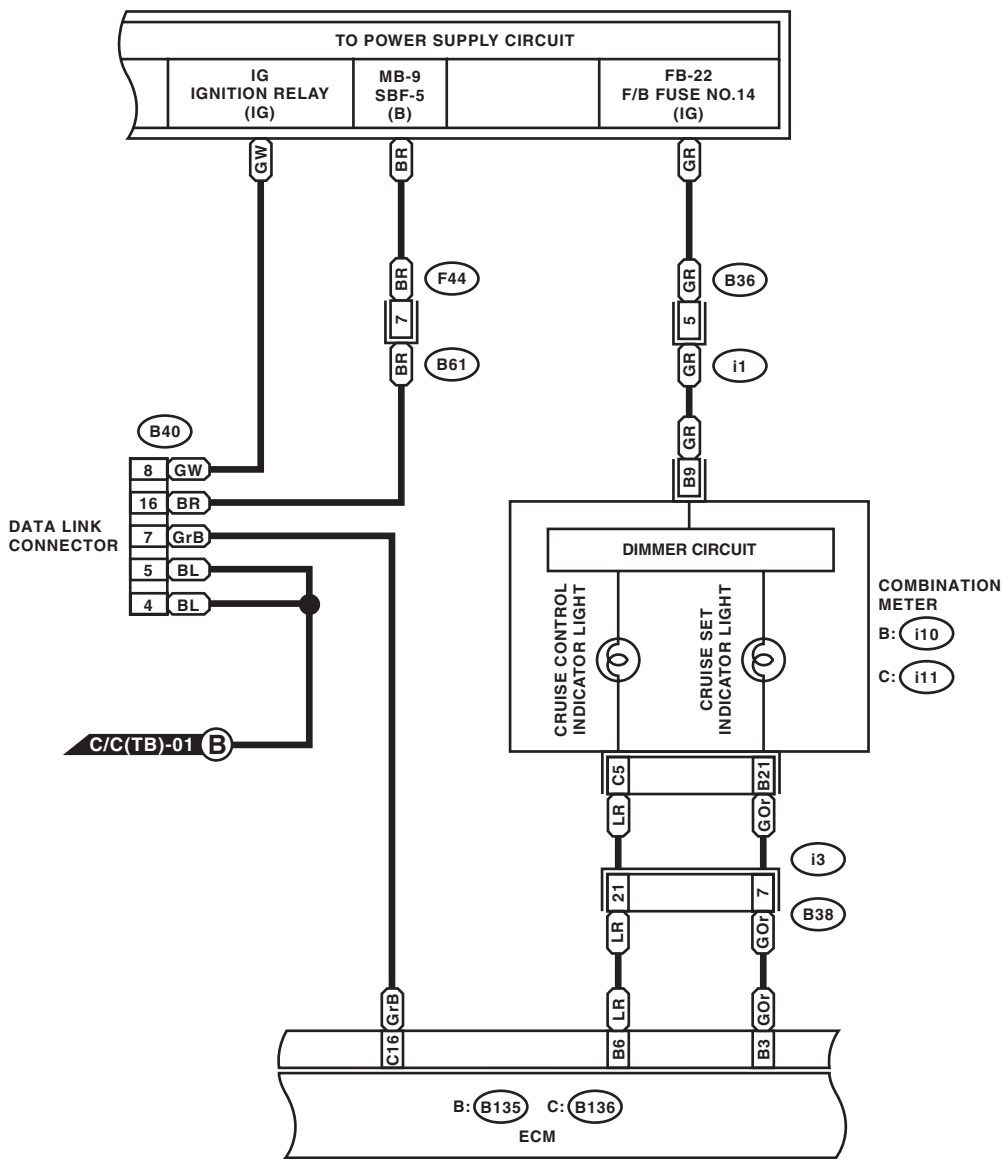
WI-15023

Cruise Control System

WIRING SYSTEM

C/C(TB)-02

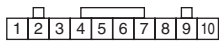
C/C(TB)-02



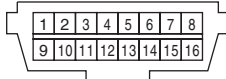
F44 (BLACK)



C: i11 (GREEN)



B40 (BLACK)



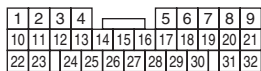
B36



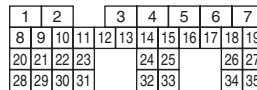
B: i10 (GREEN)



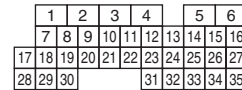
B38



B: B135 HR



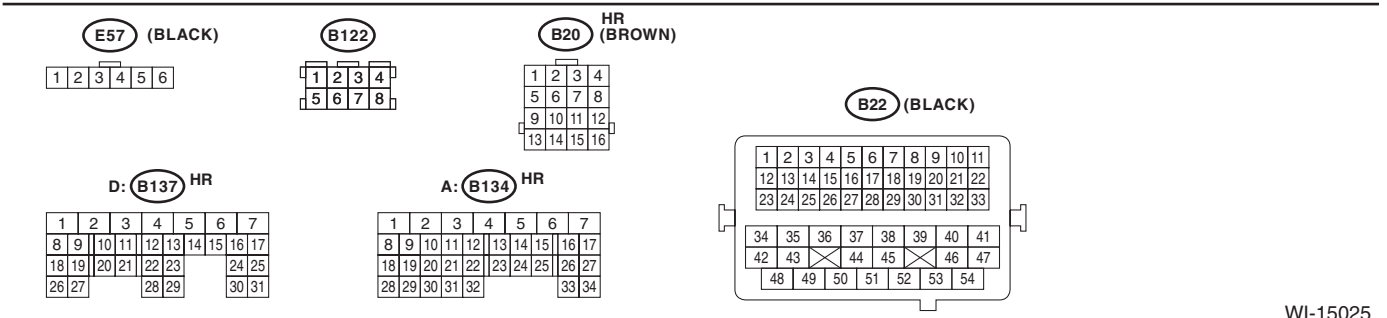
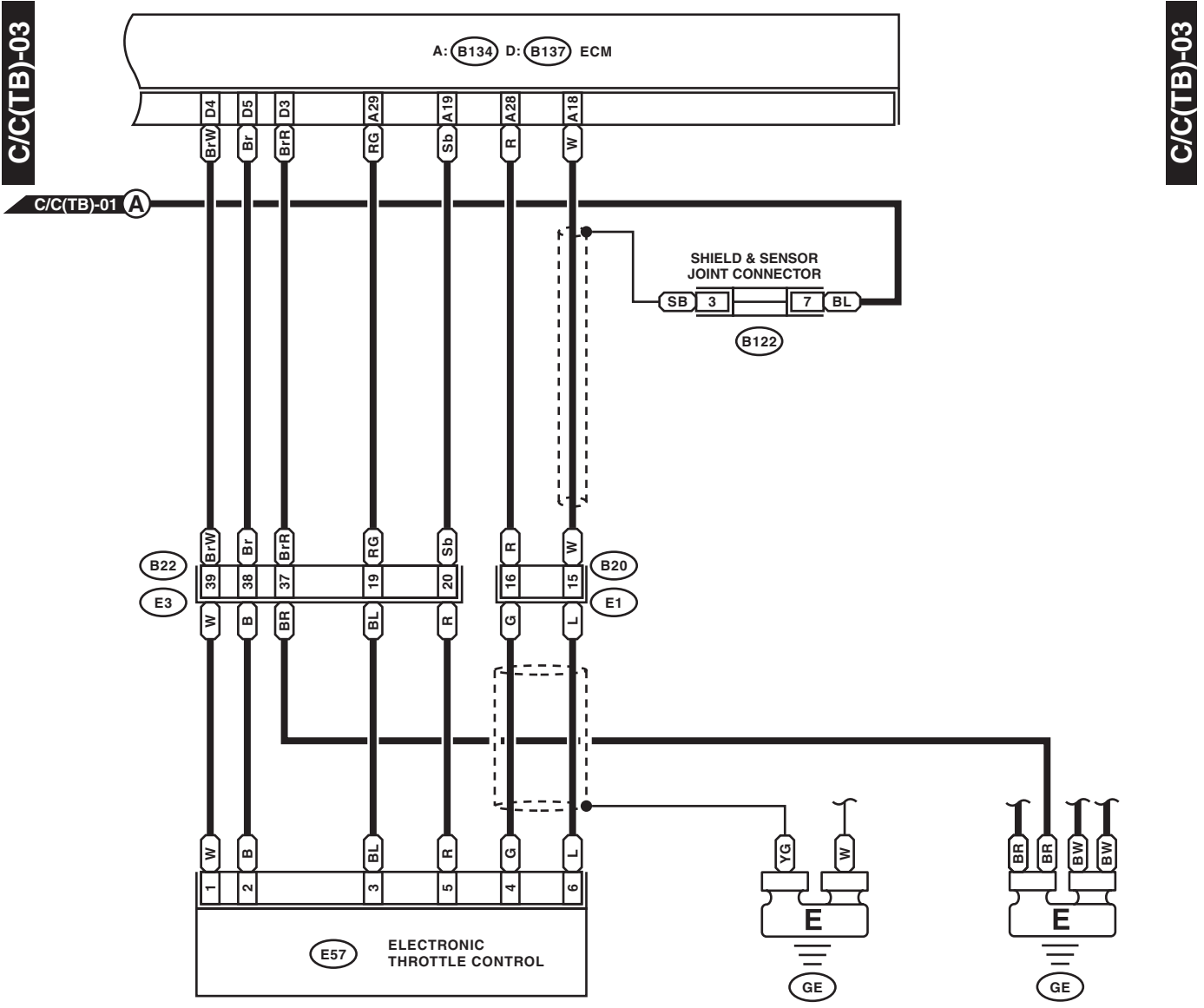
C: B136 HR



WI-15024

Cruise Control System

WIRING SYSTEM



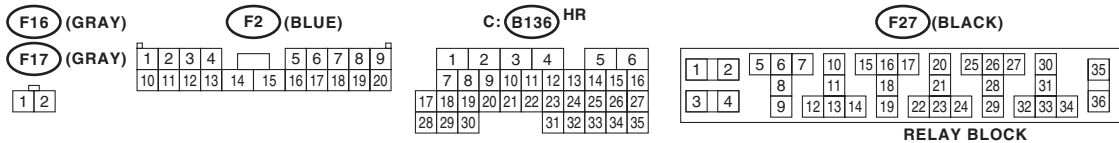
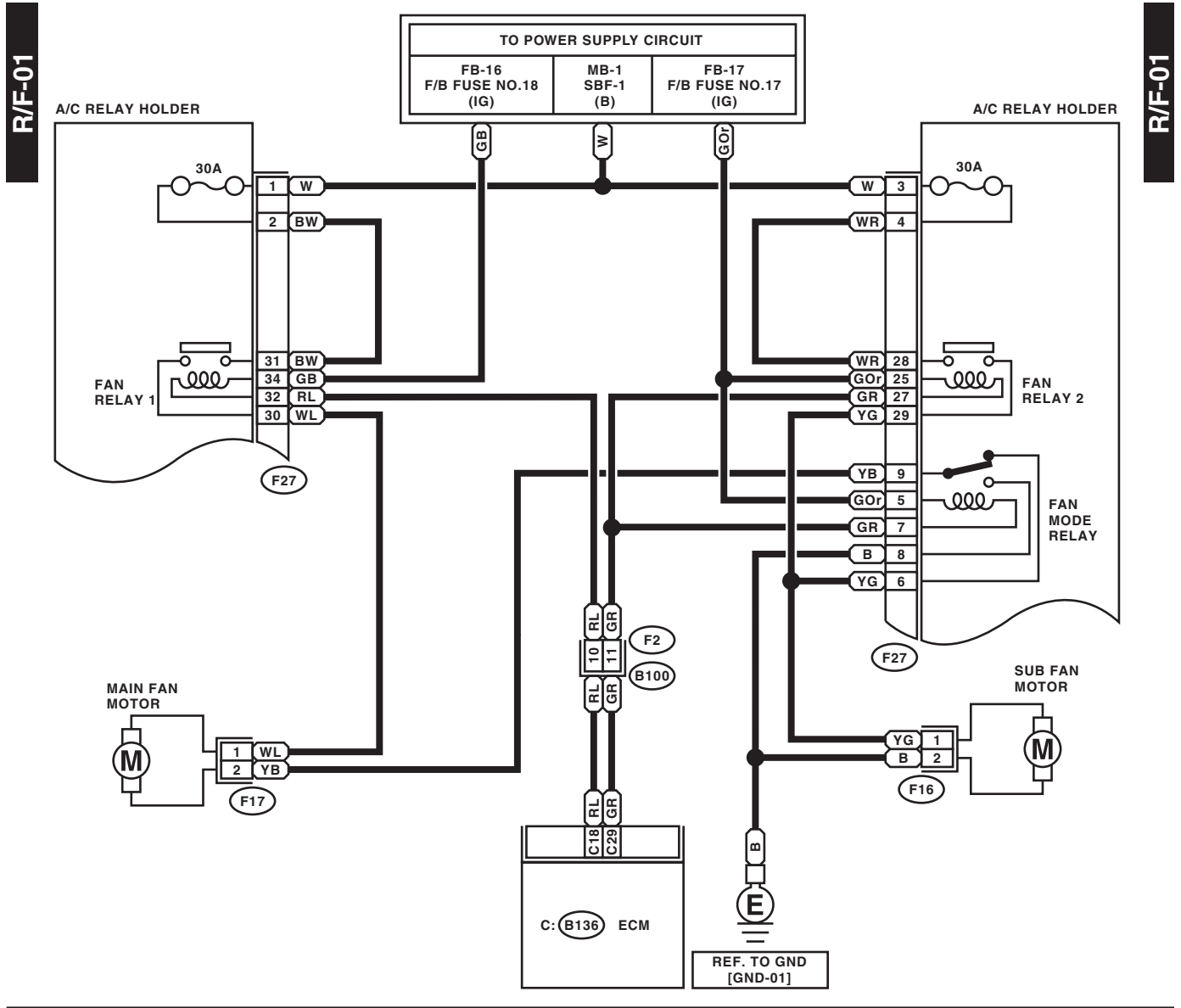
WI-15025

Radiator Fan System

WIRING SYSTEM

15. Radiator Fan System

A: WIRING DIAGRAM



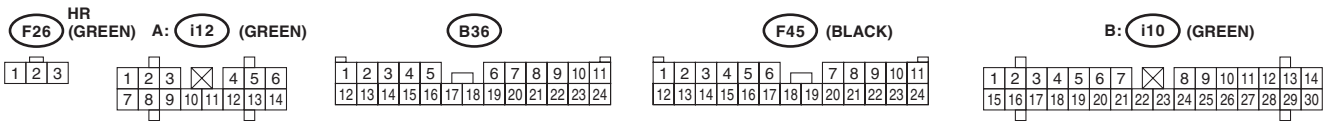
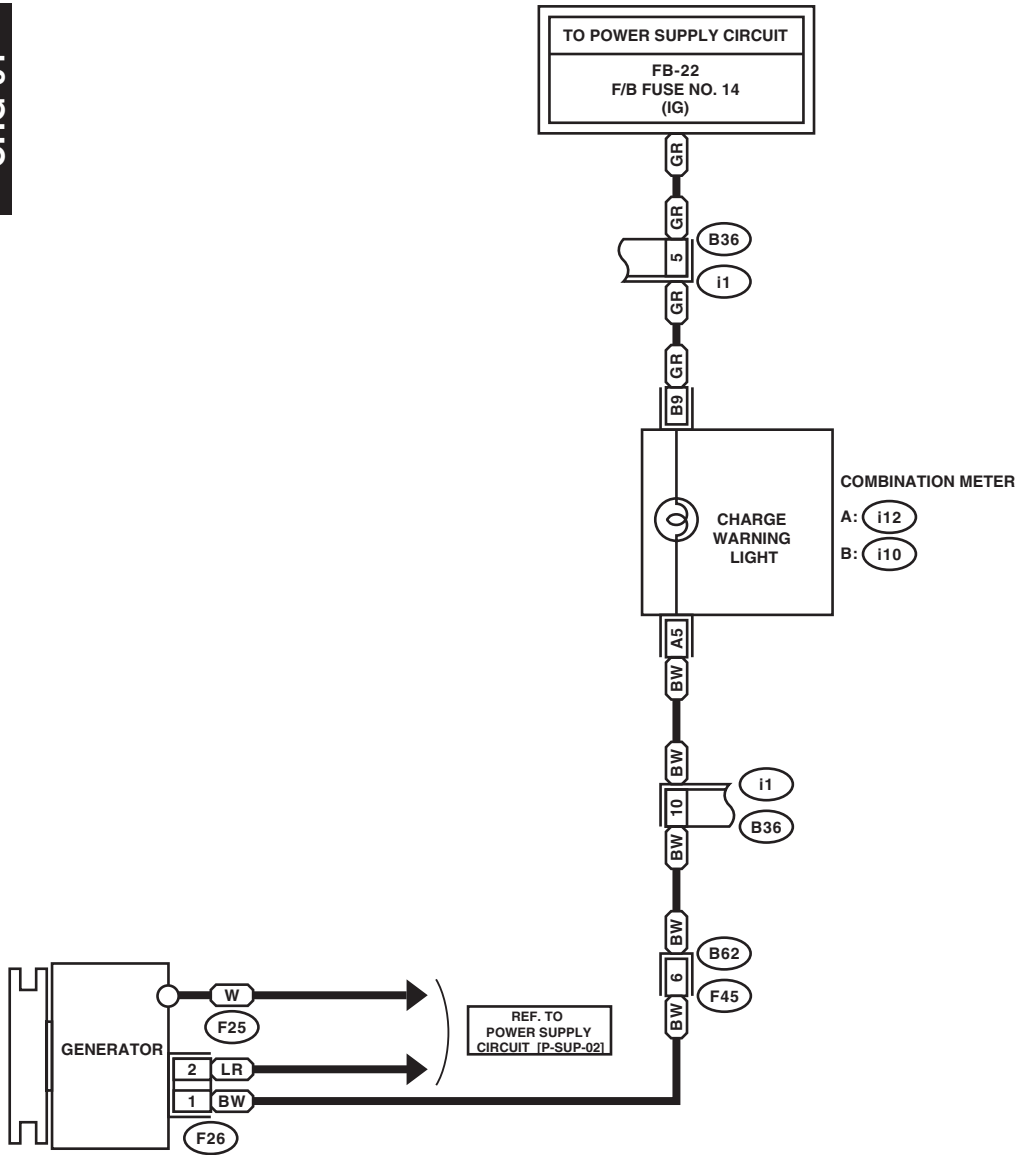
WI-15026

16. Charging System

A: WIRING DIAGRAM

CHG-01

CHG-01



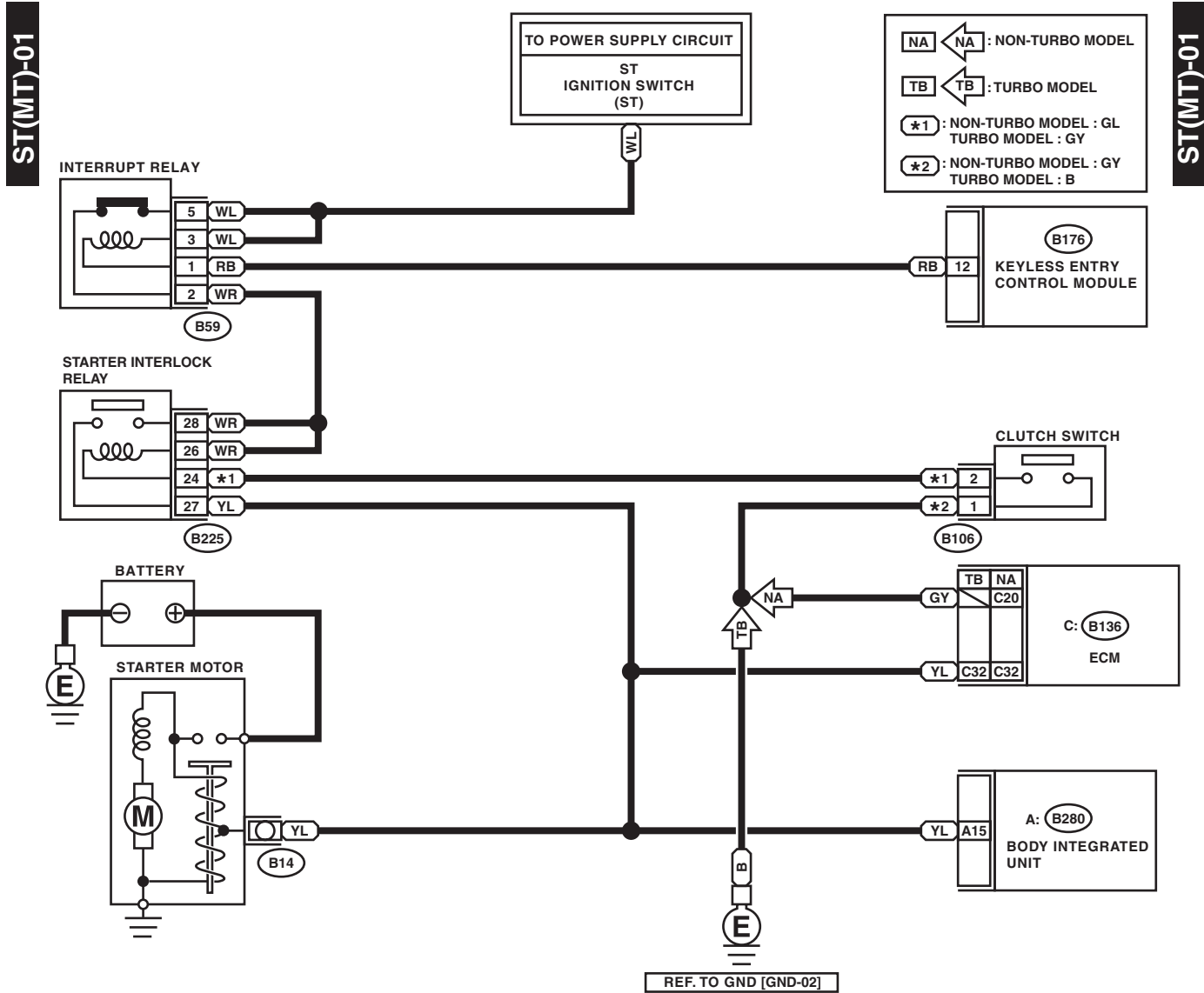
Starter System

WIRING SYSTEM

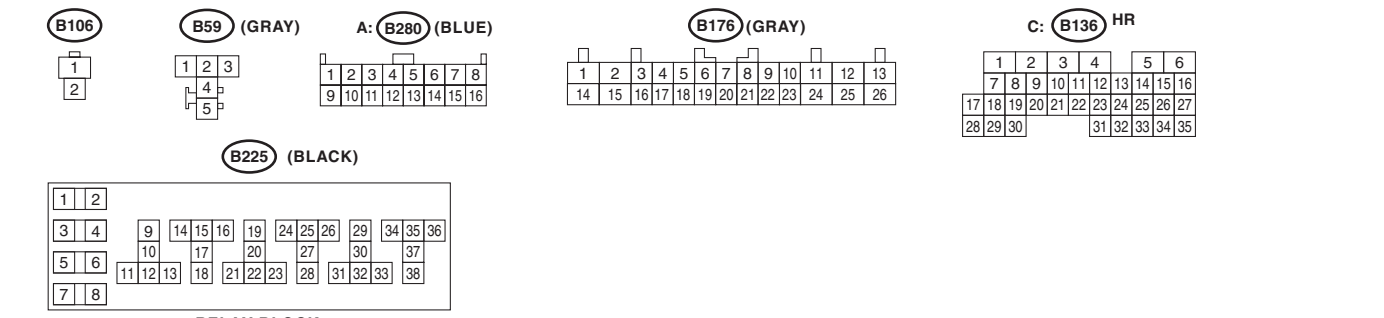
17. Starter System

A: WIRING DIAGRAM

1. MT MODEL



ST(MT)-01



WI-15028

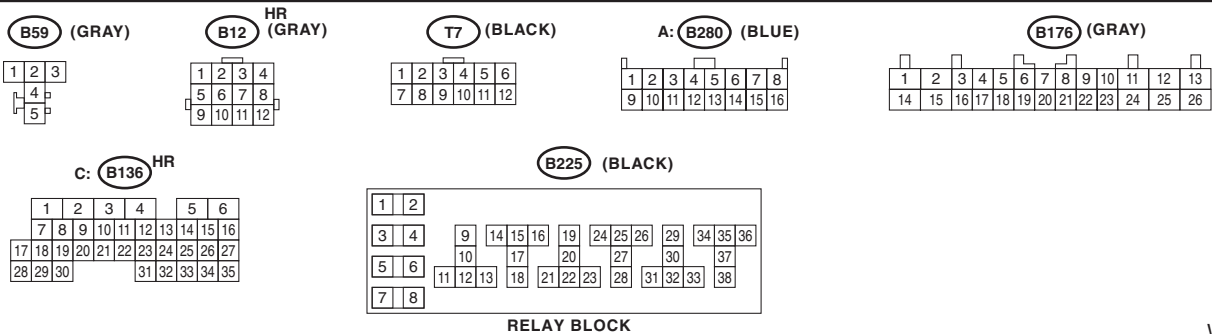
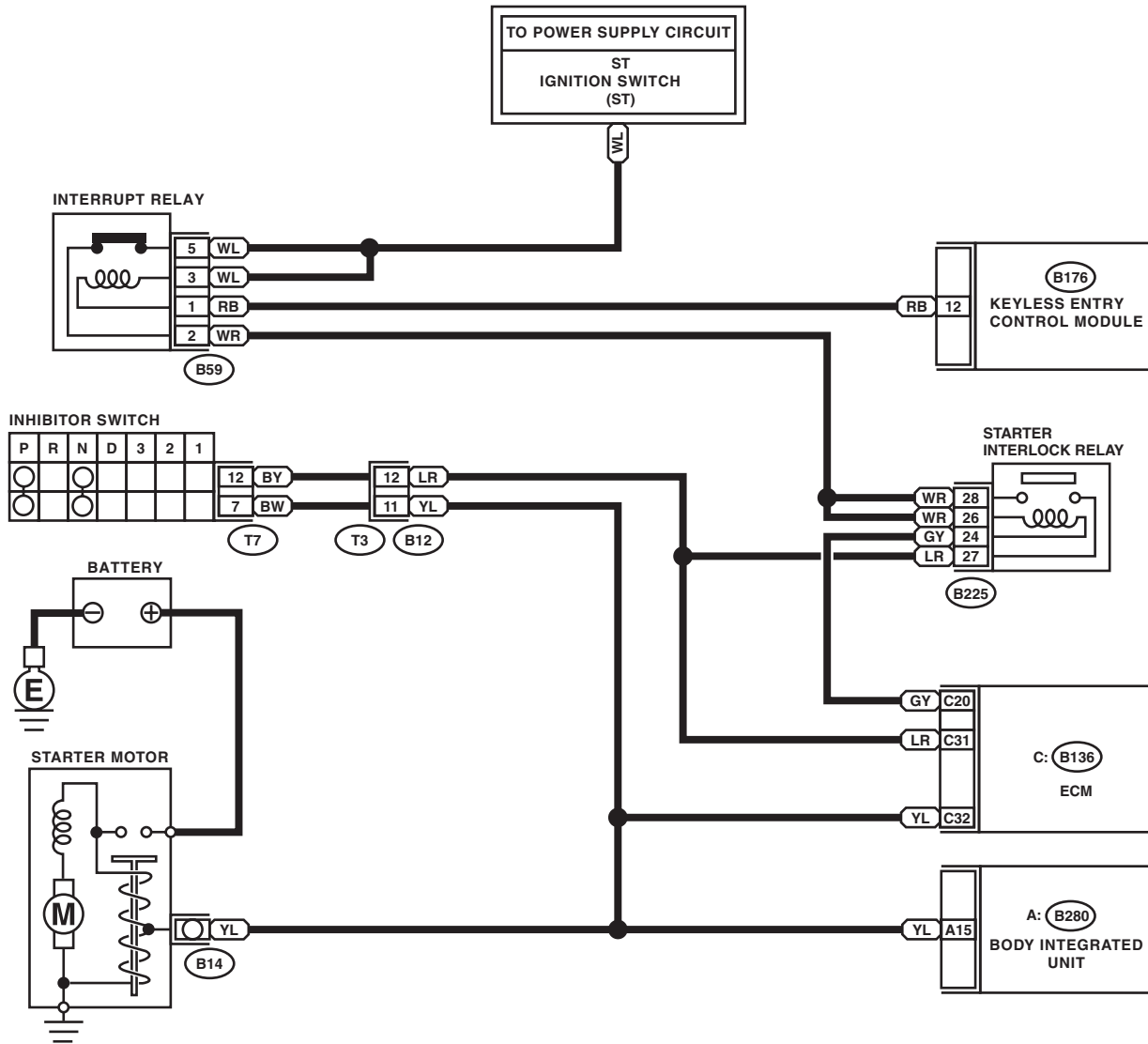
Starter System

WIRING SYSTEM

2. AT NON-TURBO MODEL

ST(AT/NA)-01

ST(AT/NA)-01

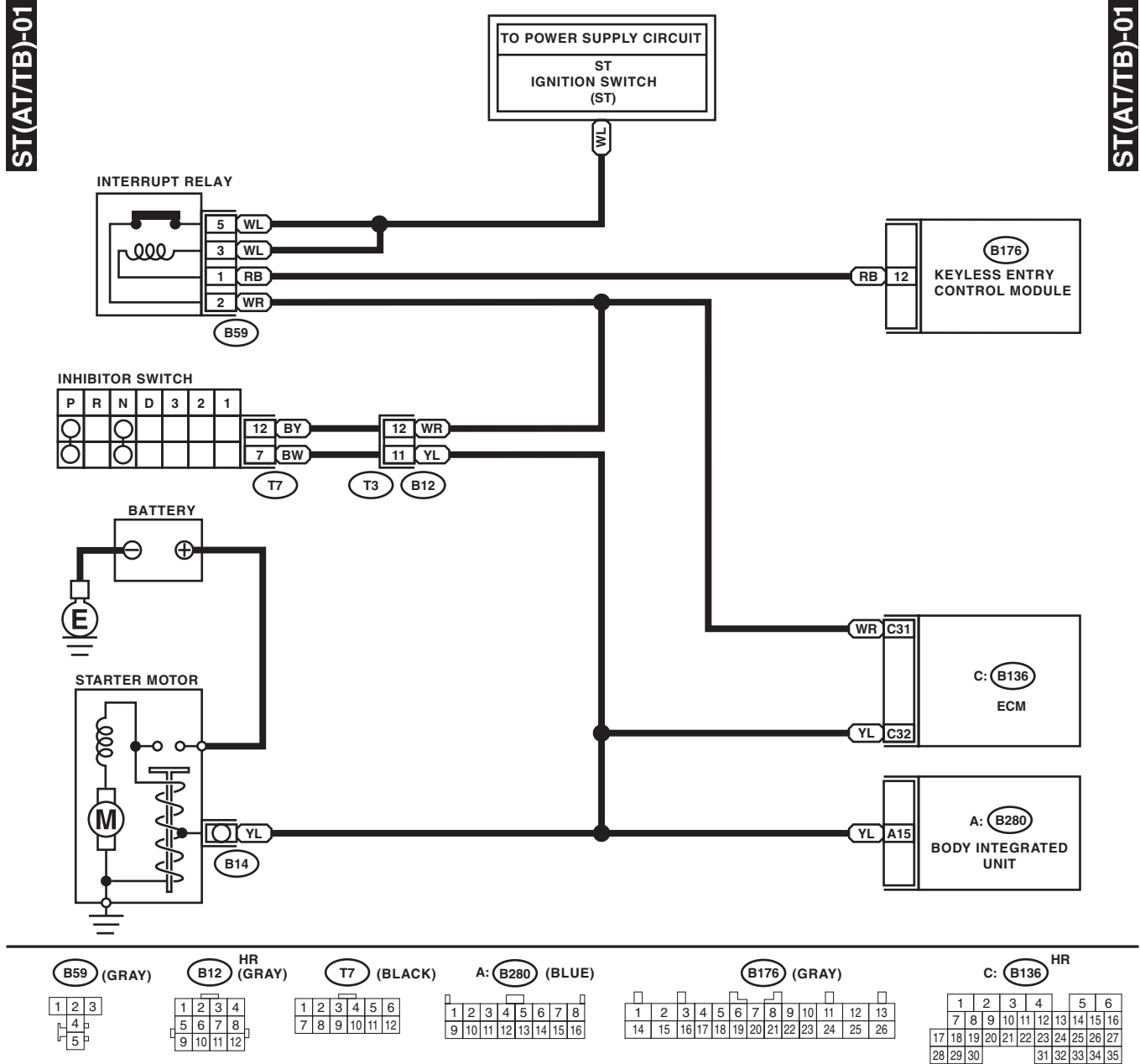


WI-15029

Starter System

WIRING SYSTEM

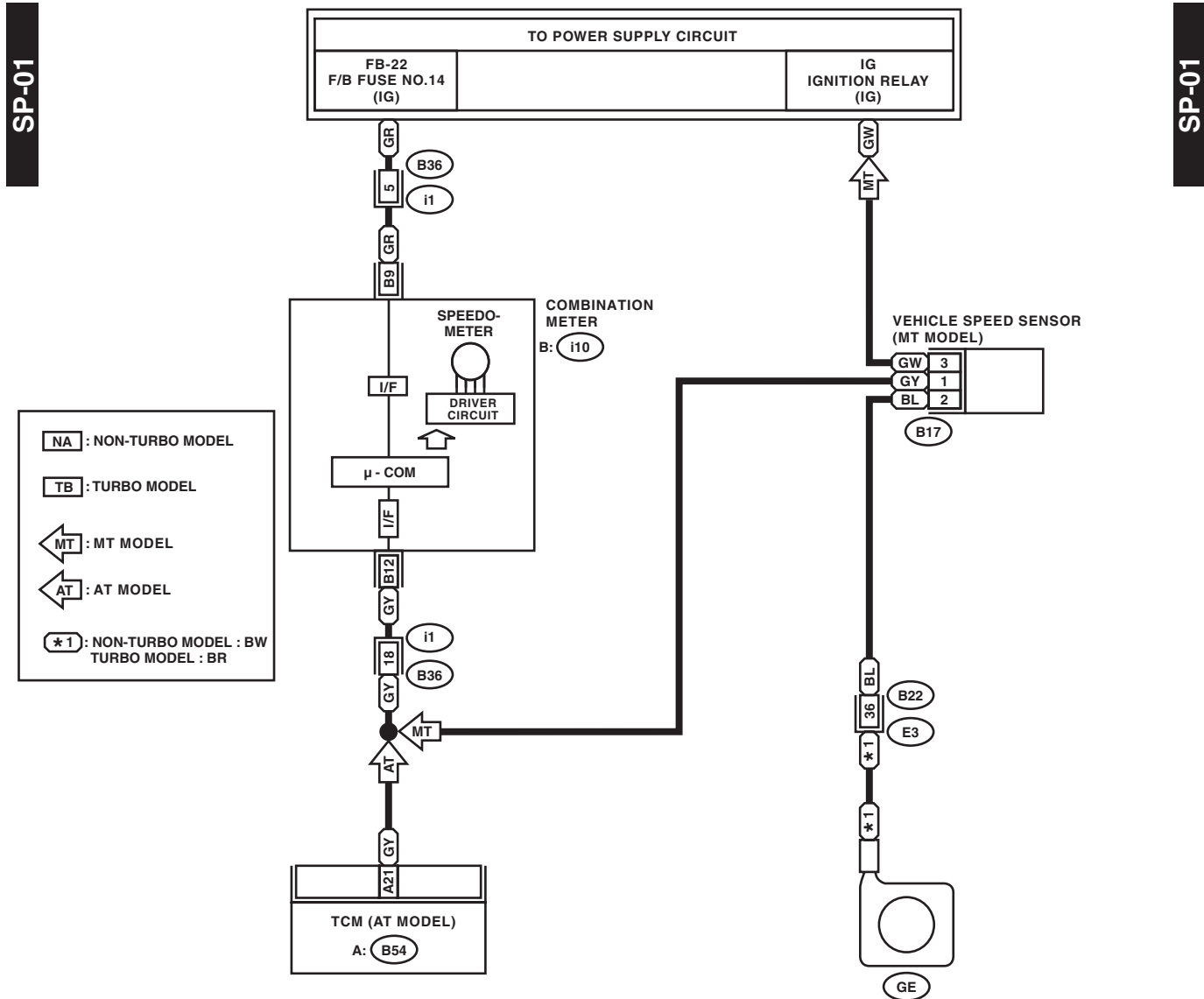
3. AT TURBO MODEL



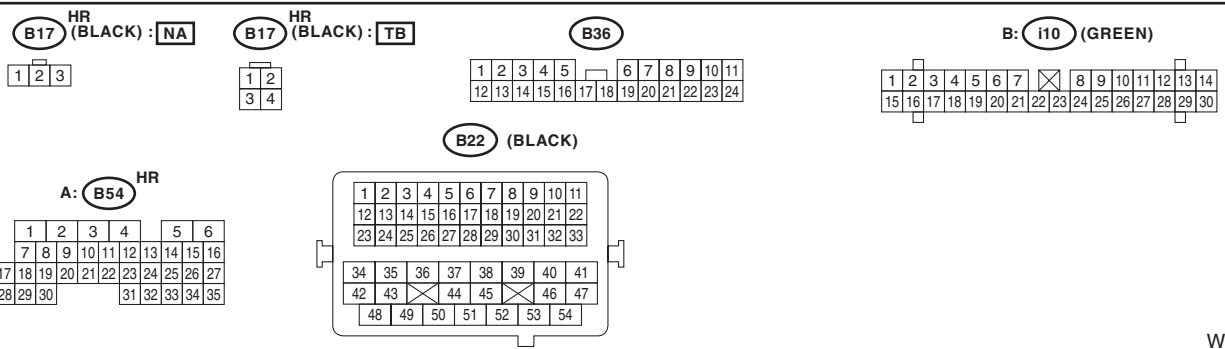
WI-15030

18.Speedmeter System

A: WIRING DIAGRAM



NA : NON-TURBO MODEL
TB : TURBO MODEL
MT : MT MODEL
AT : AT MODEL
***1** : NON-TURBO MODEL : BW
 TURBO MODEL : BR



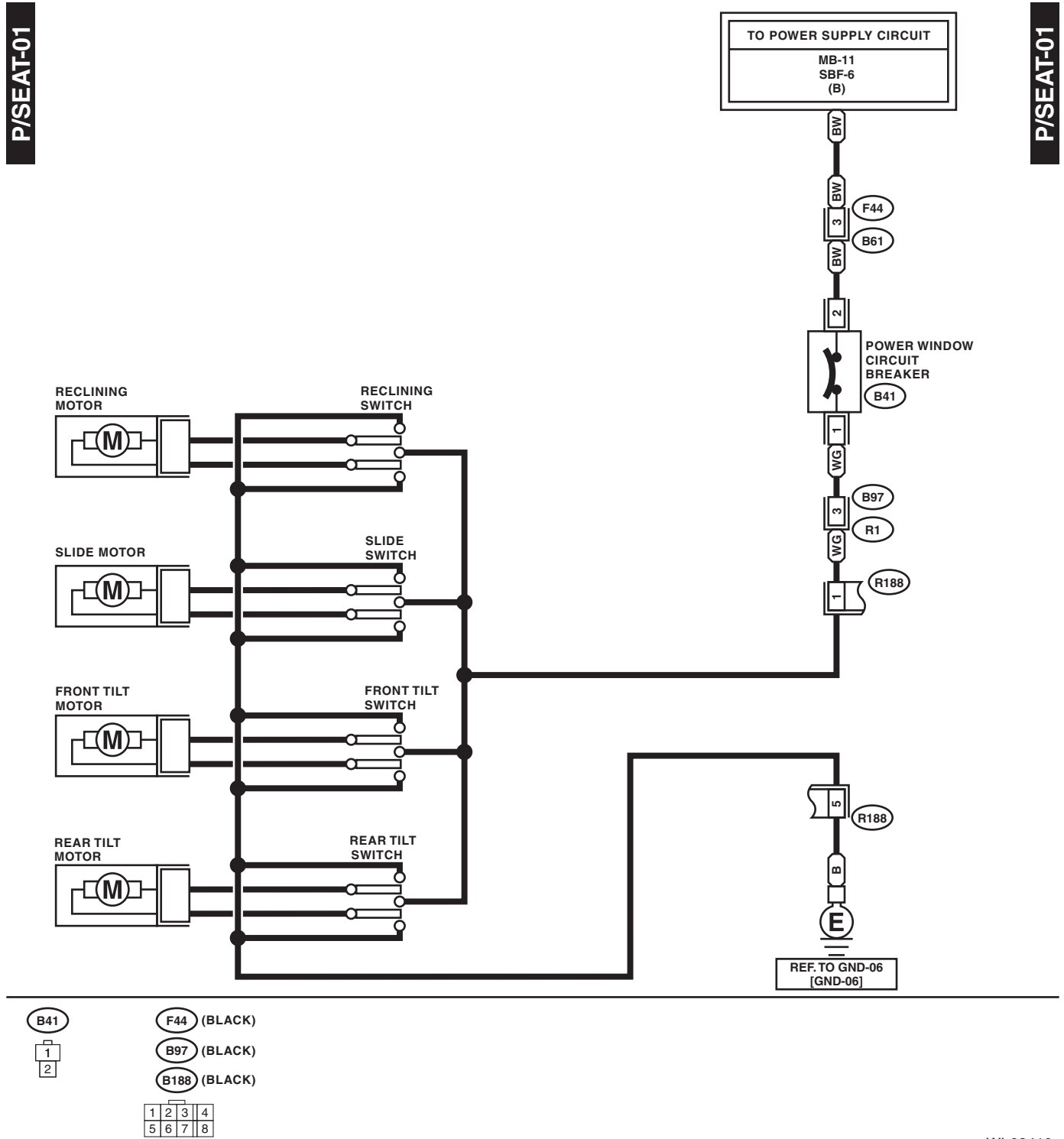
WI-15031

Power Seat System

WIRING SYSTEM

19. Power Seat System

A: WIRING DIAGRAM



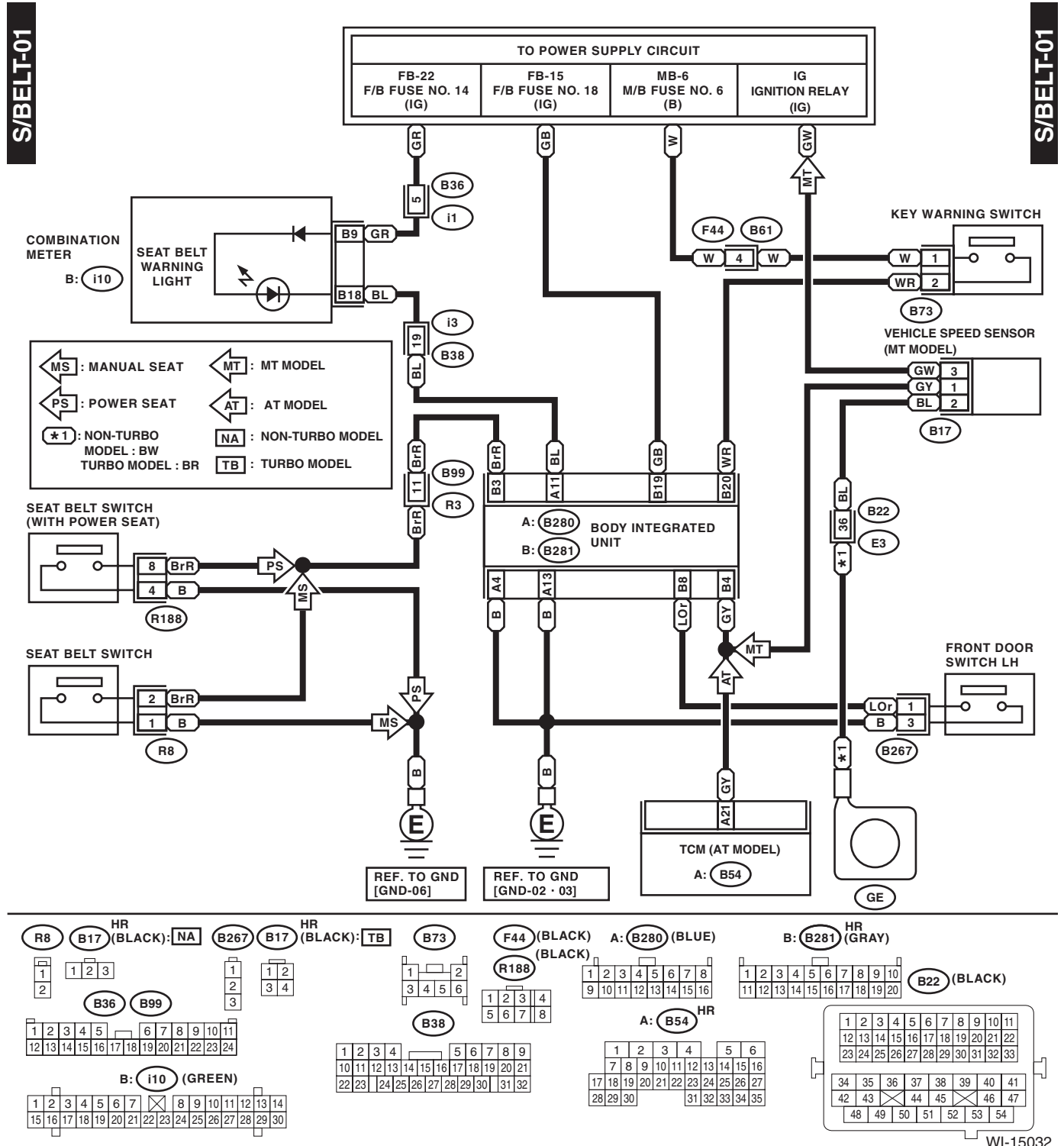
P/SEAT-01

P/SEAT-01

WI-08410

20.Seat Belt Warning System

A: WIRING DIAGRAM

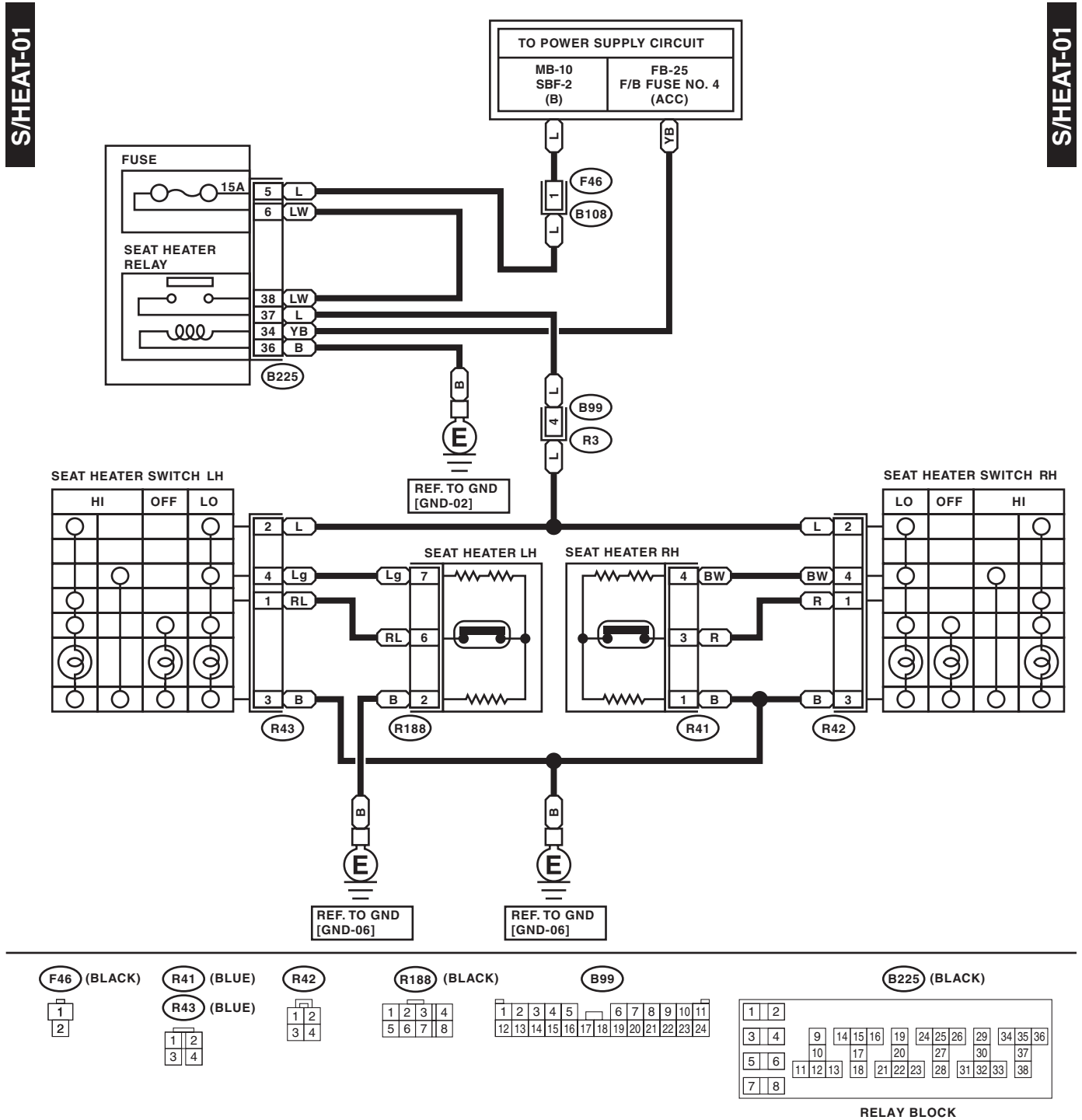


Seat Heater System

WIRING SYSTEM

21. Seat Heater System

A: WIRING DIAGRAM

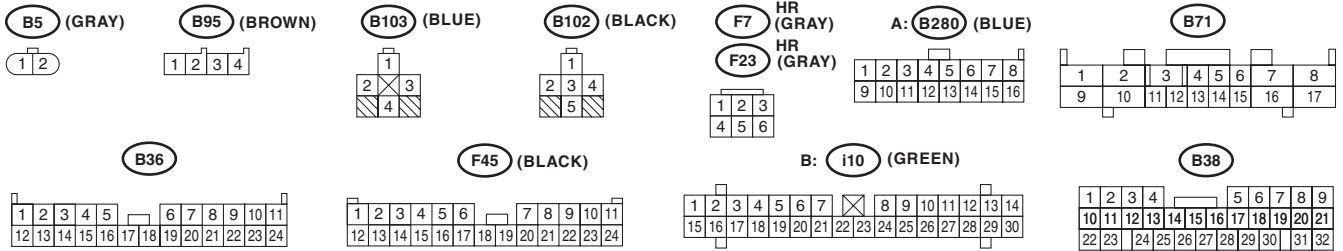
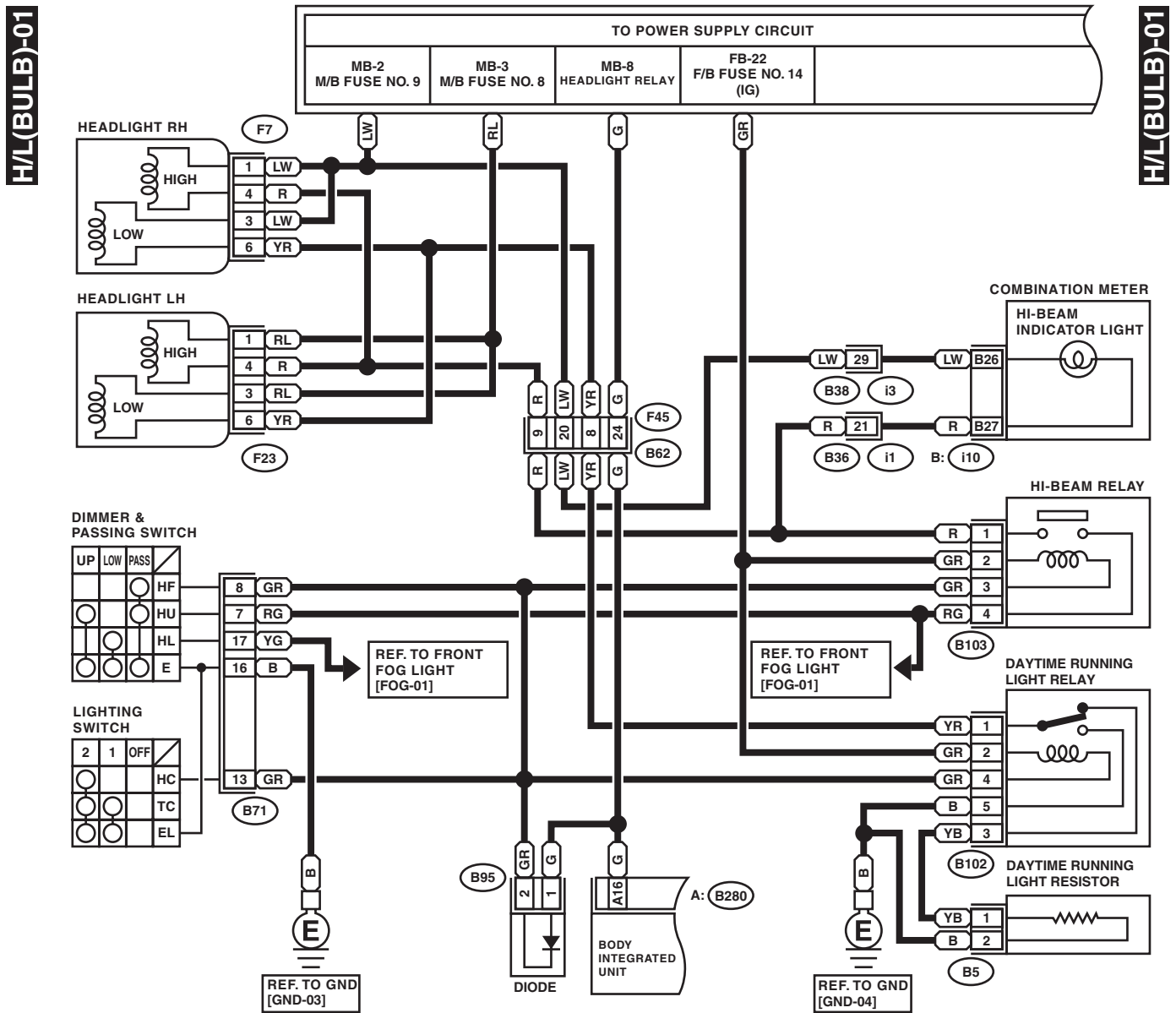


WI-12278

22. Headlight System

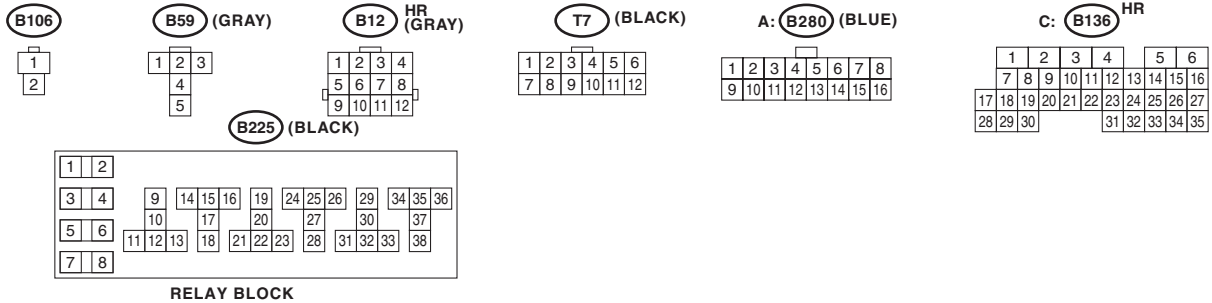
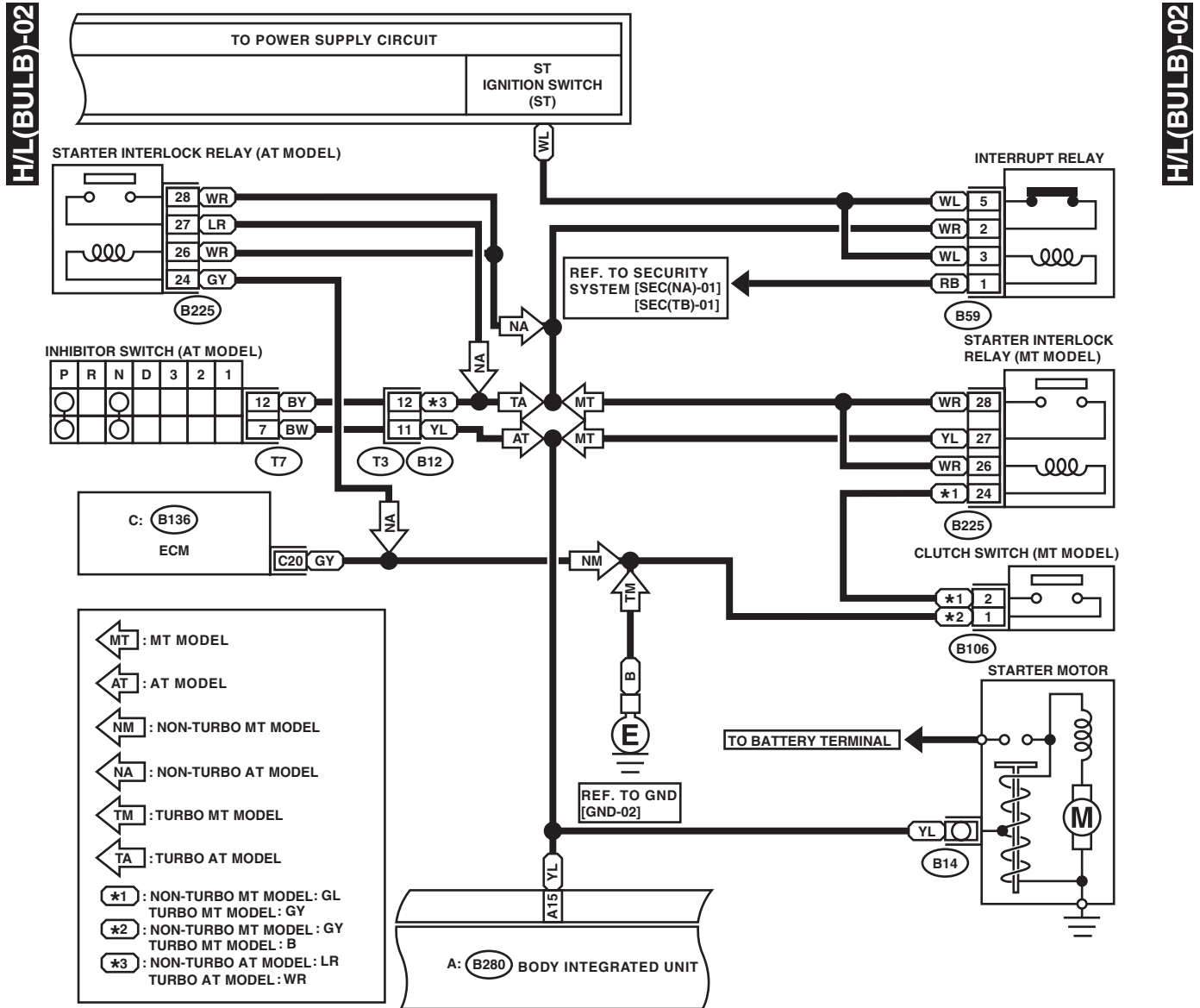
A: WIRING DIAGRAM

1. MODEL WITHOUT HID



Headlight System

WIRING SYSTEM



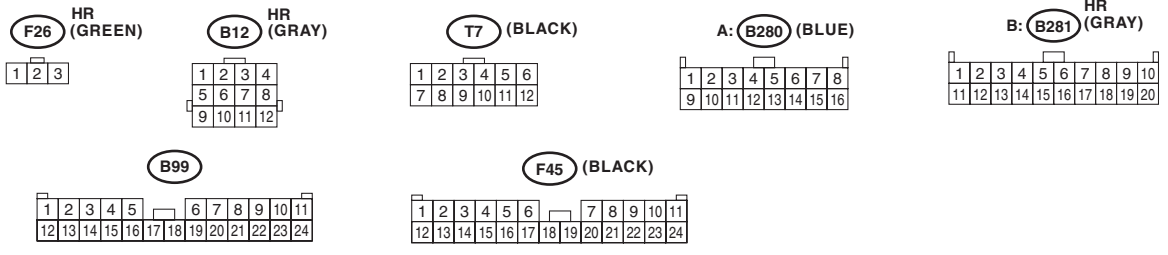
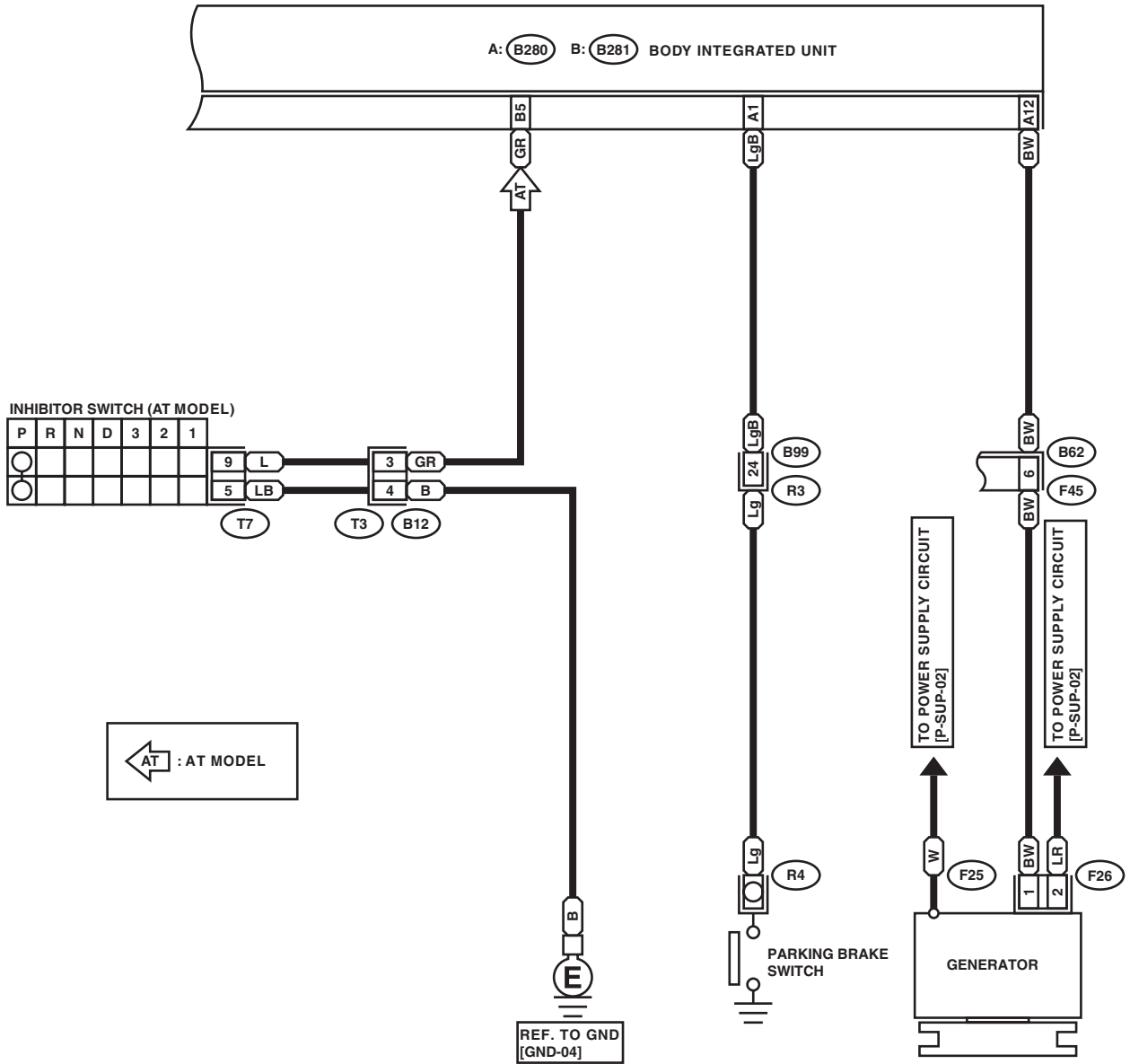
WI-15034

Headlight System

WIRING SYSTEM

H/L(BULB)-03

H/L(BULB)-03



WI-15035

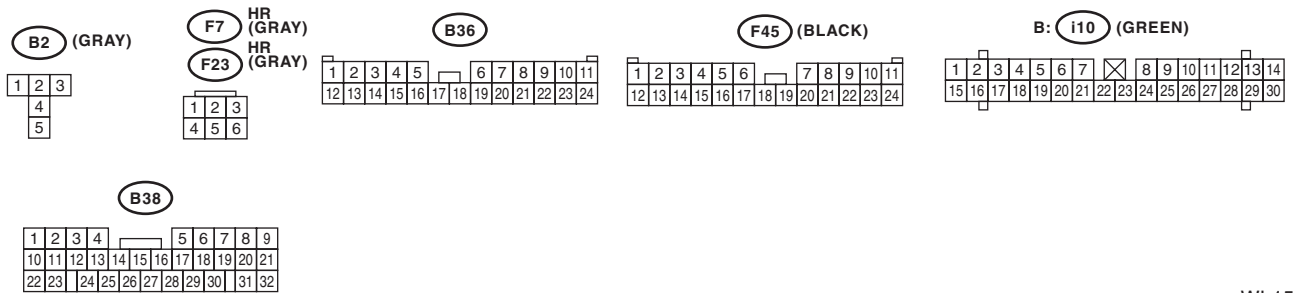
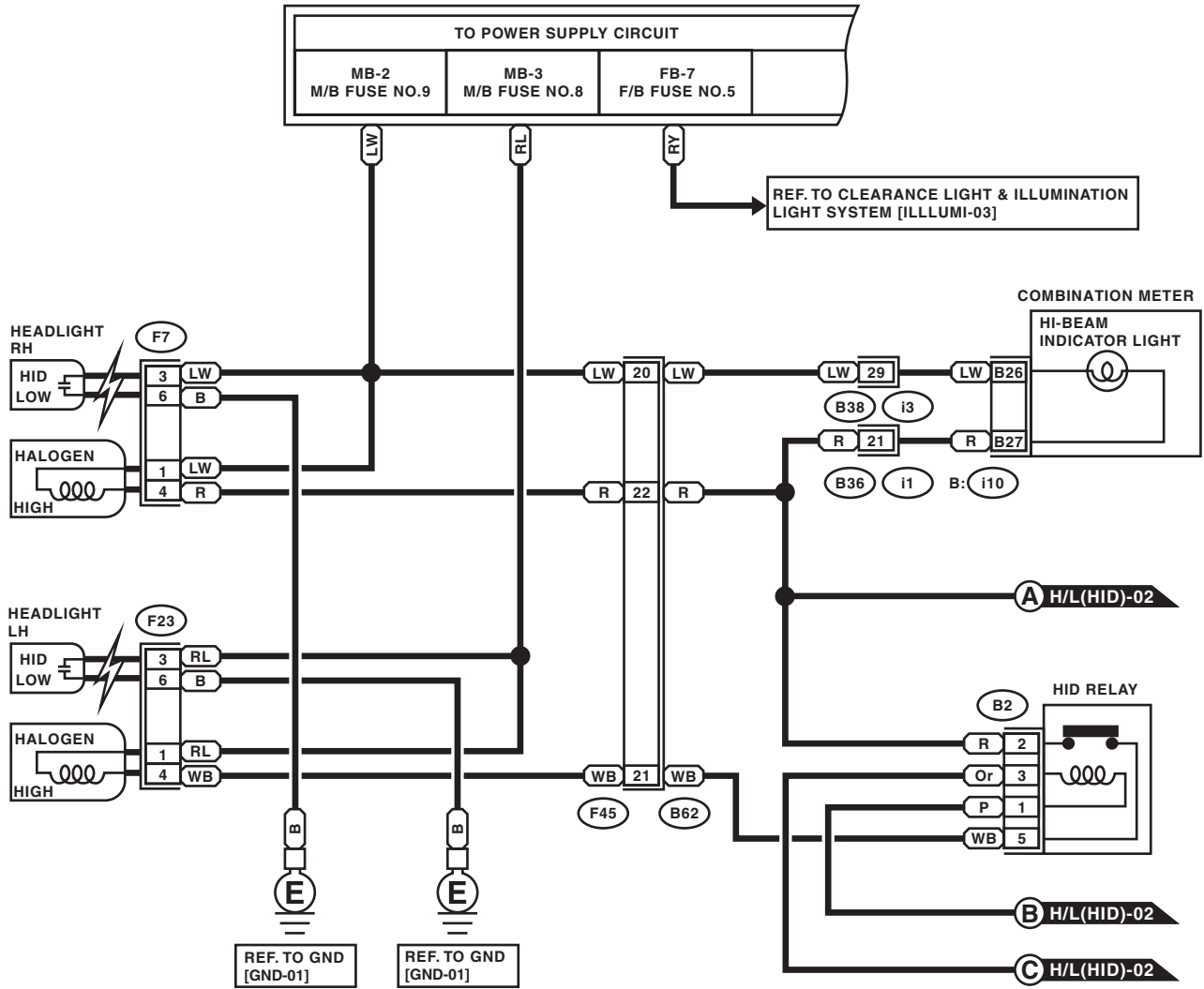
Headlight System

WIRING SYSTEM

2. MODEL WITH HID

H/L(HID)-01

H/L(HID)-01



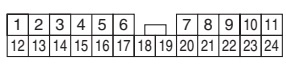
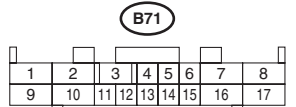
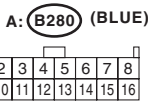
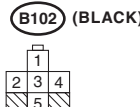
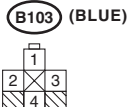
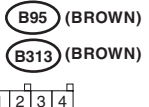
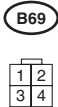
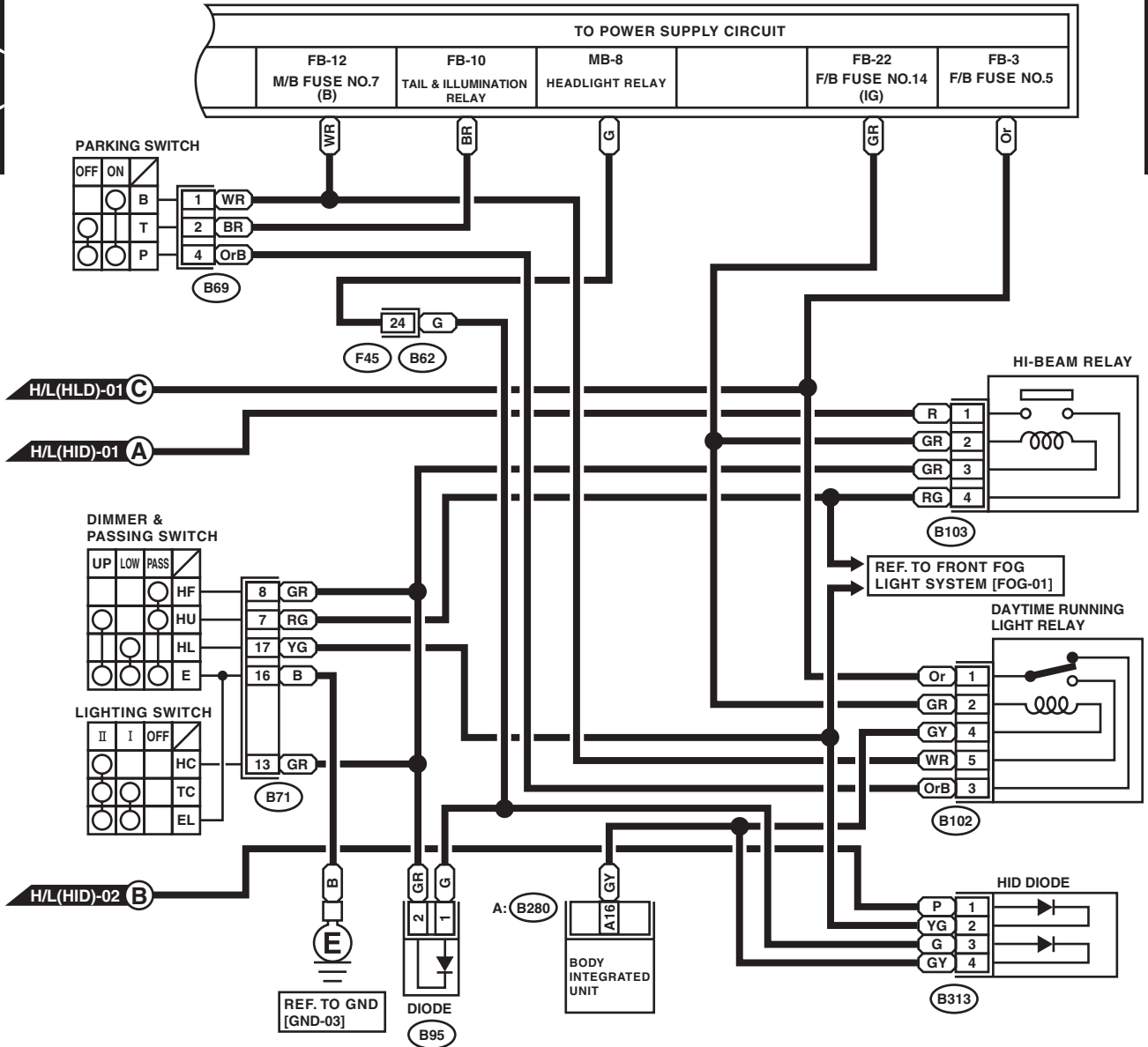
WI-15036

Headlight System

WIRING SYSTEM

H/L(HID)-02

H/L(HID)-02



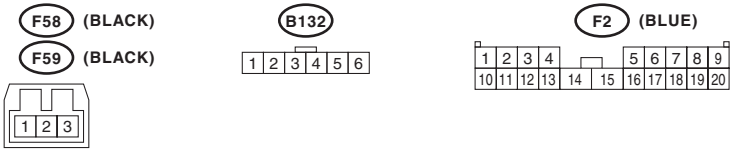
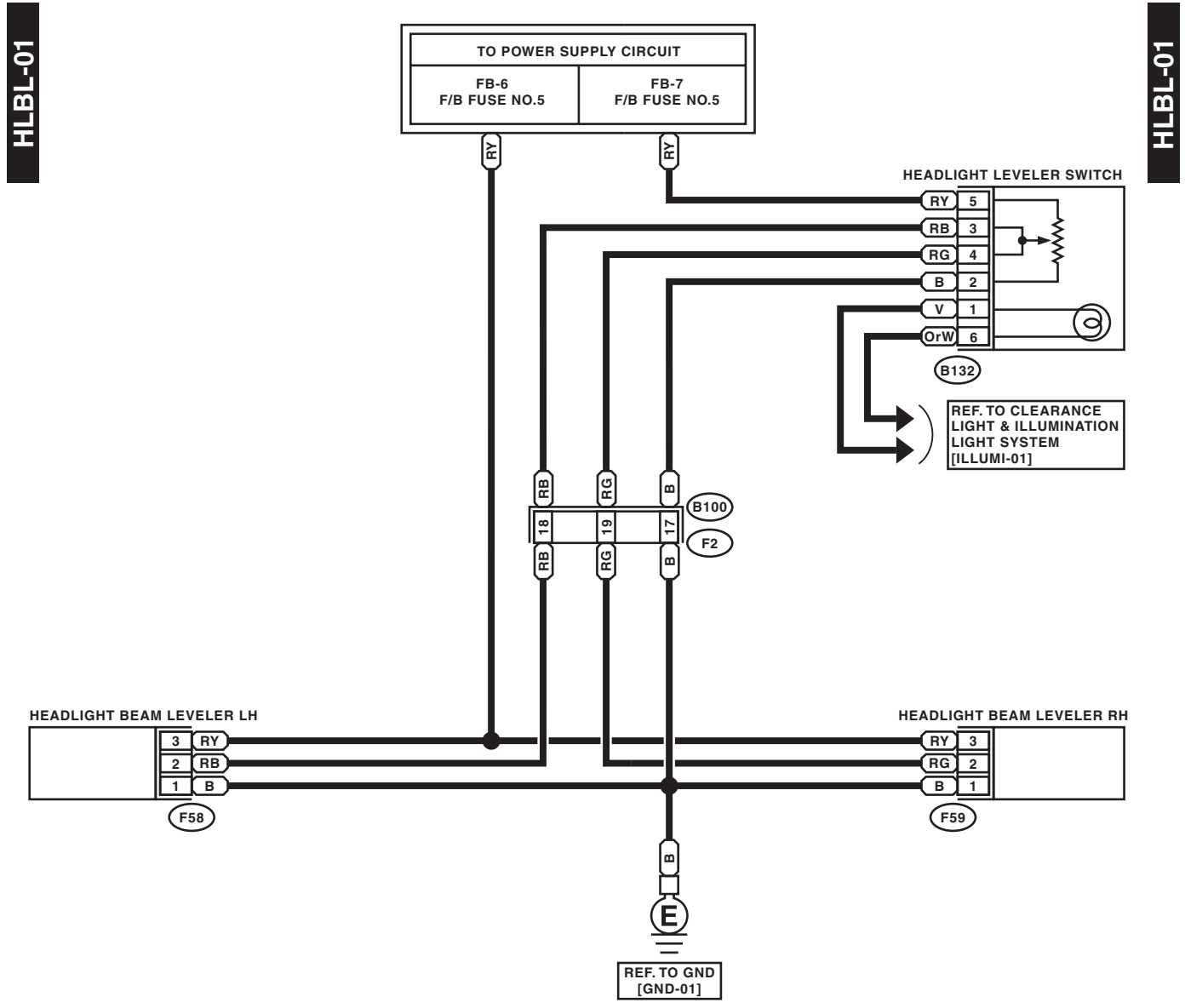
WI-12283

Headlight Beam Leveler System

WIRING SYSTEM

23. Headlight Beam Leveler System

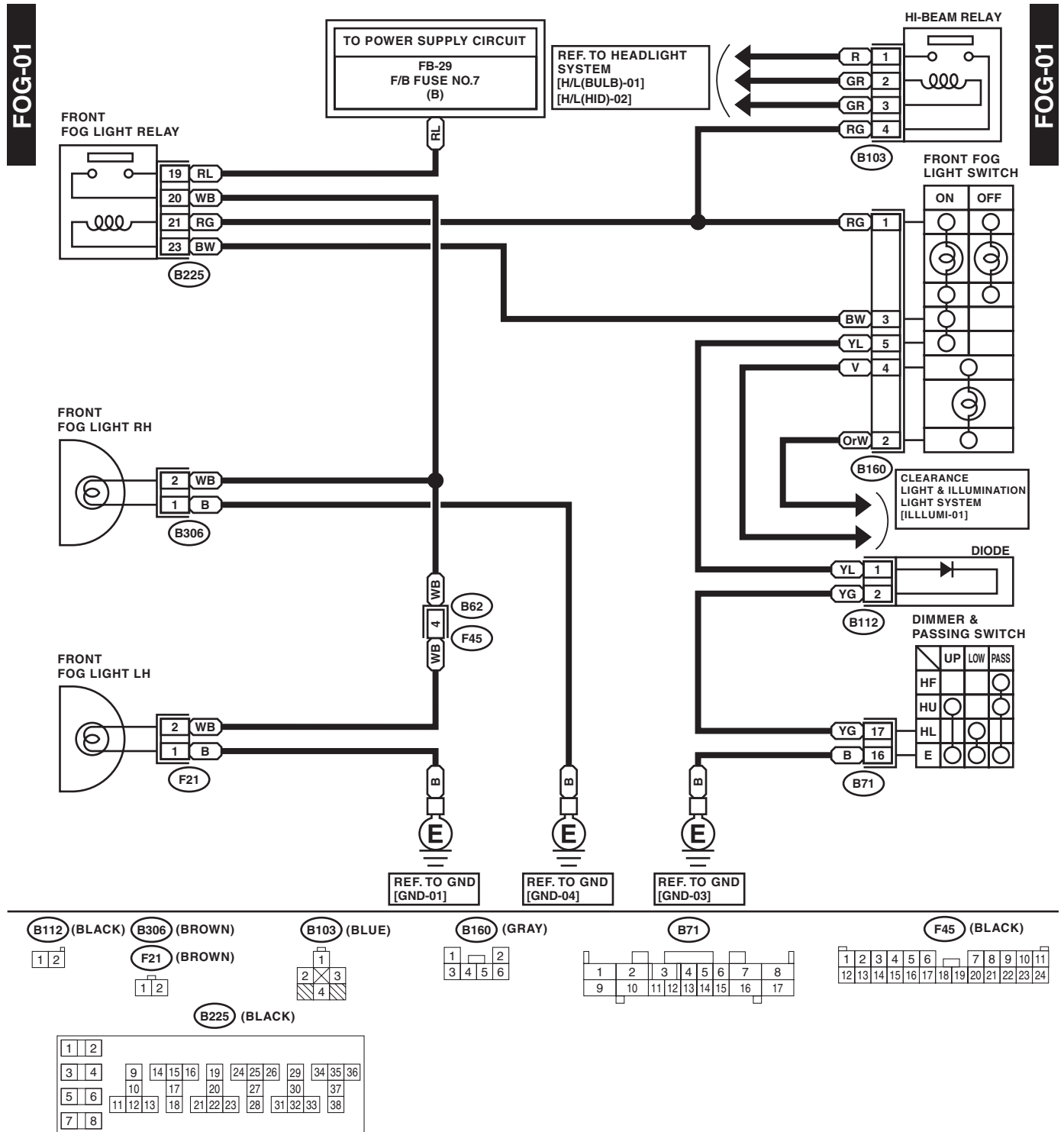
A: WIRING DIAGRAM



WI-12322

24. Front Fog Light System

A: WIRING DIAGRAM



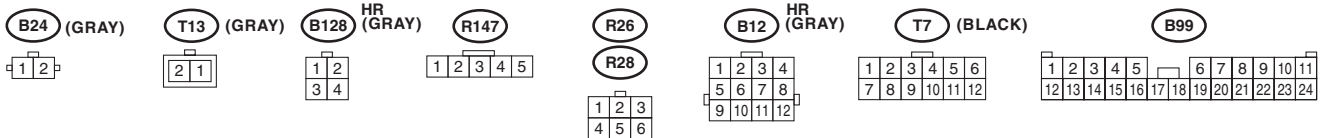
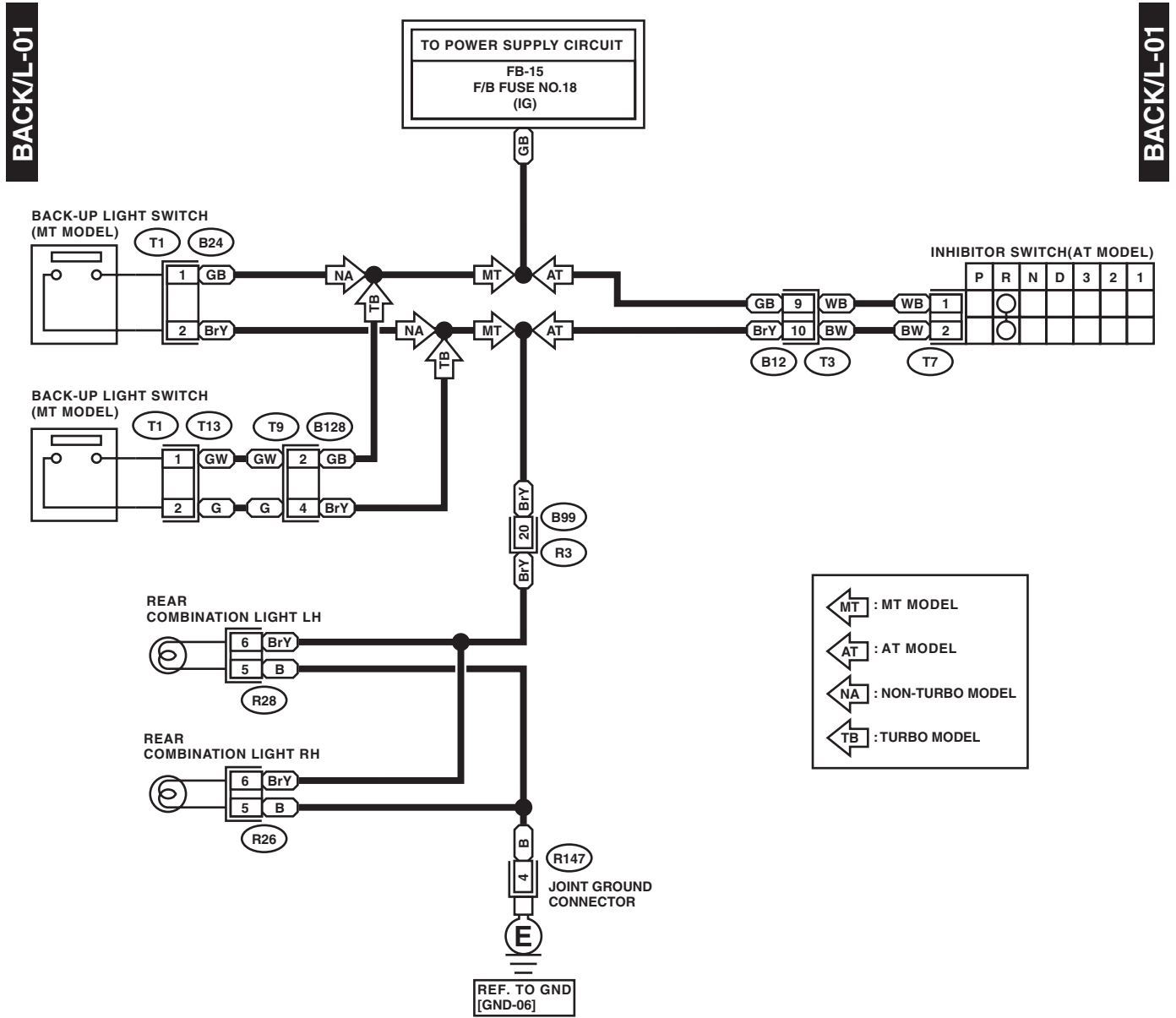
WI-12284

Back-up Light System

WIRING SYSTEM

25.Back-up Light System

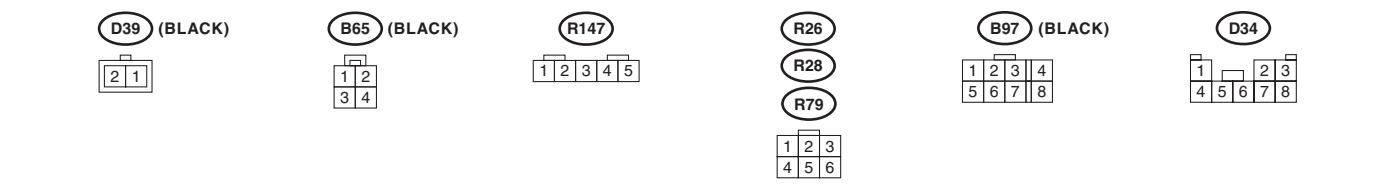
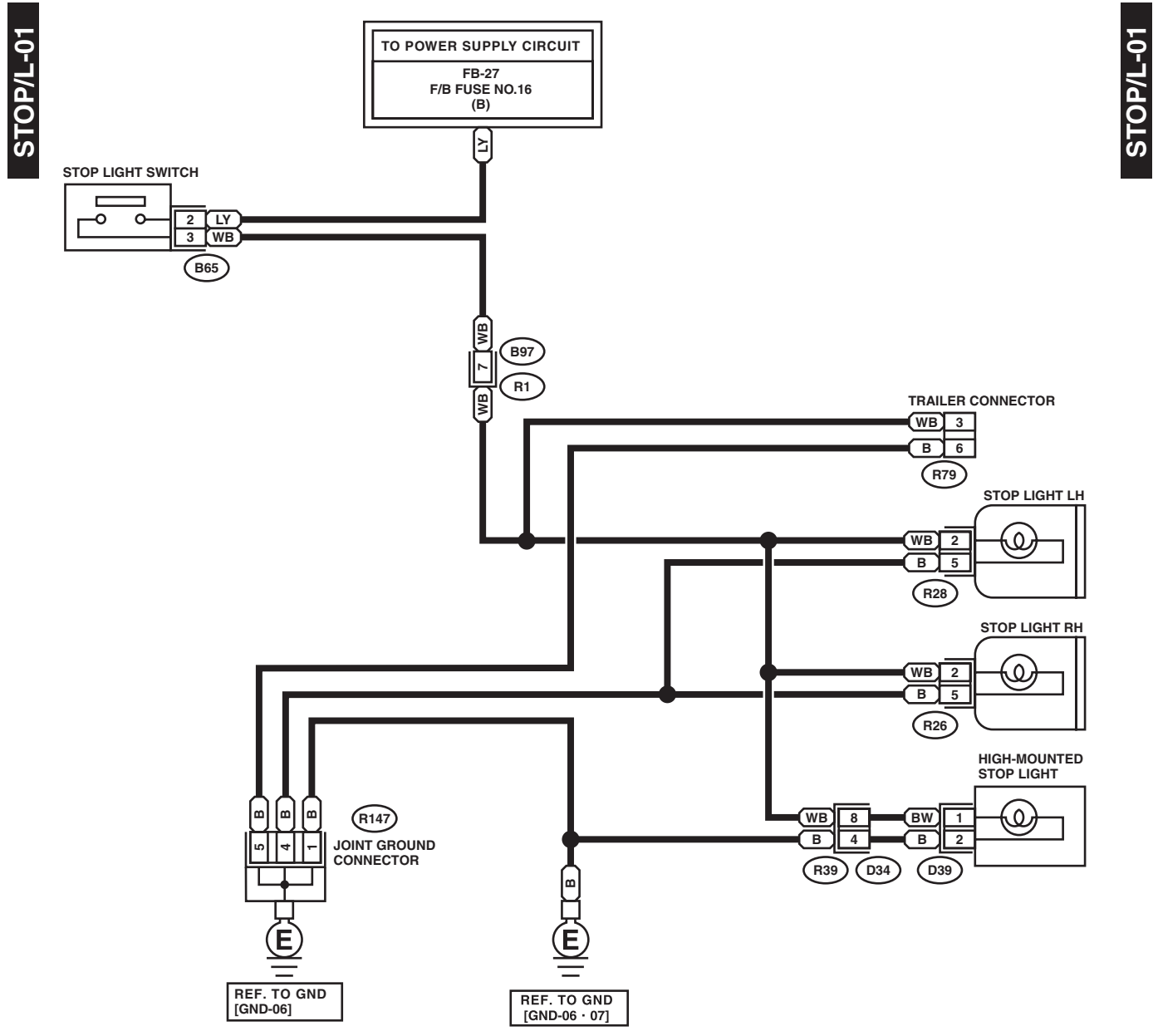
A: WIRING DIAGRAM



WI-15037

26. Stop Light System

A: WIRING DIAGRAM



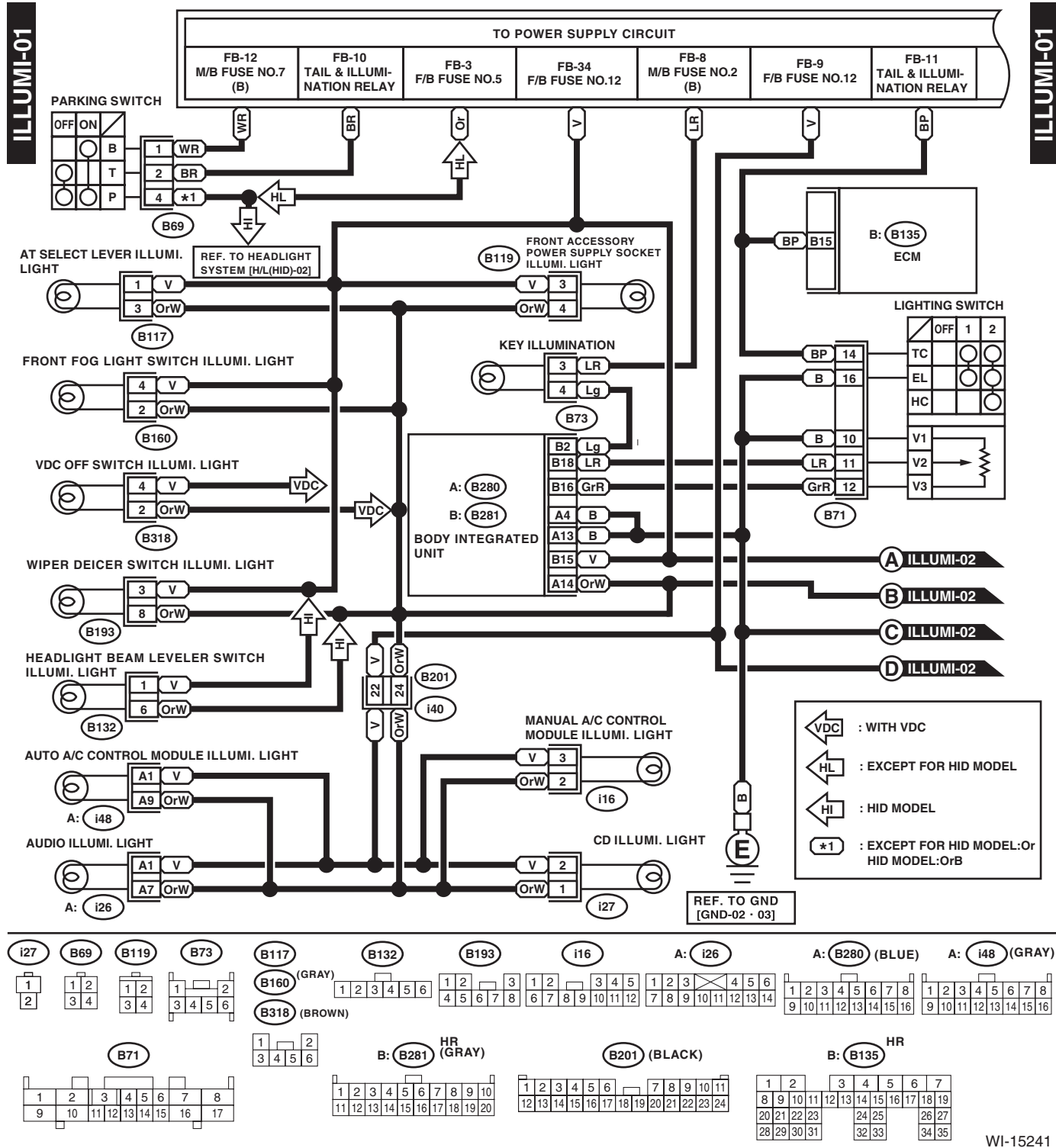
WI-12286

Clearance Light and Illumination Light System

WIRING SYSTEM

27. Clearance Light and Illumination Light System

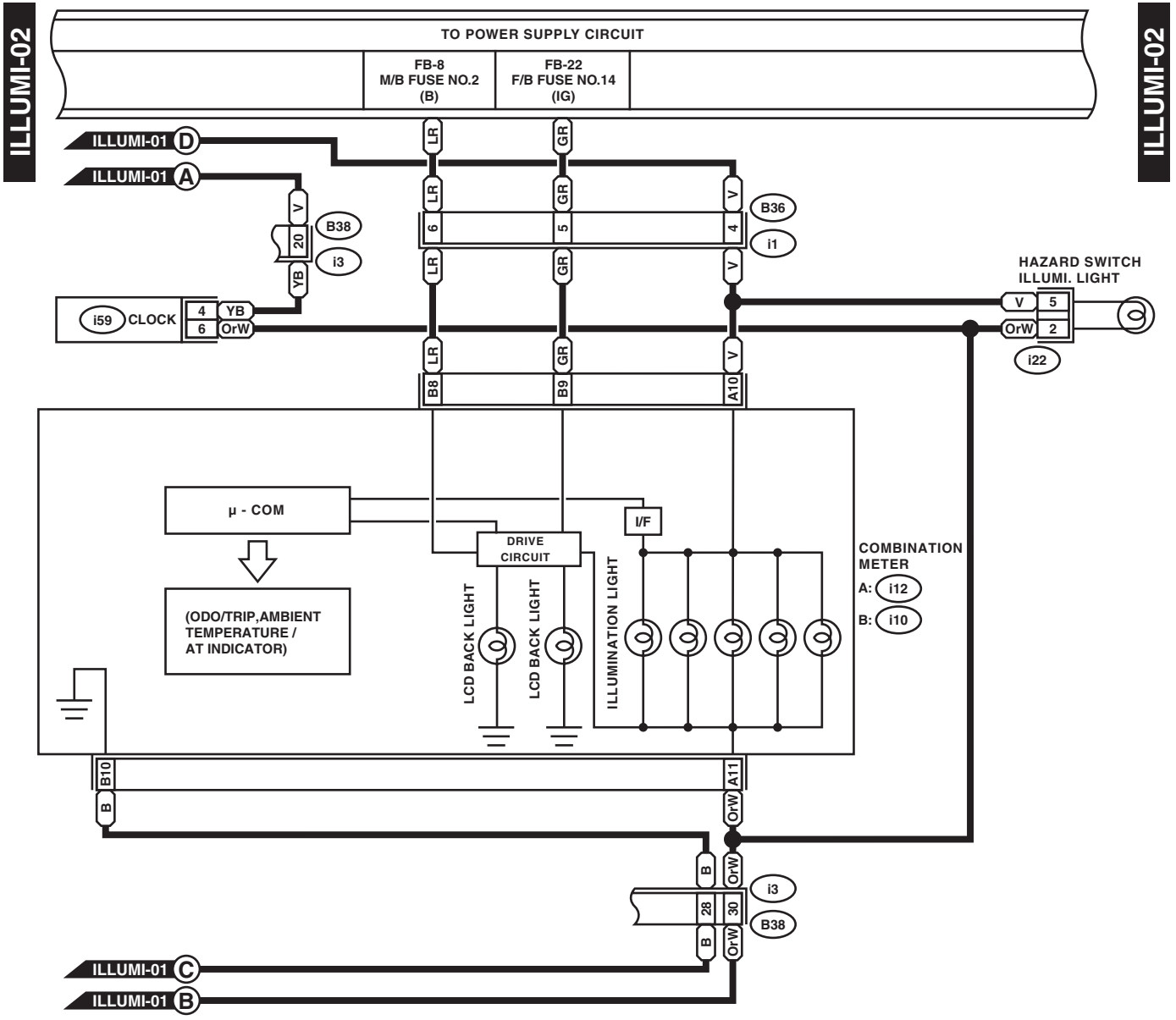
A: WIRING DIAGRAM



WI-15241

Clearance Light and Illumination Light System

WIRING SYSTEM



(i22)

1	2	3	4
5	6	7	8

(i59) (GREEN)

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

A: (i12) (GREEN)

1	2	3	4	5	6		
7	8	9	10	11	12	13	14

(B36)

1	2	3	4	5	6	7	8	9	10	11		
12	13	14	15	16	17	18	19	20	21	22	23	24

B: (i10) (GREEN)

1	2	3	4	5	6	7	8	9	10	11	12	13	14		
15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30

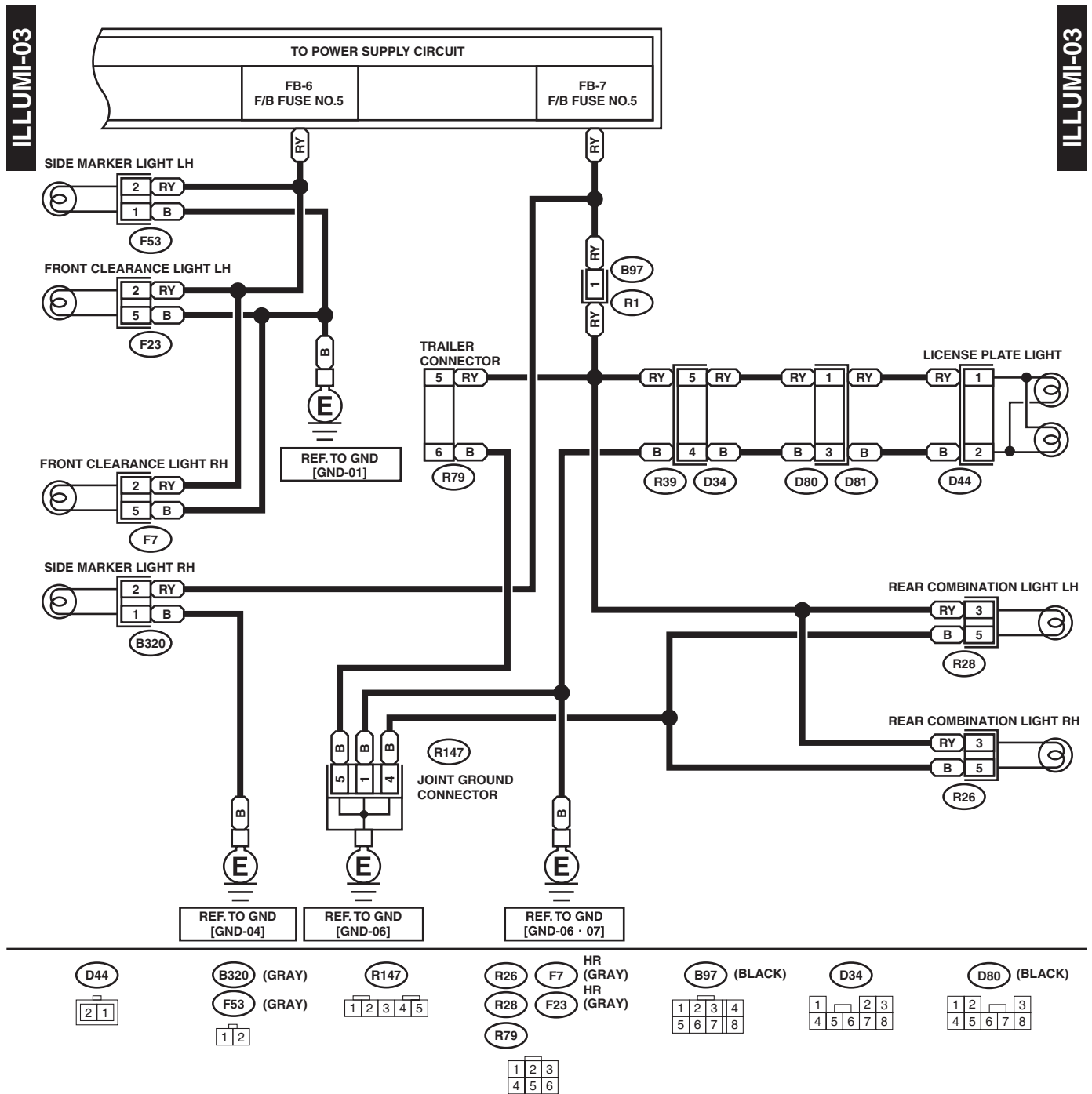
(B38)

1	2	3	4	5	6	7	8	9			
10	11	12	13	14	15	16	17	18	19	20	21
22	23	24	25	26	27	28	29	30	31	32	

WI-12288

Clearance Light and Illumination Light System

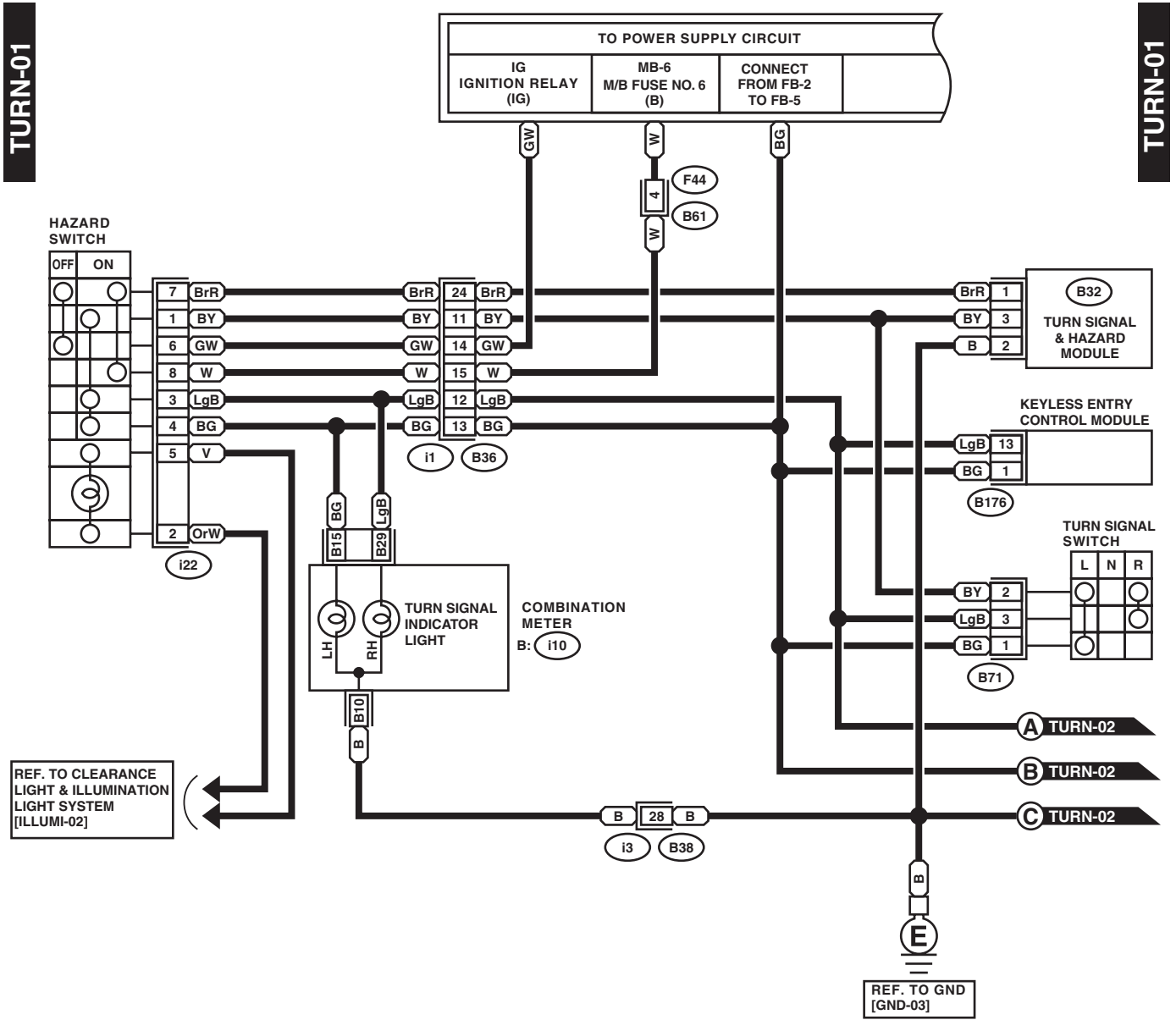
WIRING SYSTEM



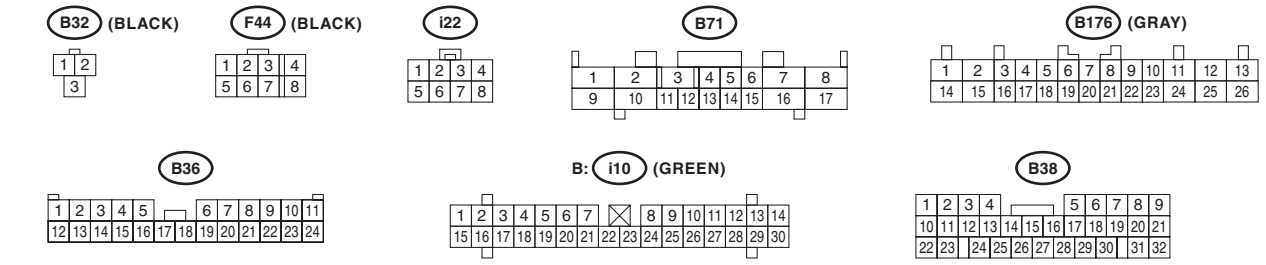
WI-15039

28. Turn Signal Light and Hazard Light System

A: WIRING DIAGRAM



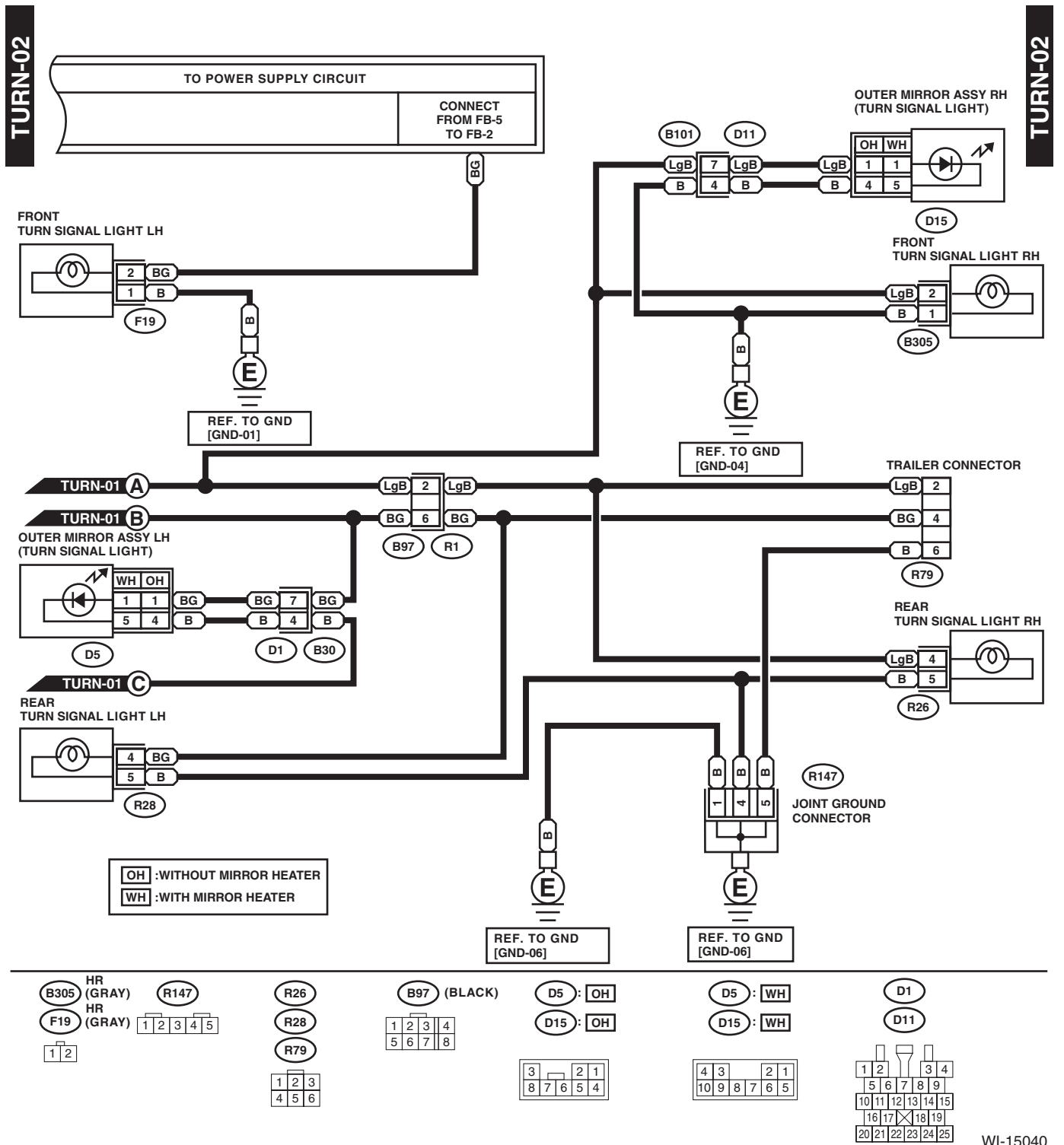
REF. TO CLEARANCE LIGHT & ILLUMINATION LIGHT SYSTEM [ILLUMI-02]



WI-12289

Turn Signal Light and Hazard Light System

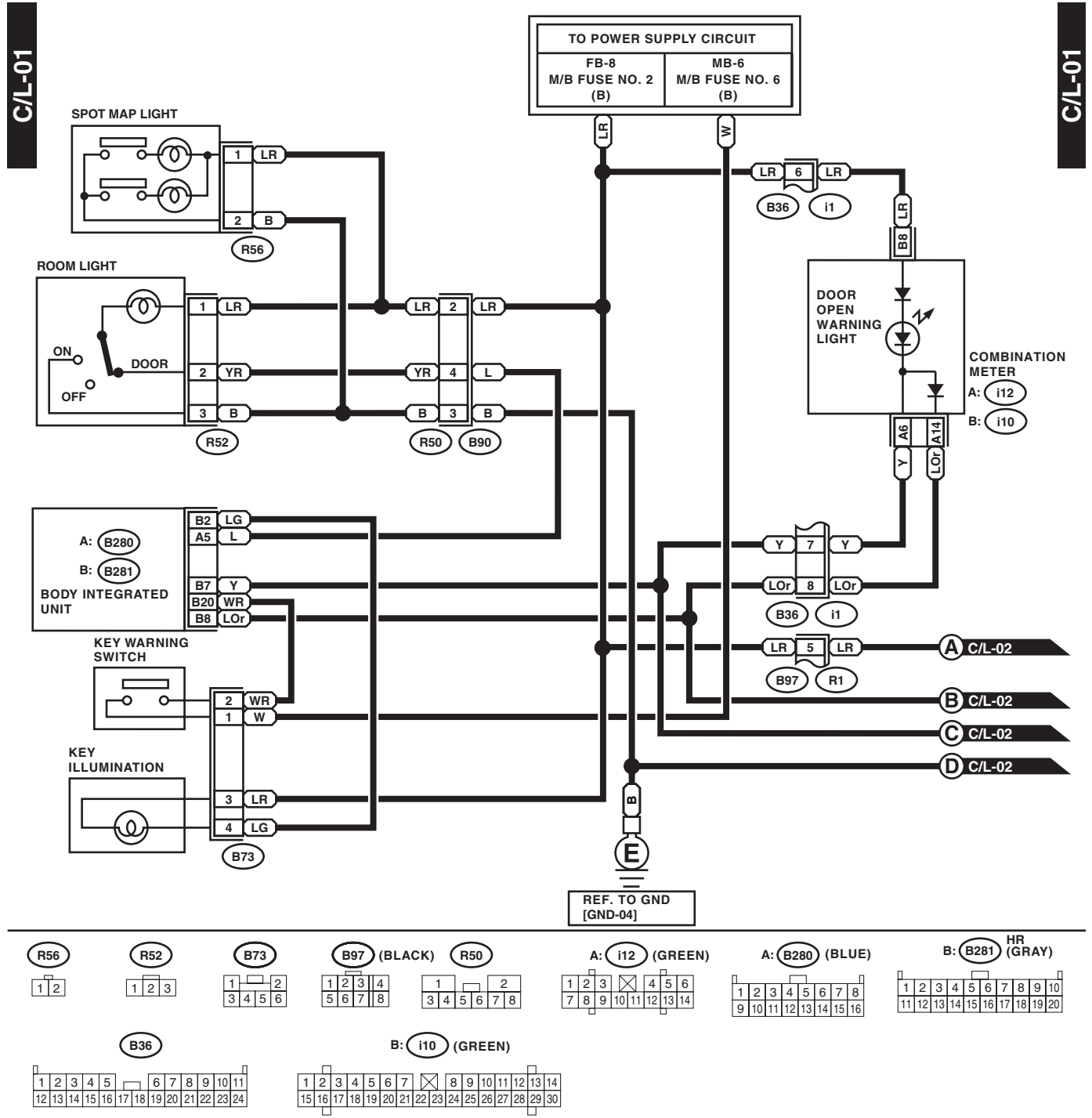
WIRING SYSTEM



WI-15040

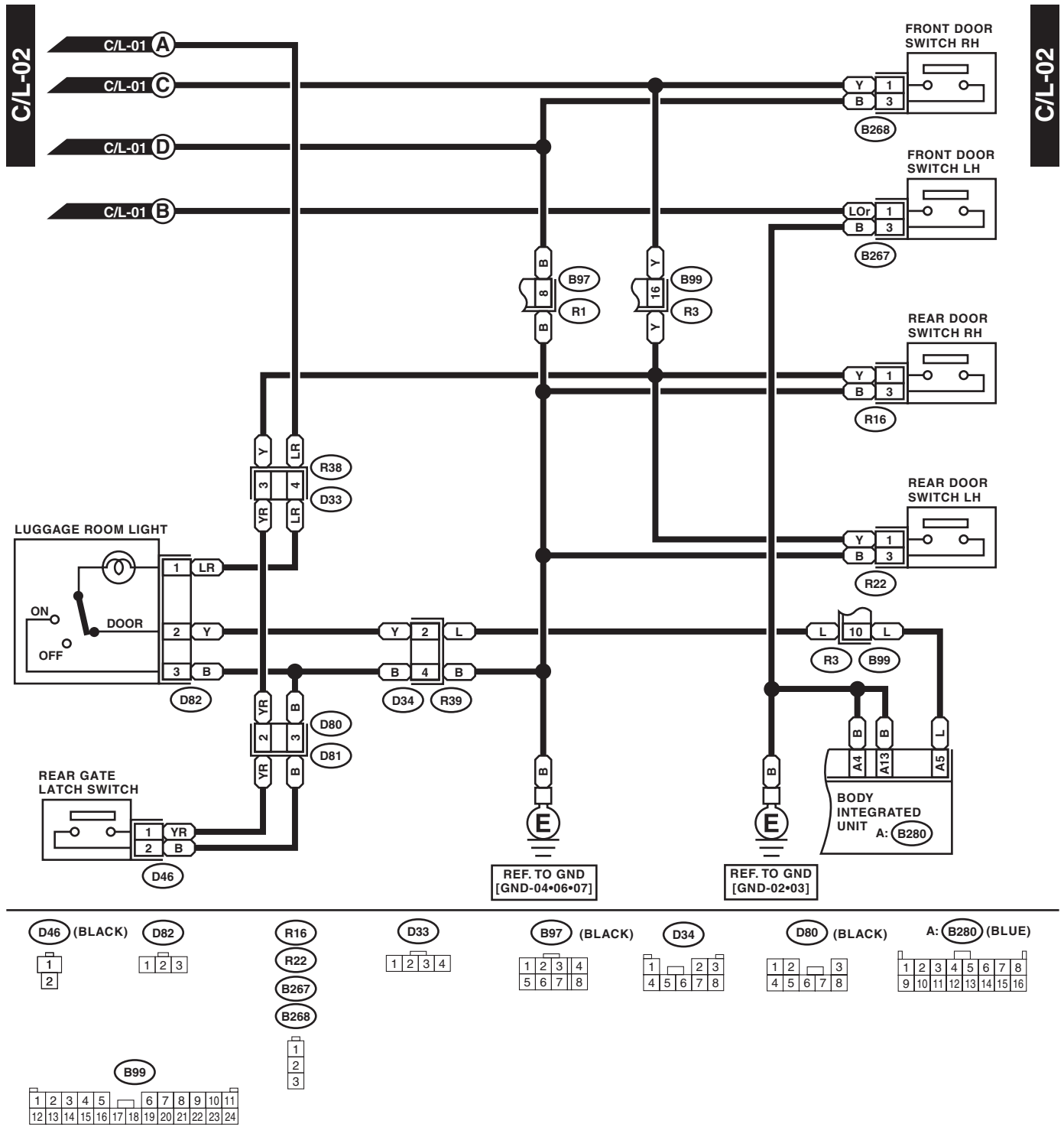
29. Interior Light System

A: WIRING DIAGRAM



Interior Light System

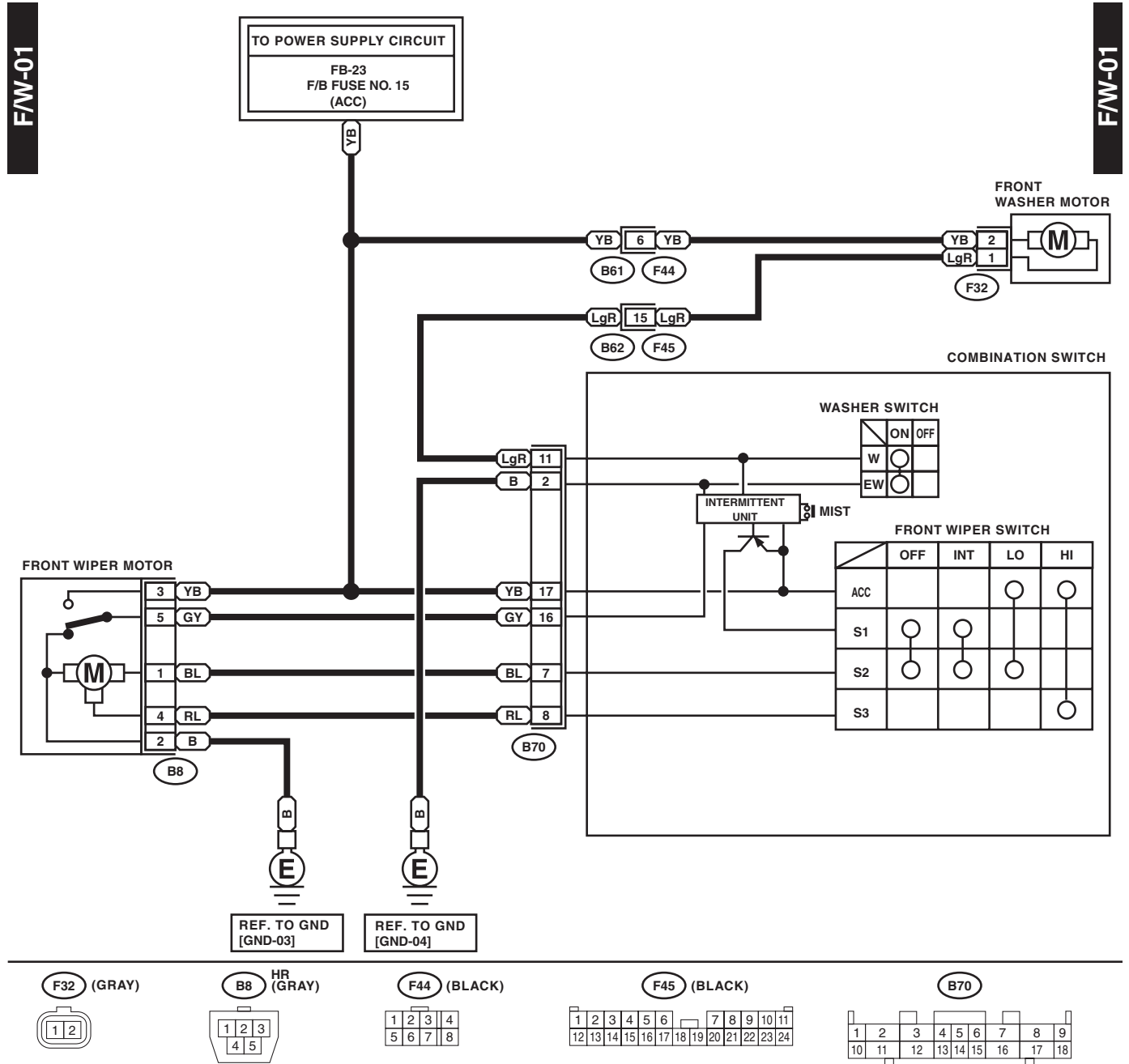
WIRING SYSTEM



WI-12332

30. Front Wiper and Washer System

A: WIRING DIAGRAM

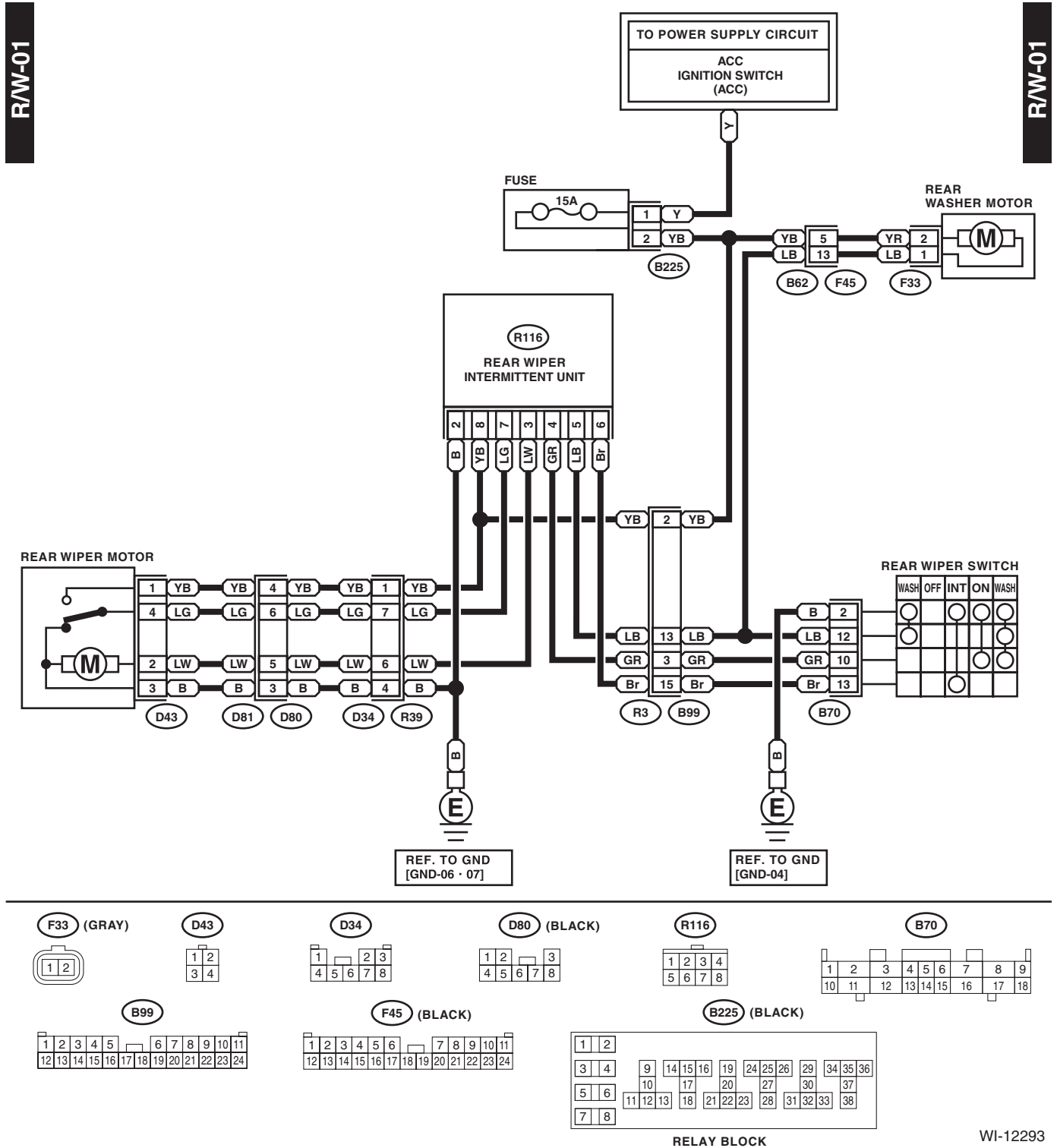


Rear Wiper and Washer System

WIRING SYSTEM

31.Rear Wiper and Washer System

A: WIRING DIAGRAM



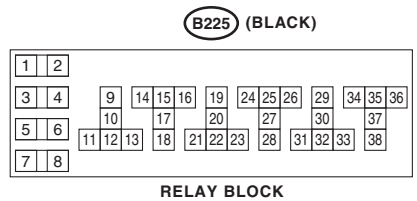
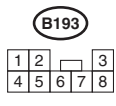
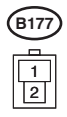
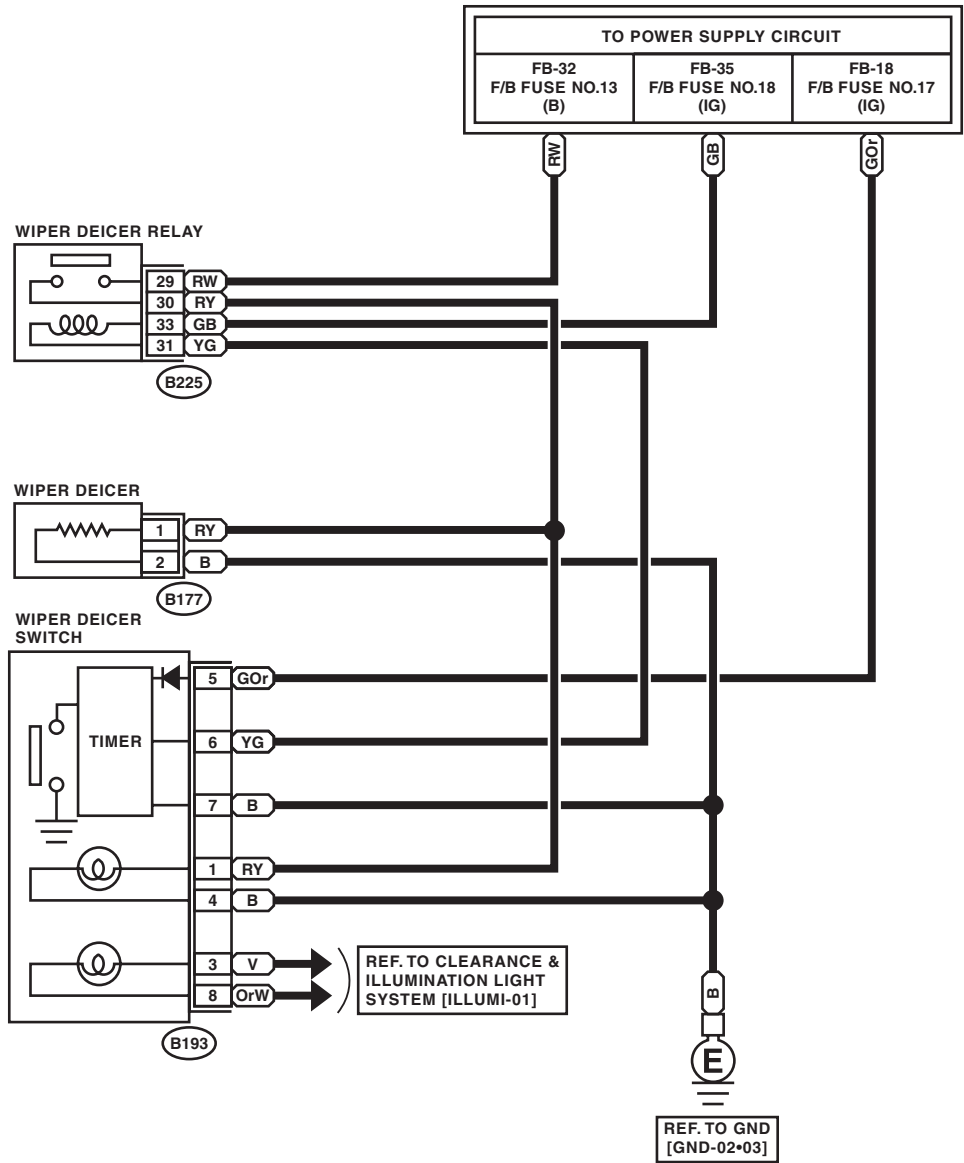
WI-12293

32. Wiper Deicer System

A: WIRING DIAGRAM

W/D-01

W/D-01

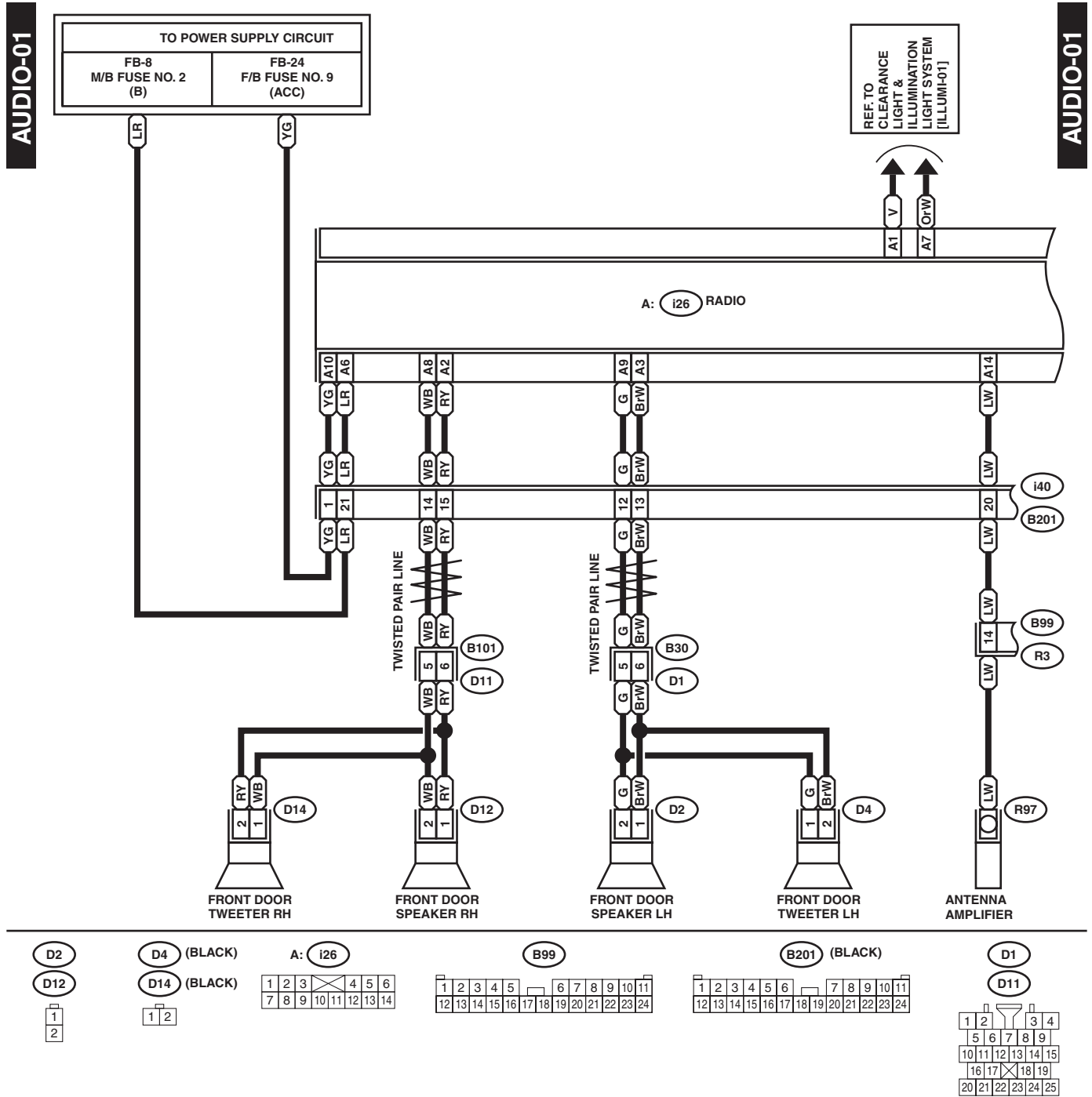


Audio System

WIRING SYSTEM

33. Audio System

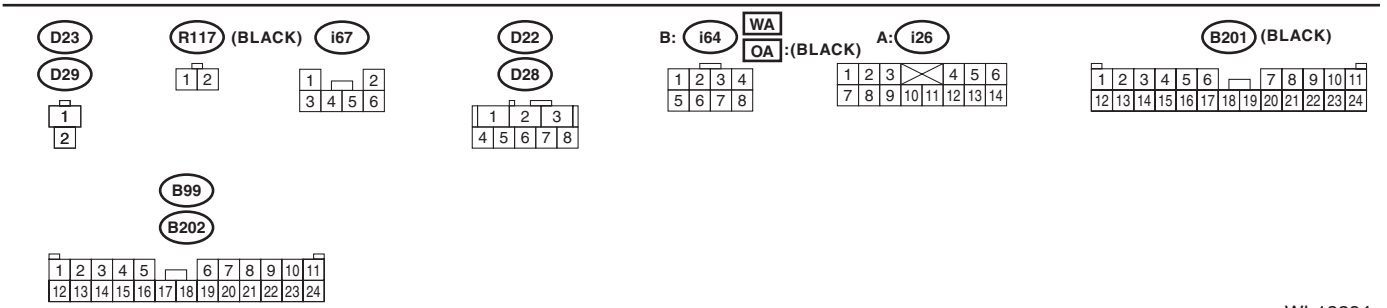
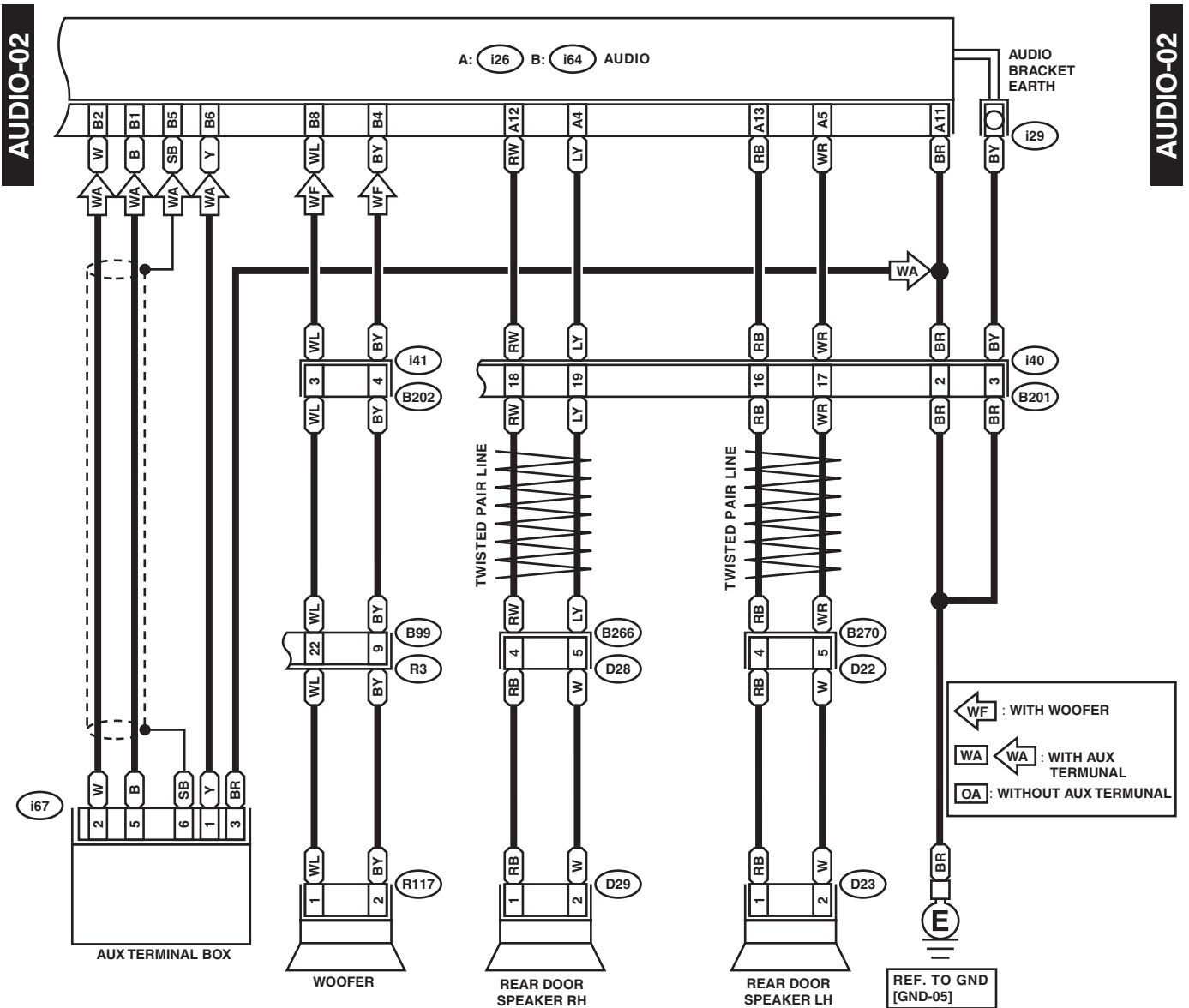
A: WIRING DIAGRAM



WI-08427

Audio System

WIRING SYSTEM



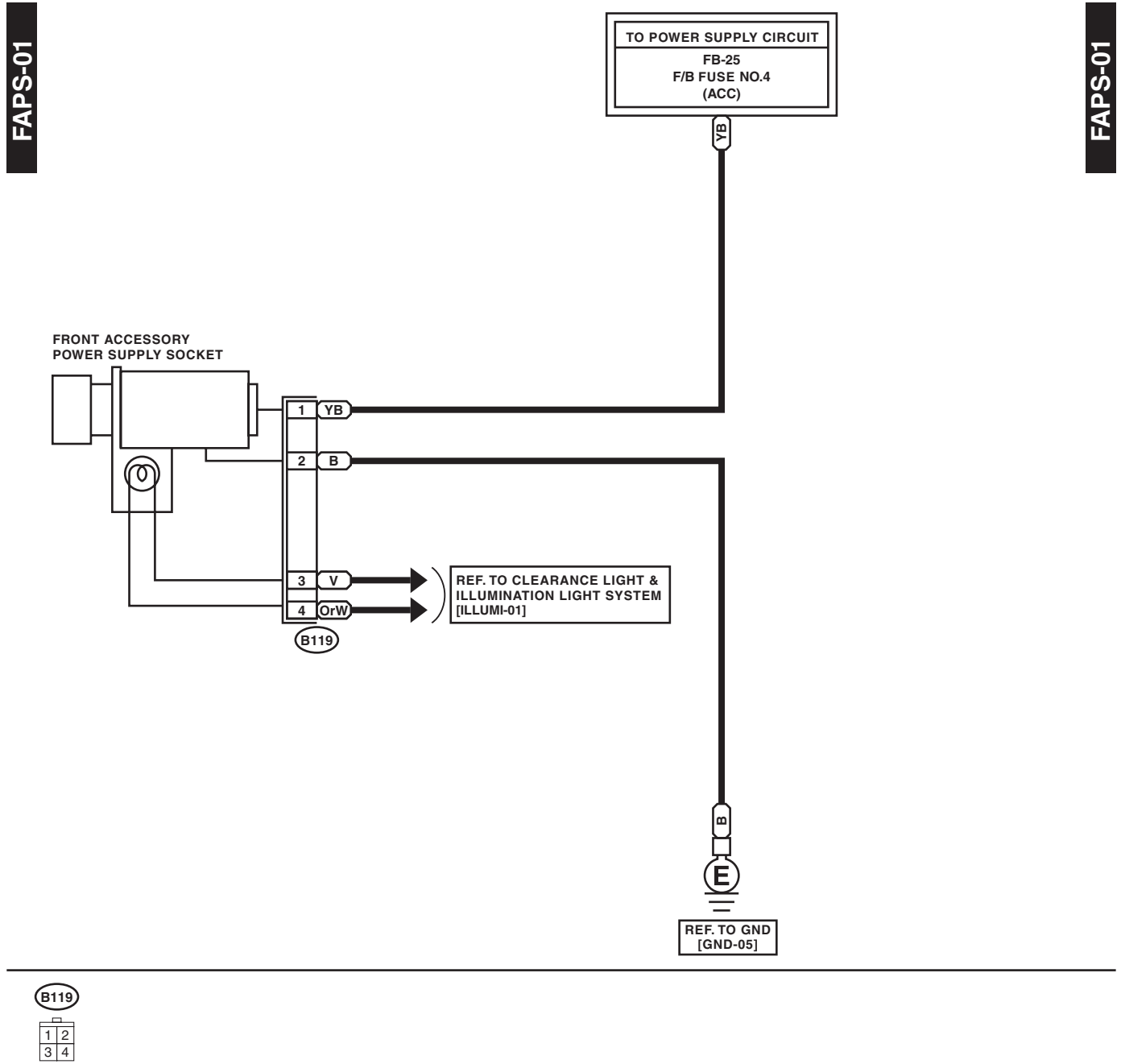
WI-12294

Front Accessory Power Supply Socket System

WIRING SYSTEM

34. Front Accessory Power Supply Socket System

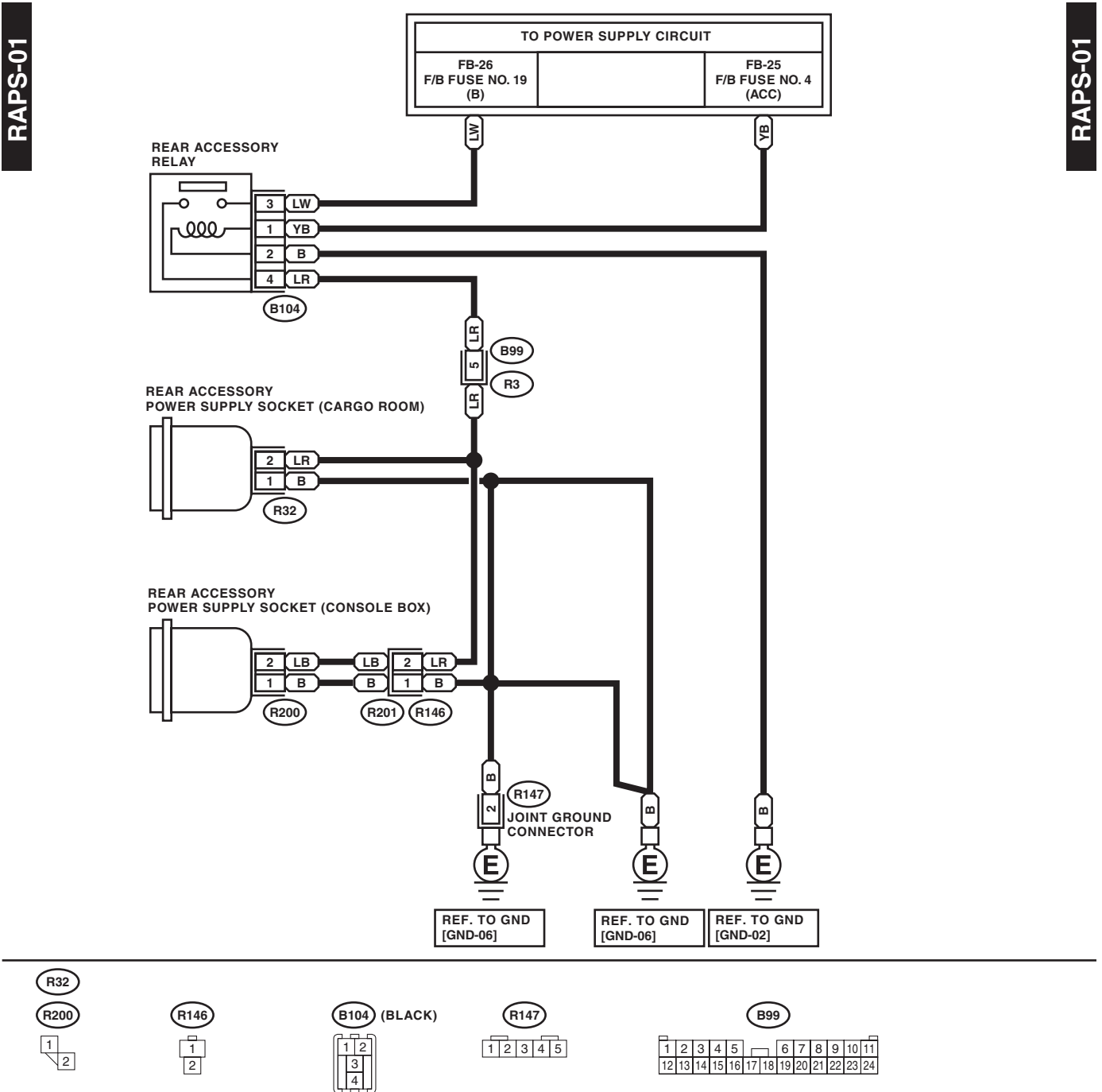
A: WIRING DIAGRAM



WI-12326

35.Rear Accessory Power Supply Socket System

A: WIRING DIAGRAM



Horn System

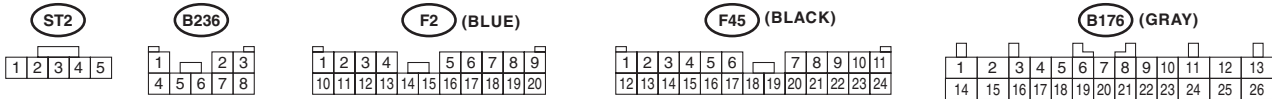
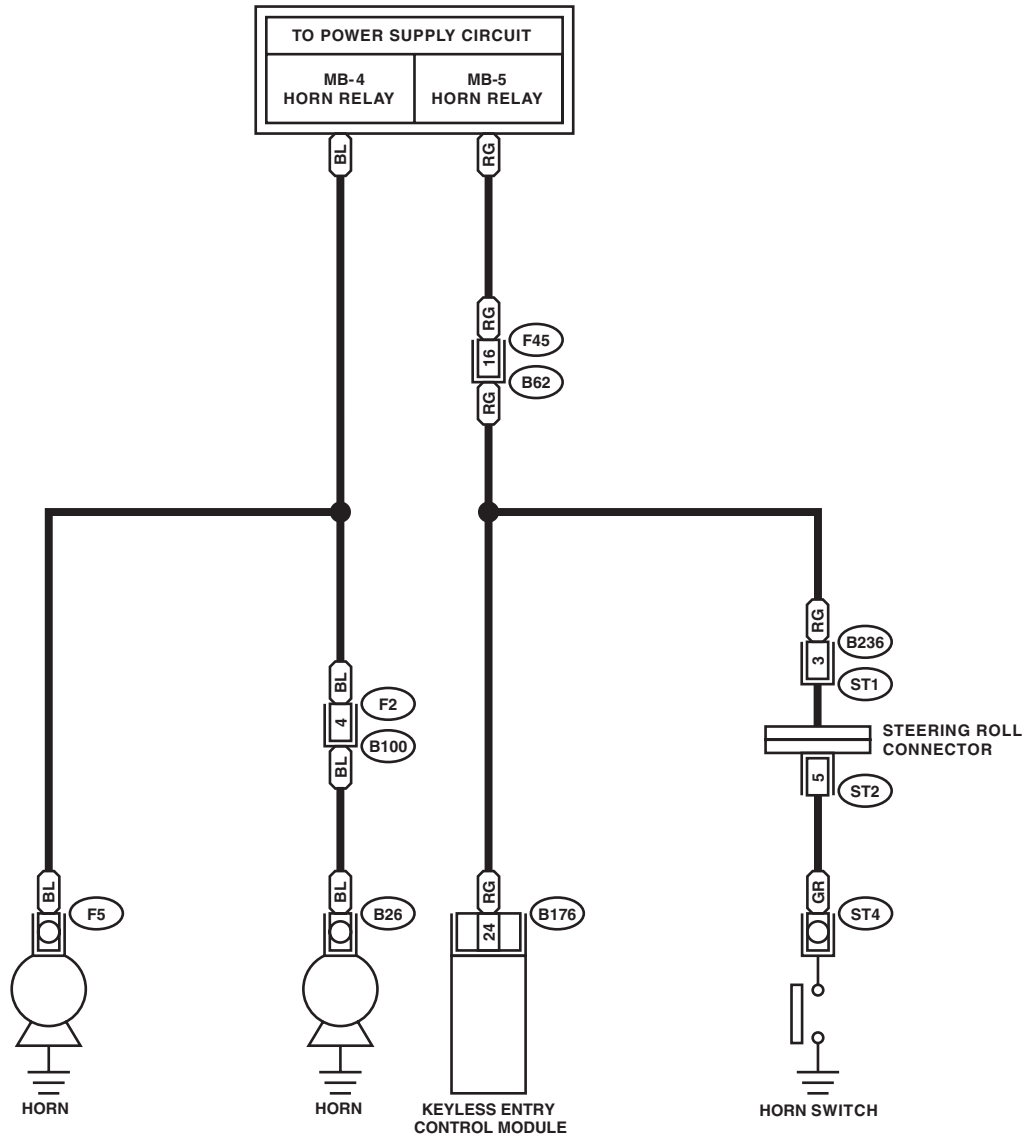
WIRING SYSTEM

36.Horn System

A: WIRING DIAGRAM

HORN-01

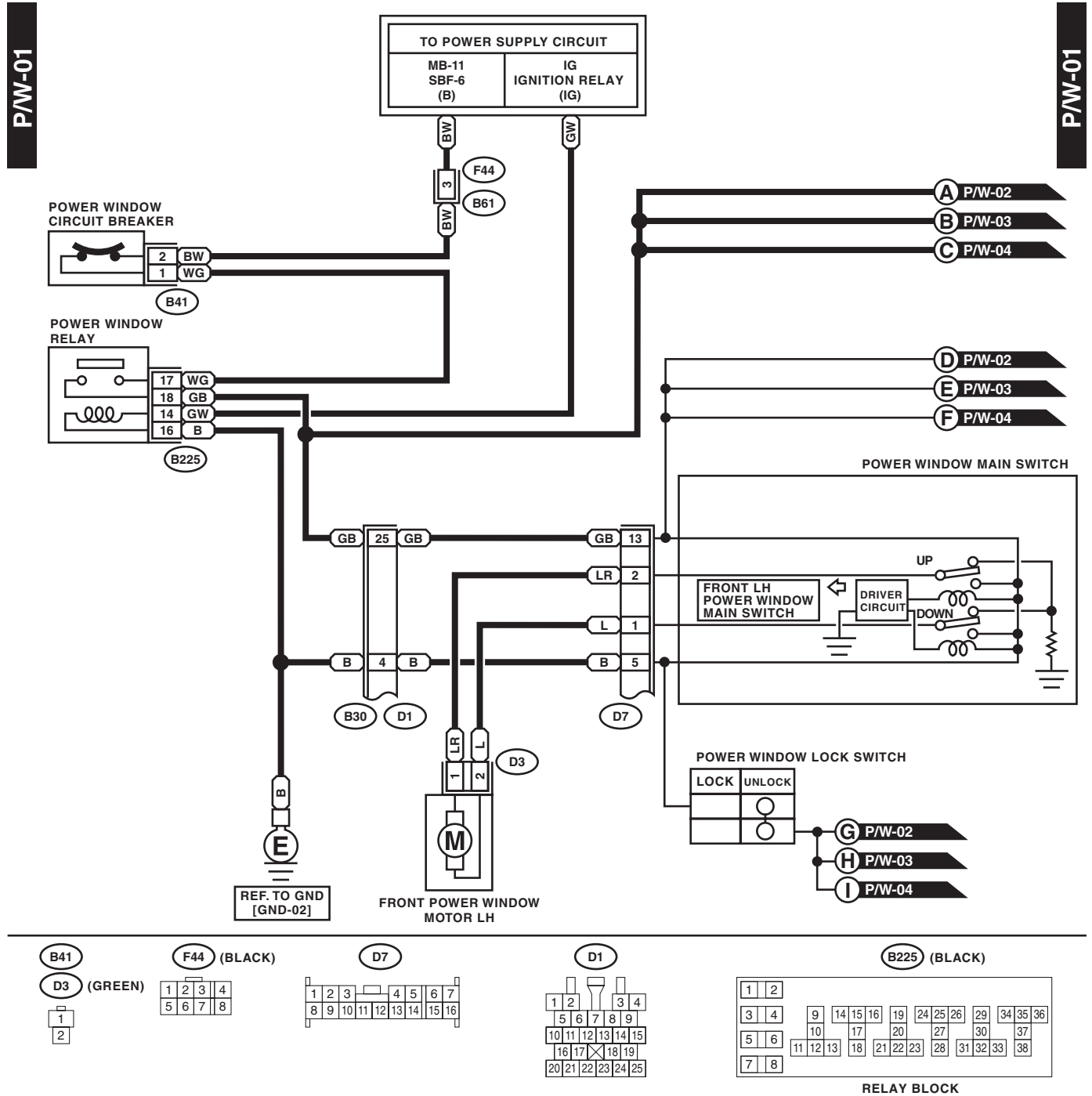
HORN-01



WI-12296

37. Power Window System

A: WIRING DIAGRAM

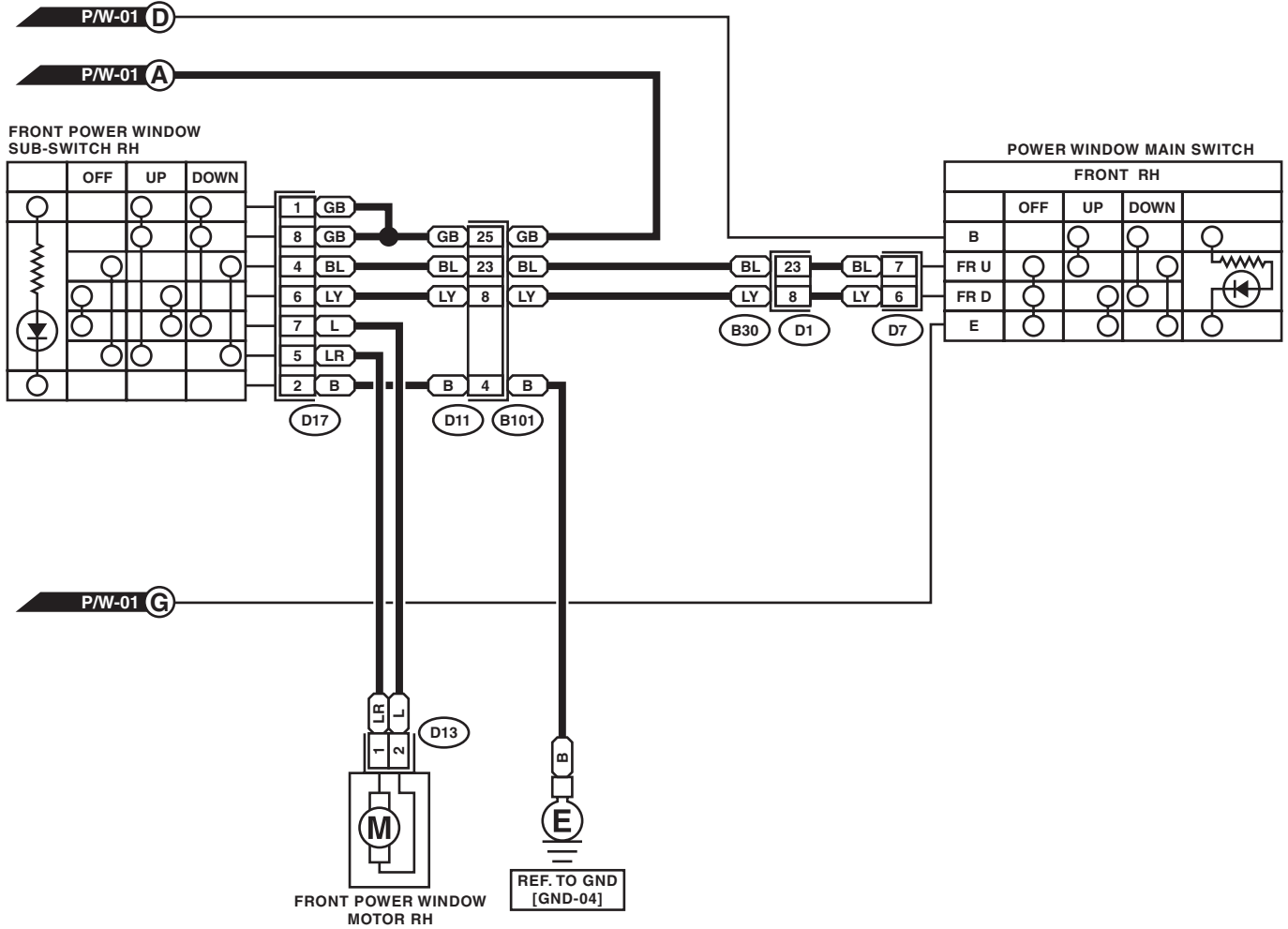


Power Window System

WIRING SYSTEM

P/W-02

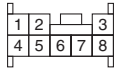
P/W-02



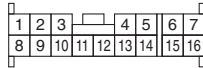
D13 (GREEN)



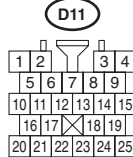
D17



D7



D1



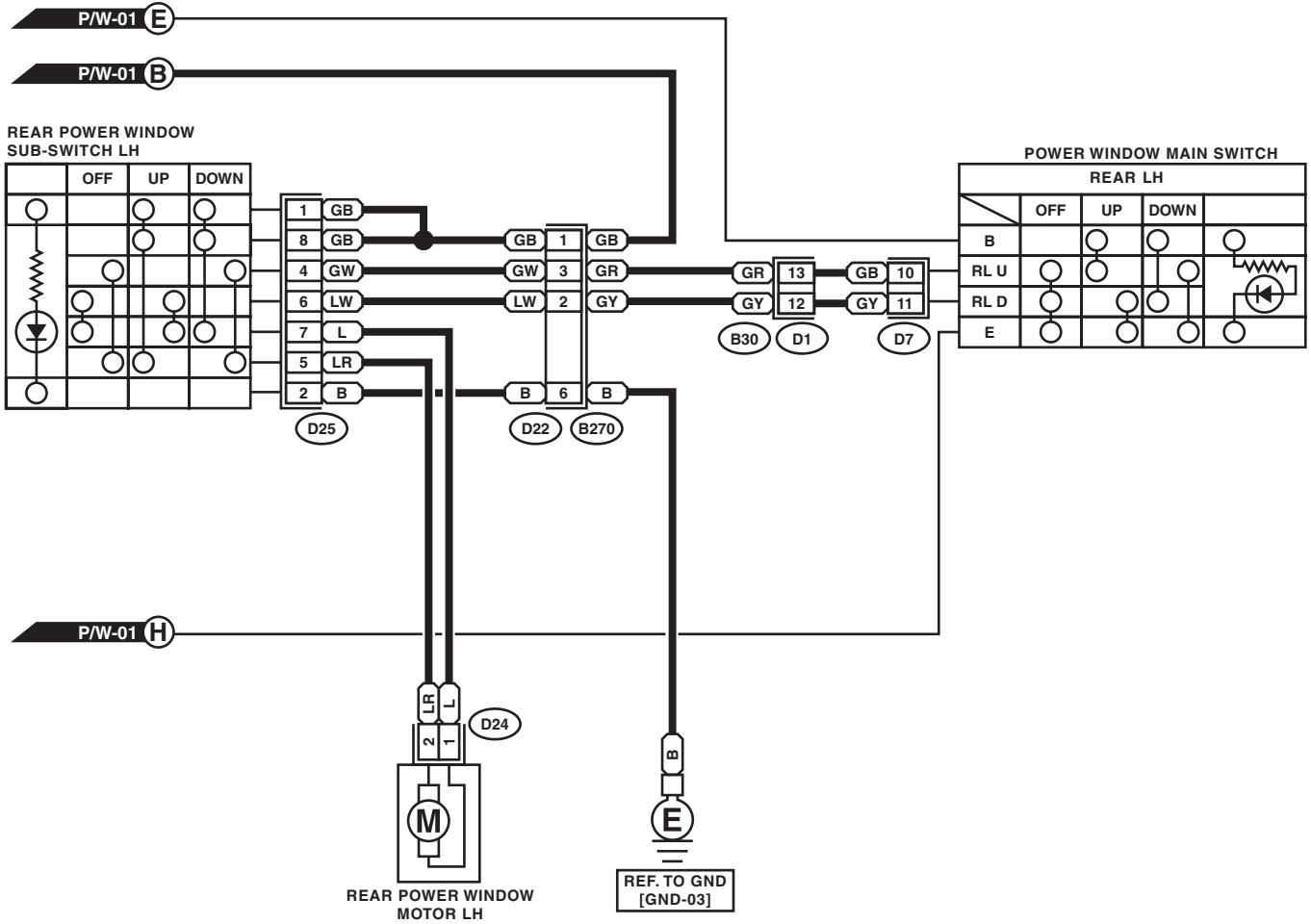
WI-12298

Power Window System

WIRING SYSTEM

P/W-03

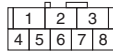
P/W-03



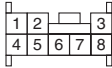
D24 (GREEN)



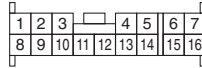
D22



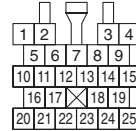
D25



D7



D1



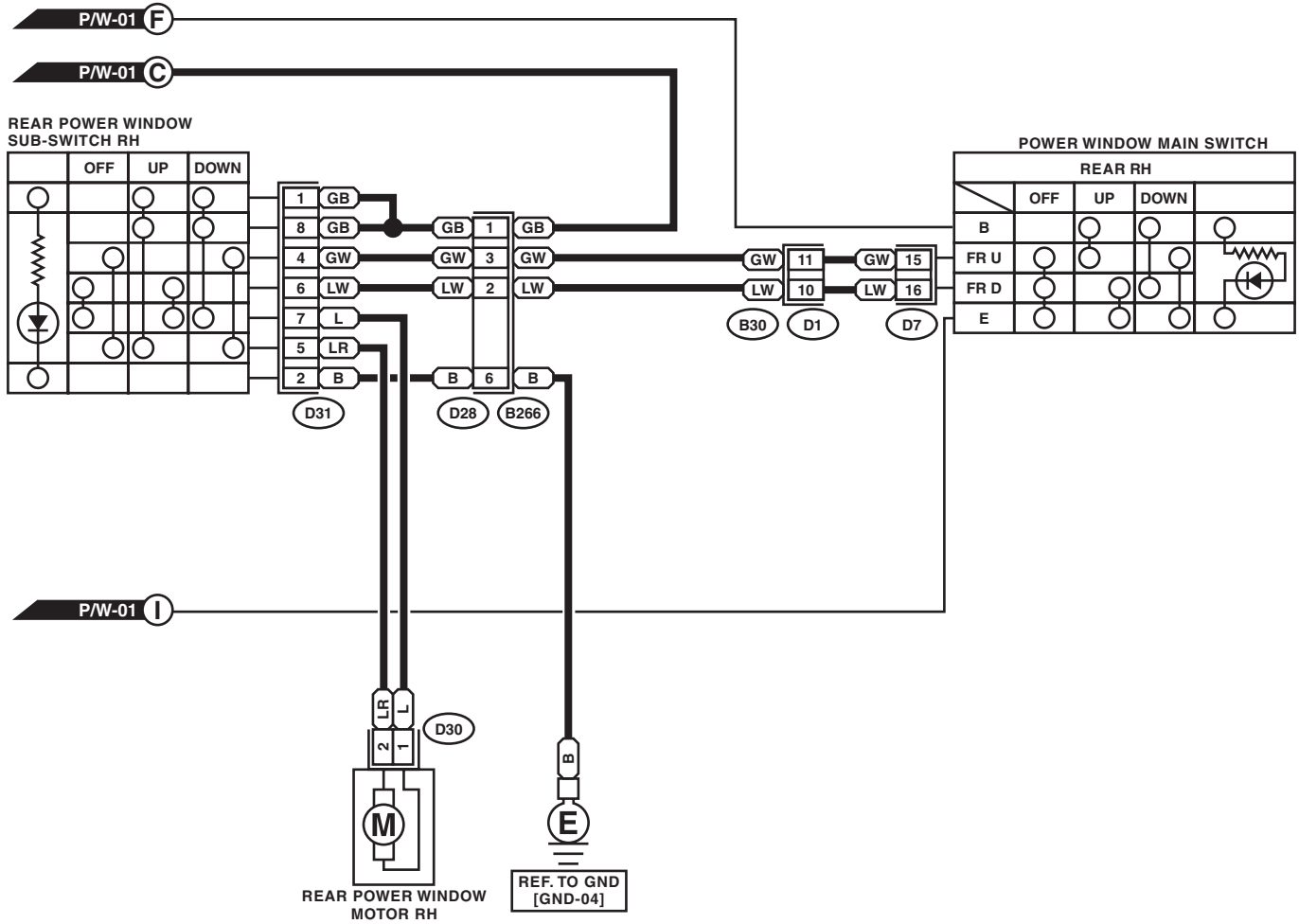
WI-12299

Power Window System

WIRING SYSTEM

P/W-04

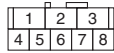
P/W-04



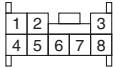
D30 (GREEN)



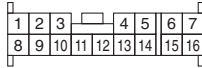
D28



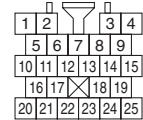
D31



D7



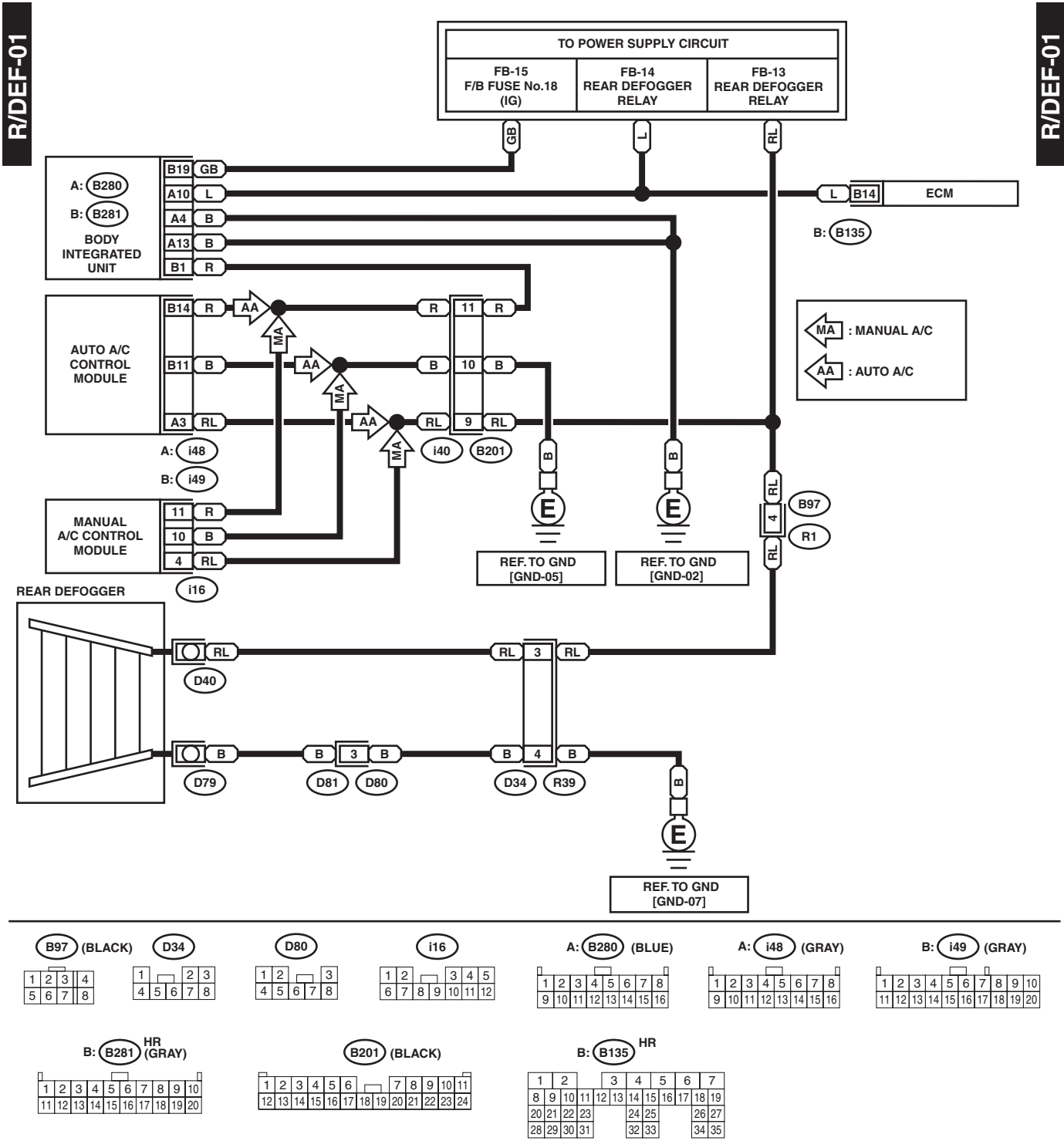
D1



WI-12300

38.Rear Defogger System

A: WIRING DIAGRAM



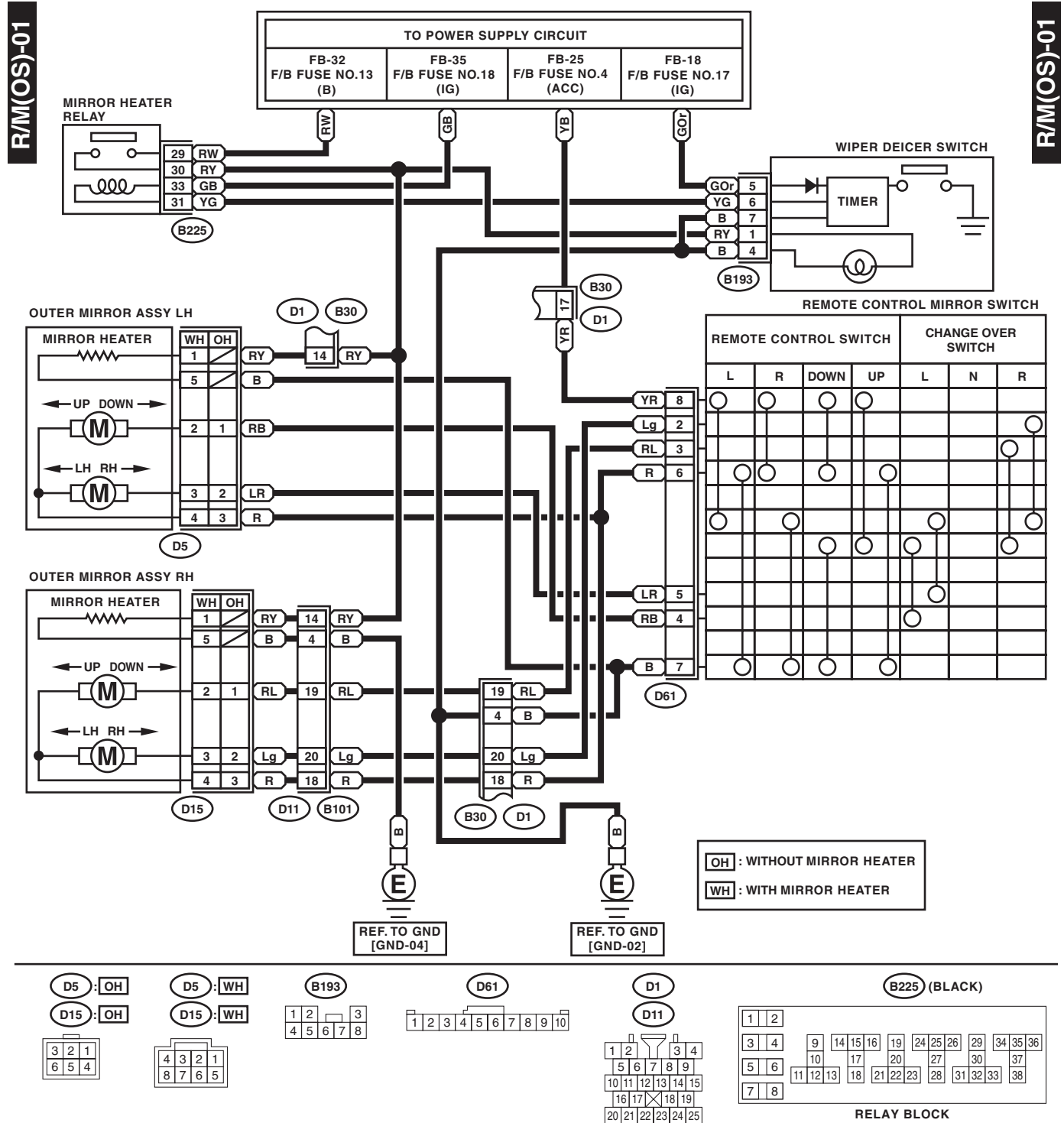
Remote Control Mirror System

WIRING SYSTEM

39.Remote Control Mirror System

A: WIRING DIAGRAM

1. WITHOUT OUTER MIRROR TURN SIGNAL LIGHT

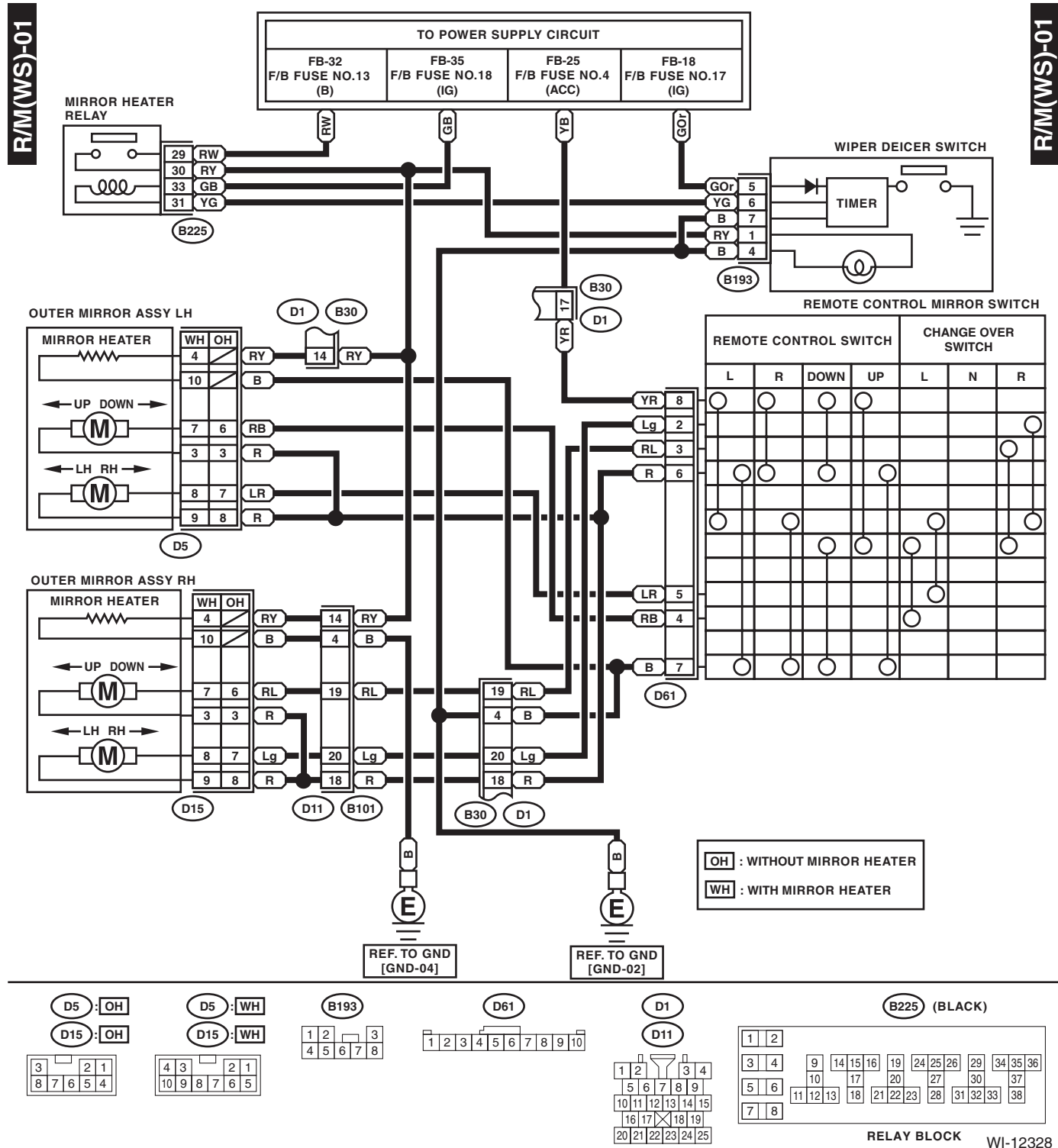


WI-12327

Remote Control Mirror System

WIRING SYSTEM

2. WITH OUTER MIRROR TURN SIGNAL LIGHT



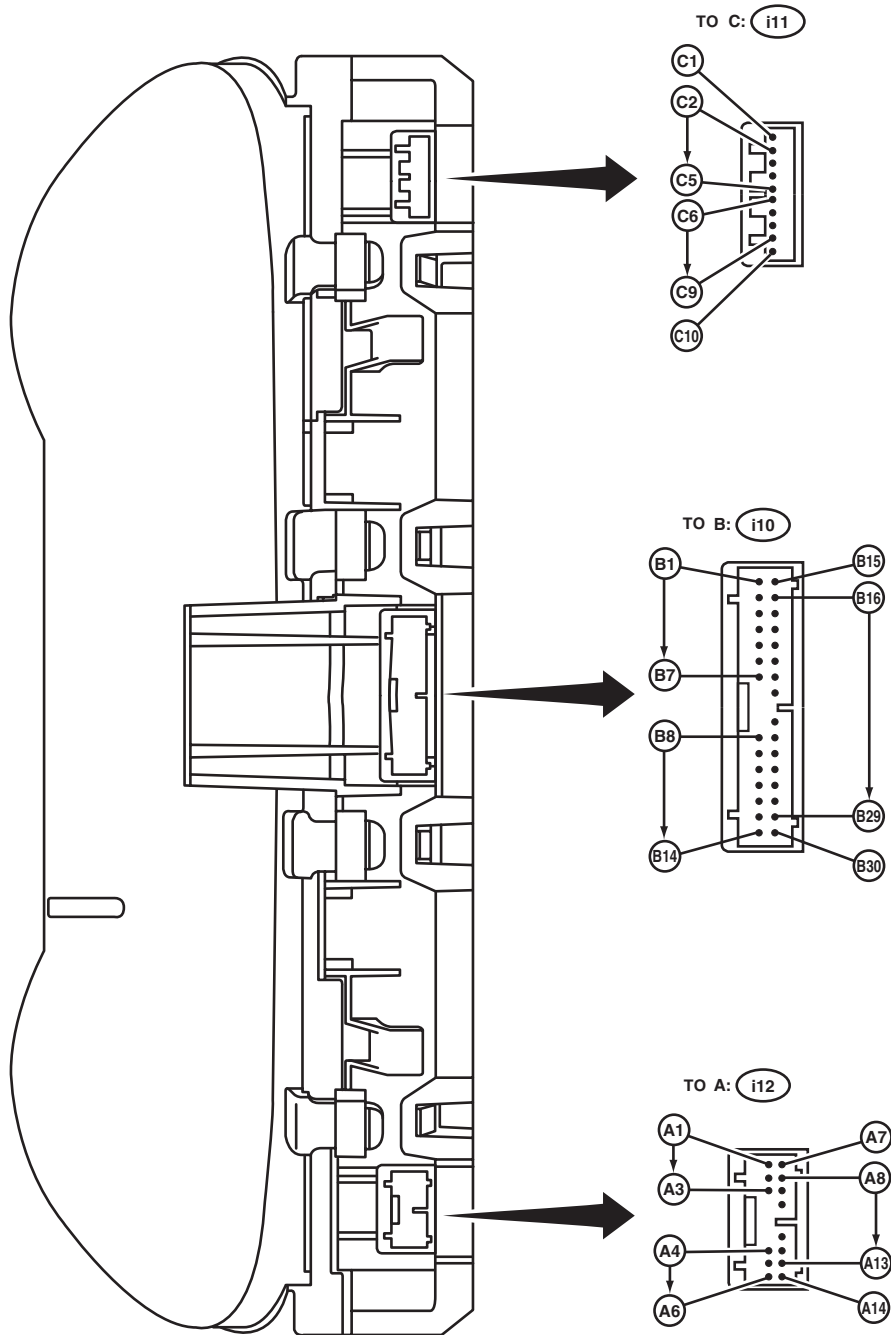
Combination Meter

WIRING SYSTEM

40. Combination Meter

A: WIRING DIAGRAM

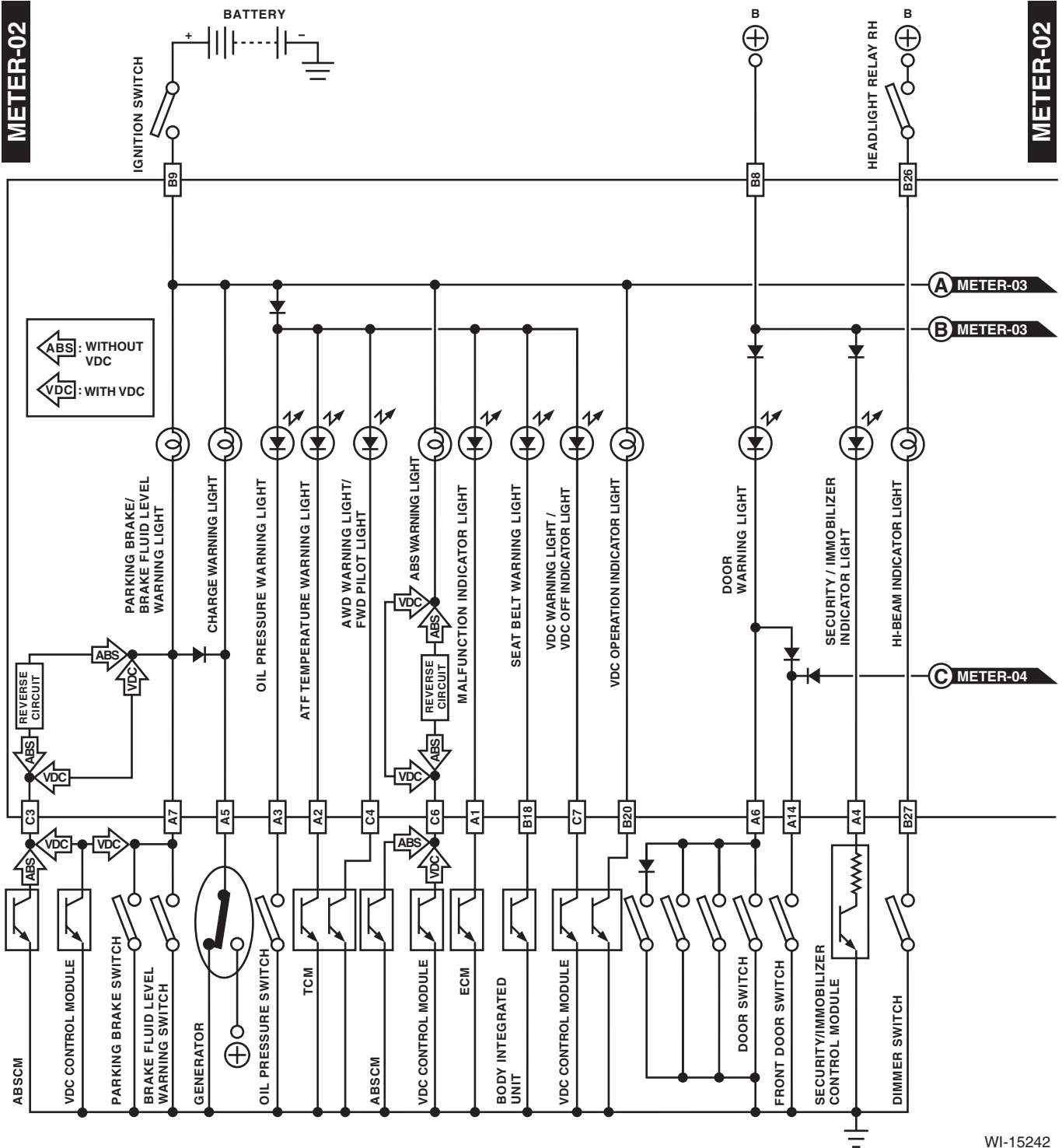
METER-01



METER-01

WI-12301

Combination Meter



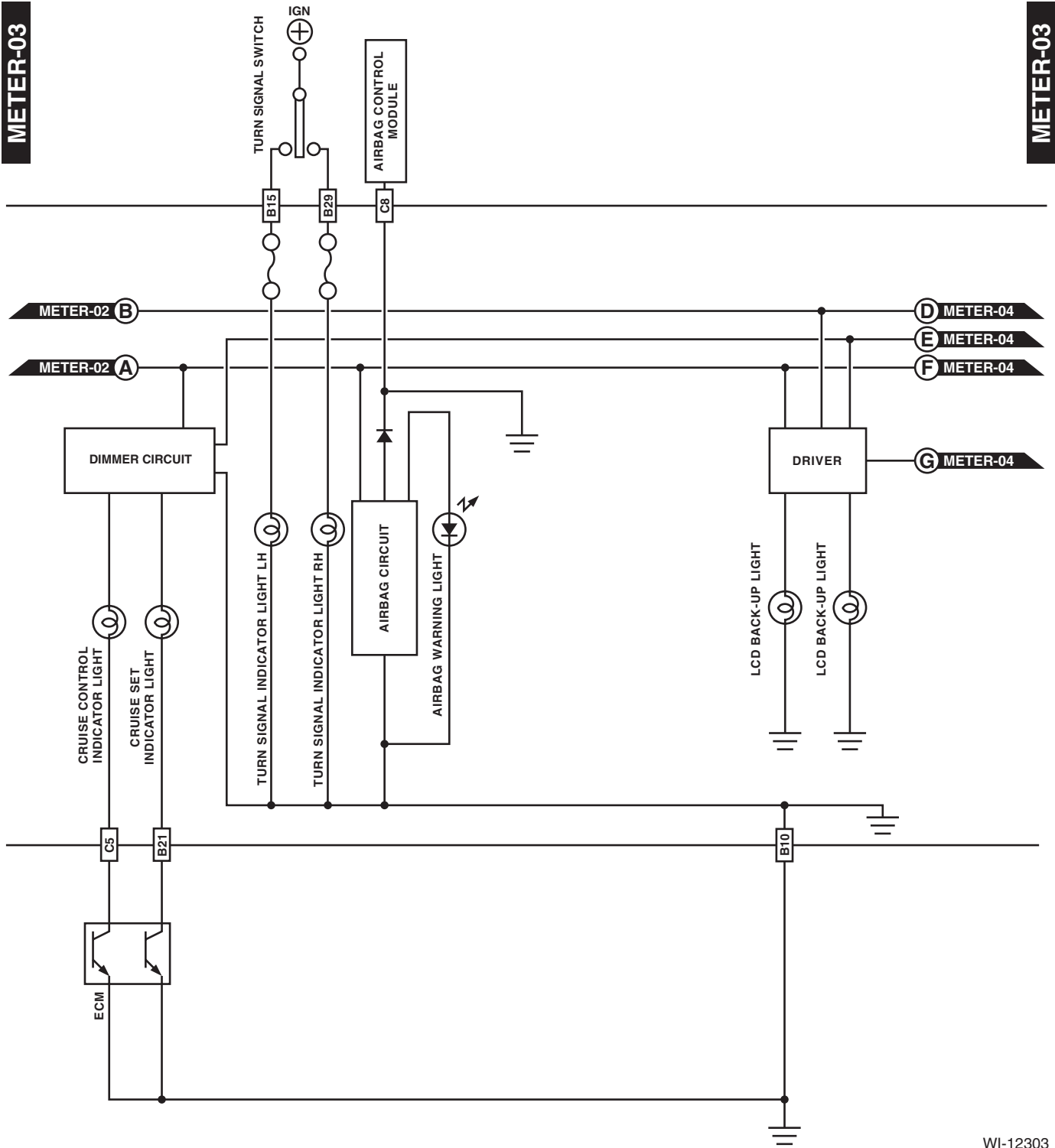
WI-15242

Combination Meter

WIRING SYSTEM

METER-03

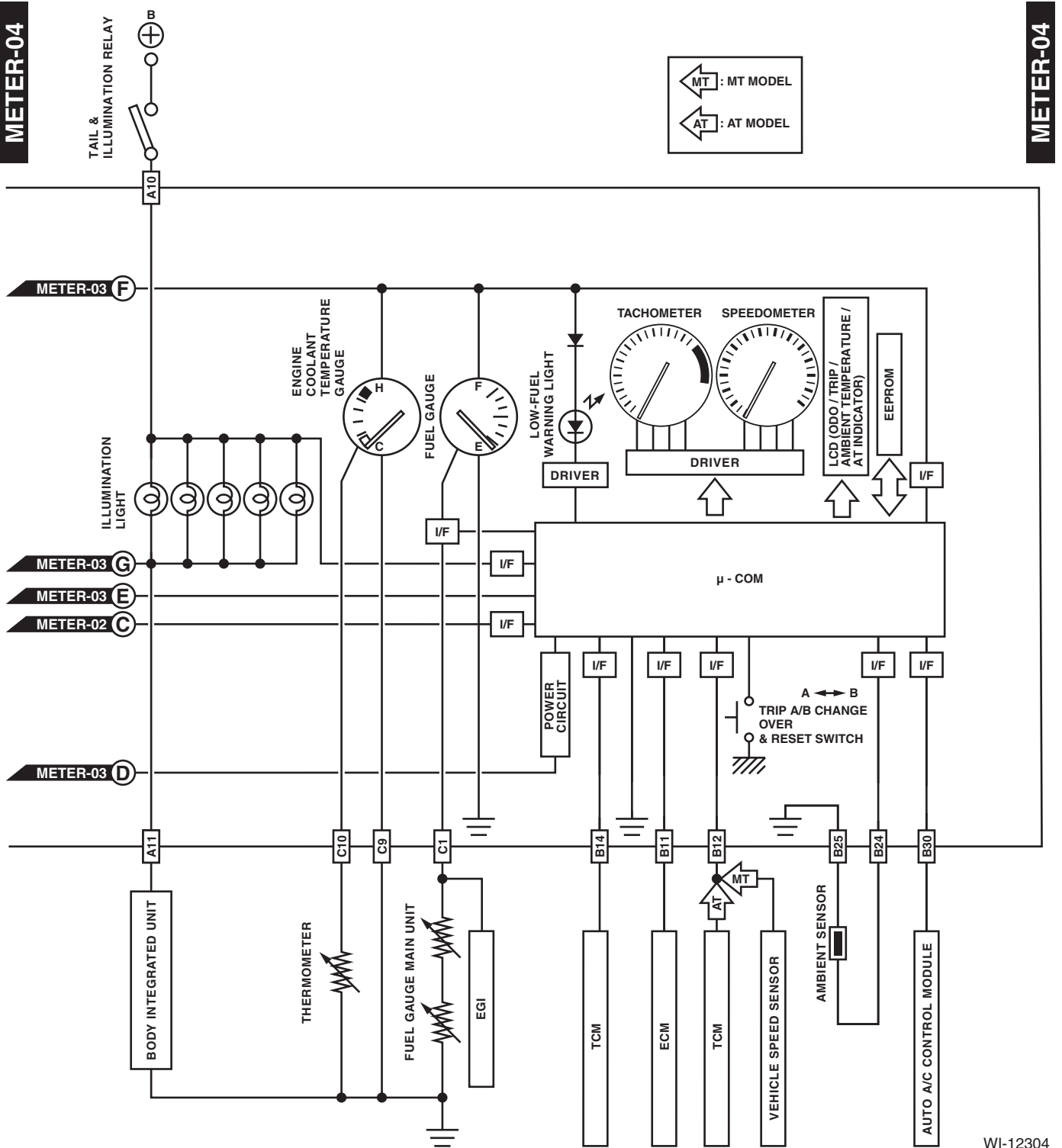
METER-03



WI-12303

Combination Meter

WIRING SYSTEM



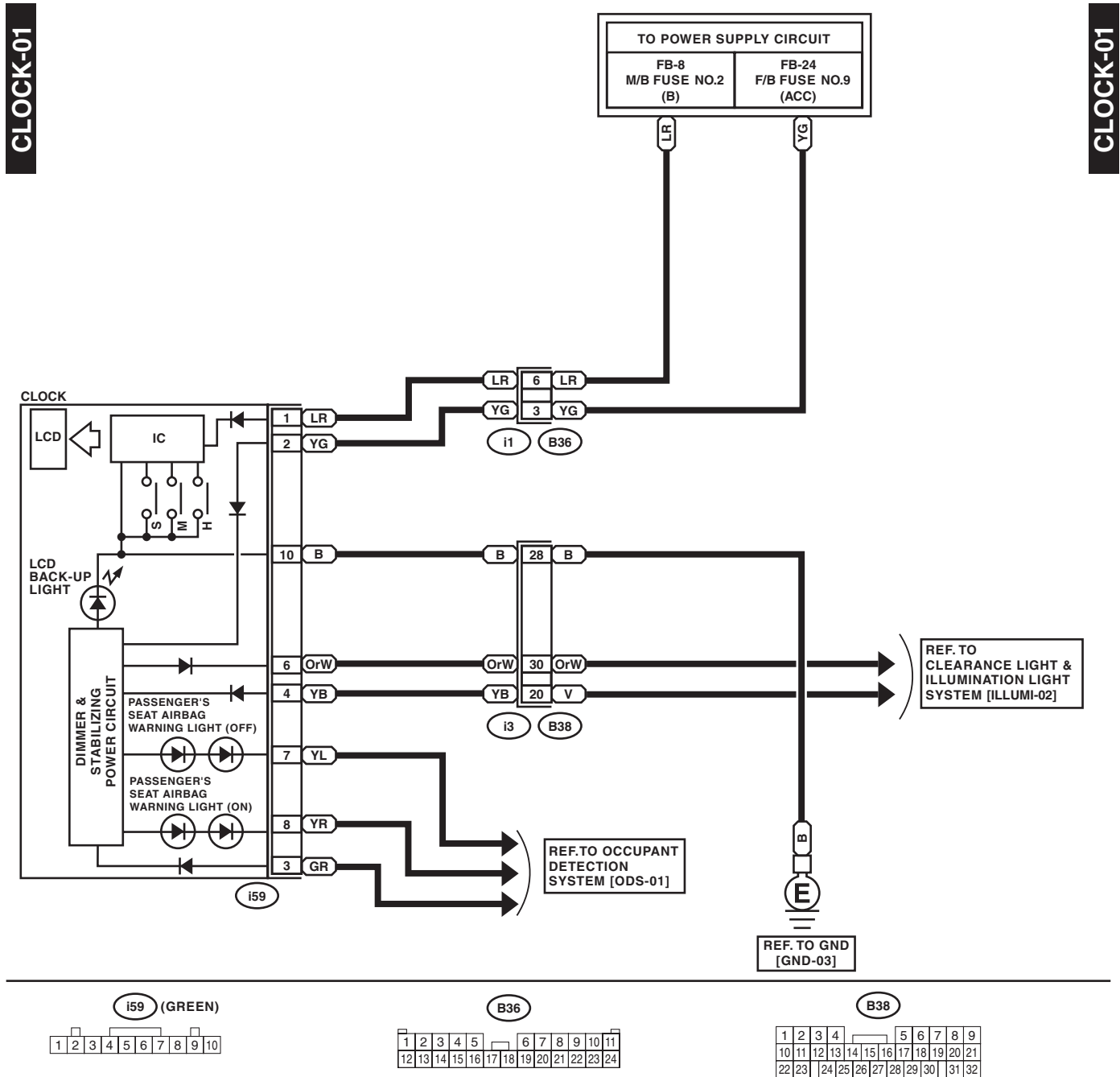
WI-12304

Clock System

WIRING SYSTEM

41.Clock System

A: WIRING DIAGRAM



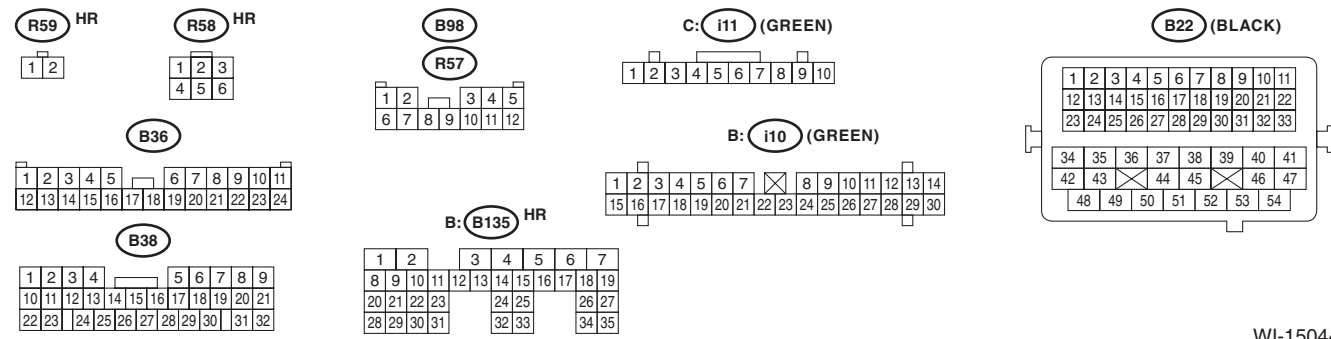
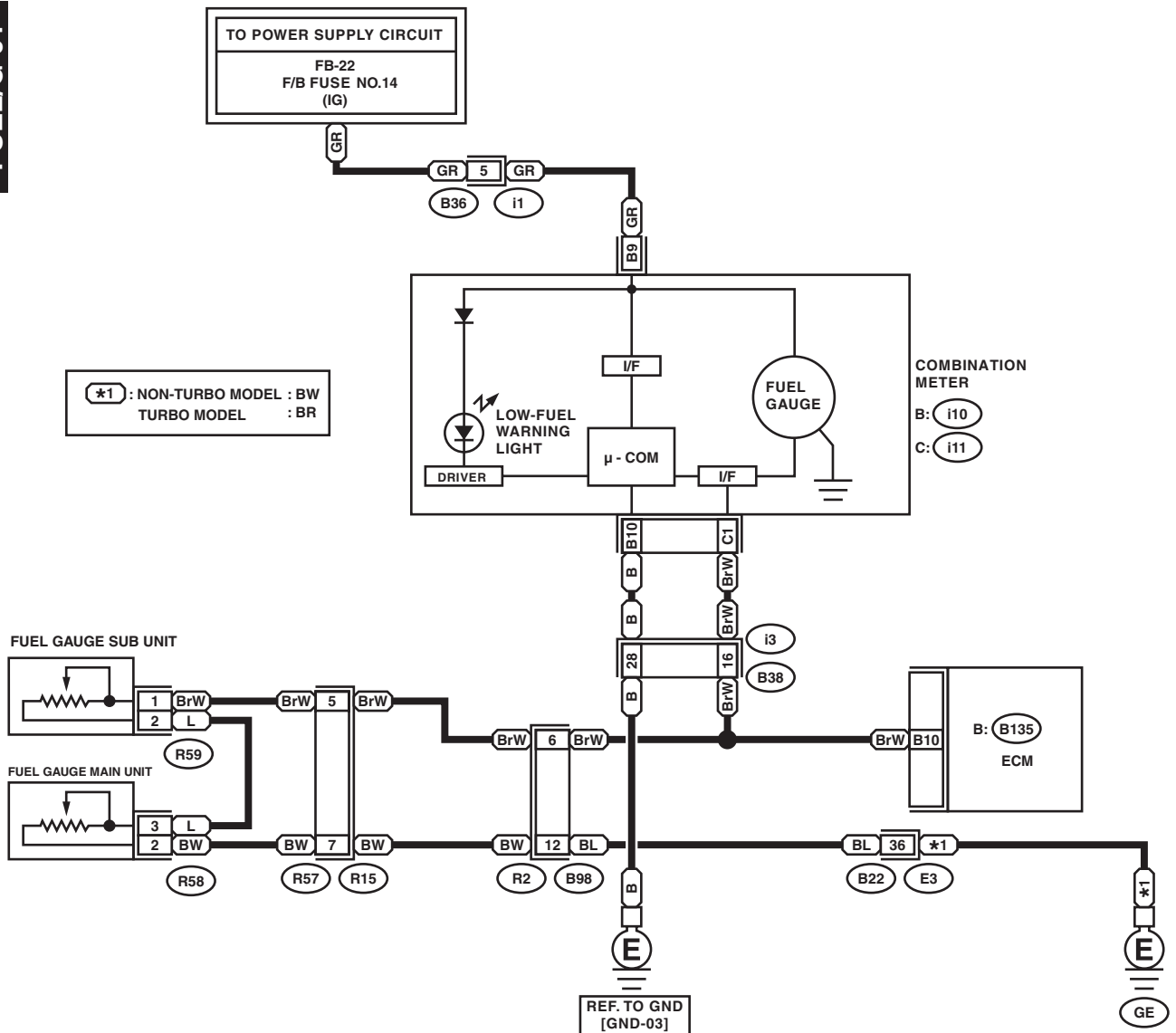
WI-12305

42. Fuel Gauge System

A: WIRING DIAGRAM

FUEL/G-01

FUEL/G-01



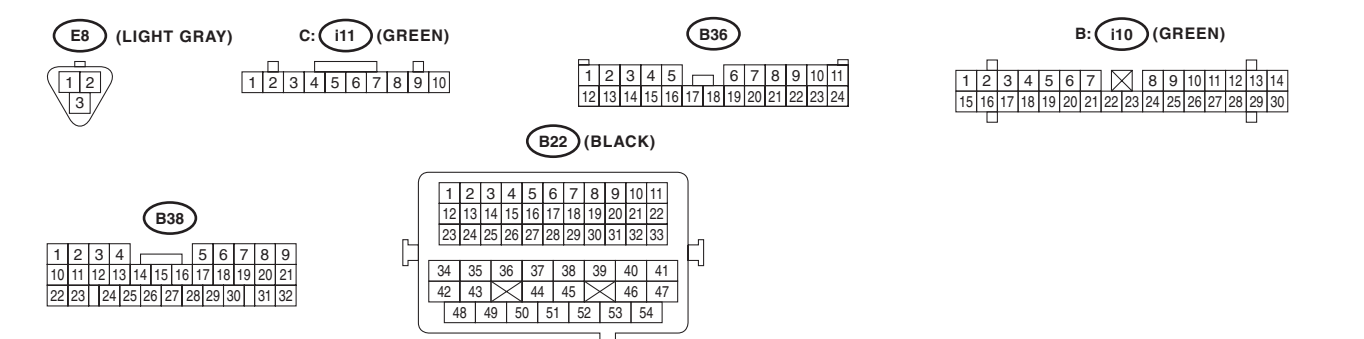
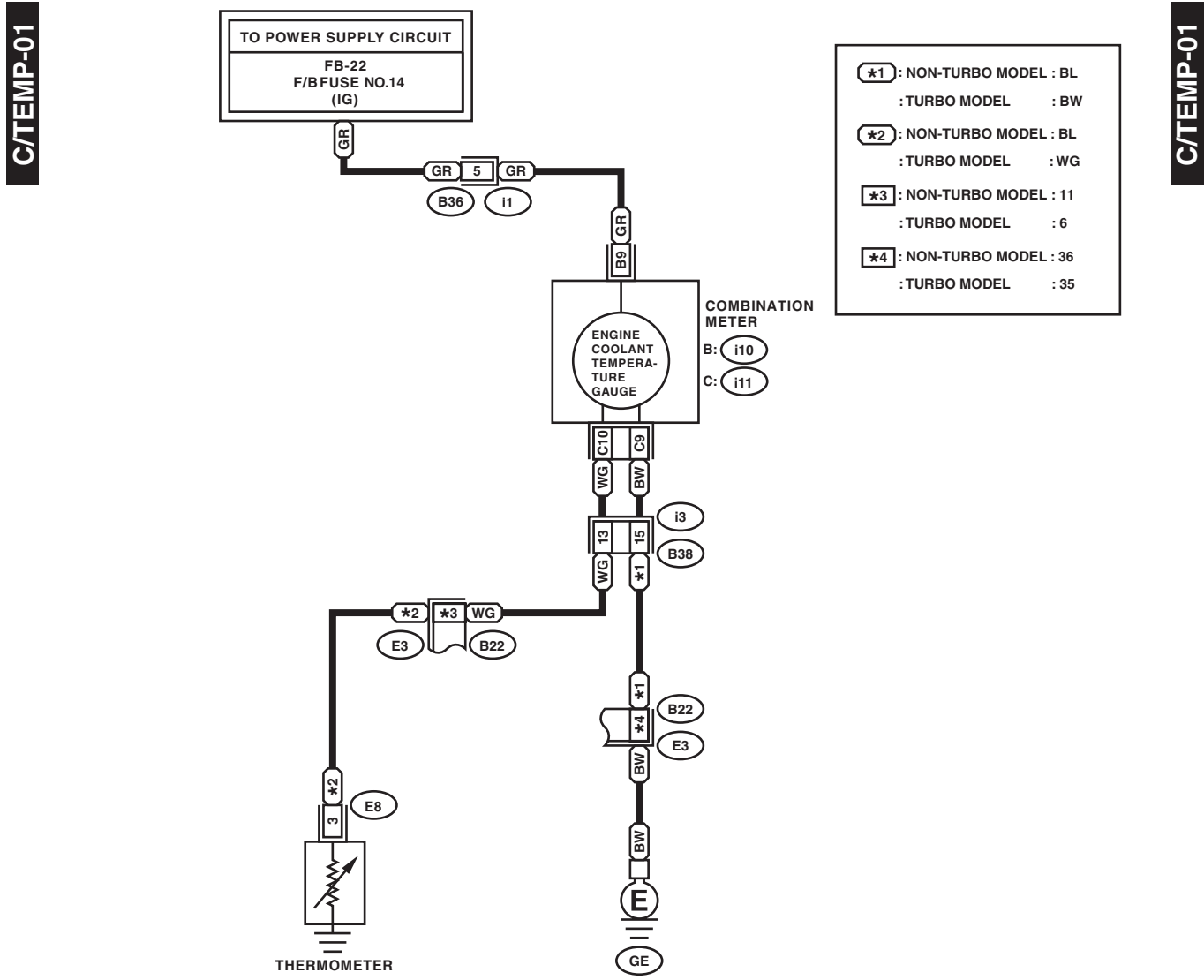
WI-15044

Coolant Temperature System

WIRING SYSTEM

43. Coolant Temperature System

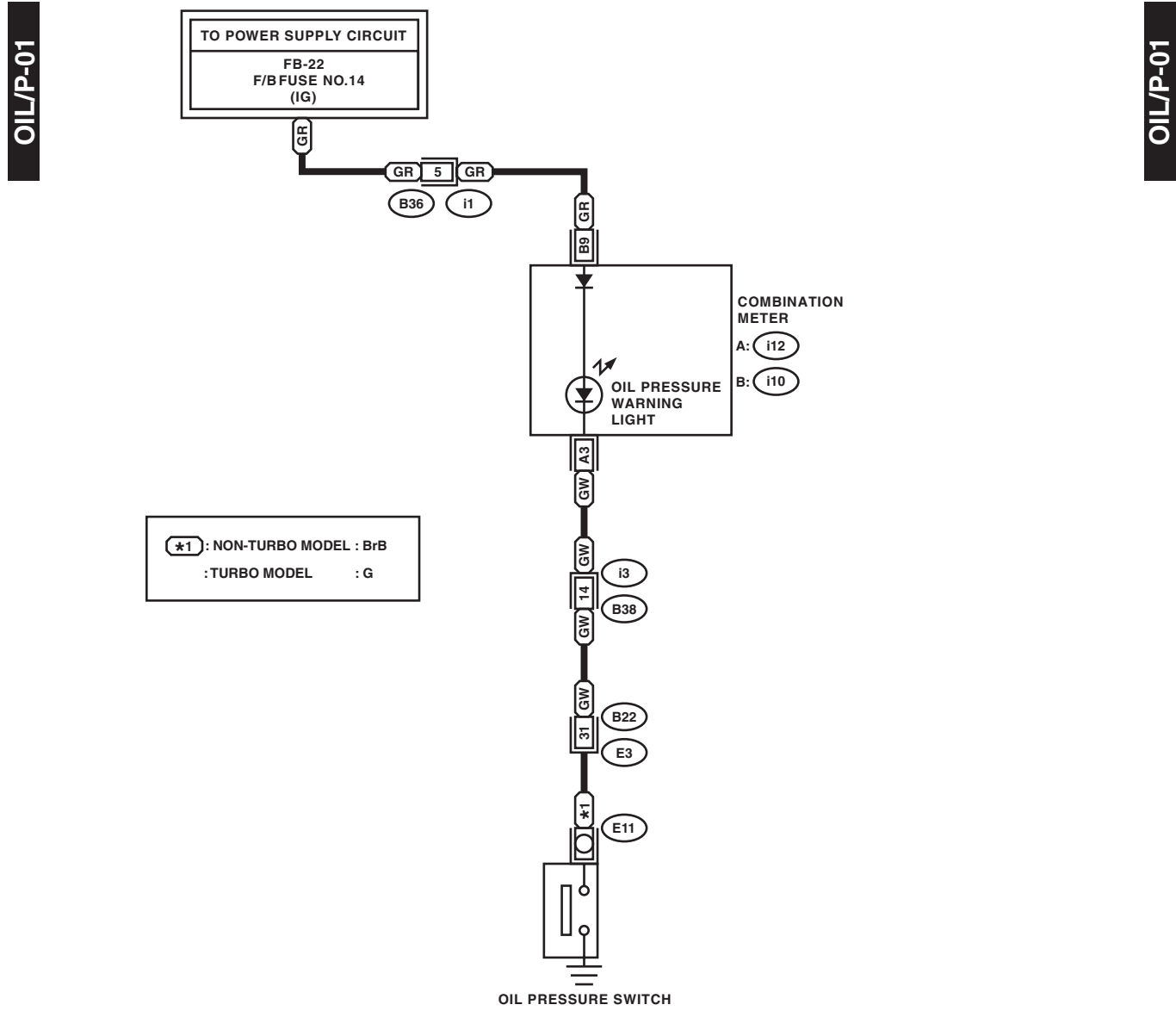
A: WIRING DIAGRAM



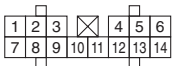
WI-12307

44.Oil Pressure Warning Light System

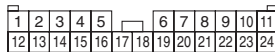
A: WIRING DIAGRAM



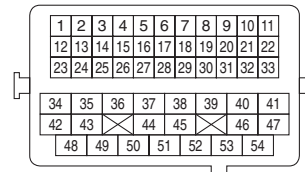
A: i12 (GREEN)



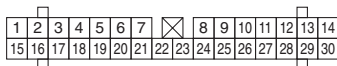
B36



B22 (BLACK)



B: i10 (GREEN)



B38



WI-12308

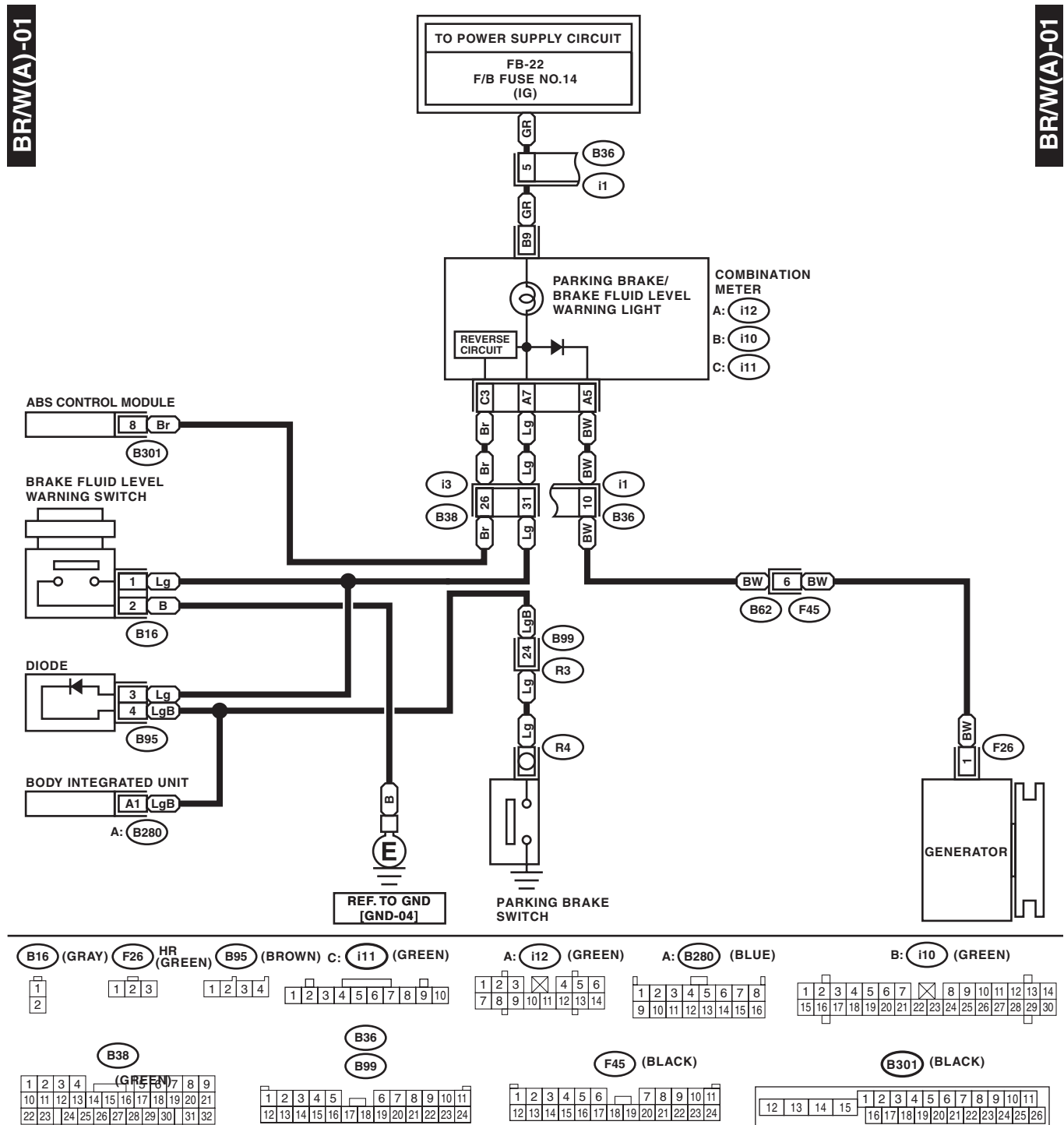
Parking Brake/Brake Fluid Level Warning Light System

WIRING SYSTEM

46. Parking Brake/Brake Fluid Level Warning Light System

A: WIRING DIAGRAM

1. WITHOUT VDC

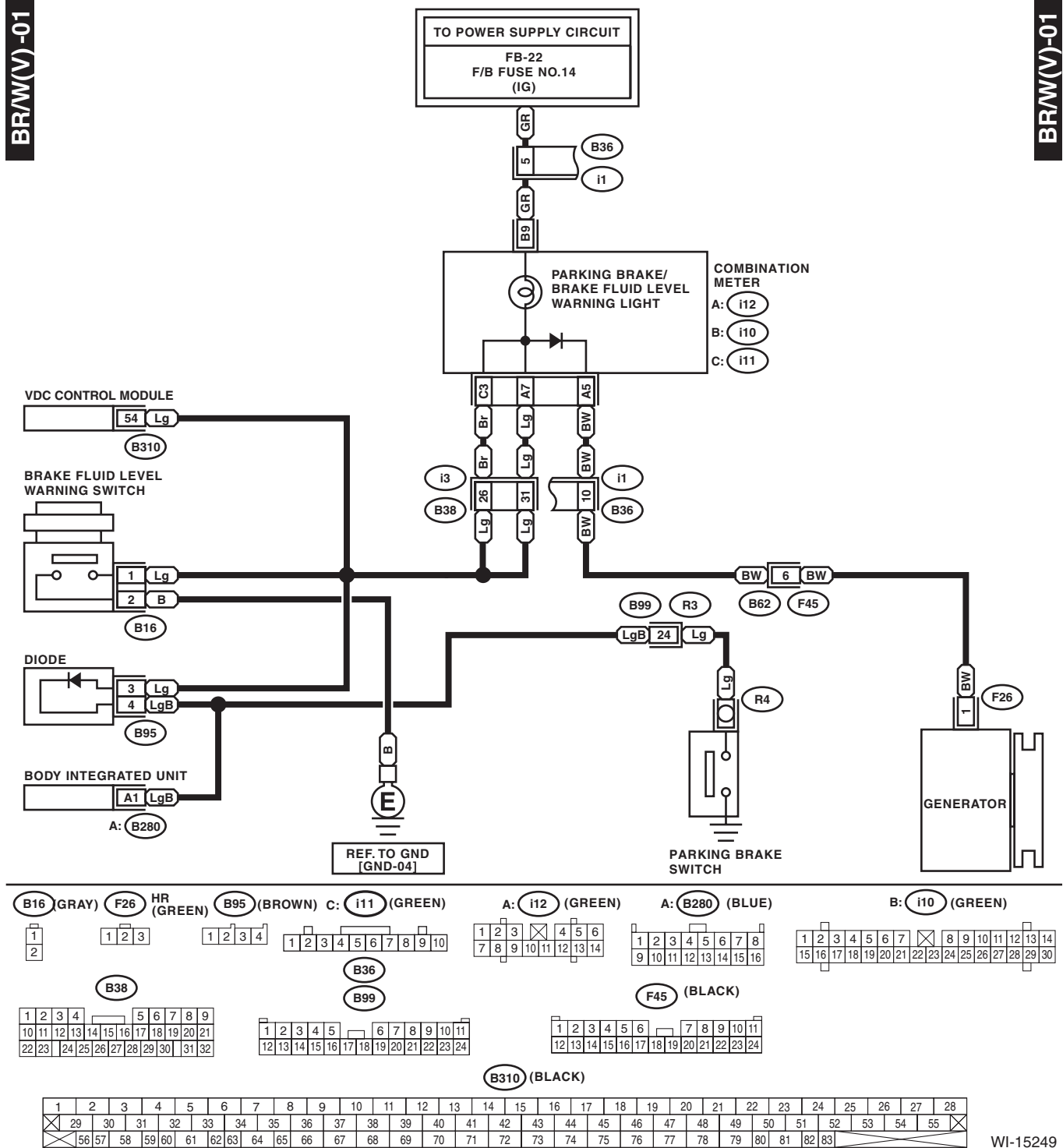


WI-15248

Parking Brake/Brake Fluid Level Warning Light System

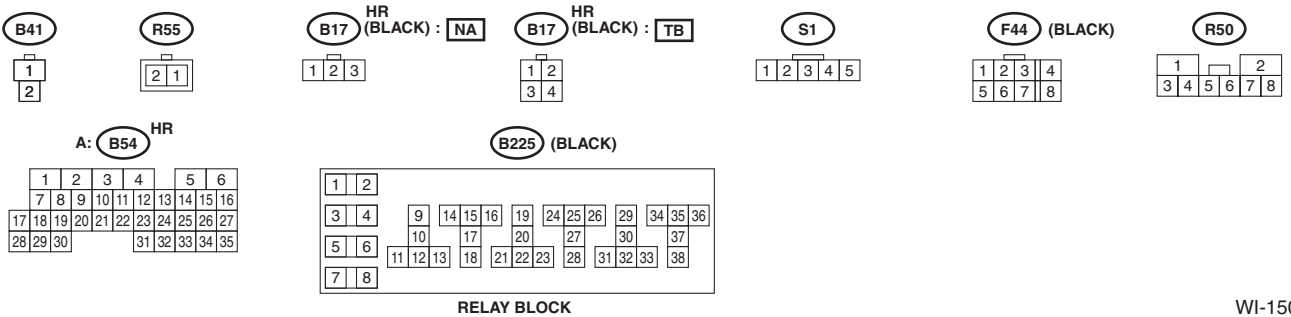
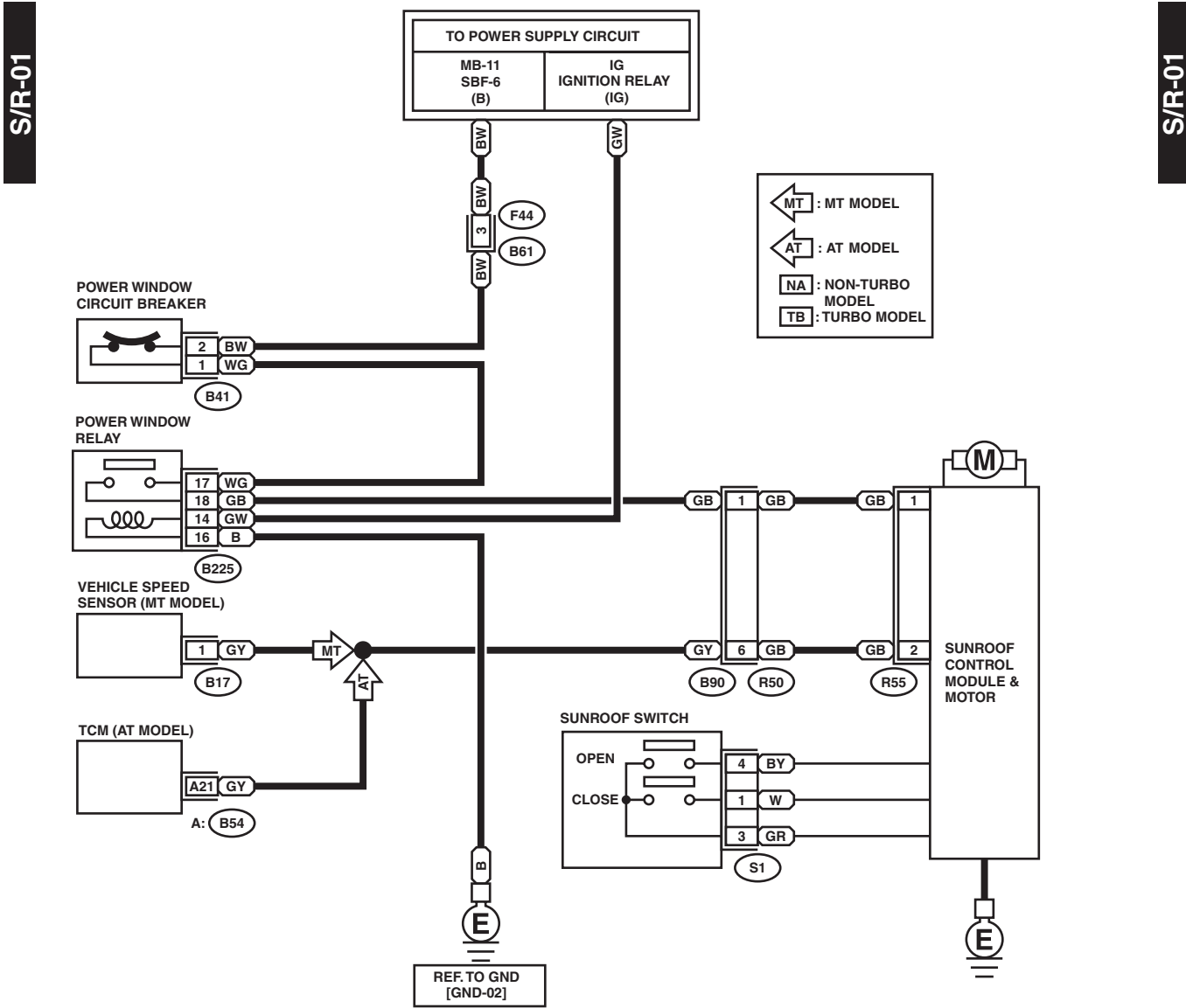
WIRING SYSTEM

2. WITH VDC



47. Sunroof Control System

A: WIRING DIAGRAM



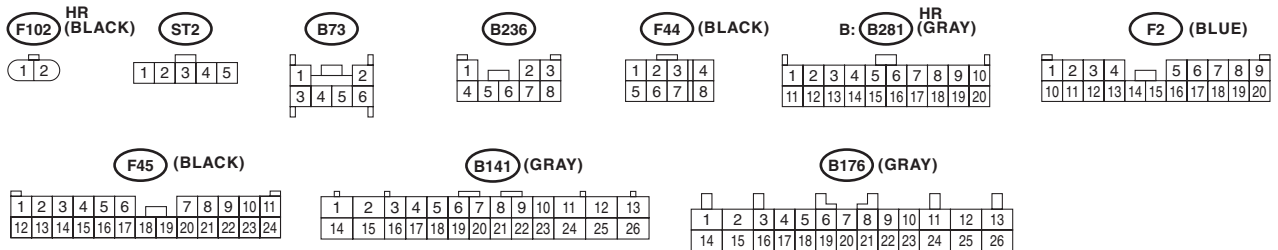
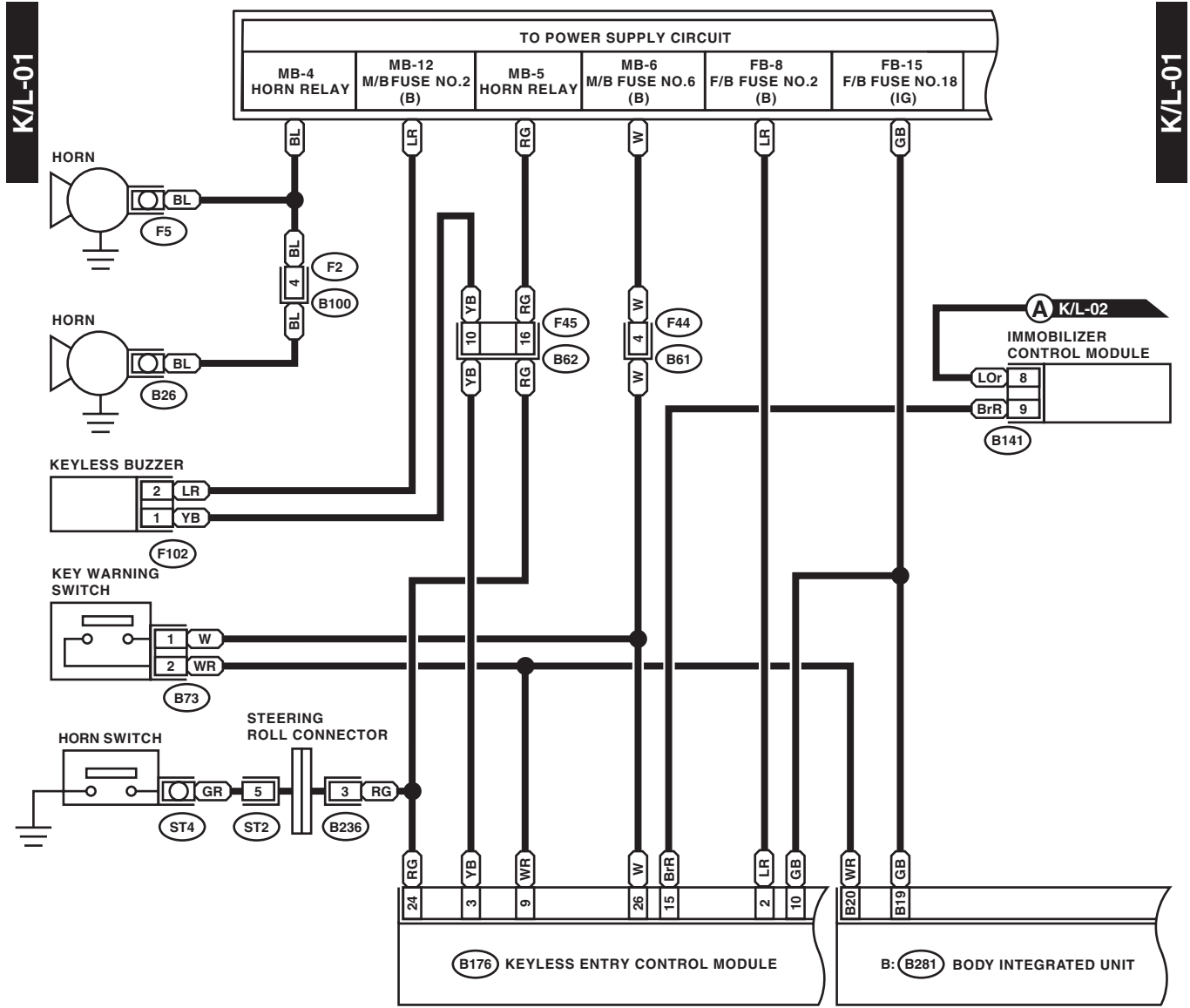
WI-15046

Keyless Entry System

WIRING SYSTEM

48. Keyless Entry System

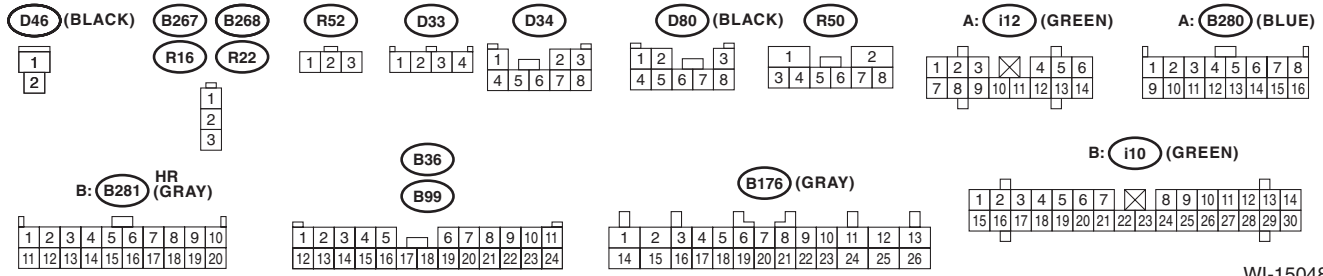
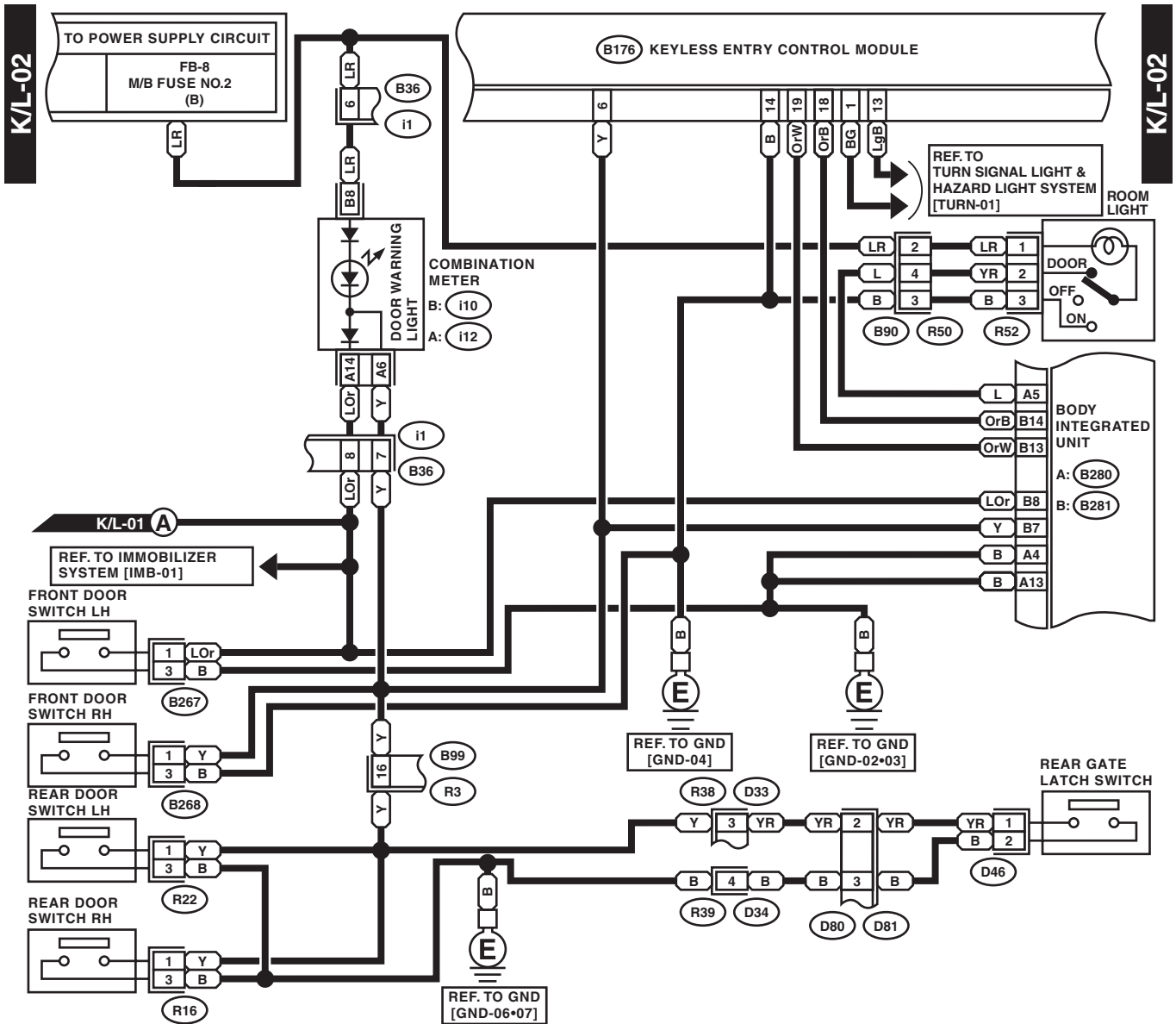
A: WIRING DIAGRAM



WI-15047

Keyless Entry System

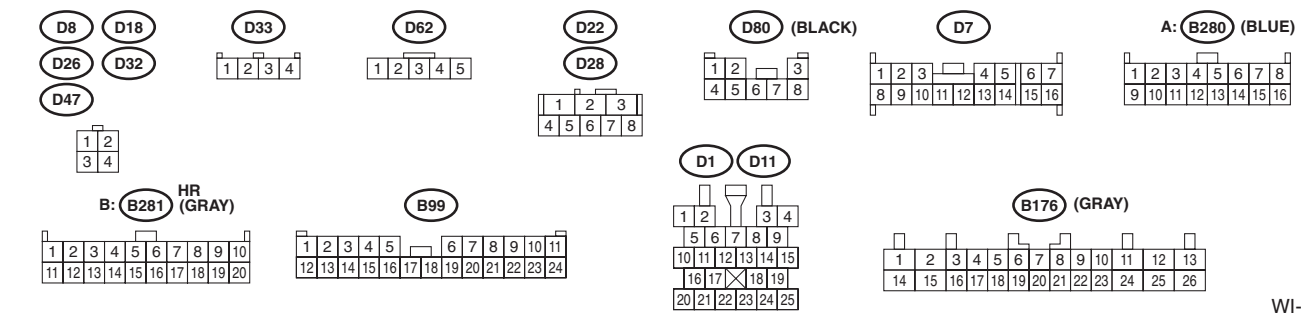
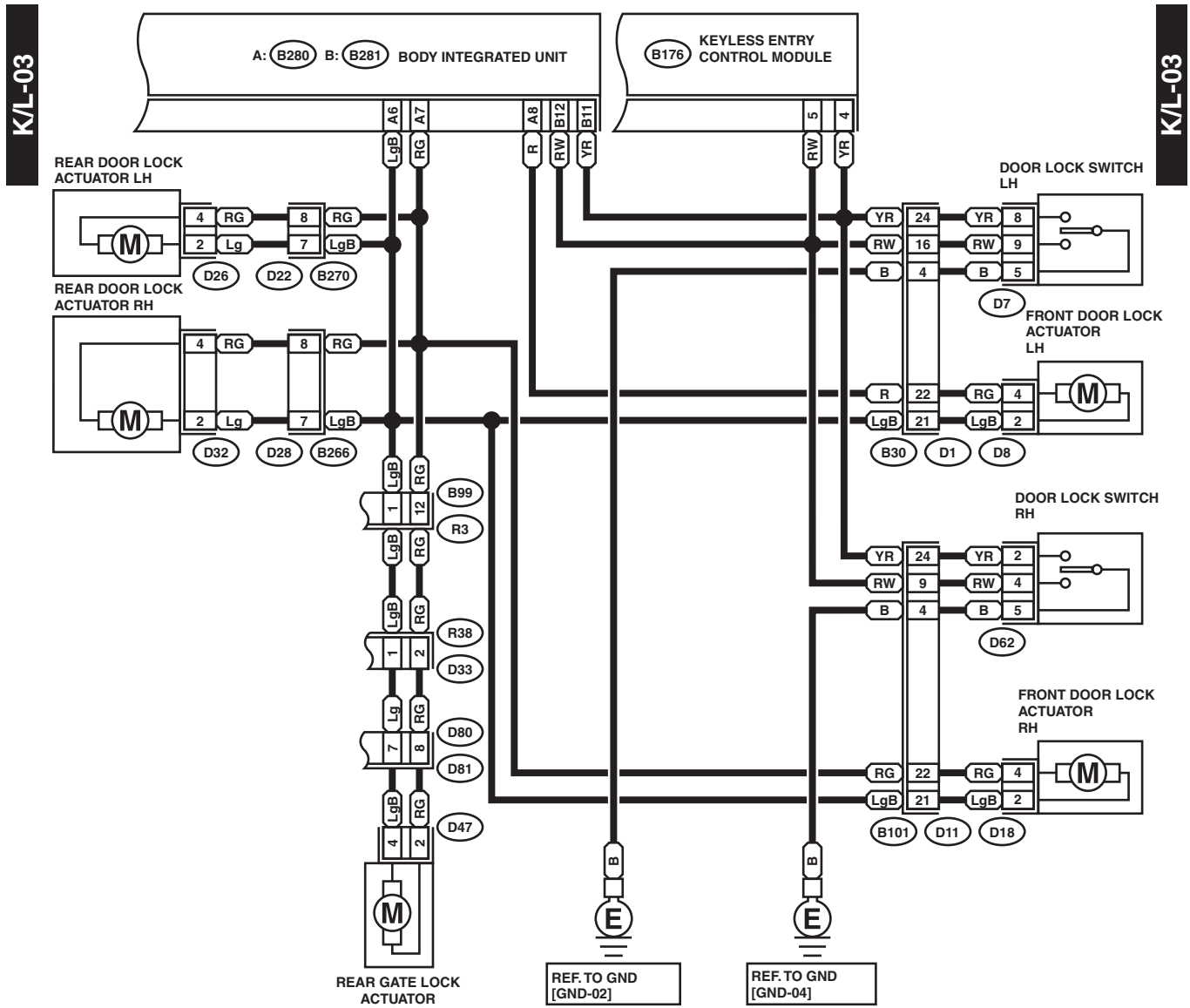
WIRING SYSTEM



WI-15048

Keyless Entry System

WIRING SYSTEM

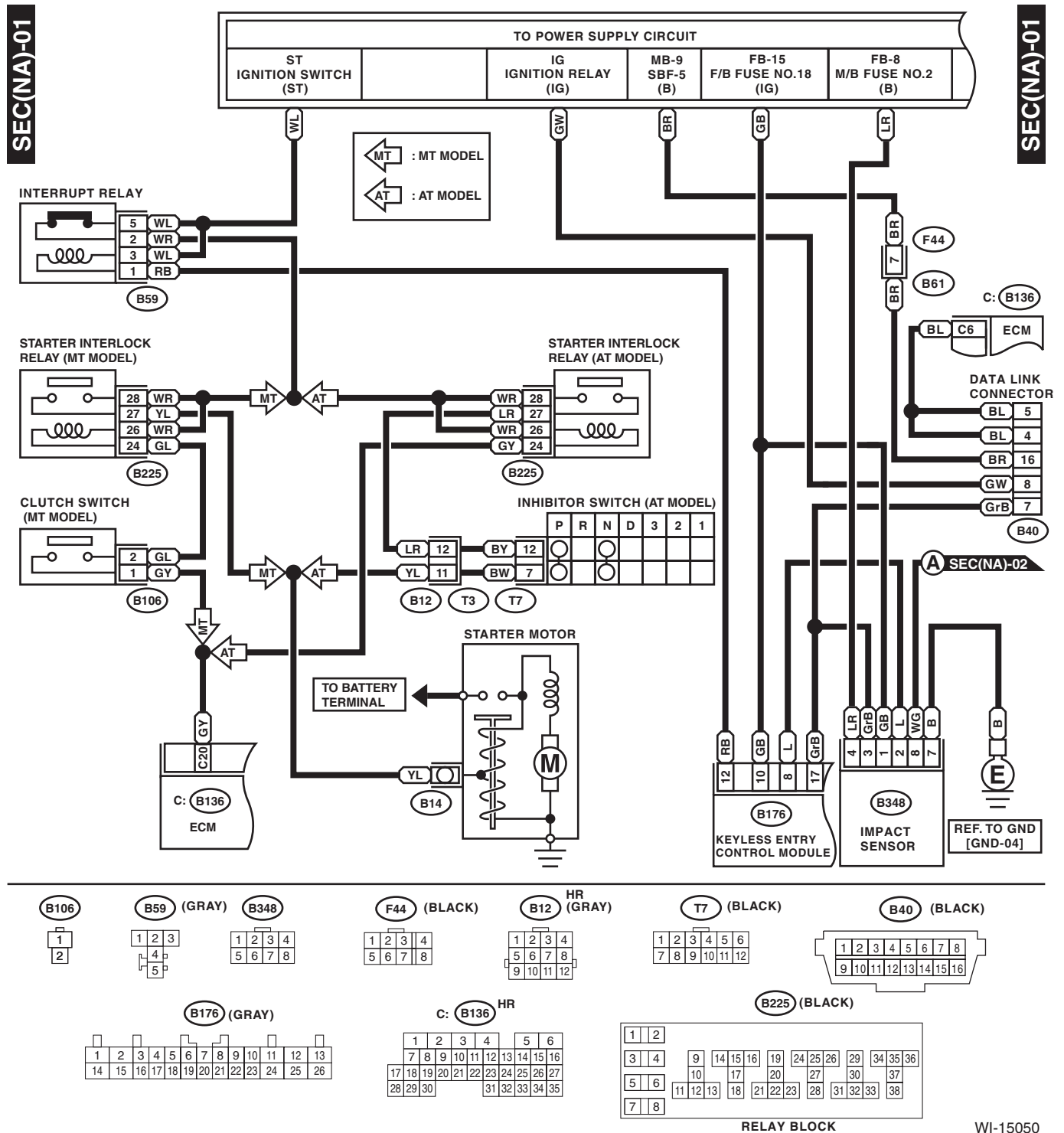


WI-15049

49. Security System

A: WIRING DIAGRAM

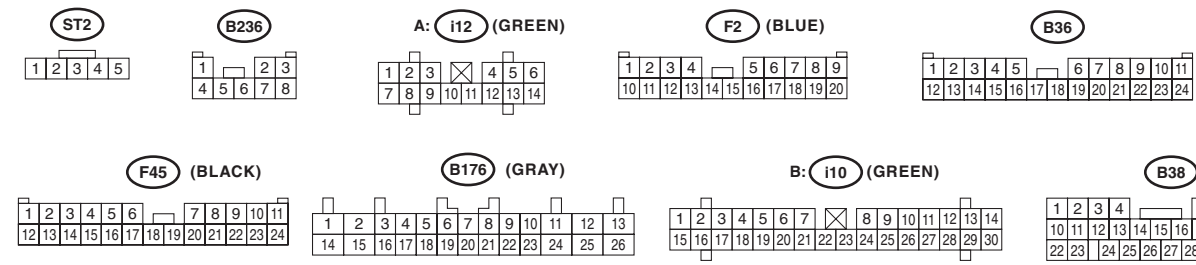
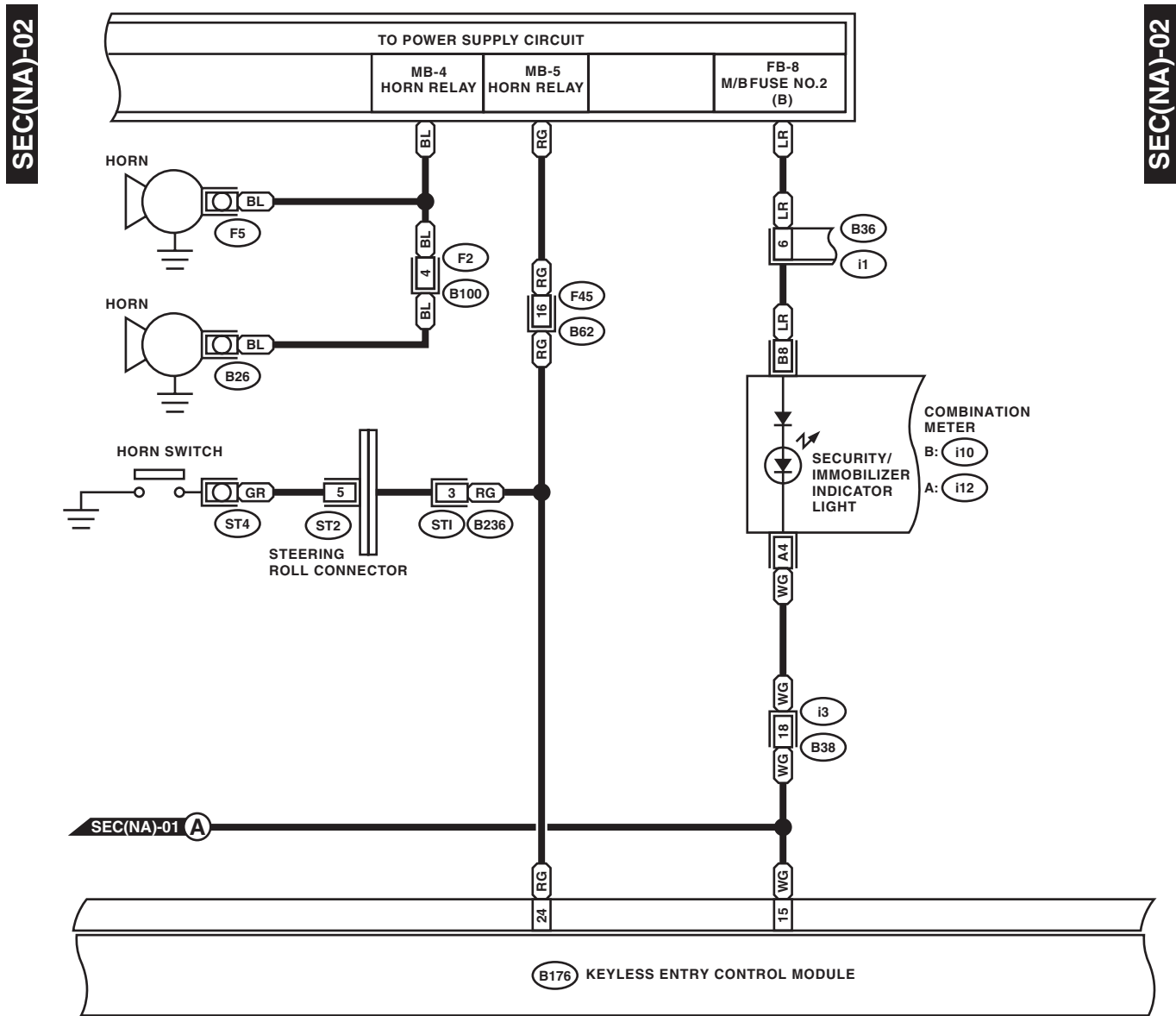
1. NON-TURBO MODEL



WI-15050

Security System

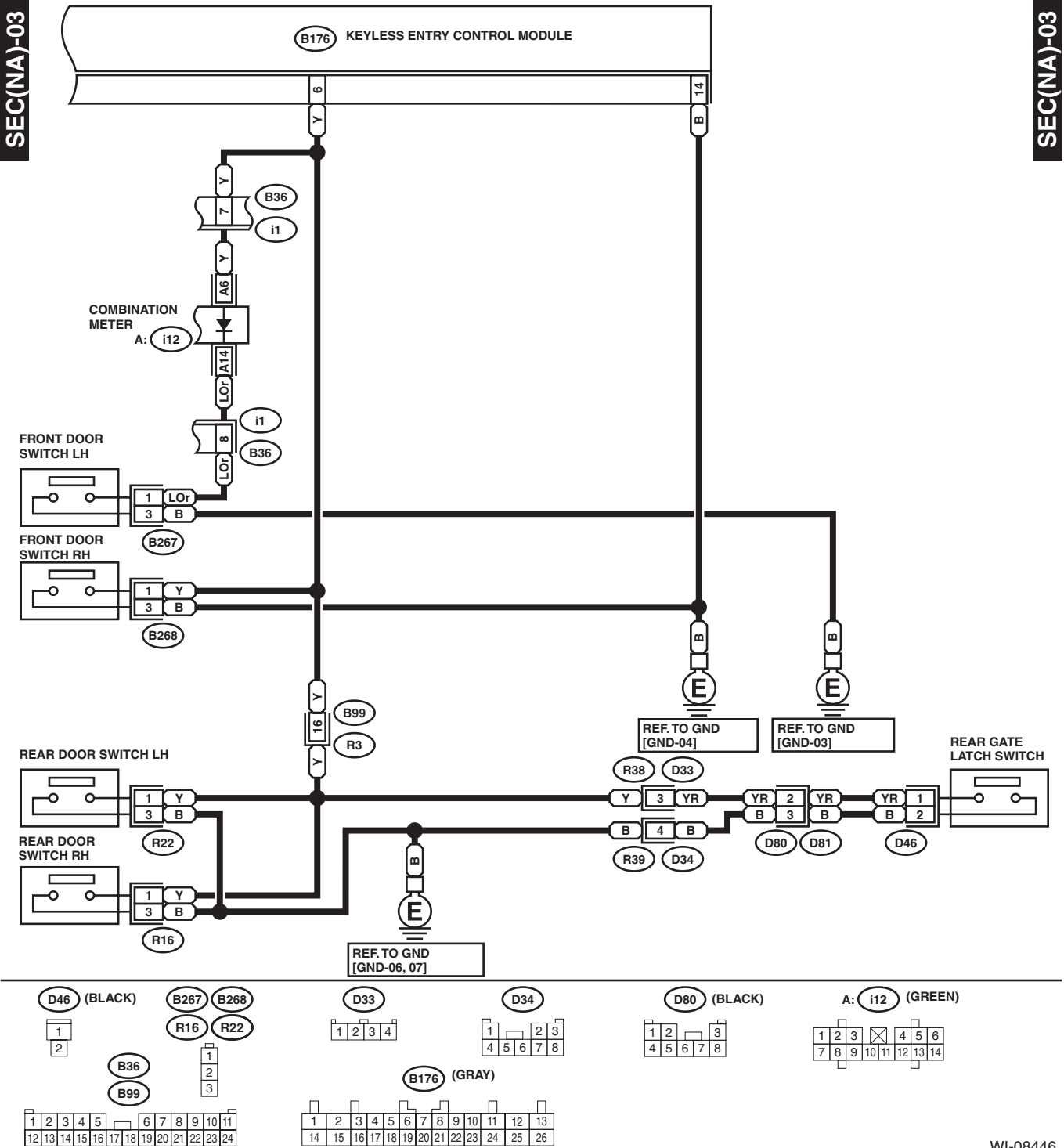
WIRING SYSTEM



WI-12264

Security System

WIRING SYSTEM

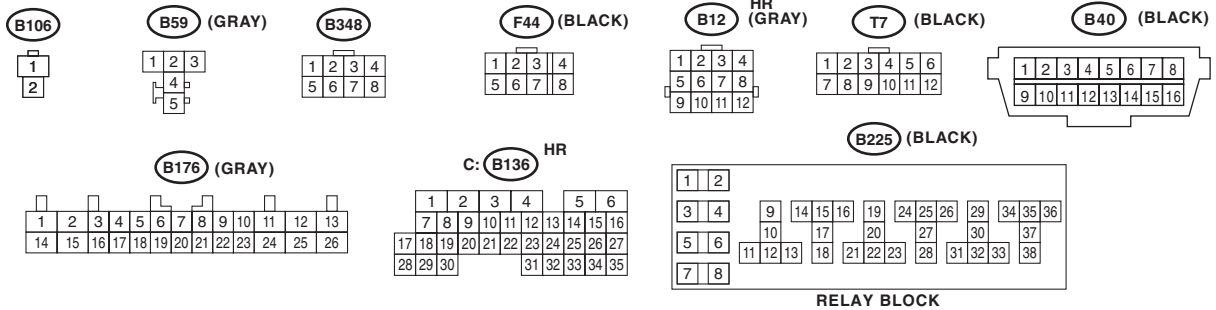
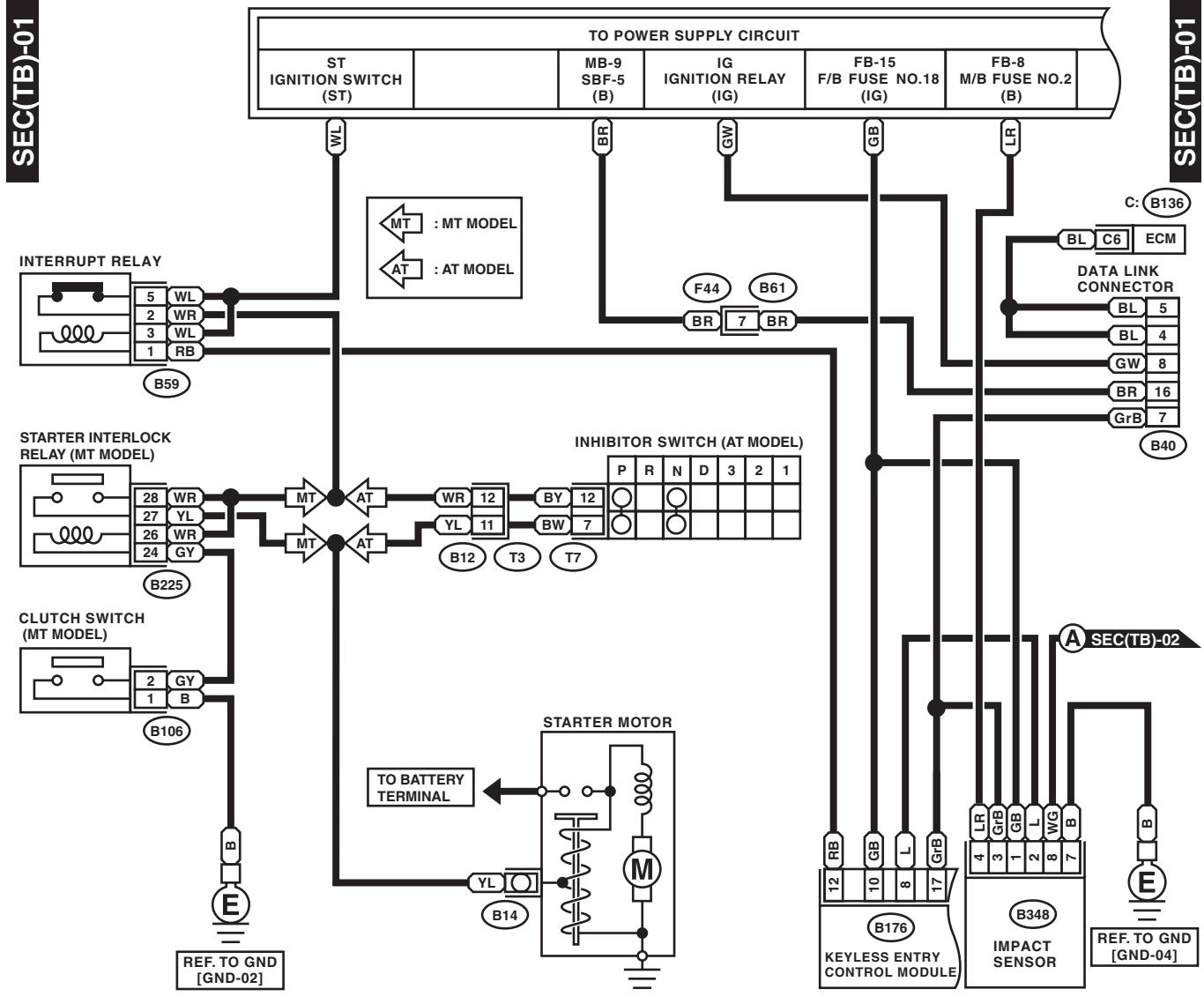


WI-08446

Security System

WIRING SYSTEM

2. TURBO MODEL



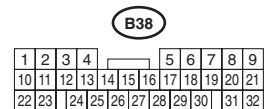
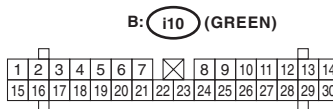
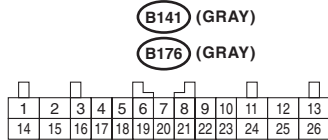
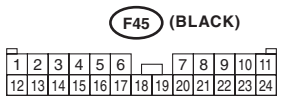
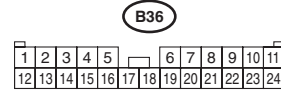
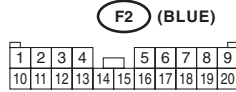
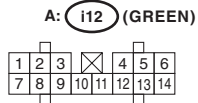
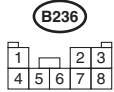
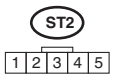
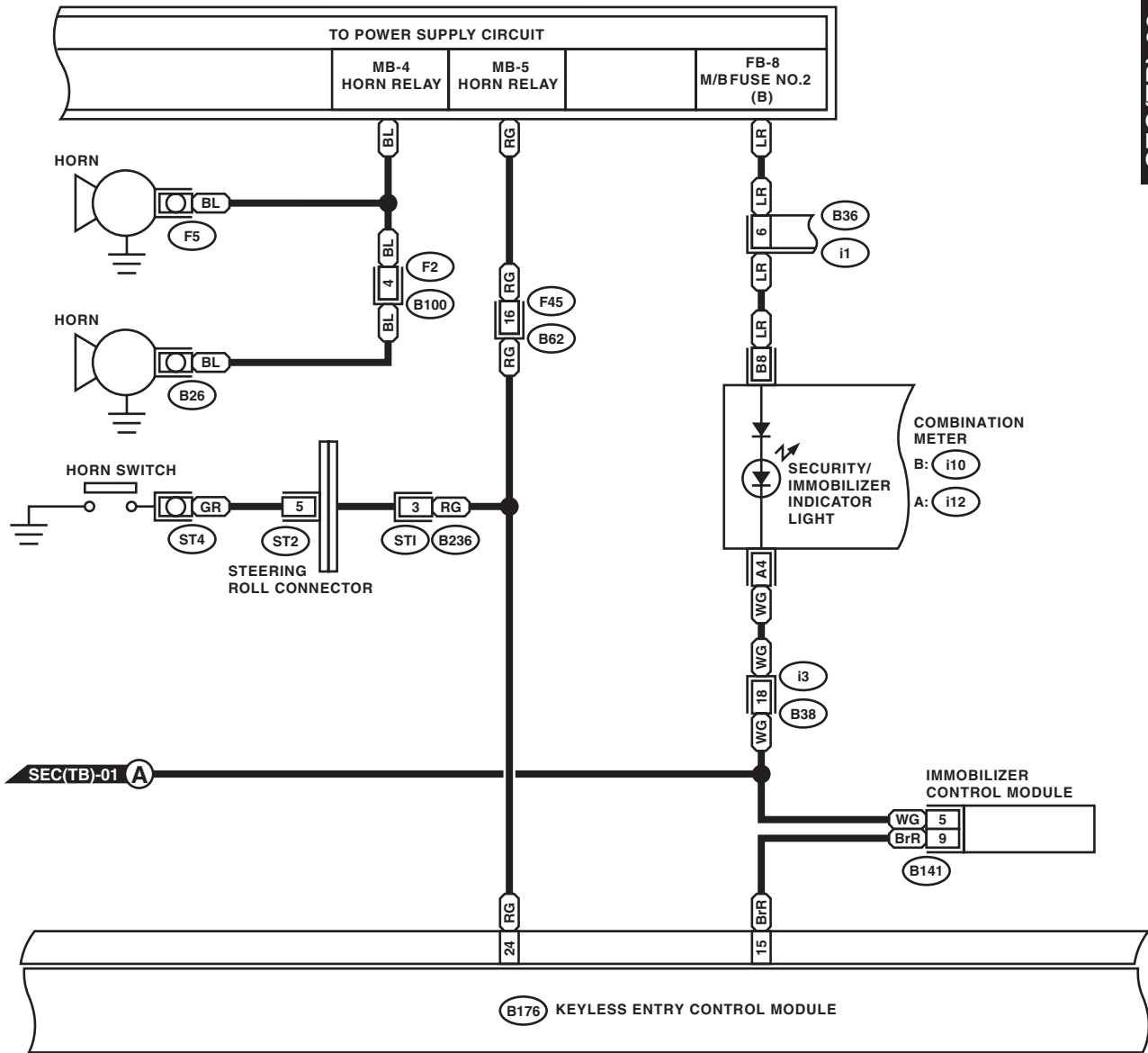
WI-15051

Security System

WIRING SYSTEM

SEC(TB)-02

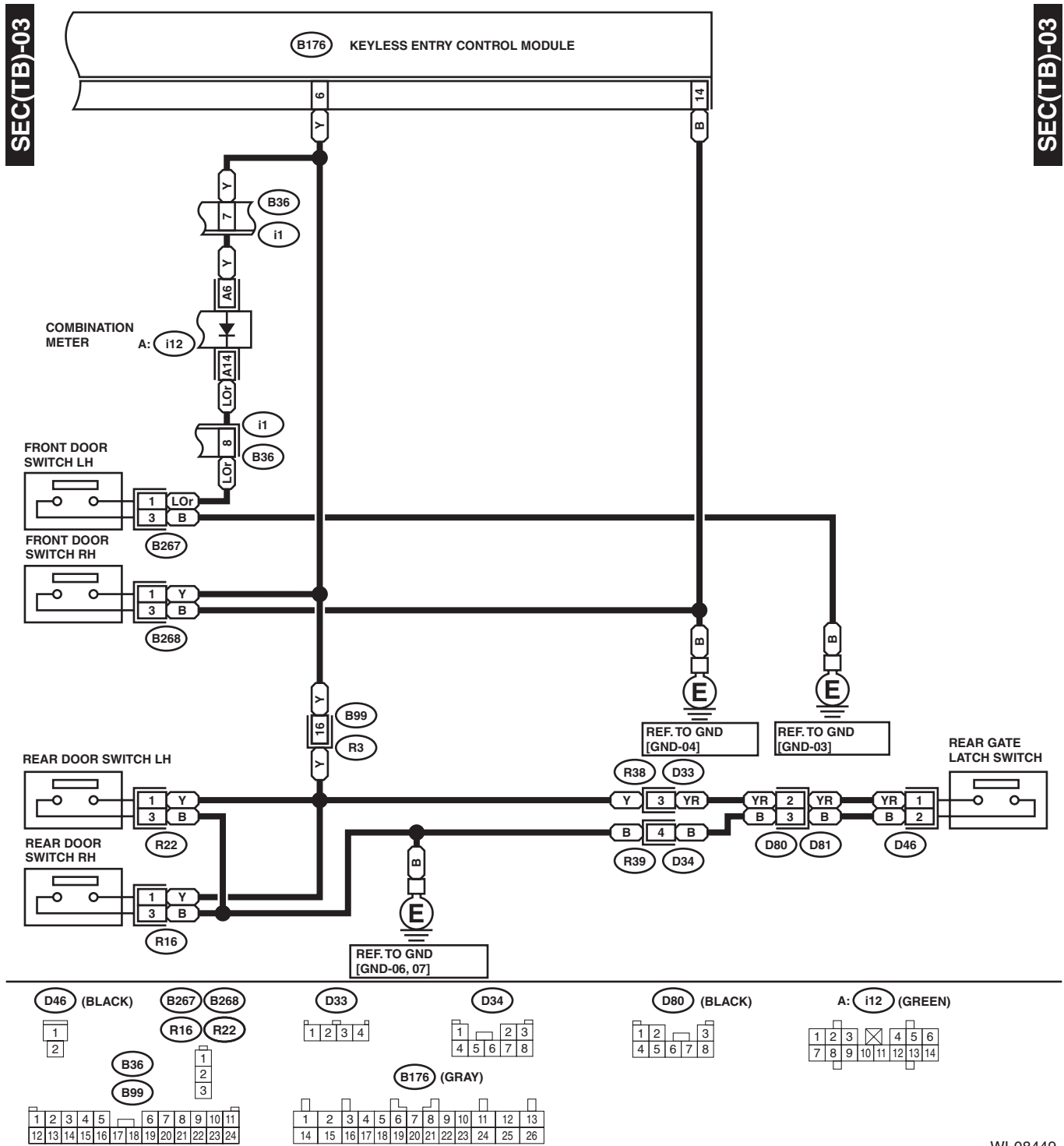
SEC(TB)-02



WI-12266

Security System

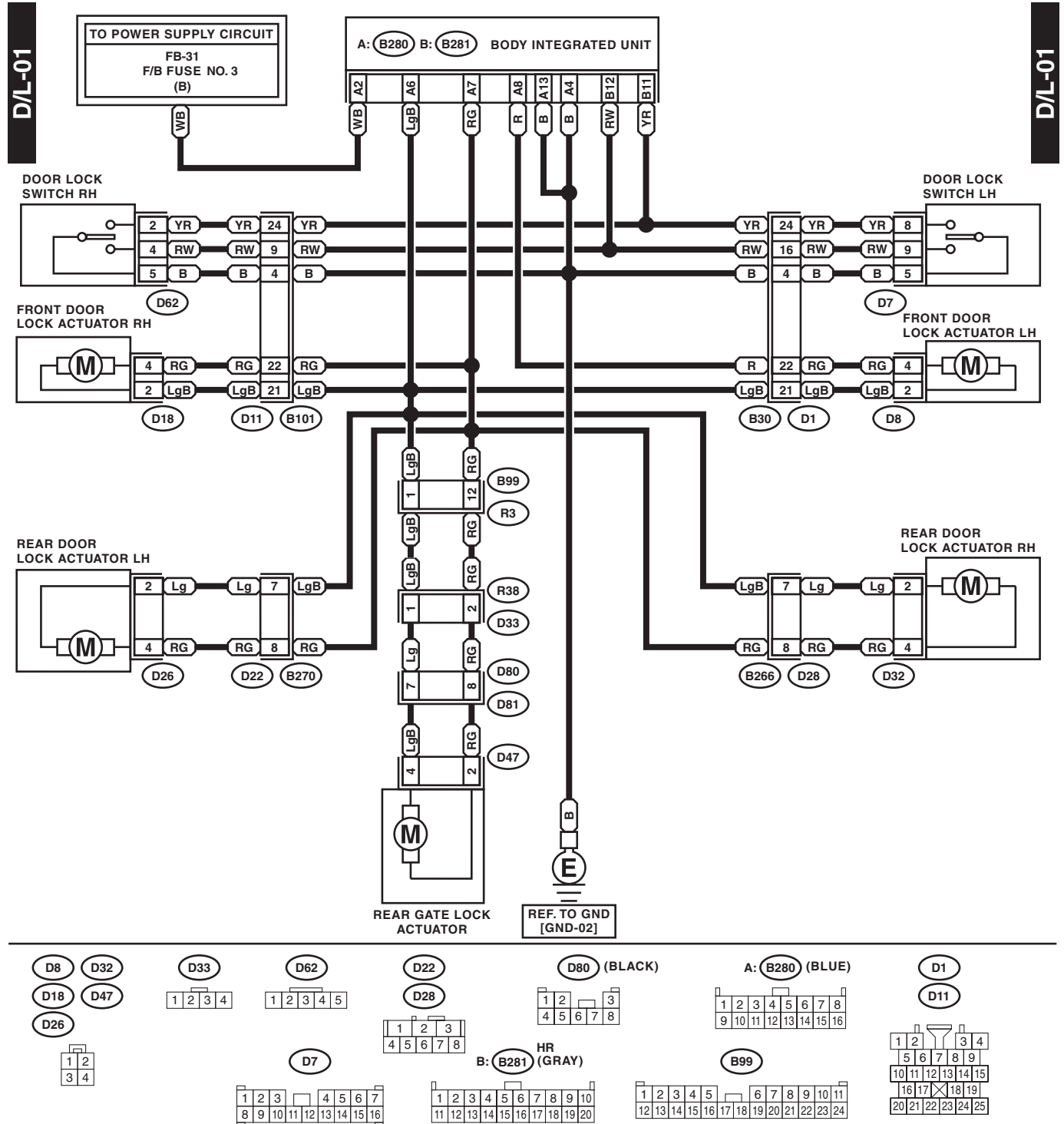
WIRING SYSTEM



WI-08449

50. Door Lock System

A: WIRING DIAGRAM



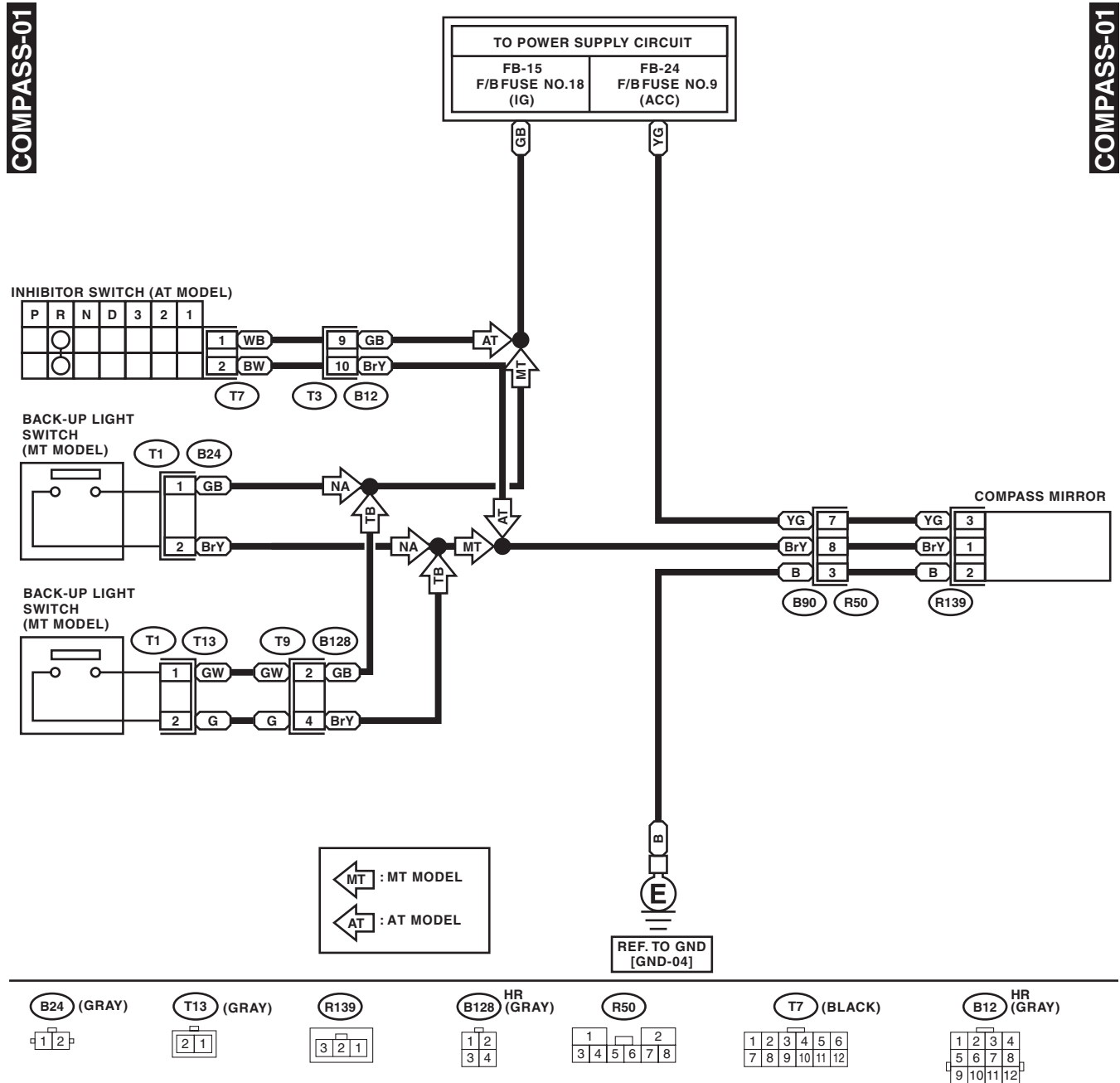
WI-15052

Compass Mirror System

WIRING SYSTEM

51. Compass Mirror System

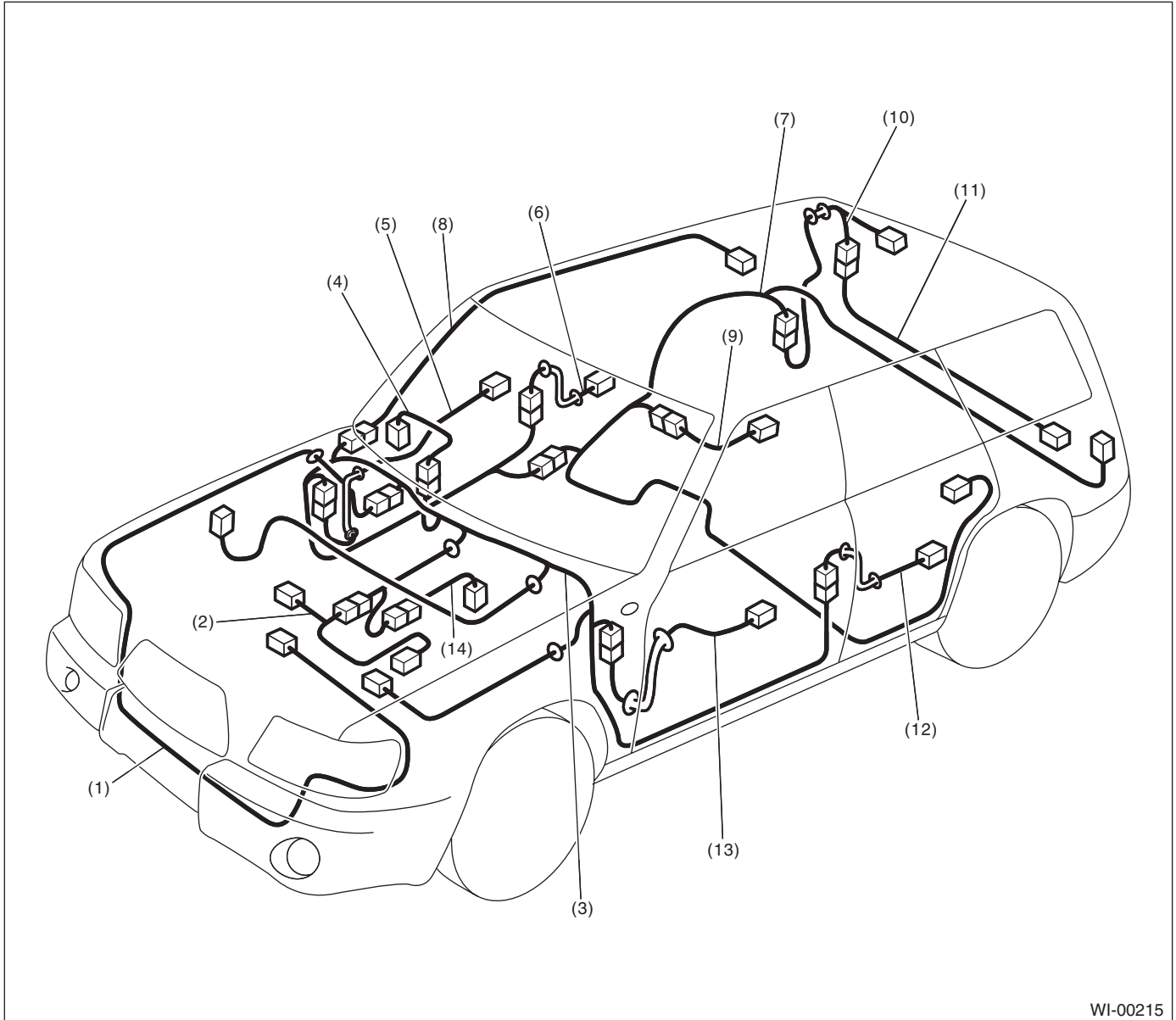
A: WIRING DIAGRAM



WI-15053

52.Harness Components Location

A: LOCATION



WI-00215

- | | | |
|-------------------------------------|-------------------------|-------------------------|
| (1) Front wiring harness | (6) Rear door cord RH | (11) Rear gate cord 2 |
| (2) Engine wiring harness | (7) Rear wiring harness | (12) Rear door cord LH |
| (3) Bulkhead wiring harness | (8) Roof cord | (13) Front door cord LH |
| (4) Instrument panel wiring harness | (9) Fuel tank cord | (14) Transmission cord |
| (5) Front door cord RH | (10) Rear gate cord | |

Front Wiring Harness

WIRING SYSTEM

53. Front Wiring Harness

A: LOCATION

- Front wiring harness

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
F2	20	Blue	B-4	B100	Bulkhead wiring harness
F5	1	Black	C-3		Horn
F7	6	Gray	B-1		Headlight RH
F9	13	Black	B-3		Secondary air relay holder
F11	2	Gray	B-2		Secondary air pump
F16	2	Gray	C-1		Sub fan motor
F17	2	Gray	C-2		Main fan motor
F19	2	Gray	C-3		Front turn signal light LH
F21	2	Brown	C-3		Front fog light LH
F23	6	Gray	C-3		Headlight LH
F24	1	Gray	B-2		Compressor
F25	1	★	B-2		Generator terminal B
F26	3	Green	B-2		Generator
F27	36	Black	B-3		A/C relay holder
F32	2	Gray	C-4		Front washer motor
F33	2	Gray	C-3		Rear washer motor
F34	4	Black	B-3		SBF holder
F35	2	Black	B-3		Main fuse box (M/B)
F36	3	★	B-4		
F37	6	★	B-4		
F38	1	Brown	B-4		
F39	8	★	B-3		
F40	9	Brown	B-5		Fuse & relay box (F/B)
F41	7	Gray	B-5		
F44	8	Black	B-4	B61	Bulkhead wiring harness
F45	24	Black	B-4	B62	
F46	2	Black	B-4	B108	
F53	2	Gray	C-3		Side marker light LH
F58	3	Black	C-3		Headlight beam leveler LH (HID model)
F59	3	Black	B-1		Headlight beam leveler RH (HID model)
F68	4	★	B-4		Main fuse box (M/B)
F78	2	Black	C-1		Ambient sensor
F94	2	Gray	B-2		Front ABS wheel speed sensor LH
F102	2	Black	C-1		Keyless buzzer

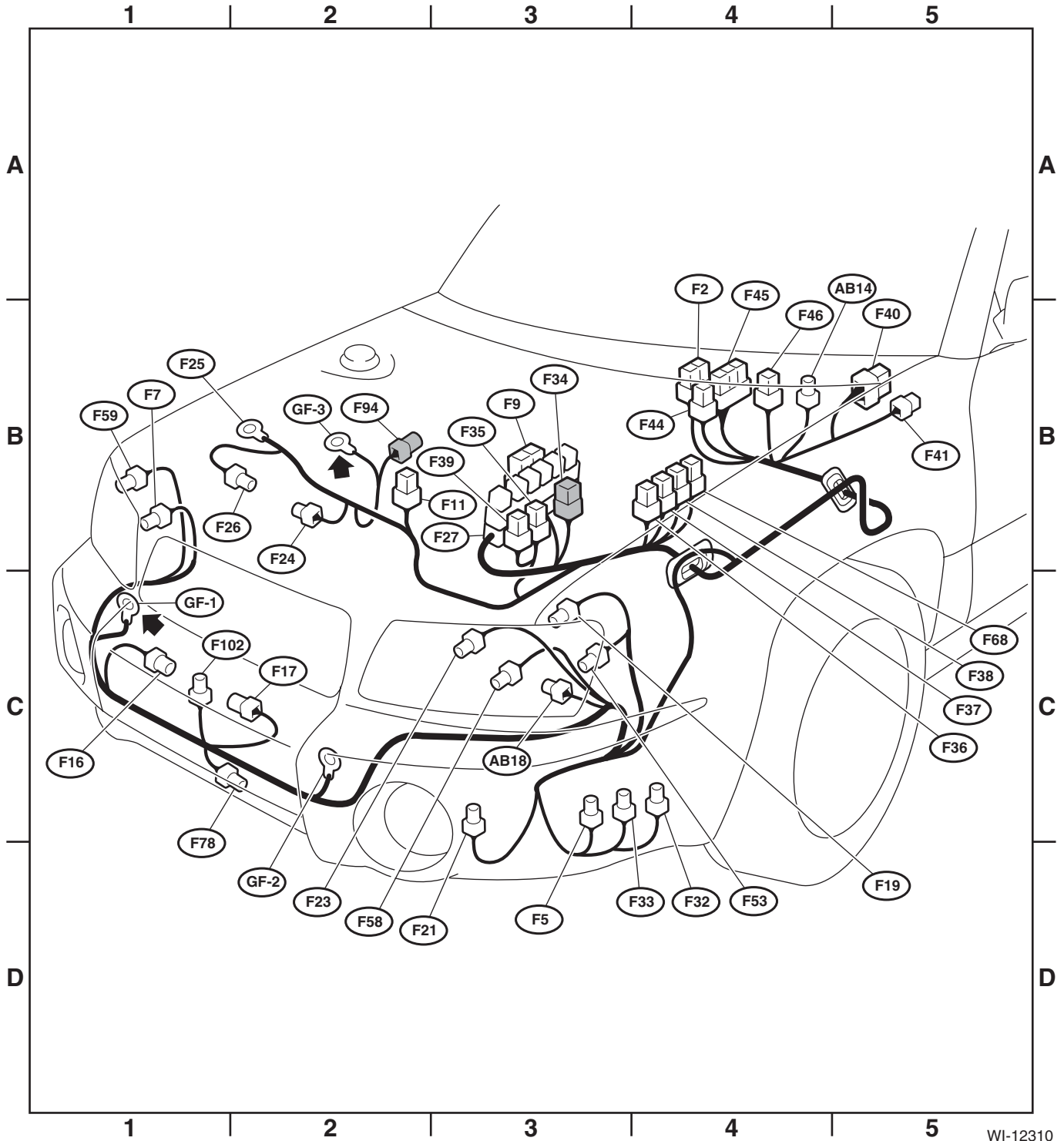
★ : White or natural color

Front Wiring Harness

WIRING SYSTEM

- Airbag wiring harness

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
AB14	2	Yellow	B-4	AB13	Airbag wiring harness
AB18	2	Yellow	C-3		Front sub sensor LH



WI-12310

Bulkhead Wiring Harness (In Engine Compartment)

WIRING SYSTEM

54. Bulkhead Wiring Harness (In Engine Compartment)

A: LOCATION

1. NON-TURBO MODEL

Bulkhead wiring harness

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
B3	5	Black	B-2		Air flow sensor
B5	2	Gray	B-2		Daytime running light register
B6	2	Gray	B-2		Front ABS wheel speed sensor RH
B7	4	★	B-3		A/C pressure switch
B8	5	Gray	B-4		Front wiper motor
B11	20	Gray	B-4	T4	Transmission code (AT model)
B12	12	Gray	B-3	T3	
B14	1	Black	B-4		Starter motor (Magnet)
B16	2	Gray	B-4		Brake fluid level warning switch
B17	3	Black	B-3		Vehicle speed sensor (MT model)
B22	54	Black	B-2	E3	Engine wiring harness
B24	2	Gray	B-3	T1	Back-up light switch (MT model)
B25	2	Brown	B-3	T2	Neutral switch (MT model)
B26	1	Black	C-1		Horn
B301	26	Black	B-2		ABS control module
B305	2	Gray	B-1		Front turn signal light RH
B306	2	Brown	C-1		Front fog light RH
B320	2	Gray	B-1		Side marker light RH

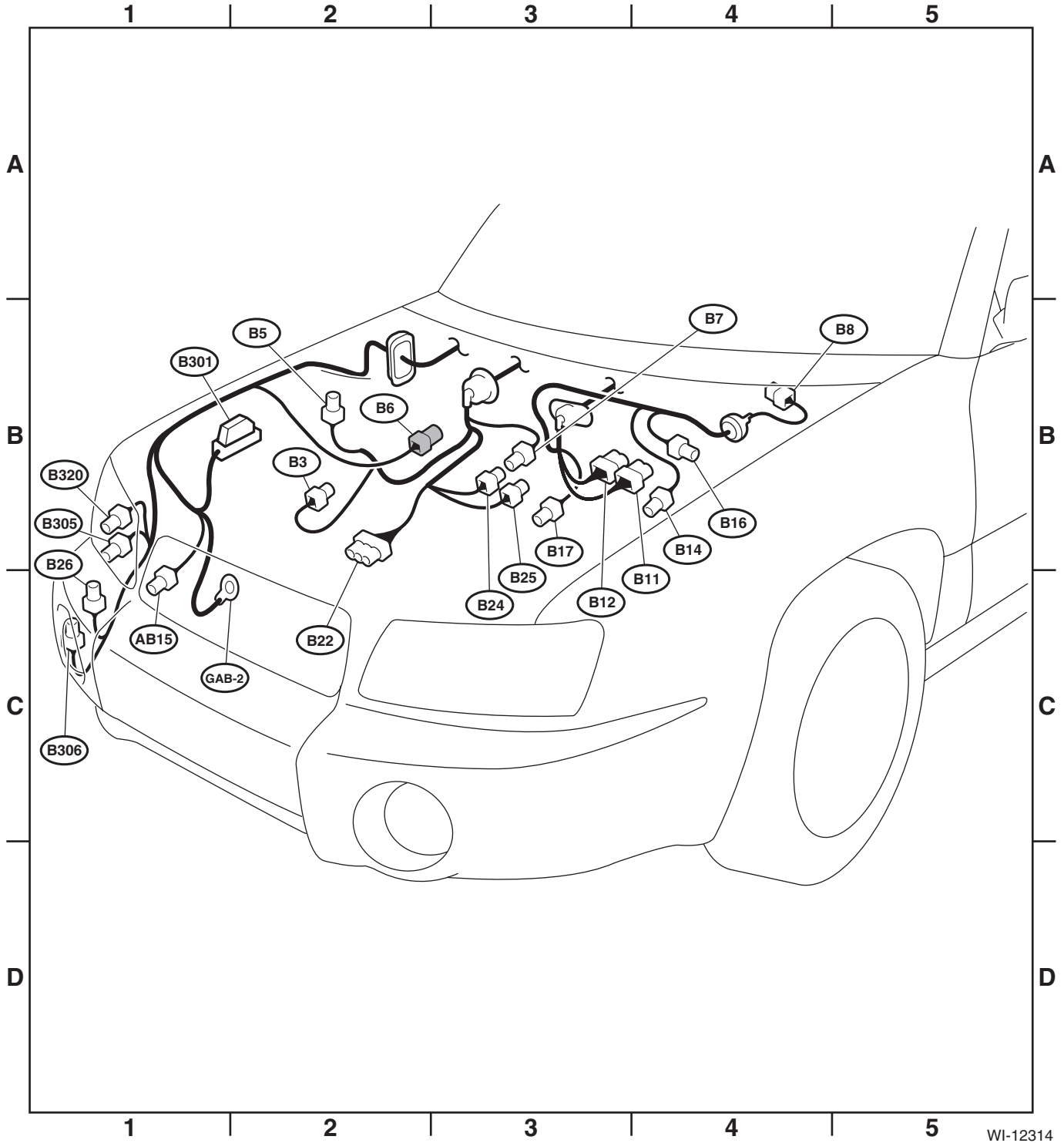
★ : White or natural color

Bulkhead Wiring Harness (In Engine Compartment)

WIRING SYSTEM

Airbag wiring harness

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
AB15	2	Yellow	C-1		Front sub sensor RH



WI-12314

Bulkhead Wiring Harness (In Engine Compartment)

WIRING SYSTEM

2. TURBO MODEL

Bulkhead wiring harness

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
B3	5	Black	B-2		Air flow sensor
B5	2	Gray	B-2		Daytime running light register
B6	2	Gray	B-2		Front ABS wheel speed sensor RH
B7	4	★	B-3		A/C pressure switch
B8	5	Gray	B-4		Front wiper motor
B11	20	Gray	B-4	T4	Transmission code (AT model)
B12	12	Gray	B-3	T3	
B14	1	Black	B-4		Starter motor (Magnet)
B16	2	Gray	B-4		Brake fluid level warning switch
B17	4	Black	B-3		Vehicle speed sensor (MT model)
B18	4	Gray	B-3	T5	Rear oxygen sensor
B20	16	Brown	B-2	E1	Engine wiring harness
B22	54	Black	B-2	E3	
B26	1	Black	C-1		Horn
B127	2	Blue	B-2		Wastegate solenoid
B128	4	Gray	B-3	T9	Transmission code (MT model)
B262	4	Gray	B-2		Front oxygen (A/F) sensor
B301	26	Black	B-2		ABS control module
B305	2	Gray	B-1		Front turn signal light RH
B306	2	Brown	C-1		Front fog light RH
B320	2	Gray	B-1		Side marker light RH
B368	16	Black	B-2		VDC hydraulic unit
B369	2	Gray	B-2		
B370	6	Black	B-2		

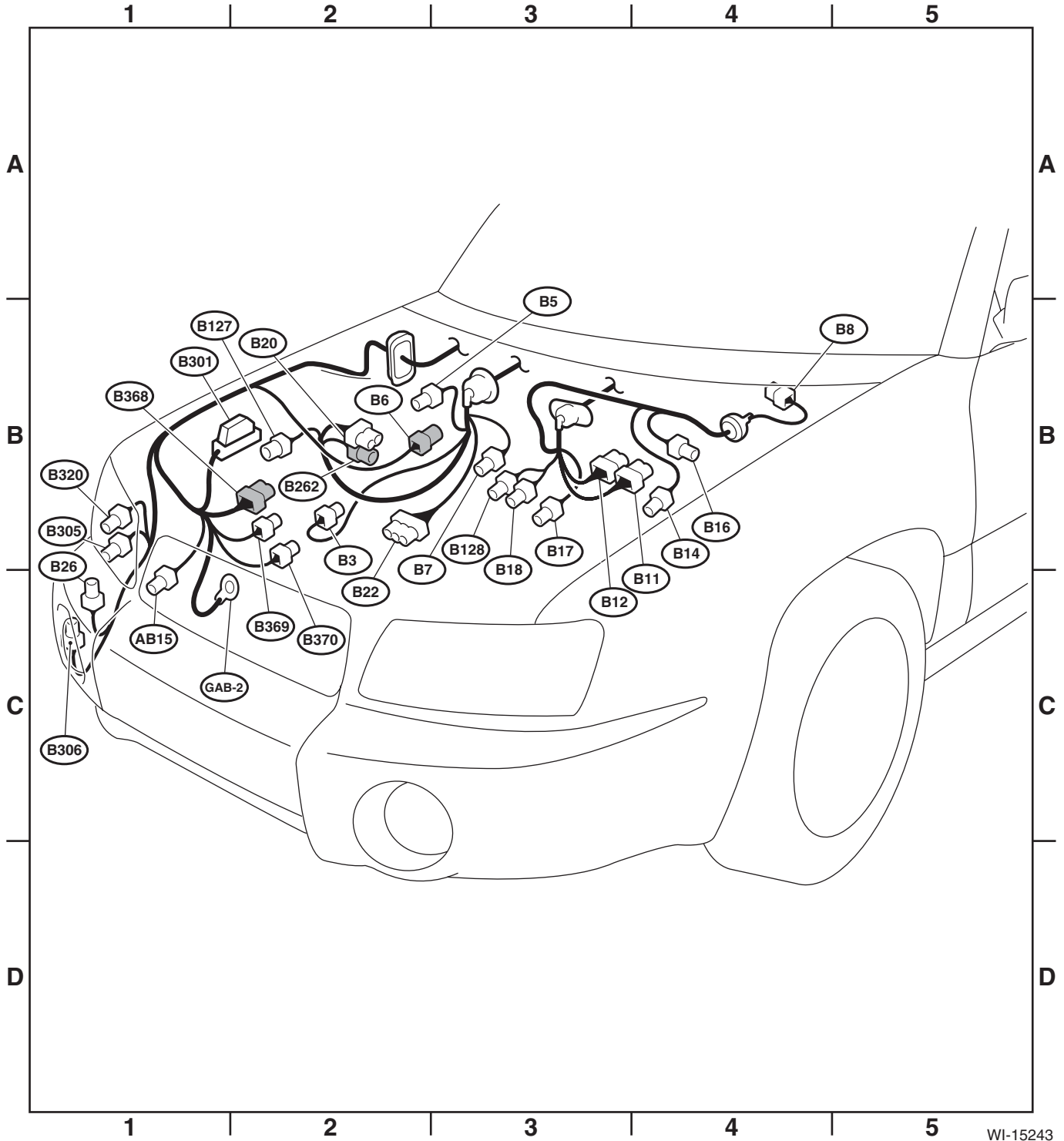
★ : White or natural color

Bulkhead Wiring Harness (In Engine Compartment)

WIRING SYSTEM

Airbag wiring harness

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
AB15	2	Yellow	C-1		Front sub sensor RH



WI-15243

Bulkhead Wiring Harness (In Compartment)

WIRING SYSTEM

55. Bulkhead Wiring Harness (In Compartment)

A: LOCATION

Bulkhead wiring harness

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
B2	5	Gray	C-2		HID relay
B30	25	★	C-1	D1	Front door cord LH
B31	8	★	D-1	AB1	Airbag wiring harness
B32	3	Black	B-3		Turn signal and hazard unit
B34	2	Yellow	C-4	AB50	Side airbag
B36	24	★	C-1	i1	Instrument panel wiring harness
B38	32	★	B-1	i3	
B40	16	Black	C-3		Data link connector
B41	2	★	C-1		Power window circuit breaker
B46	4	★	B-5		Fuel pump relay
B47	6	Brown	B-5		Main relay
B50	4	★	C-1		Blower fan relay (Manual A/C)
		Black	C-1		Blower fan relay (Auto A/C)
B51	8	Blue	C-1		Fuse & relay box (F/B)
B53	7	★	C-1		
B54	35	★	B-2		TCM
B55	35	★	C-2		
B59	5	Gray	C-1		Interrupt relay (Security)
B61	8	Black	B-1	F44	Front wiring harness
B62	24	Black	B-1	F45	
B65	4	Black	B-2		Stop light & brake switch
B69	4	★	B-3		Parking switch
B70	18	★	B-3		Combination switch
B71	17	★	B-3		
B72	4	Blue	C-2		Ignition switch
B73	6	★	C-3		Key lock solenoid and key warning switch
B75	2	Green	C-2	B76	Test mode connector
B76	2	Green	C-2	B75	
B77	10	Brown	B-3		Mode actuator (Auto A/C)
B86	6	Black	B-4		Blower fan resistor (Manual A/C)
B87	2	★	B-4		Blower motor (Manual A/C)
	6	★	B-4		Blower motor (Auto A/C)
B90	8	★	B-5	R50	Roof cord

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
B91	4	★	B-4		Intake actuator
B95	4	Brown	B-3		Diode (Daytime running light)
B100	20	Blue	B-2	F2	Front wiring harness
B101	25	★	B-5	D11	Front door cord RH
B102	5	Black	B-5		Daytime running light relay
B103	4	Blue	B-5		High-beam relay (Daytime running light)
B104	4	Black	C-1		Rear accessory relay
B106	2	★	B-2		Clutch switch (MT model)
B107	2	Blue	B-2		Clutch switch (MT model with cruise control)
B108	2	Black	C-1	F46	Front wiring harness
B112	2	Black	B-3		Diode (Front fog light)
B117	6	★	C-4		AT select lever
B119	4	★	C-4		Front accessory power supply socket
B122	8	★	C-4		Shield & sensor joint connector
B125	1	Green	B-5	B126	Line end check connector
B126	1	Green	B-5	B125	
B132	6	★	C-2		Headlight beam leveler switch (HID model)
B134	34	★	C-4		ECM
B135	35	★	B-4		
B136	35	★	B-4		
B137	31	★	B-4		
B141	26	Gray	B-2		Immobilizer control module (Turbo model)
B142	2	★	B-2		Immobilizer antenna (Turbo model)
B152	12	★	C-1		Fuse & relay box (F/B)
B158	10	Gray	C-1		
B160	6	Gray	C-2		Front fog light switch
B176	26	Gray	B-5		Keyless entry control module
B177	2	★	B-5		Wiper deicer
B193	8	★	C-2		Wiper deicer switch
B194	2	Black	C-1	B195	Joint connector (Key lock) (Turbo model)
B195	2	Black	C-1	B194	

Bulkhead Wiring Harness (In Compartment)

WIRING SYSTEM

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
B198	1	★	B-4	B199	Joint ground connector
B199	1	★	B-4	B198	
B201	24	Black	C-4	i40	Instrument panel wiring harness
B202	24	★	C-4	i41	Instrument panel wiring harness (Auto A/C)
	20	★	C-4	i41	Instrument panel wiring harness (Manual A/C)
B225	8	Black	C-2		Fuse (Relay block)
					Ignition relay (Relay block)
					Power window relay (Relay block)
					Front fog light relay (Relay block)
					Starter interlock relay (Relay block)
					Wiper deicer and mirror heater relay (Relay block)
B225					Seat heater relay (Relay block)
B230	6	Black	C-4		Yaw rate & lateral G sensor (with VDC)
B231	4	★	C-3		Steering angle sensor (with VDC)
B236	8	★	C-3		Steering roll connector
B256	3	★	B-4		Evaporator thermo switch
B271	12	Blue	C-1		Fuse & relay box (F/B)
B280	16	Blue	B-2		Body integrated unit
B281	20	Gray	B-2		
B292	3	★	C-4		ABS G sensor
B309	4	Black	B-4		Electronic throttle control relay
B310	83	Black	B-3		VDC control module
B312	6	★	B-3		VDC shield joint connector
B313	4	Brown	B-1		HID diode
B315	6	Black	B-3		Accelerator position sensor
B318	6	Brown	C-2		VDC OFF switch
B327	5	Gray	B-4		A/F & Oxygen sensor relay (Non-turbo model)
B348	8	★	B-4		Impact sensor

★ : White or natural color

Airbag wiring harness

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
AB1	8	★	D-1	B31	Bulkhead wiring harness
AB2	4	Yellow	C-3		Airbag module (Driver)
AB3	28	Yellow	C-4		Airbag control module
AB4	4	Yellow	B-5		Airbag module (Passenger)
AB1 3	2	Yellow	C-1	AB1 4	Front sub sensor LH

★ : White or natural color

56.Engine Wiring Harness and Transmission Cord

A: LOCATION

1. NON-TURBO MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
E3	54	Black	A-4	B22	Bulkhead wiring harness
E4	2	Black	A-3		CPC Solenoid
E5	2	Dark gray	A-2		Fuel injector No. 1
E6	2	Dark gray	A-3		Fuel injector No. 3
E8	3	Light gray	A-3		Engine coolant temperature sensor and thermometer
E10	2	Light gray	B-3		Crankshaft position sensor
E11	1	★	B-2		Oil pressure switch
E12	4	Dark gray	A-3		Ignition coil and ignitor
E14	2	Gray	A-4		Knock sensor
E15	2	Gray	B-4		Camshaft position sensor
E16	2	Dark gray	B-4		Fuel injector No. 2
E17	2	Dark gray	B-4		Fuel injector No. 4
E18	6	Dark gray	A-4		EGR solenoid valve
E19	1	★	B-2		Power steering oil pressure switch
E21	3	Black	A-3		Pressure sensor
E22	4	Dark gray	A-2		Rear oxygen sensor
E23	6	Black	A-2		Front oxygen (A/F) sensor
E57	6	Black	A-3		Electronic throttle control
E61	2	Dark gray	A-4		PCV diagnosis connector
E69	2	Blue	A-3		Oil switching solenoid valve RH
E70	2	Blue	B-4		Oil switching solenoid valve LH
E71	1	★	A-3		Variable valve lift diagnosis oil pressure switch RH
E72	1	★	B-4		Variable valve lift diagnosis oil pressure switch LH
E75	2	Black	B-3		Oil temperature sensor

★ : White or natural color

Engine Wiring Harness and Transmission Cord

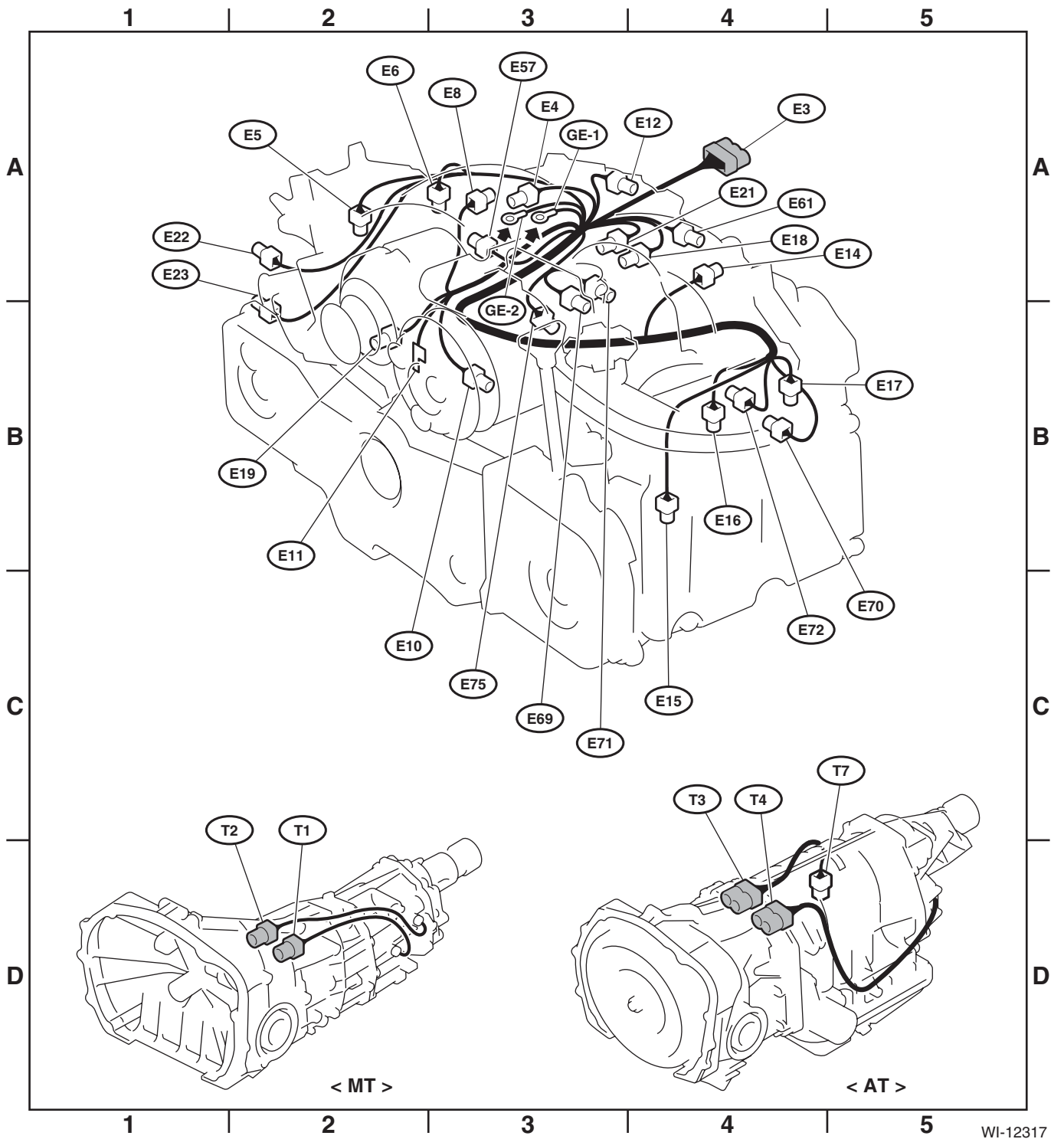
WIRING SYSTEM

Transmission cord

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
T1	2	Gray	D-2	B24	Bulkhead wiring harness (MT model)
T2	2	Brown	D-2	B25	
T3	12	Black	D-4	B12	Bulkhead wiring harness (AT model)
T4	20	Gray	D-4	B11	
T7	12	Black	D-4		Inhibitor switch

Engine Wiring Harness and Transmission Cord

WIRING SYSTEM



WI-12317

Engine Wiring Harness and Transmission Cord

WIRING SYSTEM

2. TURBO MODEL

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
E1	16	Brown	A-2	B20	Bulkhead wiring harness
E3	54	Black	A-3	B22	
E4	2	Black	B-3		CPC solenoid No. 1
E5	2	Dark gray	A-2		Fuel injector No. 1
E6	2	Dark gray	A-2		Fuel injector No. 3
E8	3	Light gray	B-3		Engine coolant temperature sensor and thermometer
E10	2	Light gray	B-2		Crankshaft position sensor
E11	1	★	B-2		Oil pressure switch
E14	2	Light gray	A-4		Knock sensor
E16	2	Dark gray	B-4		Fuel injector No. 2
E17	2	Dark gray	B-4		Fuel injector No. 4
E19	1	★	B-3		Power steering oil pressure switch
E21	3	Black	A-3		Pressure sensor
E31	3	★	B-2		Ignition coil No. 1
E32	3	★	B-4		Ignition coil No. 2
E33	3	Black	A-3		Ignition coil No. 3
E34	3	Black	B-4		Ignition coil No. 4
E35	3	Light gray	A-4		AVCS camshaft position sensor LH
E36	3	Light gray	A-3		AVCS cam shaft position sensor RH
E37	2	Blue	B-4		AVCS solenoid LH
E38	2	Blue	A-2		AVCS solenoid RH
E40	2	Black	B-3		Secondary air combination valve RH
E41	6	Black	B-4		Secondary air combination valve LH (with pressure sensor integrated)
E50	3	Black	B-3		TGV position sensor LH
E51	2	Black	A-4		TGV LH
E52	2	Black	B-3		CPC solenoid No. 2
E54	3	Black	A-3		TGV position sensor RH
E55	2	Black	A-2		TGV RH
E57	6	Black	A-3		Electronic throttle control
E61	2	Dark gray	A-3		PCV diagnosis connector

★ : White or natural color

Engine Wiring Harness and Transmission Cord

WIRING SYSTEM

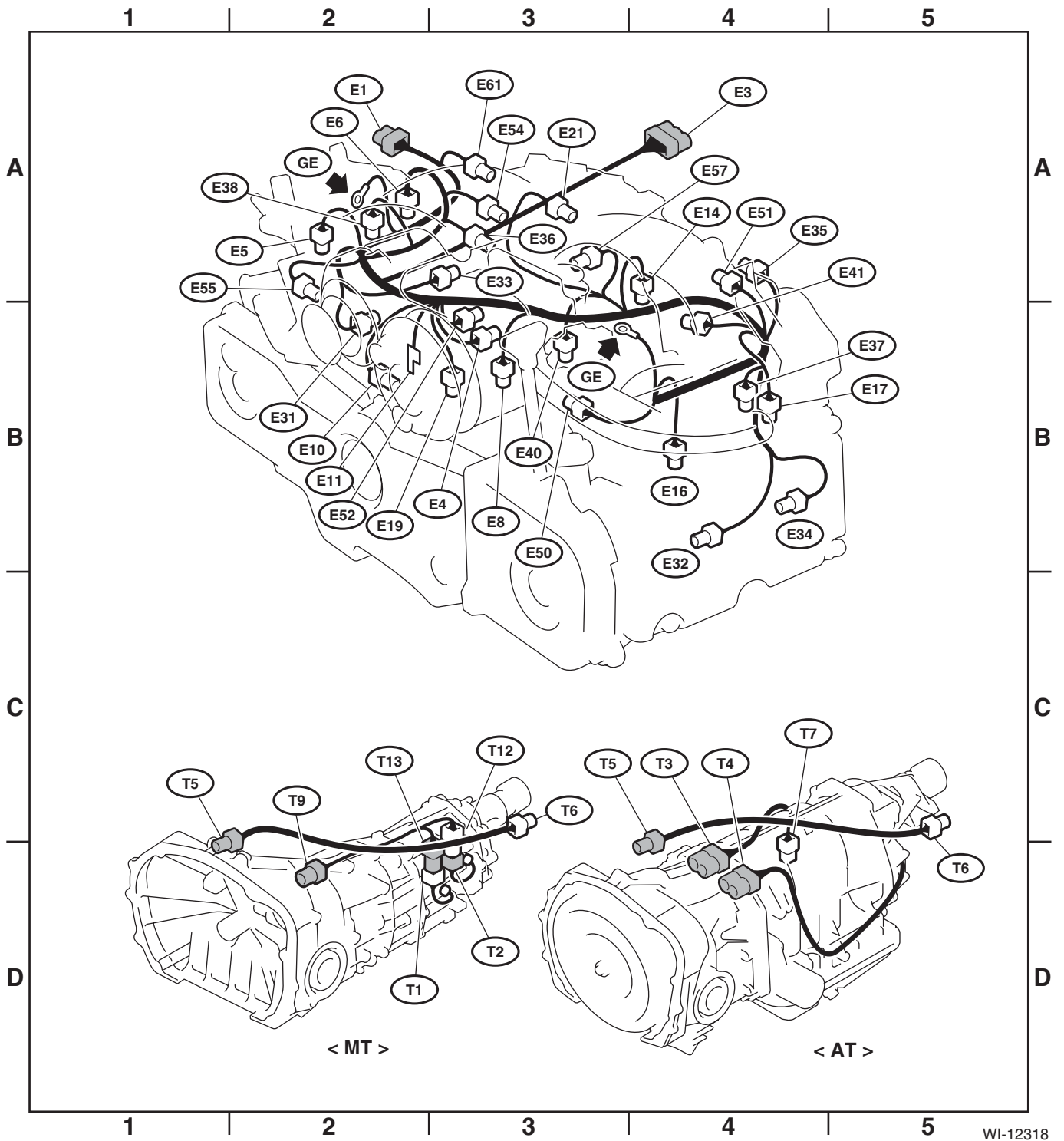
Transmission cord

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
T1	2	★	D-3		Transmission code (MT model)
T2	2	★	D-3		
T3	12	Black	D-4	B12	Bulkhead wiring harness (AT model)
T4	20	Gray	D-4	B11	
T5	4	Dark gray	C-1	B18	Bulkhead wiring harness (MT model)
			C-4	B18	Bulkhead wiring harness (AT model)
T6	4	Dark gray	C-3		Rear oxygen sensor (MT model)
			C-5		Rear oxygen sensor (AT model)
T7	12	Black	D-4		Inhibitor switch (AT model)
T9	4	Gray	D-2	B128	Bulkhead wiring harness (MT model)
T12	2	Brown	D-3		Neutral switch (MT model)
T13	2	Gray	D-3		Back-up light switch (MT model)

★ : White or natural color

Engine Wiring Harness and Transmission Cord

WIRING SYSTEM



WI-12318

57. Instrument Panel Wiring Harness

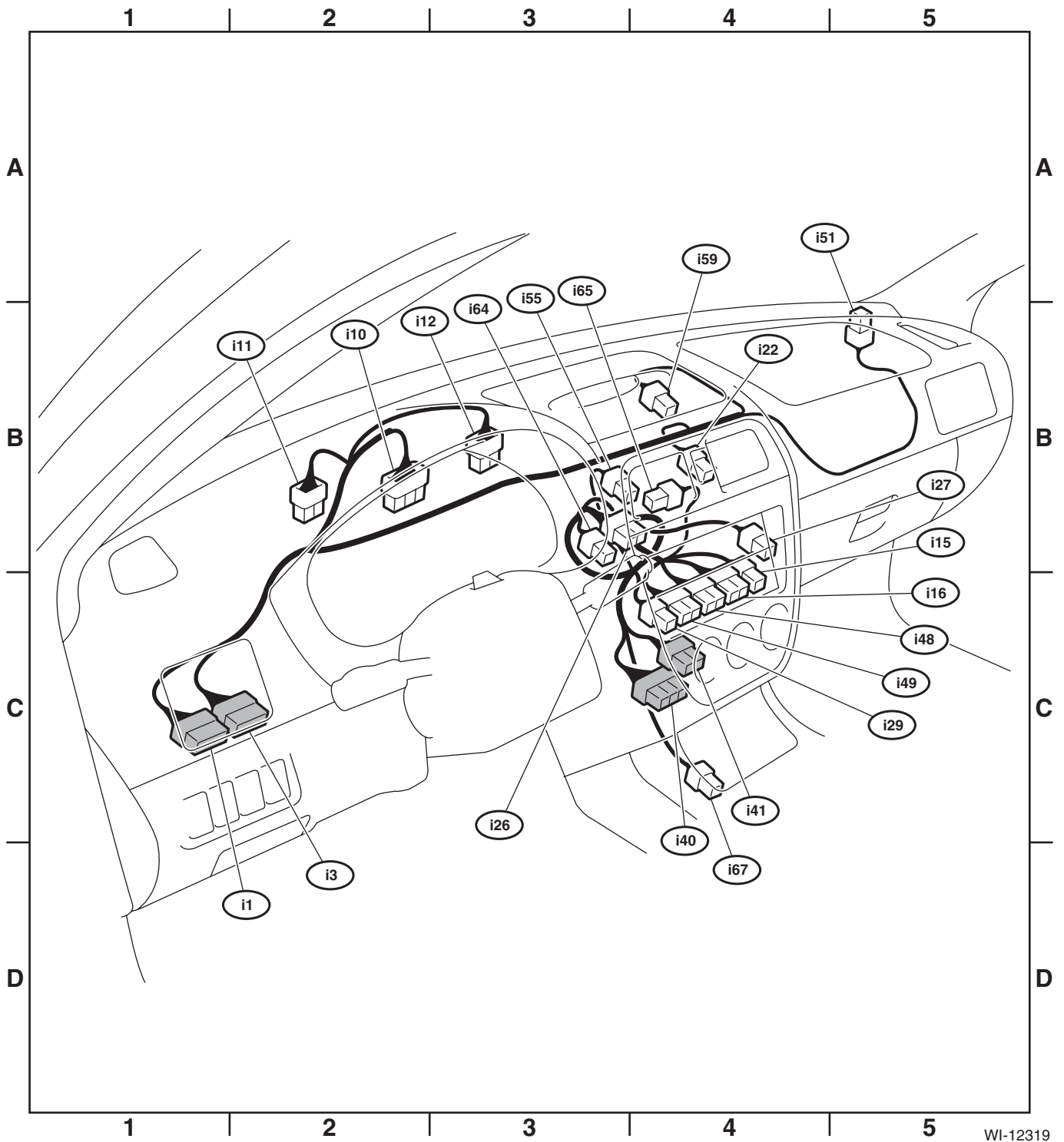
A: LOCATION

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
i1	24	★	C-1	B36	Bulkhead wiring harness
i3	32	★	C-1	B38	
i10	30	Green	B-2		Combination meter
i11	10	Green	B-2		
i12	14	Green	B-3		
i15	6	★	C-4		Blower fan switch (Manual A/C)
i16	12	★	C-4		Manual A/C control module
i22	8	★	B-4		Hazard switch
i26	14	★	B-3		Audio
i27	2	★	B-4		CD player illumination light
i29	1	Black	C-4		Audio bracket earth
i40	24	Black	C-4	B201	Bulkhead wiring harness
i41	24	★	C-4	B202	Bulkhead wiring harness (Auto A/C)
i41	20	★	C-4	B202	Bulkhead wiring harness (Manual A/C)
i48	16	Gray	C-4		Auto A/C control module
i49	20	Gray	C-4		
i51	2	★	B-5		Sunload sensor
i55	2	★	B-3		In-vehicle sensor
i59	10	Green	B-4		Clock
i64	8	Black	B-3		Audio (with woofer, without AUX terminal)
		★	B-3		Audio (with woofer and AUX terminal)
i65	6	Black	B-4		Air mix actuator (Auto A/C)
i67	6	★	C-4		AUX terminal box

★ : White or natural color

Instrument Panel Wiring Harness

WIRING SYSTEM



WI-12319

58.Rear Wiring Harness

A: LOCATION

• Rear wiring harness

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
R1	8	Black	B-2	B97	Bulkhead wiring harness
R2	12	★	B-2	B98	
R3	24	★	B-2	B99	
R4	1	Black	B-3		Parking brake switch
R8	2	★	C-4		Seat belt switch (Manual seat)
R15	12	★	B-3	R57	Fuel tank cord
R22	3	★	B-5		Rear door switch LH
R41	4	Blue	B-2		Seat heater RH
R42	4	★	B-3		Seat heater switch RH
R43	4	Blue	B-3		Seat heater switch LH
R72	2	★	B-3		Rear ABS wheel speed sensor RH
R73	2	★	C-4		Rear ABS wheel speed sensor LH
R146	2	★	B-3		Rear accessory power socket
R188	8	Black	C-3		Power seat & seat heater and seat belt switch (with power seat)

★ : White or natural color

• Bulkhead wiring harness

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
B97	8	Black	B-2	R1	Rear wiring harness
B98	12	★	B-2	R2	
B99	24	★	B-2	R3	
B266	8	★	B-2	D28	Rear door cord RH
B267	3	★	C-4		Front door switch LH
B268	3	★	B-2		Front door switch RH
B270	8	★	C-4	D22	Rear door cord LH

★ : White or natural color

• Roof cord

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
R50	8	★	B-1	B90	Bulkhead wiring harness
R52	3	★	A-3		Room light
R55	2	★	B-2		Sunroof control unit and motor
R56	2	★	B-3		Spot map light
R139	3	★	B-2		Compass mirror

★ : White or natural color

Rear Wiring Harness

WIRING SYSTEM

• Fuel tank cord

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
R47	3	Black	B-4		Fuel tank pressure sensor
R57	12	★	B-3	R15	Rear wiring harness
R58	6	★	B-3		Fuel pump assembly
R59	2	★	B-4		Fuel gauge sub module
R68	2	Gray	B-4		Pressure control solenoid valve
R69	2	Black	B-4		Drain valve

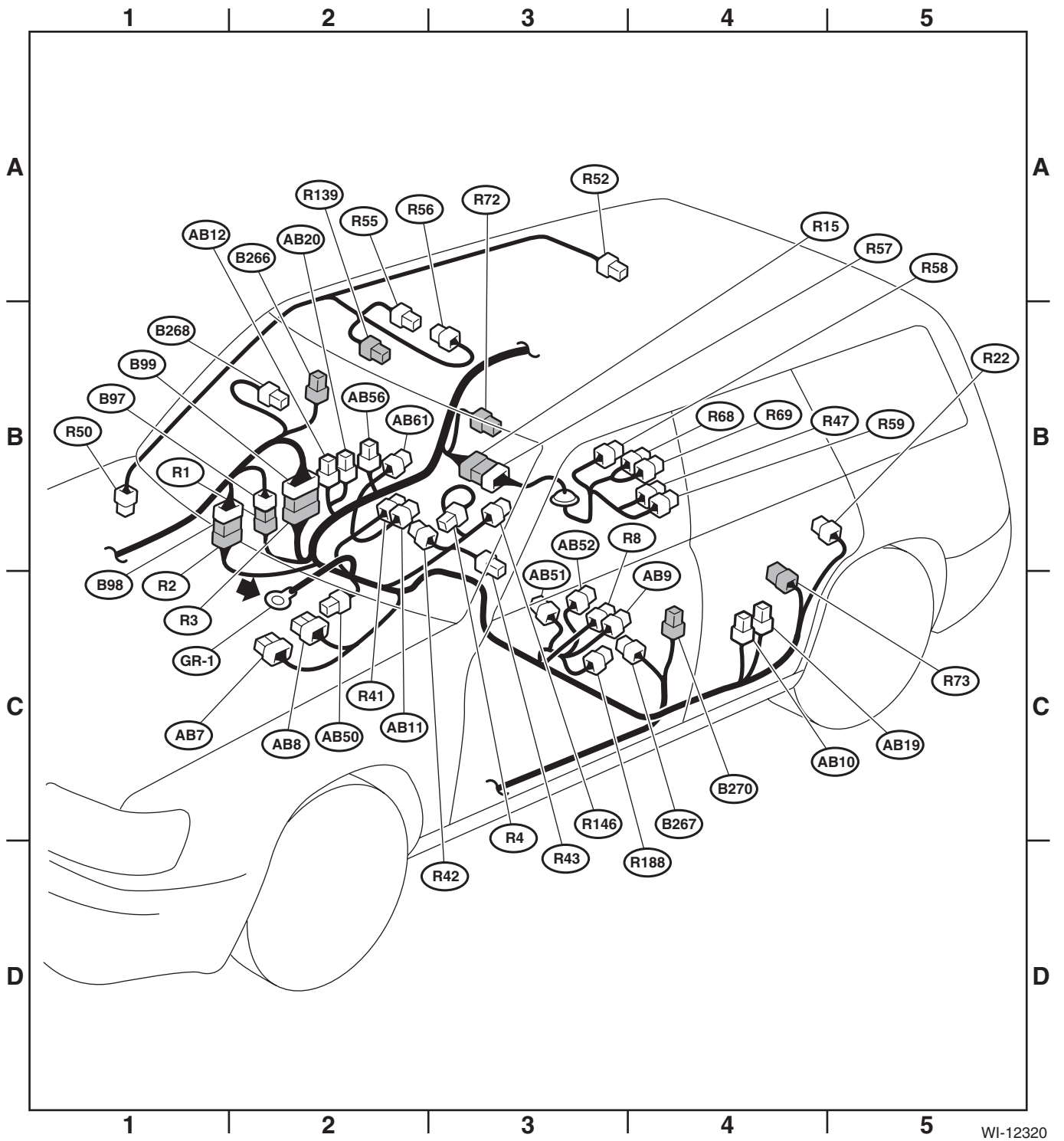
★ : White or natural color

• Airbag wiring harness

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
AB7	12	Yellow	C-2		Airbag control module
AB8	12	Yellow	C-2		
AB9	2	Yellow	C-3		Inflator (Side LH)
AB10	4	Yellow	C-4		Side airbag sensor LH
AB11	2	Yellow	B-2		Inflator (Side RH)
AB12	4	Yellow	B-2		Side airbag sensor RH
AB19	2	Black	C-4		ELR pretensioner LH
AB20	2	Black	B-2		ELR pretensioner RH
AB50	2	Yellow	C-2	B34	Bulkhead wiring harness
AB51	2	Yellow	C-3		Buckle switch
AB52	2	Yellow	C-3		Seat position sensor
AB56	3	Brown	B-2		Belt tension sensor
AB61	6	Gray	B-2	AB59	Airbag wiring harness

Rear Wiring Harness

WIRING SYSTEM



WI-12320

Door Cord

WIRING SYSTEM

59. Door Cord

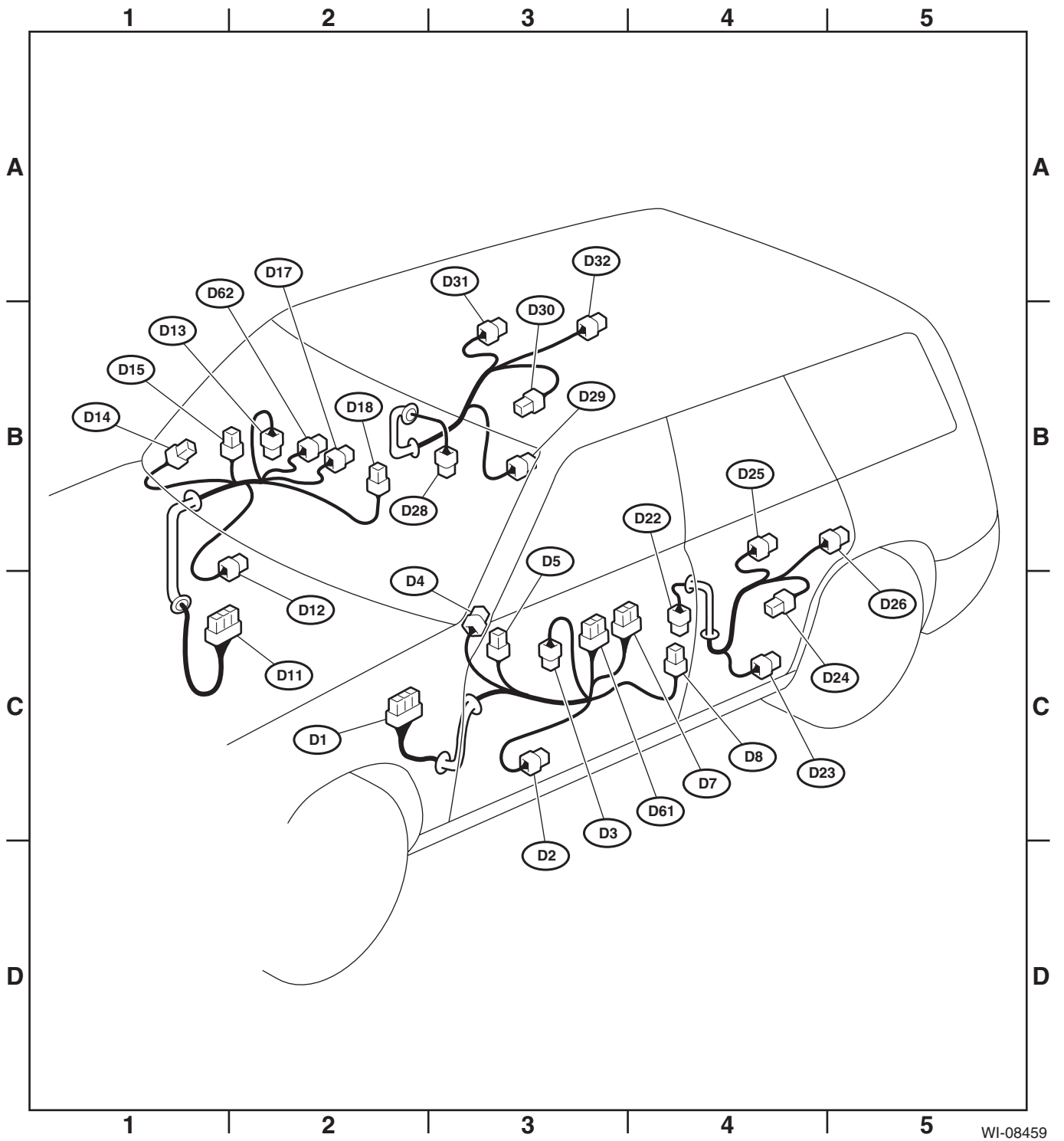
A: LOCATION

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
D1	25	★	C-2	B30	Bulkhead wiring harness
D2	2	★	C-3		Front door speaker LH
D3	2	Green	C-3		Front power window motor LH
D4	2	Black	C-3		Front door tweeter LH
D5	6	★	C-3		Outer mirror assembly LH (without outer mirror turn signal light, mirror heater)
	8	★	C-3		Outer mirror assembly LH (without outer mirror turn signal light, with mirror heater)
	8	★	C-3		Outer mirror assembly LH (with outer mirror turn signal light, without mirror heater)
	10	★	C-3		Outer mirror assembly LH (with outer mirror turn signal light, mirror heater)
D7	16	★	C-4		Front power window main switch
D8	4	★	C-4		Front door lock actuator LH
D11	25	★	C-1	B101	Bulkhead wiring harness
D12	2	★	B-1		Front door speaker LH
D13	2	Green	B-2		Front power window motor RH
D14	2	Black	B-1		Front door tweeter RH
D15	6	★	B-1		Outer mirror assembly RH (without outer mirror turn signal light, mirror heater)
	8	★	B-1		Outer mirror assembly RH (without outer mirror turn signal light, with mirror heater)
	8	★	B-1		Outer mirror assembly RH (with outer mirror turn signal light, without mirror heater)
	10	★	B-1		Outer mirror assembly RH (with outer mirror turn signal light, mirror heater)
D17	8	★	B-2		Front power window sub-switch RH
D18	4	★	B-2		Front door lock actuator RH
D22	8	★	C-4	B270	Bulkhead wiring harness
D23	2	★	C-4		Rear door speaker LH
D24	2	Green	C-4		Rear power window motor LH
D25	8	★	B-4		Rear power window sub-switch LH
D26	4	★	B-5		Rear door lock actuator LH
D28	8	★	B-3	B266	Bulkhead wiring harness
D29	2	★	B-3		Rear door speaker RH
D30	2	Green	B-3		Rear power window motor RH
D31	8	★	B-3		Rear power window sub-switch RH
D32	4	★	B-3		Rear door lock actuator RH
D61	10	★	C-3		Remote control mirror switch
D62	5	★	B-2		Front door sub-switch

★ : White or natural color

Door Cord

WIRING SYSTEM



WI-08459

Rear Wiring Harness and Rear Gate Cord

WIRING SYSTEM

60. Rear Wiring Harness and Rear Gate Cord

A: LOCATION

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
R16	3	★	C-5		Rear door switch RH
R26	6	★	C-4		Rear combination light RH
R28	6	★	C-1		Rear combination light LH
R32	2	★	C-4		Rear accessory power socket
R38	4	★	C-4	D33	Rear gate cord
R39	8	★	C-4	D34	
R79	6	★	C-3		Trailer connector
R97	1	★	B-2		Antenna amplifier
R116	8	★	C-4		Rear wiper intermittent unit
R117	2	Black	C-2		Woofers
R122	6	★	C-4		Fuel pump control unit (Turbo model)
R147	5	★	C-4		Joint ground connector

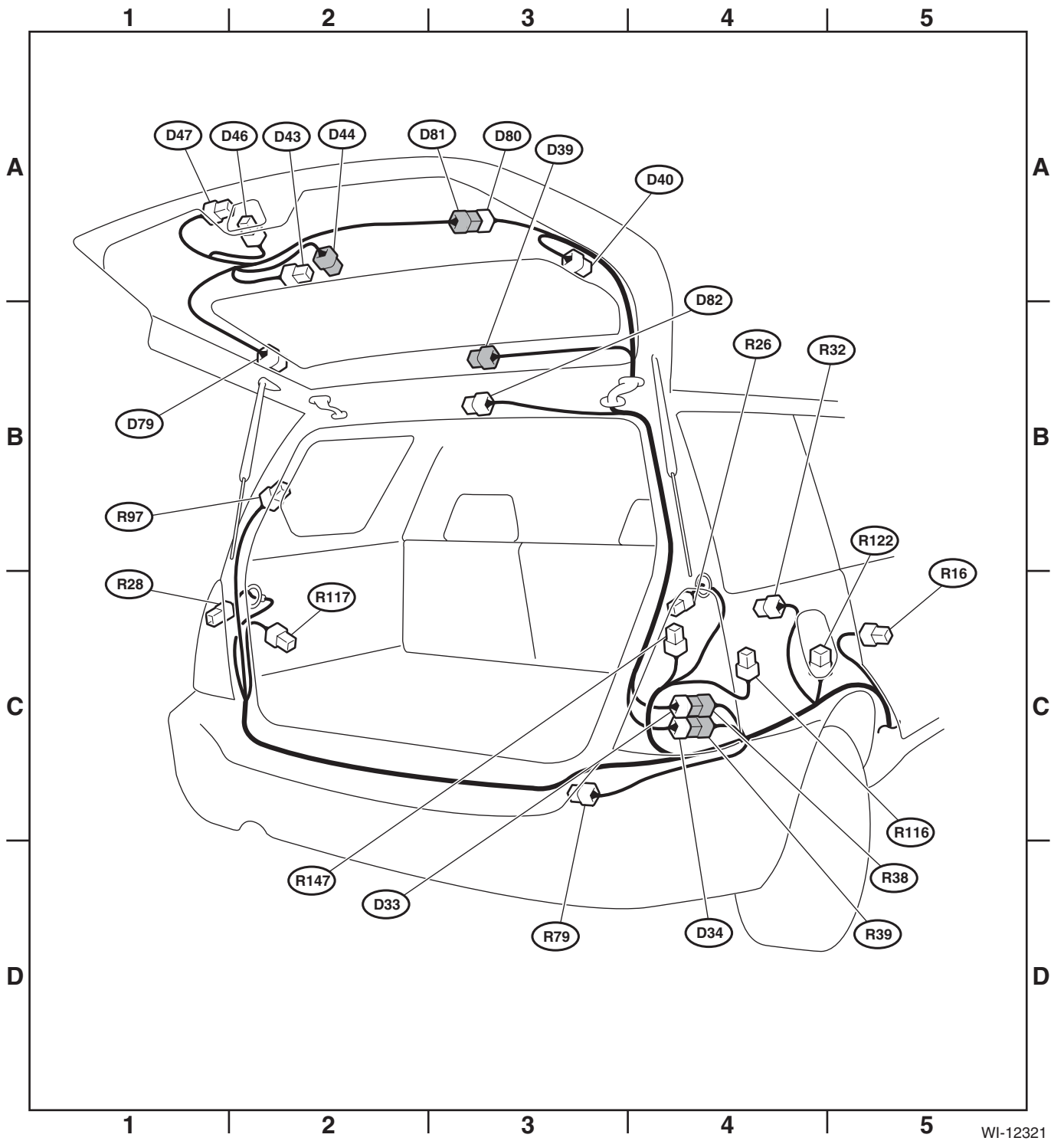
★ : White or natural color

Connector				Connecting to	
No.	Pole	Color	Area	No.	Description
D33	4	★	C-4	R38	Rear wiring harness
D34	8	★	C-4	R39	
D39	2	Black	B-3		High-mounted stop light
D40	1	Black	A-3		Rear defogger
D43	4	★	A-2		Rear wiper motor
D44	2	★	A-2		License plate light
D46	2	Black	A-2		Rear gate latch switch
D47	4	★	A-1		Rear gate lock actuator
D79	1	Black	B-2		Rear defogger
D80	8	Black	A-3	D81	Rear gate cord
D81	8	Black	A-3	D80	
D82	3	★	B-3		Luggage room light

★ : White or natural color

Rear Wiring Harness and Rear Gate Cord

WIRING SYSTEM



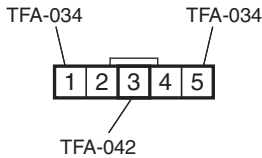
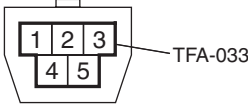
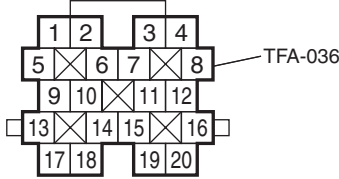
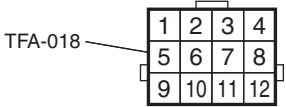
Harness Repair Kit

WIRING SYSTEM

61.Harness Repair Kit


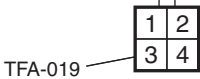
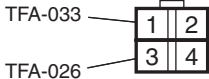
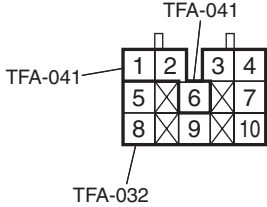
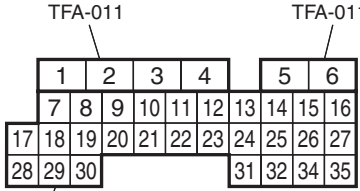
A: SPECIFICATION

1. ADAPTATION TABLE

Connector No.	Adaptive repair kit	Terminal No.	Harness repair kit No.
B3	 <p style="text-align: right;">WI-06087</p>	1, 2, 4, 5	TFA-034
		3	TFA-042
B8	 <p style="text-align: right;">WI-04676</p>	ALL	TFA-033
B11	 <p style="text-align: right;">WI-04677</p>	ALL	TFA-036
B12	 <p style="text-align: right;">WI-04679</p>	ALL	TFA-018

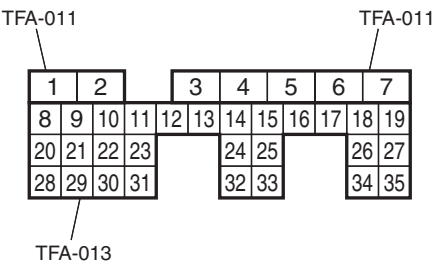
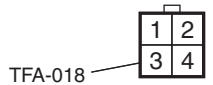
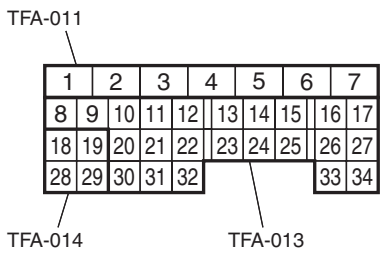
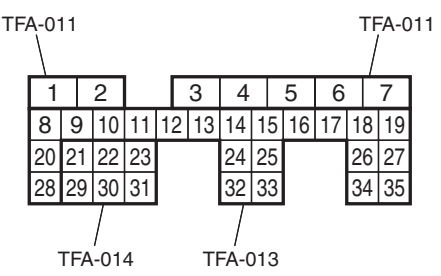
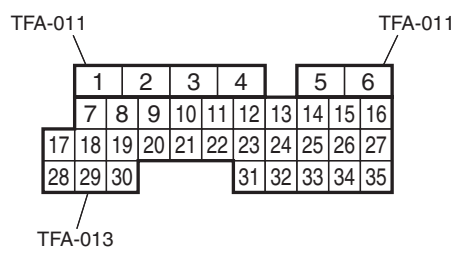
Harness Repair Kit

WIRING SYSTEM

Connector No.	Adaptive repair kit	Terminal No.	Harness repair kit No.
B17 (Non-turbo MT model)	 <p>TFA-019</p>	ALL	TFA-019
	WI-06088		
B17 (Turbo MT model)	 <p>TFA-019</p>	ALL	TFA-019
	WI-06089		
B18	 <p>TFA-033</p> <p>TFA-026</p>	1, 2	TFA-033
		3, 4	TFA-026
	WI-06090		
B20 (Turbo model)	 <p>TFA-041</p> <p>TFA-041</p> <p>TFA-032</p>	1, 2, 6	TFA-041
		3 — 5, 7 — 10	TFA-032
	WI-11568		
B54	 <p>TFA-011</p> <p>TFA-011</p> <p>TFA-013</p>	1 — 6	TFA-011
		7 — 35	TFA-013
	WI-11569		

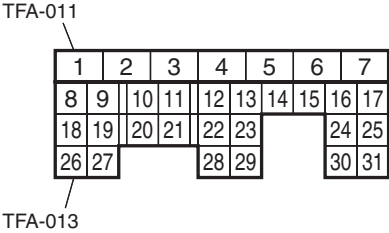
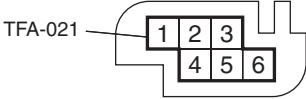
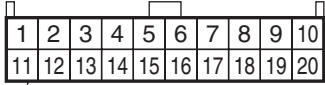

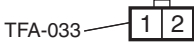
Harness Repair Kit

WIRING SYSTEM

Connector No.	Adaptive repair kit	Terminal No.	Harness repair kit No.
B55	 <p style="text-align: right;">WI-11570</p>	1 — 7	TFA-011
		8 — 35	TFA-013
B128 (Turbo MT model)	 <p style="text-align: right;">WI-06096</p>	ALL	TFA-018
B134	 <p style="text-align: right;">WI-11571</p>	1 — 7	TFA-011
		8 — 17, 20 — 27, 30 — 34	TFA-013
		18, 19, 28, 29	TFA-014
B135	 <p style="text-align: right;">WI-11572</p>	1 — 7	TFA-011
		8 — 20, 24 — 28, 32 — 35	TFA-013
		21 — 23, 29 — 31	TFA-014
B136	 <p style="text-align: right;">WI-11573</p>	1 — 6	TFA-011
		7 — 35	TFA-013

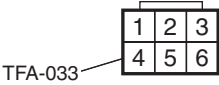
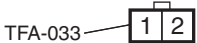
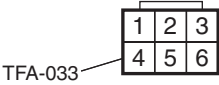


Harness Repair Kit

WIRING SYSTEM

Connector No.	Adaptive repair kit	Terminal No.	Harness repair kit No.
<p>B137</p>	<p>TFA-011</p>  <p>WI-04697</p>	1 — 7	TFA-011
		8 — 31	TFA-013
<p>B230 (Model with VDC)</p>	<p>TFA-021</p>  <p>WI-04700</p>	ALL	TFA-021
<p>B281</p>	<p>TFA-016</p>  <p>WI-11574</p>	ALL	TFA-016
<p>B292 (Model without VDC)</p>	<p>TFA-012</p>  <p>WI-06101</p>	ALL	TFA-012
<p>B305</p>	<p>TFA-033</p>  <p>WI-04717</p>	ALL	TFA-033



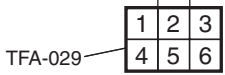
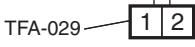
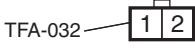
Harness Repair Kit

WIRING SYSTEM

Connector No.	Adaptive repair kit	Terminal No.	Harness repair kit No.
F7	 <p style="text-align: right;">WI-11576</p>	ALL	TFA-033
F19	 <p style="text-align: right;">WI-04717</p>	ALL	TFA-033
F23	 <p style="text-align: right;">WI-11576</p>	ALL	TFA-033
F24	 <p style="text-align: right;">WI-06103</p>	ALL	TFA-018
F26	 <p style="text-align: right;">WI-06104</p>	ALL	TFA-032

Harness Repair Kit

WIRING SYSTEM

Connector No.	Adaptive repair kit	Terminal No.	Harness repair kit No.
F102	 <p style="text-align: right;">WI-06109</p>	ALL	TFA-018
R47	 <p style="text-align: right;">WI-06088</p>	ALL	TFA-019
R58	 <p style="text-align: right;">WI-11578</p>	ALL	TFA-029
R59	 <p style="text-align: right;">WI-06095</p>	ALL	TFA-029
R68	 <p style="text-align: right;">WI-06110</p>	ALL	TFA-032

Harness Repair Kit

WIRING SYSTEM
